Mathematics

Grade 8

DETROIT
PUBLIC SCHOOLS
COMMUNITY DISTRICT

Dear DPSCD Families,

The Office of Mathematics is partnering with families to support Distance Learning while students are home. As your child's first teacher, we empower you to utilize the resources provided to foster a deeper understanding of grade-level mathematics.

Students in grades K-8 will work from our core curriculum, Eureka Math, utilizing this Academic Packet supported by Knowledge on the Go recorded videos. The videos have a Eureka Math instructor presenting a lesson for students to engage in grade-level mathematics. The instructor will guide students to work through the lesson by completing problems simultaneously with your child and/or asking them to pause the video for independent solving and then check. As the instructor demonstrates sample problems in the Problem Set, Application Problems, Fluency Activities, Examples and/or Exercises, parents feel free to engage your child in this work. Ask students to show work and explain their answers. When appropriate have students add models or drawings to help them solve and record answers in complete sentences.

Daily lesson guidance can be found on the pages that follow. Each day has been designed to provide you access to materials from the Eureka Math Knowledge on the Go website https://gm.greatminds.org/en-us/knowledgeonthego . After you have accessed the site, click your child's grade level, and scroll down to find the desired lesson. The resources are found at the bottom of the page and we recommend the lessons be completed in order.

SCAN ME

Eureka Math is our core curriculum, but we also recognize it is necessary to differentiate mathematics instruction to meet all students' needs. Students took the **i-Ready** diagnostic earlier this year and it created a Learning Path for students to follow. Students work weekly on the goals set on the i-Ready Learning Path. After their core math lesson, if able, we ask that students continue to work on their Learning Path by logging on to www.clever.com and selecting the i-Ready icon. In addition, students may also access the i-Ready Teacher-Assigned Lessons which would be an enrichment to grade-level content and should be utilized if extension activities are needed.

SCAN ME

If one-on-one, live support is required, please feel free to call the **Homework Hotline** at 1-833-466-3978. Please check the Homework Hotline page for operating hours. We have DPSCD mathematics teachers standing by and are ready to assist.

SCAN ME

If students need additional help, and parents have internet access, please refer to the **Homework Helper** document and sign up for an account. Homework Helper provides step by step

explanations of how to work the Eureka Math problems. Also, provided on the Eureka Math Knowledge on the Go website is a plethora of **Additional Resources** that consists of Templates, Homework, Parent Tip Sheets, and more.

We appreciate your continued dedication, support and partnership with Detroit Public Schools Community District and with your assistance we can press forward with our priority: Outstanding Achievement. Be safe. Be well!

Tony R. Hawk

Deputy Executive Director of K-12 Mathematics

Parents,

Find additional resources aligned to Eureka Math here:

EUREKA MATH™

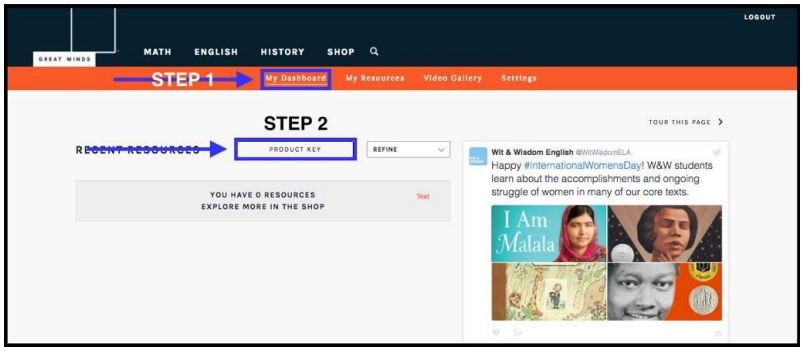
ACCESSING HOMEWORK HELPER eBOOKS

STEP 1: CREATE AN ACCOUNT

Sign up for a free account at GreatMinds.org/store/signup.

STEP 2: ACCESS YOUR DASHBOARD

Once you have created an account at GreatMinds.org, you will be taken to your Dashboard.



After you have logged in you can also access your Dashboard by clicking “MY DASHBOARD” in the upper right-hand corner of the site.

STEP 3: ENTER YOUR PRODUCT KEY

In your Dashboard you will see several buttons, select “PRODUCT KEY” and enter **H00688525** to access your Homework Helper eBook.

STEP 4: ACCESS YOUR HOMEWORK HELPER eBOOK

After you’ve entered your Product Key, select a grade-level, and the Homework Helper eBook will be added to your Dashboard. Click “LAUNCH PRODUCT” to navigate into the eBook. Note: if you are viewing the Homework Helper eBooks on a mobile device or tablet, we recommend using landscape view.

Questions? Contact us at info@GreatMinds.org.

Clever—How to access DPSCD Curriculum Applications through Clever.com

DETROIT PUBLIC SCHOOLS COMMUNITY DISTRICT
Students Rise. We All Rise.

1 Click on the Clever desktop shortcut or open Google Chrome and go to clever.com/in/dpscd

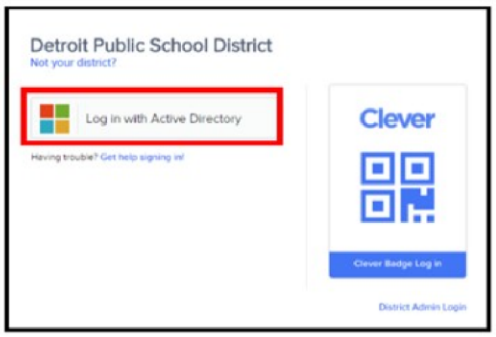
1 

OR Clever.com/in/dpscd

2 Click "Log in with Active Directory"

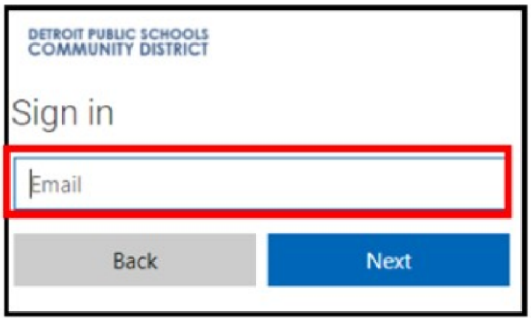
Teacher's will use the same credentials that they use to login to their email.

Student's will follow the following format listed below

2 

3 Enter student's username in the space identified. The username will consist of the students ID # with @thedps.org appended on.

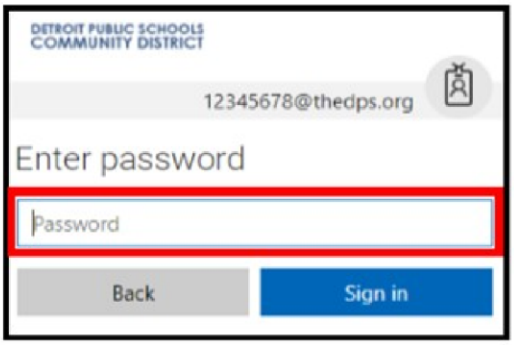
For example 12345678@thedps.org

3 

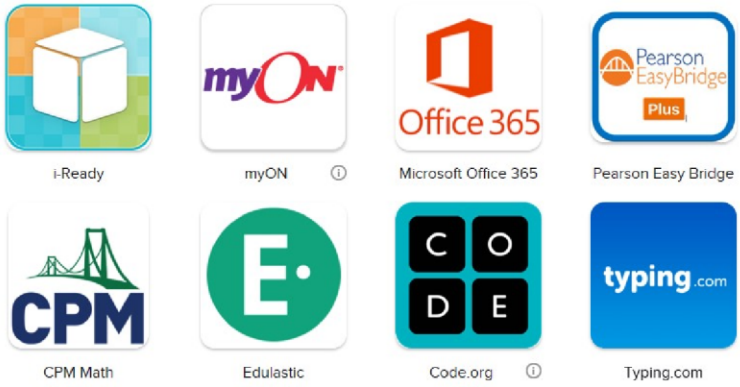
4 Enter the student's password. The password will consist of the following:

First letter of first name in upper case
First letter of last name in lower case
2 digit of their birth month
2 digit of their birth year
01 (male) or 02 (female)

For example: Jane Doe's birthday is May 13, 2004. Her password is Jd050402

4 

5 Click on the application you are interested in accessing

5 

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

4/14/20 to 4/17/20 Week 1 (4 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.
Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.C.7

Module Module 4: Linear Equations
Topic Topic A: Writing and Solving Linear Equations

Materials Needed :

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

SCAN ME Knowledge on the Go Videos

SCAN ME clever.com

SCAN ME Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day1	Knowledge on the Go Lesson Materials for Module 4, Lesson 1	i-Ready "Teacher Assigned" Lesson clever.com	i-Ready "My Path" Lesson clever.com
Day 2	Knowledge on the Go Lesson Materials for Module 4, Lesson 2	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 3	Knowledge on the Go Lesson Materials for Module 4, Lesson 3	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 4	Knowledge on the Go Lesson Materials for Module 4, Lesson 4	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 1

Standard	8.EE.C.7
Learning Target	Students write mathematical statements using symbols to represent numbers. Students know that written statements can be written as more than one correct mathematical sentence.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 1***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 1*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 1.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

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Lesson 2

Standard	8.EE.C.7
Learning Target	Students know the properties of linear and nonlinear expressions in x . Students transcribe and identify expressions as linear or nonlinear.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 2***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 2*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 2.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 3

Standard	8.EE.C.7
Learning Target	Students know that a linear equation is a statement of equality between two expressions. Students know that a linear equation in x is actually a question: Can you find all numbers x , if they exist, that satisfy a given equation? Students know that those numbers x that satisfy a given equation are called solutions.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 3***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 3*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 3.
Extend	***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	 ***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 4

Standard	8.EE.C.7
Learning Target	Students extend the use of the properties of equality to solve linear equations having rational coefficients.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 4***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 4*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 4.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

4/20/20 to 4/24/20 Week 2 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.C.7

Module Module 4: Linear Equations

Topic Topic A: Writing and Solving Linear Equations

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

SCAN ME Knowledge on the Go Videos

SCAN ME clever.com

SCAN ME Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 5	Knowledge on the Go Lesson Materials for Module 4, Lesson 5	i-Ready "Teacher Assigned" Lesson clever.com	i-Ready "My Path" Lesson clever.com
Day 6	Knowledge on the Go Lesson Materials for Module 4, Lesson 6	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 7	Knowledge on the Go Lesson Materials for Module 4, Lesson 7	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 8	Knowledge on the Go Lesson Materials for Module 4, Lesson 8	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 9	Knowledge on the Go Lesson Materials for Module 4, Lesson 9	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 5

Standard	8.EE.C.7
Learning Target	Students apply knowledge of geometry to writing and solving linear equations.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 5***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 5*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 5.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 6

Standard	8.EE.C.7
Learning Target	Students transform equations into simpler forms using the distributive property. Students learn that not every linear equation has a solution.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 6***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 6*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 6.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 7

Standard	8.EE.C.7
Learning Target	Students know the conditions for which a linear equation has a unique solution, no solution, or infinitely many solutions.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 7***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 7*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 7.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 8

Standard	8.EE.C.7
Learning Target	Students rewrite and solve equations that are not obviously linear equations using properties of equality.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 8***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 8*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 8.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 9

Standard	8.EE.C.7
Learning Target	Students know how to rewrite an exponential expression that represents a series as a linear equation.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 9***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 9*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 9.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

4/27/20 to 5/01/20 Week 3 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.B.5

Module Module 4: Linear Equations

Topic Topic B: Linear Equations in Two Variables and Their Graphs

Materials Needed:

- Access to the Knowledge on the Go Lesson Materials and Clever (see links and QR codes below).
- Paper, Pencil, Knowledge on the Go Packet/Problem Sets.

SCAN ME Knowledge on the Go Videos

SCAN ME clever.com

SCAN ME Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 10	Knowledge on the Go Lesson Materials for Module 4, Lesson 10	i-Ready "Teacher Assigned" Lesson clever.com	i-Ready "My Path" Lesson clever.com
Day 11	Knowledge on the Go Lesson Materials for Module 4, Lesson 11	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 12	Knowledge on the Go Lesson Materials for Module 4, Lesson 12	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 13	Knowledge on the Go Lesson Materials for Module 4, Lesson 13	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 14	Knowledge on the Go Lesson Materials for Module 4, Lesson 14	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 10

Standard	8.EE.B.5
Learning Target	Students work with proportional relationships that involve average speed and constant speed in order to write a linear equation in two variables. Students use linear equations in two variables to answer questions about distance and time.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 10***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 10*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 10.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

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Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 11

Standard	8.EE.B.5
Learning Target	Students know the definition of constant rate in varied contexts as expressed using two variables where one is t representing a time interval. Students graph points on a coordinate plane related to constant rate problems.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 11***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 11*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 11.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

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Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 12

Standard	8.EE.B.5
Learning Target	Students use a table to find solutions to a given linear equation and plot the solutions on a coordinate plane.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 12***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 12*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 12.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention .	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 13

Standard	8.EE.B.5
Learning Target	Students predict the shape of a graph of a linear equation by finding and plotting solutions on a coordinate plane. Students informally explain why the graph of a linear equation is not curved in terms of solutions to the given linear equation.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 13***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 13*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 13.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 14

Standard	8.EE.B.5
Learning Target	Students graph linear equations in standard form, ax + by = c (a or b=0), that produce a horizontal or a vertical line.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 14***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 14*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 14.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

5/04/20 to 5/08/20 Week 4 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.B.5, 8.EE.B.6

Module Module 4: Linear Equations

Topic Topic C: Slope and Equations of Lines

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

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Knowledge on the Go Videos clever.com Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 15	Knowledge on the Go Lesson Materials for Module 4, Lesson 15	i-Ready "Teacher Assigned" Lesson clever.com	i-Ready "My Path" Lesson clever.com
Day 16	Knowledge on the Go Lesson Materials for Module 4, Lesson 16	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 17	Knowledge on the Go Lesson Materials for Module 4, Lesson 17	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 18	Knowledge on the Go Lesson Materials for Module 4, Lesson 18	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 19	Knowledge on the Go Lesson Materials for Module 4, Lesson 19	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 15

Standard	8.EE.B.5
Learning Target	Students know slope is a number that describes the steepness or slant of a line. Students interpret the unit rate as the slope of a graph.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 15***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 15*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 15.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 16

Standard	8.EE.B.6
Learning Target	Students use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. Students use the slope formula to compute the slope of a non-vertical line.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 16***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 16*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 16.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 17

Standard	8.EE.B.6
Learning Target	Students show that the slope of a line joining any two distinct points of the graph of y = mx + b has slope m . Students transform the standard form of an equation into y = −a/bx + c/b .
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 17***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 17*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 17.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 18

Standard	8.EE.B.6
Learning Target	Students graph equations in the form of y = mx + b using information about slope and y-intercept point. Students know that if they have two straight lines with the same slope and a common point, the lines are the same.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 18***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 18*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 18.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 19

Standard	8.EE.B.6
Learning Target	Students prove that any point on the graph of y = mx + b is on a line l and that any point on a line l is a point on the graph of y = mx + b . Students graph linear equations on the coordinate plane.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 19***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 19*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 19.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

5/11/20 to 5/15/20 Week 5 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.B.5, 8EE.B.6, 8.EE.C.8

Module Module 4: Linear Equations

Topic Topic C: Slope and Equations of Lines
Topic D: Systems of Linear Equations and Their Solutions

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

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Knowledge on the Go Videos Clever.com Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 20	Knowledge on the Go Lesson Materials for Module 4, Lesson 20	i-Ready "Teacher Assigned" Lesson clever.com	i-Ready "My Path" Lesson clever.com
Day 21	Knowledge on the Go Lesson Materials for Module 4, Lesson 21	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 22	Knowledge on the Go Lesson Materials for Module 4, Lesson 22	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 23	Knowledge on the Go Lesson Materials for Module 4, Lesson 23	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 24	Knowledge on the Go Lesson Materials for Module 4, Lesson 24	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 20

Standard	8.EE.B.6
Learning Target	Students know that any non-vertical line is the graph of a linear equation in the form of y = mx + b, where b is a constant. Students write the linear equation whose graph is a given line.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 20***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 20*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 20.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 21

Standard	8.EE.B.6
Learning Target	Students write the equation of a line given two points or the slope and a point on the line. Students know the traditional forms of the slope formula and slope-intercept equation.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 21***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 21*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 21.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 22

Standard	8.EE.B.5, 8.EE.B.6
Learning Target	Students know that any constant rate problem can be described by a linear equation in two variables where the slope of the graph is the constant rate. Students compare two different proportional relationships represented by graphs, equations, and tables to determine which has a greater rate of change.
Launch	SCAN ME  ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 22.*** Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 22*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 22.
Extend	SCAN ME  ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 23

Standard	8.EE.B.6
Learning Target	Students know that two equations in the form of ax + by = c and a'x + b'y = c' graph as the same line when a'/a = b'/b = c'/c and at least one of a or b is nonzero. Students know that the graph of a linear equation ax + by =c , where a , b , and c are constants and at least one of a or b is nonzero, is the line defined by the equation ax + by = c .
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 23***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 23*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 23.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 24

Standard	8.EE.B.5, 8.EE.C.8
Learning Target	Students know that a system of linear equations, also known as simultaneous equations, is when two or more equations are involved in the same problem and work must be completed on them simultaneously. Students also learn the notation for simultaneous equations. Students compare the graphs that comprise a system of linear equations in the context of constant rates to answer questions about time and distance.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 24***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 24*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 24.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

5/18/20 to 5/22/20 Week 6 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.C.8

Module Module 4: Linear Equations

Topic Topic D: Systems of Linear Equations and Their Solutions

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

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Knowledge on the Go Videos clever.com Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 25	Knowledge on the Go Lesson Materials for Module 4, Lesson 25	i-Ready "Teacher Assigned" Lesson clever.com	i-Ready "My Path" Lesson clever.com
Day 26	Knowledge on the Go Lesson Materials for Module 4, Lesson 26	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 27	Knowledge on the Go Lesson Materials for Module 4, Lesson 27	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 28	Knowledge on the Go Lesson Materials for Module 4, Lesson 28	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 29	Knowledge on the Go Lesson Materials for Module 4, Lesson 29	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 25

Standard	8.EE.C.8
Learning Target	Students sketch the graphs of two linear equations and find the point of intersection. Students identify the point of intersection of the two lines as the solution to the system. Students verify by computation that the point of intersection is a solution to each of the equations in the system.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 25***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 25*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 25.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 26

Standard	8.EE.C.8
Learning Target	Students know that when a system of linear equations has no solution (i.e., no point of intersection of the lines), then the lines are parallel.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 26***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 26*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 26.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 27

Standard	8.EE.B.5, 8.EE.C.8
Learning Target	Students know that since two equations in the form ax + by = c and a'x + b'y = c' , when a , b , and c are non-zero numbers, graph as the same line when a'a = b'b = c'c , then the system of linear equations has infinitely many solutions. Students know a strategy for solving a system of linear equations algebraically.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 27***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 27*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 27.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 28

Standard	8.EE.C.8
Learning Target	Students learn the elimination method for solving a system of linear equations. Students use properties of rational numbers to find a solution to a system, if it exists, through computation using substitution and elimination methods.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 28***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 28*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 28.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 29

Standard	8.EE.B.5, 8.EE.C.8
Learning Target	Students know that a system of linear equations, also known as simultaneous equations, is when two or more equations are involved in the same problem and work must be completed on them simultaneously. Students also learn the notation for simultaneous equations. Students compare the graphs that comprise a system of linear equations in the context of constant rates to answer questions about time and distance.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 29***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 29*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 29.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

5/26/20 to 5/29/20 Week 7 (4 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.EE.C.7, 8.EE.C.8, 8.G.B.7, 8.F.A.1

Module
Topic
Module 4: Linear Equations
Topic D: Systems of Linear Equations and Their Solutions
Topic E: Pythagorean Theorem
Module 5: Examples of Functions from Geometry
Topic A: Functions

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

SCAN ME Knowledge on the Go Videos

SCAN ME clever.com

SCAN ME Module 4

SCAN ME Module 5

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 30	Knowledge on the Go Lesson Materials for Module 4, Lesson 30	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 31	Knowledge on the Go Lesson Materials for Module 4, Lesson 31	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 32	Knowledge on the Go Lesson Materials for Module 5, Lesson 1	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 33	Knowledge on the Go Lesson Materials for Module 5, Lesson 2	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 30

Standard	8.EE.C.8
Learning Target	Students learn a real-world application of linear equations with respect to the conversion of temperatures from Celsius to Fahrenheit and Fahrenheit to Celsius.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 30***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 30*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 30.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 31

Standard	8.EE.C.7, 8.EE.C.8, 8.G.B.7
Learning Target	Students know that a Pythagorean triple can be obtained by multiplying any known triple by a common whole number. Students use this method to generate Pythagorean triples. Students use a system of equations to find three numbers, a , b , and c , so that $a^2 + b^2 = c^2$.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 4, Lesson 31***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 4, Lesson 31*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 4 Lesson 31.
Extend .	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 32

Standard	8.F.A.1
Learning Target	Students analyze a nonlinear data set. Students realize that an assumption of a constant rate of motion is not appropriate for all situations.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 1***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 1*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 1.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 33

Standard	8.F.A.1
Learning Target	Students refine their understanding of the definition of a function. Students recognize that some, but not all, functions can be described by an equation between two variables.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 2***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 2*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 2.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

6/01/20 to 6/05/20 Week 8 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.F.A.1, 8.F.A.2, 8.F.A.3

Module Module 5: Examples of Functions from Geometry

Topic Topic A: Functions

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

SCAN ME — Knowledge on the Go Videos

SCAN ME — clever.com

SCAN ME — Additional Resources

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 34	Knowledge on the Go Lesson Materials for Module 5, Lesson 3	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 35	Knowledge on the Go Lesson Materials for Module 5, Lesson 4	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 36	Knowledge on the Go Lesson Materials for Module 5, Lesson 5	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 37	Knowledge on the Go Lesson Materials for Module 5, Lesson 6	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 38	Knowledge on the Go Lesson Materials for Module 5, Lesson 7	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 34

Standard	8.F.A.3
Learning Target	Students realize that linear equations of the form y=mx+b can be seen as rules defining functions (appropriately called linear functions). Students explore examples of linear functions.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 3***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 3*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 3.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 35

Standard	8.F.A.1
Learning Target	Students classify functions as either discrete or not discrete.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 4***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 4*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 4.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 36

Standard	8.F.A.1, 8.F.A.3
Learning Target	Students define the graph of a numerical function to be the set of all points (x, y) with x an input of the function and y its matching output. Students realize that if a numerical function can be described by an equation, then the graph of the function precisely matches the graph of the equation.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 5***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 5*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 5.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 37

Standard	8.F.A.1, 8.F.A.3
Learning Target	Students deepen their understanding of linear functions.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 6***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 6*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 6.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 38

Standard	8.F.A.2, 8.F.A.3
Learning Target	Students compare the properties of two functions that are represented in different ways via tables, graphs, equations, or written descriptions. Students use rate of change to compare linear functions.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 7***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 7*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 7.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

6/08/20 to 6/12/20 Week 9 (5 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.F.A.1, 8.F.A.3, 8.F.B.4, 8.G.C.9

Module Module 5: Examples of Functions from Geometry

Topic Topic A: Functions
Topic B: Volume
Module 6: Linear Functions
Topic A: Linear Functions

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

SCAN ME Knowledge on the Go Videos

SCAN ME clever.com

SCAN ME Module 6

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 39	Knowledge on the Go Lesson Materials for Module 5, Lesson 8	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 40	Knowledge on the Go Lesson Materials for Module 5, Lesson 9	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 41	Knowledge on the Go Lesson Materials for Module 5, Lesson 10	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 42	Knowledge on the Go Lesson Materials for Module 5, Lesson 11	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 43	Knowledge on the Go Lesson Materials for Module 6, Lesson 1	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 39

Standard	8.F.A.1, 8.F.A.3
Learning Target	Students examine the average rate of change for nonlinear function over various intervals and verify that these values are not constant.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 8***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 8*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 8.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 40

Standard	8.G.C.9
Learning Target	Students write rules to express functions related to geometry. Students review what they know about volume with respect to rectangular prisms and further develop their conceptual understanding of volume by comparing the liquid contained within a solid to the volume of a standard rectangular prism (i.e., a prism with base area equal to one).
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 9***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 9*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 9.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 41

Standard	8.G.C.9
Learning Target	Students know the volume formulas for cones and cylinders. Students apply the formulas for volume to real-world and mathematical problems.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 10***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 10*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 10.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention .	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 42

Standard	8.G.C.9
Learning Target	Students know the volume formula for a sphere as it relates to a right circular cylinder with the same diameter and height. Students apply the formula for the volume of a sphere to real-world and mathematical problems.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 5, Lesson 11***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 5, Lesson 11*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 5 Lesson 11.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 43

Standard	8.F.B.4
Learning Target	Students determine a linear function given a verbal description of a linear relationship between two quantities. Students interpret linear functions based on the context of a problem. Students sketch the graph of a linear function by constructing a table of values, plotting points, and connecting points by a line.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 6, Lesson 1***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 6, Lesson 1*** *from the "Knowledge on the Go" video.* Scan the Knowledge on the Go QR Code or click the link and scroll down to Student Downloads to access the Module 6, Lesson 1 Problem Set
Closing	**Recommended:** Students will reflect and share their learning on Module 6 Lesson 1.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Grade 8 Mathematics

WEEKLY DISTANCE LEARNING STUDENT SCHEDULE

6/15/20 to 6/19/20 Week 10 (4 days)

Directions: **Parents:** Assist students with accessing the "Knowledge on the Go" videos, Problem Sets in this packet, and i-Ready through the Clever app. Also, monitor student's progress while working on the videos and/or online lessons.

Students: Click or watch the "Knowledge on the Go" video each day and complete the daily Problem Set. Visit i-ready to continue your learning path and complete Teacher-Assigned lessons.

Target Standard(s) 8.F.B.4, 8.F.B.5, 8.SP.A.1

Module Module 6: Linear Functions

Topic Topic A: Linear Functions
Topic B: Bivariate Numerical Data

Materials Needed:

- Access to Knowledge on the Go Lesson Videos & Resources including Templates & Homework Helpers which provide guidance with worked examples for each lesson.
- Clever Access for i-Ready (see links and QR codes below)
- Paper, Pencil, Academic Packet including Problem Sets

SCAN ME — Knowledge on the Go Videos

SCAN ME — clever.com

SCAN ME — Module 6

	Daily Lesson (50 minutes)	Extension (10-15 minutes)	Intervention (15 minutes)
Day 44	Knowledge on the Go Lesson Materials for Module 6, Lesson 2	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 45	Knowledge on the Go Lesson Materials for Module 6, Lesson 3	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 46	Knowledge on the Go Lesson Materials for Module 6, Lesson 4	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson
Day 47	Knowledge on the Go Lesson Materials for Module 6, Lesson 5	i-Ready "Teacher Assigned" Lesson	i-Ready "My Path" Lesson

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 44

Standard	8.F.B.4, 8.F.B.5
Learning Target	Students interpret the constant rate of change and initial value of a line in context. Students interpret slope as rate of change and relate slope to the steepness of a line and the sign of the slope, indicating that a linear function is increasing if the slope is positive and decreasing if the slope is negative.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 6, Lesson 2***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 6, Lesson 2*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 6 Lesson 2.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 45

Standard	8.F.B.4, 8.F.B.5
Learning Target	Students graph a line specified by a linear function. Students graph a line specified by an initial value and a rate of change of a function and construct the linear function by interpreting the graph. Students graph a line specified by two points of a linear relationship and provide the linear function.
Launch	 ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 6, Lesson 3***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 6, Lesson 3*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 6 Lesson 3.
Extend	 ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 46

Standard	8.F.B.5
Learning Target	Students describe qualitatively the functional relationship between two types of quantities by analyzing a graph. Students sketch a graph that exhibits the qualitative features of a function based on a verbal description.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 6, Lesson 5***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 6, Lesson 5*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 6 Lesson 5.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

Click the Knowledge on the Go Lesson Materials link or scan the Knowledge on the Go QR Code in the Materials section. Then scroll down and click on the corresponding Module and Lesson. Problem sets are included in this academic packet.

Daily Fluency Practice

Mathematical Fluencies:

In Grade 8, students are expected to solve one-variable linear equations, including cases with infinitely many solutions or no solutions. Solve problems involving volumes of cones, cylinders, and spheres together with previous geometry work, proportional reasoning and multi-step problem solving in grade 7.end of year. This is a great time to practice these skills.

Lesson 47

Standard	8.F.B.5
Learning Target	Students qualitatively describe the functional relationship between two types of quantities by analyzing a graph. Students sketch a graph that exhibits the qualitative features of linear and nonlinear functions based on a verbal description.
Launch	SCAN ME ***Recommended***: Students will *view the "Knowledge on the Go" video for* ***Module 6, Lesson 5***. Scan the Knowledge on the Go QR Code or click the link to access the video. We encourage parents to assist students with accessing and engaging with the "Knowledge on the Go" videos.
Guided Practice	***Recommended:*** *Students will complete the Problem Set* for ***Module 6, Lesson 5*** from the "Knowledge on the Go" video along with the instructor. These are included in this academic packet.
Closing	**Recommended:** Students will reflect and share their learning on Module 6 Lesson 5.
Extend	SCAN ME ***Recommended:*** Students will complete the "Teacher Assigned" lesson in i-Ready. Visit Clever.com to access i-Ready.
Intervention	***Recommended****:* Students will work on their individual Learning Path (My Path) in i-Ready. Visit Clever.com to access i-Ready.

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1. George is four years older than his sister Sylvia. George's other sister is five years younger than Sylvia. The sum of all of their ages is 68 years.

   Let x be Sylvia's age. Then,
   $(x + 4) + (x - 5) + x = 68$.

Since I know something about Sylvia and both her brother and sister, I will define my variable as Sylvia's age.

2. The sum of three consecutive integers is 843.

   Let x be the first integer. Then,
   $x + (x + 1) + (x + 2) = 843.$

I remember that consecutive means one after the next. If my first number was 5, then a numeric statement would look like this:
$5 + (5 + 1) + (5 + 2)$.
I need to write something similar using symbols.

3. One number is two more than another number. The sum of their squares is 33.

   Let x be the smaller number. Then,
   $x^2 + (x + 2)^2 = 33.$

4. When you add 42 to $\frac{1}{3}$ of a number, you get the number itself.

   Let x be the number. Then,
   $\frac{1}{3}x + 42 = x$.

I don't know what number a fraction of 45 is. I remember that taken away from 23 means I need to subtract the number from 23.

5. When a fraction of 45 is taken away from 23, what remains exceeds one-half of eleven by twelve.

   Let x be the fraction of 45. ***Then,***
   $23 - x = \frac{1}{2} \cdot 11 + 12.$

6. The sum of three consecutive odd integers is 165. Let x be the middle of the three odd integers. Transcribe the statement accordingly.

   $(x - 2) + x + (x + 2) = 165$

If the middle number is odd, then I need to subtract two to get the odd integer before it, and I need to add two to get the odd integer after it.

Write each of the following statements using symbolic language.

1. Bruce bought two books. One book costs $\$4.00$ more than three times the other. Together, the two books cost him $\$72$.

2. Janet is three years older than her sister Julie. Janet's brother is eight years younger than their sister Julie. The sum of all of their ages is 55 years.

3. The sum of three consecutive integers is $1{,}623$.

4. One number is six more than another number. The sum of their squares is 90.

5. When you add 18 to $\frac{1}{4}$ of a number, you get the number itself.

6. When a fraction of 17 is taken away from 17, what remains exceeds one-third of seventeen by six.

7. The sum of two consecutive even integers divided by four is 189.5.

8. Subtract seven more than twice a number from the square of one-third of the number to get zero.

9. The sum of three consecutive integers is 42. Let x be the middle of the three integers. Transcribe the statement accordingly.

Write each of the following statements as a mathematical expression. State whether the expression is linear or nonlinear. If it is nonlinear, then explain why.

1. A number added to five cubed

   Let x be a number; then, $5^3 + x$ is a linear expression.

   It is linear because it a sum of constants and x to the 1st power.

2. The quotient of seven and a number, added to twenty-five

   Let x be a number; then, $\frac{7}{x} + 25$ is a nonlinear expression. The term $\frac{7}{x}$ is the same as $7 \cdot \frac{1}{x}$ and $\frac{1}{x} = x^{-1}$, which is why it is not linear.

   I remember that $\frac{1}{x} = x^{-1}$ from the beginning of the year.

3. The sum that represents the number of hotdogs sold if 148 hotdogs were sold Thursday, half of the remaining hotdogs were sold on Friday, and 203 hotdogs were sold on Saturday

   Let x be the remaining number of hotdogs; then, $148 + \frac{1}{2}x + 203$ is a linear expression.

4. The product of 46 and a number, added to the reciprocal of the number squared

   Let x be a number; then, $46x + \frac{1}{x^2}$ is a nonlinear expression. The term $\frac{1}{x^2}$ is the same as x^{-2}, which is why it is not linear.

   I could write the expression as $\frac{1}{x^2} + 46x$ by applying the commutative property of addition.

5. The product of 12 and a number and then the product multiplied by itself seven times

   Let x be a number; then, $(12x)^7$ is a nonlinear expression. The expression can be written as $12^7 \cdot x^7$. The exponent of 7 with a base of x is the reason it is not linear.

6. The sum of seven and a number, multiplied by the number

   Let x be a number; then, $(7 + x)x$ is a nonlinear expression because $(7 + x)x = 7x + x^2$ after using the distributive property. It is nonlinear because the power of x in the term x^2 is greater than 1.

   I need to use parentheses around the sum of seven and a number.

Write each of the following statements as a mathematical expression. State whether the expression is linear or nonlinear. If it is nonlinear, then explain why.

1. A number decreased by three squared

2. The quotient of two and a number, subtracted from seventeen

3. The sum of thirteen and twice a number

4. 5.2 more than the product of seven and a number

5. The sum that represents the number of tickets sold if 35 tickets were sold Monday, half of the remaining tickets were sold on Tuesday, and 14 tickets were sold on Wednesday

6. The product of 19 and a number, subtracted from the reciprocal of the number cubed

7. The product of 15 and a number, and then the product multiplied by itself four times

8. A number increased by five and then divided by two

9. Eight times the result of subtracting three from a number

10. The sum of twice a number and four times a number subtracted from the number squared

11. One-third of the result of three times a number that is increased by 12

12. Five times the sum of one-half and a number

13. Three-fourths of a number multiplied by seven

14. The sum of a number and negative three, multiplied by the number

15. The square of the difference between a number and 10

1. Given that $5x - 3 = 17$ and $7x + 3 = 17$, does $5x - 3 = 7x + 3$? Explain.

   yes, $5x - 3 = 7x + 3$ because a linear equation is a statement about equality. We are given that $5x - 3$ is equal to 17, but $7x + 3$ is also equal to 17. Since each linear expression is equal to the same number, the expressions are equal, $5x - 3 = 7x + 3$.

Since the left side of both expressions are equal to the same number, I can say that the expressions are equal to each other.

2. Is 5 a solution to the equation $3x - 1 = 5x + 7$? Explain.

   If we replace x with the number 5, then the left side of the equation is

$$\begin{aligned} 3 \cdot (5) - 1 &= 15 - 1 \\ &= 14, \end{aligned}$$

   and the right side of the equation is

$$\begin{aligned} 5 \cdot (5) + 7 &= 25 + 7 \\ &= 32. \end{aligned}$$

   Since $14 \neq 32$, 5 is not a solution of the equation $3x - 1 = 5x + 7$.

I need to see if the right side is equal to the left side when I replace x with the number 5. If the left side is not equal to the right side, then I know 5 is not a solution.

I know that a linear equation is really a question that is asking what number x will satisfy the equation.

3. Use the linear equation $11(x - 2) = 11x - 22$ to answer parts (a)–(c).

   a. Does $x = 3$ satisfy the equation above? Explain.

   if we replace x with the number 3, then the left side of the equation is

$$\begin{aligned} 11(x - 2) &= 11(3 - 2) \\ &= 11(1) \\ &= 11, \end{aligned}$$

   and the right side of the equation is

$$\begin{aligned} 11x - 22 &= 11 \cdot 3 - 22 \\ &= 33 - 22 \\ &= 11. \end{aligned}$$

   Since $11 = 11$, then $x = 3$ is a solution of the equation $11(x - 2) = 11x - 22$.

b. Is $x = -\frac{1}{2}$ a solution of the equation above? Explain.

If we replace x with the number $-\frac{1}{2}$, then the left side of the equation is

$$\begin{aligned} 11(x-2) &= 11\left(-\frac{1}{2}-2\right) \\ &= 11\left(-\frac{1}{2}-\frac{4}{2}\right) \\ &= 11\left(-\frac{5}{2}\right) \\ &= -\frac{55}{2}, \end{aligned}$$

I can rewrite 2 as an equivalent fraction with the same denominator as $\frac{1}{2}$.

and the right side of the equation is

$$\begin{aligned} 11x-22 &= 11\cdot -\frac{1}{2}-22 \\ &= -\frac{11}{2}-22 \\ &= -\frac{11}{2}-\frac{44}{2} \\ &= -\frac{55}{2}. \end{aligned}$$

Since the right side is equal to the left side, $-\frac{1}{2}$ is a solution.

Since $-\frac{55}{2} = -\frac{55}{2}$, $x = -\frac{1}{2}$ is a solution of the equation $11(x-2) = 11x-22$.

c. What interesting fact about the equation $11(x-2) = 11x-22$ is illuminated by the answers to parts (a) and (b)? Why do you think this is true?

I notice that the equation $11(x-2) = 11x-22$ is an identity under the distributive law.

I remember my teacher saying illuminated means "What do I notice?"

I think I can choose any number for x and the equation will be true.

1. Given that $2x + 7 = 27$ and $3x + 1 = 28$, does $2x + 7 = 3x + 1$? Explain.

2. Is -5 a solution to the equation $6x + 5 = 5x + 8 + 2x$? Explain.

3. Does $x = 1.6$ satisfy the equation $6 - 4x = -\frac{x}{4}$? Explain.

4. Use the linear equation $3(x + 1) = 3x + 3$ to answer parts (a)–(d).
   a. Does $x = 5$ satisfy the equation above? Explain.
   b. Is $x = -8$ a solution of the equation above? Explain.
   c. Is $x = \frac{1}{2}$ a solution of the equation above? Explain.
   d. What interesting fact about the equation $3(x + 1) = 3x + 3$ is illuminated by the answers to parts (a), (b), and (c)? Why do you think this is true?

For each problem, show your work, and check that your solution is correct.

1. Solve the linear equation $5x - 7 + 2x = -21$. State the property that justifies your first step and why you chose it.

   I used the commutative and distributive properties on the left side of the equal sign to simplify the expression to fewer terms.

$$\begin{aligned}
5x - 7 + 2x &= -21 \\
5x + 2x - 7 &= -21 \\
(5+2)x - 7 &= -21 \\
7x - 7 &= -21 \\
7x - 7 + 7 &= -21 + 7 \\
7x &= -14 \\
\frac{1}{7}(7)x &= \frac{1}{7}(-14) \\
x &= -2
\end{aligned}$$

The commutative property allows me to rearrange and group terms within expressions. The distributive property allows me to simplify expressions by combining terms that are alike.

Check: The left side is equal to $5(-2) - 7 + 2(-2) = -10 - 7 - 4 = -21$***, which is equal to the right side. Therefore,*** $x = -2$ ***is a solution to the equation*** $5x - 7 + 2x = -21$.

2. Solve the linear equation $\frac{1}{7}x - 11 = \frac{1}{4}x - 14$. State the property that justifies your first step and why you chose it.

I chose to use the addition property of equality to get all of the constants on one side of the equal sign and the subtraction property of equality to get all of the terms with an x on the other side of the equal sign.

$$\frac{1}{7}x - 11 = \frac{1}{4}x - 14$$
$$\frac{1}{7}x - 11 + 11 = \frac{1}{4}x - 14 + 11$$
$$\frac{1}{7}x - \frac{1}{4}x = \frac{1}{4}x - \frac{1}{4}x - 3$$
$$\left(\frac{1}{7} - \frac{1}{4}\right)x = -3$$
$$\left(\frac{4}{28} - \frac{7}{28}\right)x = -3$$
$$-\frac{3}{28}x = -3$$
$$-\frac{28}{3}\left(-\frac{3}{28}\right)x = -\frac{28}{3}(-3)$$
$$x = 28$$

I remember that the order doesn't matter, as long as I use the properties of equality correctly. I could use the subtraction property of equality to get all the terms with an x on one side of the equal sign and then use the addition property of equality to get all the constants on the other side.

Check: The left side of the equation is $\frac{1}{7}(28) - 11 = 4 - 11 = -7$. ***The right side of the equation is*** $\frac{1}{4}(28) - 14 = 7 - 14 = -7$. ***Since both sides equal*** -7, $x = 28$ ***is a solution to the equation*** $\frac{1}{7}x - 11 = \frac{1}{4}x - 14$.

I need to check my answer in the original equation because I may have made a mistake when transforming the equation.

3. Corey solved the linear equation $5x + 7 - 18x = 14 + 3x - 87$. His work is shown below. When he checked his answer, the left side of the equation did not equal the right side. Find and explain Corey's error, and then solve the equation correctly.

$$\begin{aligned} 5x + 7 - 18x &= 14 + 3x - 87 \\ -13x + 7 &= 3x - 73 \\ -13x + 7 + 3x &= 3x - 73 - 3x \\ -10x + 7 &= -73 \\ -10x + 7 - 7 &= -73 - 7 \\ -10x &= -80 \\ \frac{-10}{-10}x &= \frac{-80}{-10} \\ x &= 8 \end{aligned}$$

A strategy I used in class is to solve the linear equation and check my answer without looking at Corey's solution. I will compare my solution to Corey's to see if I find any differences.

Corey made a mistake on the third line. He added $3x$ to the left side of the equal sign and subtracted $3x$ on the right side of the equal sign. To use the property correctly, he should have subtracted $3x$ on both sides of the equal sign, making the equation at that point:

$$\begin{aligned} \mathbf{-13x + 7 - 3x} &= \mathbf{3x - 73 - 3x} \\ \mathbf{-16x + 7} &= \mathbf{-73} \\ \mathbf{-16x + 7 - 7} &= \mathbf{-73 - 7} \\ \mathbf{-16x} &= \mathbf{-80} \\ \mathbf{\frac{-16}{-16}x} &= \mathbf{\frac{-80}{-16}} \\ \mathbf{x} &= \mathbf{5} \end{aligned}$$

For each problem, show your work, and check that your solution is correct.

1. Solve the linear equation $x + 4 + 3x = 72$. State the property that justifies your first step and why you chose it.

2. Solve the linear equation $x + 3 + x - 8 + x = 55$. State the property that justifies your first step and why you chose it.

3. Solve the linear equation $\frac{1}{2}x + 10 = \frac{1}{4}x + 54$. State the property that justifies your first step and why you chose it.

4. Solve the linear equation $\frac{1}{4}x + 18 = x$. State the property that justifies your first step and why you chose it.

5. Solve the linear equation $17 - x = \frac{1}{3} \cdot 15 + 6$. State the property that justifies your first step and why you chose it.

6. Solve the linear equation $\frac{x+x+2}{4} = 189.5$. State the property that justifies your first step and why you chose it.

7. Alysha solved the linear equation $2x - 3 - 8x = 14 + 2x - 1$. Her work is shown below. When she checked her answer, the left side of the equation did not equal the right side. Find and explain Alysha's error, and then solve the equation correctly.

$$\begin{aligned}
2x - 3 - 8x &= 14 + 2x - 1 \\
-6x - 3 &= 13 + 2x \\
-6x - 3 + 3 &= 13 + 3 + 2x \\
-6x &= 16 + 2x \\
-6x + 2x &= 16 \\
-4x &= 16 \\
\frac{-4}{-4}x &= \frac{16}{-4} \\
x &= -4
\end{aligned}$$

For each of the following problems, write an equation and solve.

The sum of the measures of complementary angles is $90°$.

1. An angle measures eleven more than four times a number. Its complement is two more than three times the number. What is the measure of each angle in degrees?

   Let x be the number. Then, the measure of one angle is $4x + 11$. The measure of the other angle is $3x + 2$. Since the angles are complementary, the sum of their measures will be $90°$.

$$\begin{aligned} 4x + 11 + 3x + 2 &= 90 \\ 7x + 13 &= 90 \\ 7x + 13 - 13 &= 90 - 13 \\ 7x &= 77 \\ x &= 11 \end{aligned}$$

I'm not done yet. I need to make sure I find the measure of each angle.

   Replacing x with 11 in $4x + 11$ gives $4(11) + 11 = 44 + 11 = 55$.
   Replacing x with 11 in $3x + 2$ gives $3(11) + 2 = 33 + 2 = 35$.
   Therefore, the measures of the angles are $55°$ and $35°$.

2. The angles of a triangle are described as follows: $\angle A$ is the smallest angle. The measure of $\angle B$ is one more than the measure of $\angle A$ The measure of $\angle C$ is 3 more than twice the measure of $\angle A$. Find the measures of the three angles in degrees.

   Let x be the measure of $\angle A$. Then, the measure of $\angle B$ is $x + 1°$ and $\angle C$ is $2x + 3°$. The sum of the measures of the angles must be $180°$.

$$\begin{aligned} x + x + 1° + 2x + 3° &= 180° \\ 4x + 4° &= 180° \\ 4x + 4° - 4° &= 180° - 4° \\ 4x &= 176° \\ x &= 44° \end{aligned}$$

The sum of the measures of the interior angles of a triangle is $180°$.

   The measures of the angles are as follows: $\angle A = 44°$, $\angle B = 45°$, and $\angle C = 2(44°) + 3° = 88° + 3° = 91°$.

3. A pair of corresponding angles are described as follows: The measure of one angle is fifteen less than four times a number, and the measure of the other angle is twenty more than four times the number. Are the angles congruent? Why or why not?

I need to use the fact that corresponding angles of parallel lines are congruent so that I can write an equation.

Let x be the number. Then, the measure of one angle is $4x - 15$, and the measure of the other angle is $4x + 20$. Assume they are congruent, which means their measures are equal.

$$4x - 15 = 4x + 20$$
$$4x - 4x - 15 = 4x - 4x + 20$$
$$-15 \neq 20$$

Since $-15 \neq 20$, the angles are not congruent.

4. Three angles are described as follows: $\angle A$ is one-third the size of $\angle B$. The measure of $\angle C$ is equal to seven more than three times the measure of $\angle B$. The sum of the measures of $\angle A$ and $\angle C$ is $147°$. Can the three angles form a triangle? Why or why not?

Since I don't know if the three angle measures form a triangle, I need to use the sum of the two triangles to write my equation.

Let x represent the measure of $\angle B$. Then, the measure of $\angle A$ is $\frac{x}{3}$ and the measure of $\angle C$ is $3x + 7°$.

The sum of the measures of $\angle A$ and $\angle C$ is $147°$.

$$\frac{x}{3} + 3x + 7° = 147°$$
$$\frac{1}{3}x + \frac{9}{3}x + 7° = 147°$$
$$\left(\frac{1}{3} + \frac{9}{3}\right)x + 7° = 147°$$
$$\frac{10}{3}x + 7° - 7° = 147° - 7°$$
$$\frac{10}{3}x = 140°$$
$$10x = 420°$$
$$x = 42°$$

I need to check the sum of the three angles to see if they form a triangle.

The measure of $\angle A$ is $\left(\frac{42}{3}\right)° = 14°$, the measure of $\angle B$ is $42°$, and the measure of $\angle C$ is $3(42°) + 7° = 133°$. The sum of the three angles is $14° + 42° + 133° = 189°$. Since the sum of the measures of the interior angles of a triangle must have a sum of $180°$, these angles do not form a triangle. Their sum is too large.

For each of the following problems, write an equation and solve.

1. The measure of one angle is thirteen less than five times the measure of another angle. The sum of the measures of the two angles is $140°$. Determine the measure of each angle in degrees.

2. An angle measures seventeen more than three times a number. Its supplement is three more than seven times the number. What is the measure of each angle in degrees?

3. The angles of a triangle are described as follows: $\angle A$ is the largest angle; its measure is twice the measure of $\angle B$. The measure of $\angle C$ is 2 less than half the measure of $\angle B$. Find the measures of the three angles in degrees.

4. A pair of corresponding angles are described as follows: The measure of one angle is five less than seven times a number, and the measure of the other angle is eight more than seven times the number. Are the angles congruent? Why or why not?

5. The measure of one angle is eleven more than four times a number. Another angle is twice the first angle's measure. The sum of the measures of the angles is $195°$. What is the measure of each angle in degrees?

6. Three angles are described as follows: $\angle B$ is half the size of $\angle A$. The measure of $\angle C$ is equal to one less than two times the measure of $\angle B$. The sum of$\angle A$ and $\angle B$ is $114°$. Can the three angles form a triangle? Why or why not?

1. $3x - (x + 2) + 11x = \frac{1}{2}(4x - 8)$

The negative sign in front of the parentheses means to take the opposite of each term inside the parentheses.

I need to use the distributive property to each term inside the parentheses. It will allow me to see all the terms and collect like terms.

$$\begin{aligned} 3x - (x + 2) + 11x &= \frac{1}{2}(4x - 8) \\ 3x - x - 2 + 11x &= 2x - 4 \\ 13x - 2 &= 2x - 4 \\ 13x - 2x - 2 &= 2x - 2x - 4 \\ 11x - 2 &= -4 \\ 11x - 2 + 2 &= -4 + 2 \\ 11x &= -2 \\ \frac{11}{11}x &= -\frac{2}{11} \\ x &= -\frac{2}{11} \end{aligned}$$

I need to check my answer.

Check: The left side is $3\left(-\frac{2}{11}\right) - \left(-\frac{2}{11} + 2\right) + 11\left(-\frac{2}{11}\right) = -\frac{6}{11} - \frac{20}{11} - 2 = -\frac{48}{11}$.

The right side is $\frac{1}{2}\left(4\left(-\frac{2}{11}\right) - 8\right) = \frac{1}{2}\left(-\frac{8}{11} - \frac{88}{11}\right) = \frac{1}{2}\left(\frac{96}{11}\right) = -\frac{48}{11}$. ***Since*** $-\frac{48}{11} = -\frac{48}{11}$, $x = -\frac{2}{11}$ ***is the solution.***

2. $5(2 + x) - 4 = 81$

I need to use the distributive property to each term inside the parentheses only but not to the -4.

$$\begin{aligned} 5(2 + x) - 4 &= 81 \\ 10 + 5x - 4 &= 81 \\ 5x + 6 &= 81 \\ 5x + 6 - 6 &= 81 - 6 \\ 5x &= 75 \\ x &= 15 \end{aligned}$$

I can check this answer mentally.

3. $6x + \frac{1}{3}(9x + 5) = 10x + \frac{13}{3} - (x + 1)$

$$\mathbf{6x + \frac{1}{3}(9x + 5) = 10x + \frac{13}{3} - (x + 1)}$$

$$\mathbf{6x + 3x + \frac{5}{3} = 10x + \frac{13}{3} - x - 1}$$

$$\mathbf{9x + \frac{5}{3} = 9x + \frac{10}{3}}$$

$$\mathbf{9x - 9x + \frac{5}{3} = 9x - 9x + \frac{10}{3}}$$

$$\mathbf{\frac{5}{3} \neq \frac{10}{3}}$$

This is an untrue sentence; therefore, this equation has no solution.

This equation has no solution.

Transform the equation if necessary, and then solve it to find the value of x that makes the equation true.

1. $x - (9x - 10) + 11 = 12x + 3\left(-2x + \frac{1}{3}\right)$

2. $7x + 8\left(x + \frac{1}{4}\right) = 3(6x - 9) - 8$

3. $-4x - 2(8x + 1) = -(-2x - 10)$

4. $11(x + 10) = 132$

5. $37x + \frac{1}{2} - \left(x + \frac{1}{4}\right) = 9(4x - 7) + 5$

6. $3(2x - 14) + x = 15 - (-9x - 5)$

7. $8(2x + 9) = 56$

1. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $12x + 7 = -3(9 - 5x)$. Transform the equation into a simpler form if necessary.

The coefficients of x are different and so are the constants.

$$\mathbf{12}x + \mathbf{7} = -\mathbf{3}(\mathbf{9} - \mathbf{5}x)$$
$$\mathbf{12}x + \mathbf{7} = -\mathbf{27} + \mathbf{15}x$$

This equation will have a unique solution.

After I use the distributive property on the right side, the coefficients of x are different ($12 \neq 15$), and the constants are different ($7 \neq -27$) on each side. This means the equation will have a unique solution.

2. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $\mathbf{18}\left(\frac{\mathbf{1}}{\mathbf{2}} + \frac{\mathbf{1}}{\mathbf{3}}x\right) = \mathbf{6}x + \mathbf{9}$. Transform the equation into a simpler form if necessary.

$$\mathbf{18}\left(\frac{\mathbf{1}}{\mathbf{2}} + \frac{\mathbf{1}}{\mathbf{3}}x\right) = \mathbf{6}x + \mathbf{9}$$
$$\mathbf{9} + \mathbf{6}x = \mathbf{6}x + \mathbf{9}$$

This is an identity under the distributive property. Therefore, this equation will have infinitely many solutions.

After I use the distributive property on the left side, the coefficients of x are the same ($6 = 6$), and the constants are the same ($9 = 9$) on each side. This means the equation will have infinitely many solutions.

3. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $5(2x + 4) = 2(5x - 10)$. Transform the equation into a simpler form if necessary.

$$\mathbf{5}(\mathbf{2}x + \mathbf{4}) = \mathbf{2}(\mathbf{5}x - \mathbf{10})$$
$$\mathbf{10}x + \mathbf{20} = \mathbf{10}x - \mathbf{20}$$

The coefficients of x are the same, but the constants are different. Therefore, this equation has no solutions.

After I use the distributive property on both sides of the equation, the coefficients of x are the same ($10 = 10$), and the constants are different ($20 \neq -20$) on each side. This means the equation will have no solution.

1. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $18x + \frac{1}{2} = 6(3x + 25)$. Transform the equation into a simpler form if necessary.

2. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $8 - 9x = 15x + 7 + 3x$. Transform the equation into a simpler form if necessary.

3. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $5(x + 9) = 5x + 45$. Transform the equation into a simpler form if necessary.

4. Give three examples of equations where the solution will be unique; that is, only one solution is possible.

5. Solve one of the equations you wrote in Problem 4, and explain why it is the only solution.

6. Give three examples of equations where there will be no solution.

7. Attempt to solve one of the equations you wrote in Problem 6, and explain why it has no solution.

8. Give three examples of equations where there will be infinitely many solutions.

9. Attempt to solve one of the equations you wrote in Problem 8, and explain why it has infinitely many solutions.

Solve the following equations of rational expressions, if possible. If the equation cannot be solved, explain why.

1. $\frac{x+5}{-2} = \frac{3-x}{7}$

$$\frac{x+5}{-2} = \frac{3-x}{7}$$
$$-2(3-x) = (x+5)7$$
$$-6+2x = 7x+35$$
$$-6+2x-2x = 7x-2x+35$$
$$-6 = 5x+35$$
$$-6-35 = 5x+35-35$$
$$-41 = 5x$$
$$-\frac{41}{5} = x$$

I can multiply each numerator by the other fraction's denominator. I put the expressions with more than one term in parentheses so that I remember to use the distributive property.

2. $\frac{12}{x-3} = \frac{4}{x+2}$

$$\frac{12}{x-3} = \frac{4}{x+2}$$
$$12(x+2) = (x-3)4$$
$$12x+24 = 4x-12$$
$$12x-4x+24 = 4x-4x-12$$
$$8x+24 = -12$$
$$8x+24-24 = -12-24$$
$$8x = -36$$
$$\frac{8}{8}x = -\frac{36}{8}$$
$$x = -\frac{9}{2}$$

I used the distributive property, and now I see that I have a linear equation that I can solve using properties of equalities that I learned earlier in the module in Lesson 4.

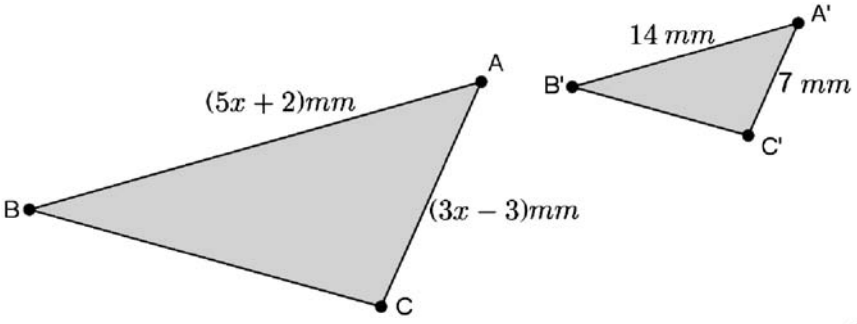
I can rewrite the fraction $-\frac{36}{8}$ as $-\frac{9}{2}$ because they are equivalent.

3. $\dfrac{\frac{1}{3}x-2}{8}=\dfrac{4x}{9}$

$$\frac{\frac{1}{3}x-2}{8}=\frac{4x}{9}$$
$$\left(\frac{1}{3}x-2\right)9=8(4x)$$
$$3x-18=32x$$
$$3x-3x-18=32x-3x$$
$$-18=29x$$
$$-\frac{18}{29}=x$$

I could write the equation as $8(4x)=9\left(\frac{1}{3}x-2\right)$ because when I distribute, I will get $32x=3x-18$. When I use the properties of equalities, my answer will be the same, $x=-\frac{18}{29}$.

4. In the diagram below, $\Delta\ ABC\sim\ \Delta\ A'B'C'$. Determine the lengths of $\overline{AB}$ and $\overline{AC}$.



Since I know the triangles are similar, I can write a proportion using corresponding sides.

$$\frac{5x+2}{14}=\frac{3x-3}{7}$$
$$7(5x+2)=14(3x-3)$$
$$35x+14=42x-42$$
$$35x-35x+14=42x-35x-42$$
$$14=7x-42$$
$$14+42=7x-42+42$$
$$56=7x$$
$$8=x$$

I need to use my answer to determine the side lengths of the triangle.

The length of $\overline{AB}$ is $(5(8)+2)\ mm\ =42\ mm$, and the length of $\overline{AC}$ is $(3(8)-3)\ mm\ =21\ mm$.

Solve the following equations of rational expressions, if possible. If an equation cannot be solved, explain why.

1. $\frac{5}{6x-2} = \frac{-1}{x+1}$

2. $\frac{4-x}{8} = \frac{7x-1}{3}$

3. $\frac{3x}{x+2} = \frac{5}{9}$

4. $\frac{\frac{1}{2}x+6}{3} = \frac{x-3}{2}$

5. $\frac{7-2x}{6} = \frac{x-5}{1}$

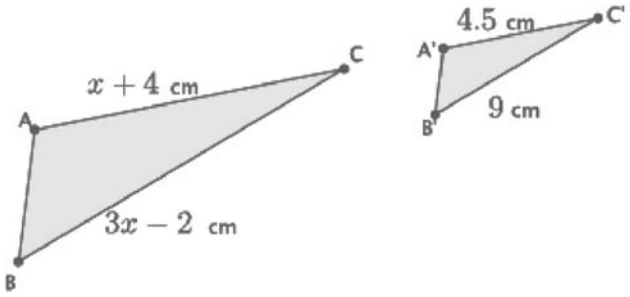
6. $\frac{2x+5}{2} = \frac{3x-2}{6}$

7. $\frac{6x+1}{3} = \frac{9-x}{7}$

8. $\frac{\frac{1}{3}x-8}{12} = \frac{-2-x}{15}$

9. $\frac{3-x}{1-x} = \frac{3}{2}$

10. In the diagram below, $\Delta ABC \sim \Delta A'B'C'$. Determine the lengths of $\overline{AC}$ and $\overline{BC}$.



1. You forward a blog that you found online to five of your friends. They liked it so much that they each forwarded it on to two of their friends, who then each forwarded it on to two of their friends, and so on. The number of people who saw the blog is shown below. Let S_1 represent the number of people who saw the blog after one step, let S_2 represent the number of people who saw the blog after two steps, and so on.

$$S_1 = 5$$
$$S_2 = 5 + 5 \cdot 2$$
$$S_3 = 5 + 5 \cdot 2 + 5 \cdot 2^2$$
$$S_4 = 5 + 5 \cdot 2 + 5 \cdot 2^2 + 5 \cdot 2^3$$

I will start with S_2 since $S_1 = 5$ and try to manipulate S_2 into an equation that contains S_2.

a. Find the pattern in the equations.

By adding $5 \cdot 2^2$, I can use the distributive property to get a linear equation in S_2.

$$\boldsymbol{S_2 = 5 + 5 \cdot 2}$$
$$\boldsymbol{S_2 - 5 = 5 \cdot 2}$$
$$\boldsymbol{S_2 - 5 + 5 \cdot 2^2 = 5 \cdot 2 + 5 \cdot 2^2}$$
$$\boldsymbol{S_2 - 5 + 5 \cdot 2^2 = 2(5 + 5 \cdot 2)}$$
$$\boldsymbol{S_2 - 5 + 5 \cdot 2^2 = 2S_2}$$

$$\boldsymbol{S_3 = 5 + 5 \cdot 2 + 5 \cdot 2^2}$$
$$\boldsymbol{S_3 - 5 = 5 \cdot 2 + 5 \cdot 2^2}$$
$$\boldsymbol{S_3 - 5 + 5 \cdot 2^3 = 5 \cdot 2 + 5 \cdot 2^2 + 5 \cdot 2^3}$$
$$\boldsymbol{S_3 - 5 + 5 \cdot 2^3 = 2(5 + 5 \cdot 2 + 5 \cdot 2^2)}$$
$$\boldsymbol{S_3 - 5 + 5 \cdot 2^3 = 2S_3}$$

By adding $5 \cdot 2$ raised to the power of the step number, I can use the distributive property to get a linear equation in terms of that step number.

I don't want to multiply out any of the terms so that I can see the pattern better.

$$\boldsymbol{S_4 = 5 + 5 \cdot 2 + 5 \cdot 2^2 + 5 \cdot 2^3}$$
$$\boldsymbol{S_4 - 5 = 5 \cdot 2 + 5 \cdot 2^2 + 5 \cdot 2^3}$$
$$\boldsymbol{S_4 - 5 + 5 \cdot 2^4 = 5 \cdot 2 + 5 \cdot 2^2 + 5 \cdot 2^3 + 5 \cdot 2^4}$$
$$\boldsymbol{S_4 - 5 + 5 \cdot 2^4 = 2(5 + 5 \cdot 2 + 5 \cdot 2^2 + 5 \cdot 2^3)}$$
$$\boldsymbol{S_4 - 5 + 5 \cdot 2^4 = 2S_4}$$

b. Assuming the trend continues, how many people will have seen the blog after 8 steps?

I want to use the properties of equality to get S_8 on one side and the constants on the other side of the equal sign and use the distributive property.

$$S_8 - 5 + 5 \cdot 2^8 = 2S_8$$
$$S_8 - 2S_8 = 5 - 5 \cdot 2^8$$
$$S_8(1 - 2) = 5 - 5 \cdot 2^8$$
$$S_8(1 - 2) = 5(1 - 2^8)$$
$$S_8 = \frac{5(1 - 2^8)}{(1 - 2)}$$
$$S_8 = 1,275$$

I multiplied out on the last step.

After 8 steps, $1{,}275$ people will have seen the blog.

c. How many people will have seen the blog after n steps?

$$S_n = \frac{5(1 - 2^n)}{(1 - 2)}$$

I see a pattern from the work I have done.

2. The length of a rectangle is 4 more than 2 times the width. If the perimeter of the rectangle is 20.6 cm. what is the area of the rectangle?

Let x represent the width of the rectangle. Then the length of the rectangle is $4 + 2x$.

Since I know the perimeter, I will write my equation in terms of perimeter. Perimeter of a rectangle means I need to add twice the width to twice the length, $P = 2w + 2l$.

$$2(4 + 2x) + 2x = 20.6$$
$$8 + 4x + 2x = 20.6$$
$$8 + 6x = 20.6$$
$$6x = 12.6$$
$$x = \frac{12.6}{6}$$
$$x = 2.1$$

The problem asked for the area of the rectangle. Area of a rectangle means I have to multiply the length and width.

The width of the rectangle is 2.1 cm, and the length is $(4 + 2(2.1))$ cm $= 8.2$ cm, so the area is 17.22 cm^2.

3. Each month, Gilbert pays $\$42$ to his phone company just to use the phone. Each text he sends costs him an additional $\$0.15$. In June, his phone bill was $\$162.75$. In July, his phone bill was $\$155.85$. How many texts did he send each month?

Let x be the number of texts he sent in June.

$$\begin{aligned} 42 + 0.15x &= 162.75 \\ 0.15x &= 120.75 \\ x &= \frac{120.75}{0.15} \\ x &= 805 \end{aligned}$$

I am using a different letter to define my variable because the number of texts for July is different than the number of texts for June since the cost was different for both months.

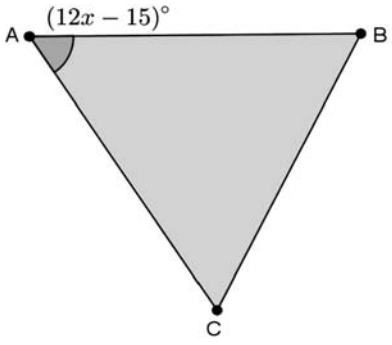
He sent 805 texts in June.

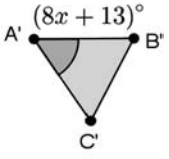
Let y be the number of texts he sent in July.

$$\begin{aligned} 42 + 0.15y &= 155.85 \\ 0.15y &= 113.85 \\ y &= \frac{113.85}{0.15} \\ y &= 759 \end{aligned}$$

He sent 759 texts in July.

4. In the diagram below, $\Delta\ ABC \sim \Delta\ A'B'C'$. Determine the measure of $\angle A$.





Since the triangles are similar, the angles are equal in measure.

$$\begin{aligned} 12x - 15 &= 8x + 13 \\ 12x - 8x - 15 &= 8x - 8x + 13 \\ 4x - 15 &= 13 \\ 4x - 15 + 15 &= 13 + 15 \\ 4x &= 28 \\ x &= 7 \end{aligned}$$

The measure of $\angle A$ is $(12(7) - 15)^\circ = 69^\circ$.

1. You forward an e-card that you found online to three of your friends. They liked it so much that they forwarded it on to four of their friends, who then forwarded it on to four of their friends, and so on. The number of people who saw the e-card is shown below. Let S_1 represent the number of people who saw the e-card after one step, let S_2 represent the number of people who saw the e-card after two steps, and so on.

$$S_1 = 3$$
$$S_2 = 3 + 3 \cdot 4$$
$$S_3 = 3 + 3 \cdot 4 + 3 \cdot 4^2$$
$$S_4 = 3 + 3 \cdot 4 + 3 \cdot 4^2 + 3 \cdot 4^3$$

   a. Find the pattern in the equations.

   b. Assuming the trend continues, how many people will have seen the e-card after 10 steps?

   c. How many people will have seen the e-card after n steps?

For each of the following questions, write an equation, and solve to find each answer.

2. Lisa has a certain amount of money. She spent $\$39$ and has $\frac{3}{4}$ of the original amount left. How much money did she have originally?

3. The length of a rectangle is 4 more than 3 times the width. If the perimeter of the rectangle is 18.4 cm, what is the area of the rectangle?

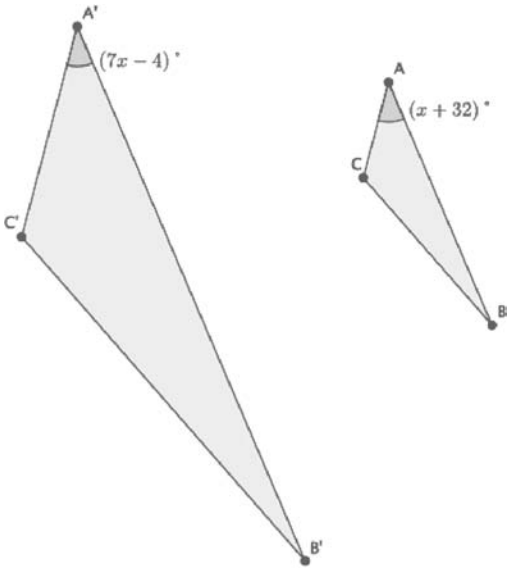
4. Eight times the result of subtracting 3 from a number is equal to the number increased by 25. What is the number?

5. Three consecutive odd integers have a sum of 3. What are the numbers?

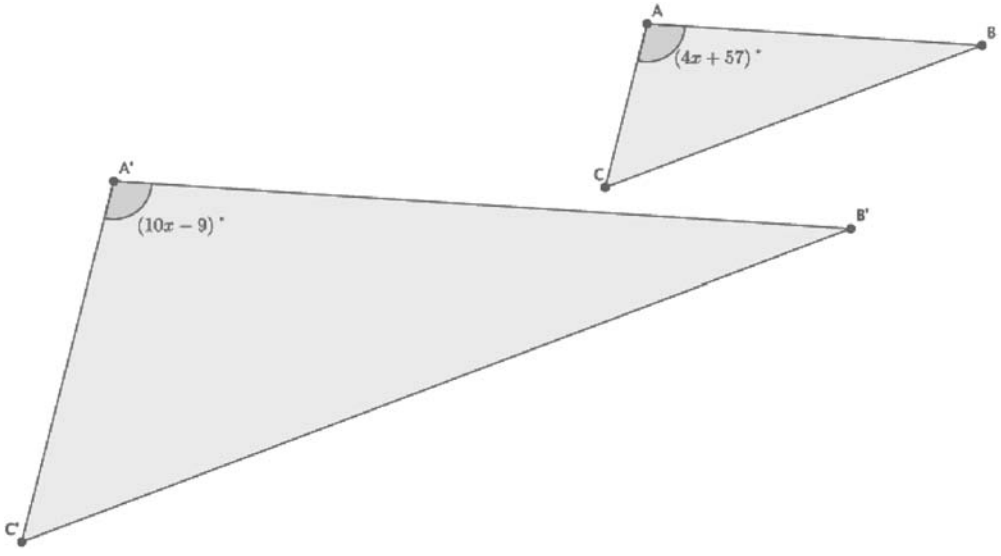
6. Each month, Liz pays $\$35$ to her phone company just to use the phone. Each text she sends costs her an additional $\$0.05$. In March, her phone bill was $\$72.60$. In April, her phone bill was $\$65.85$. How many texts did she send each month?

7. Claudia is reading a book that has 360 pages. She read some of the book last week. She plans to read 46 pages today. When she does, she will be $\frac{4}{5}$ of the way through the book. How many pages did she read last week?

8. In the diagram below, $\Delta ABC \sim \Delta A'B'C'$. Determine the measure of $\angle A$.



9. In the diagram below, $\Delta ABC \sim \Delta A'B'C'$. Determine the measure of $\angle A$.



1. Jurgen types a paper for his Humanities class at a constant speed. He types 12 pages, and it took him 66 minutes.

   a. What fraction represents his constant speed, C?

   $$C = \frac{12}{66} = \frac{2}{11}$$

   To write the fraction for his constant speed, I have to compare the number of pages typed to the interval of time spent typing.

   b. Write the fraction that represents his constant speed, C, if he types y pages in 24 minutes.

   $$C = \frac{y}{24}$$

   c. Write a proportion using the fractions from parts (a) and (b) to determine how many pages he types after 24 minutes. Round your answer to the hundredths place.

   $$\begin{aligned} \frac{2}{11} &= \frac{y}{24} \\ 2(24) &= 11(y) \\ 48 &= 11(y) \\ \frac{1}{11}(48) &= \frac{1}{11}(11)y \\ 4.36 &\approx y \end{aligned}$$

   Jurgen types approximately 4.36 pages in 24 minutes.

   d. Write a two-variable equation to represent how many pages Jurgen can type over any time interval.

   Let y represent the number of pages typed. Let x represent the number of minutes typed.

   $$\begin{aligned} \frac{2}{11} &= \frac{y}{x} \\ 2(x) &= 11(y) \\ \frac{1}{11}(2)x &= \frac{1}{11}(11)y \\ \frac{2}{11}x &= y \end{aligned}$$

   When I write a two-variable equation, I have to remember to define my variables.

2. Parker runs at a constant speed of 6.25 miles per hour.

   a. If he runs for y miles and it takes him x hours, write the two-variable equation to represent the number of miles Parker can run in x hours.

   Let y represent the number of miles run. Let x represent the number of hours run.

$$\frac{6.25}{1} = \frac{y}{x}$$
$$6.25x = y$$

   b. Parker has been training for a marathon by running to the school 11 miles from his house, then to the park 2 miles from the school, and then returning home, which is 14 miles from the park. Assuming he runs at a constant speed the entire time, how long will it take him to get back home after running his route? Round your answer to the hundredths place.

   Total miles: $11 + 2 + 14 = 27$. Let x be the number of hours run.

$$6.25x = 27$$
$$\frac{1}{6.25}(6.25)x = \frac{1}{6.25}(27)$$
$$x = 4.32$$

   It will take Parker 4.32 hours to run 27 miles.

3. Jared walks from baseball practice to his aunt's house, a distance of 6 miles, in 90 minutes. Assuming he walks at a constant speed, C, how far does he walk in 20 minutes? Round your answer to the hundredths place.

   Let y represent the number of miles walked.

   Since $\frac{6}{90} = C$ and $\frac{y}{20} = C$, then

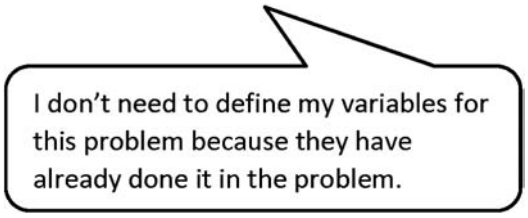
$$\frac{6}{90} = \frac{y}{20}$$
$$6(20) = 90y$$
$$120 = 90y$$
$$\frac{1}{90}(120) = \frac{1}{90}(90)y$$
$$\frac{120}{90} = y$$
$$1.33 \approx y$$

   Jared walks approximately 1.33 miles in 20 minutes.

4. Sammy bikes 3 miles every night for exercise. It takes him exactly 1.75 hours to finish his ride.

   a. Assuming he rides at a constant rate, write an equation that represents how many miles, y, Sammy can ride in x hours.

$$\frac{3}{1.75} = \frac{y}{x}$$
$$3x = 1.75y$$
$$\frac{1}{1.75}(3)x = \frac{1}{1.75}(1.75)\,y$$
$$\frac{3}{1.75}x = y$$



   b. Use your equation from part (a) to complete the table below. Use a calculator, and round all values to the hundredths place.

x (hours)	Linear Equation in y: $\frac{3}{1.75}x = y$	y (miles)
0.25	$\frac{3}{1.75}(0.25) = y$	0.43
0.5	$\frac{3}{1.75}(0.5) = y$	0.86
0.75	$\frac{3}{1.75}(0.75) = y$	1.29
1	$\frac{3}{1.75}(1) = y$	1.71
3	$\frac{3}{1.75}(3) = y$	5.14

1. Eman walks from the store to her friend's house, 2 miles away. It takes her 35 minutes.
   a. What fraction represents her constant speed, C?
   b. Write the fraction that represents her constant speed, C, if she walks y miles in 10 minutes.
   c. Write and solve a proportion using the fractions from parts (a) and (b) to determine how many miles she walks after 10 minutes. Round your answer to the hundredths place.
   d. Write a two-variable equation to represent how many miles Eman can walk over any time interval.

2. Erika drives from school to soccer practice 1.3 miles away. It takes her 7 minutes.
   a. What fraction represents her constant speed, C?
   b. What fraction represents her constant speed, C, if it takes her x minutes to drive exactly 1 mile?
   c. Write and solve a proportion using the fractions from parts (a) and (b) to determine how much time it takes her to drive exactly 1 mile. Round your answer to the tenths place.
   d. Write a two-variable equation to represent how many miles Erika can drive over any time interval.

3. Darla drives at a constant speed of 45 miles per hour.
   a. If she drives for y miles and it takes her x hours, write the two-variable equation to represent the number of miles Darla can drive in x hours.
   b. Darla plans to drive to the market 14 miles from her house, then to the post office 3 miles from the market, and then return home, which is 15 miles from the post office. Assuming she drives at a constant speed the entire time, how much time will she spend driving as she runs her errands? Round your answer to the hundredths place.

4. Aaron walks from his sister's house to his cousin's house, a distance of 4 miles, in 80 minutes. How far does he walk in 30 minutes?

5. Carlos walks 4 miles every night for exercise. It takes him exactly 63 minutes to finish his walk.
   a. Assuming he walks at a constant rate, write an equation that represents how many miles, y, Carlos can walk in x minutes.
   b. Use your equation from part (a) to complete the table below. Use a calculator, and round all values to the hundredths place.

x (minutes)	Linear Equation:	y (miles)
15		
30		
40		
60		
75		

1. A bus travels at a constant rate of 40 miles per hour.

   What is the distance, d, in miles, that the bus travels in t hours?

   Let C be the constant rate the bus travels. Then, $\frac{40}{1} = C$, and $\frac{d}{t} = C$; therefore, $\frac{40}{1} = \frac{d}{t}$

   $$\frac{40}{1} = \frac{d}{t}$$
   $$d = 40t$$

   If I can write two fractions, each equal to the constant rate, C, then I can use the proportional relationship to solve for d.

2. A teenage boy named Harry can consume 8 hot dogs in 1.25 hours. Assume that the young man eats at a constant rate.

   a. How many hot dogs, y, can be consumed by Harry in t hours?

      Let C be the constant rate Harry eats hot dogs. Then, $\frac{8}{1.25} = C$, and $\frac{y}{t} = C$; therefore, $\frac{8}{1.25} = \frac{y}{t}$.

      $$\frac{8}{1.25} = \frac{y}{t}$$
      $$1.25y = 8t$$
      $$\frac{1.25}{1.25}y = \frac{8}{1.25}t$$
      $$y = 6.4t$$

   b. Pretend that he can eat every hour of every day for a week. How many hot dogs would Harry consume?

      24 hours a day for 7 days is a total of 168 hours.

      $$y = 6.4t$$
      $$y = 6.4(168)$$
      $$y = 1{,}075.2$$

      Harry would consume about $1{,}075$ hot dogs in one week.

      Once I figure out how many hours are in a week, I can use my equation from part (a) to determine the answer.

3. Your cell phone company charges at a constant rate. The company charges $\$1.00$ for 4 minutes of use.

   a. Write an equation to represent the number of dollars, d, that will be charged over any time interval, t.

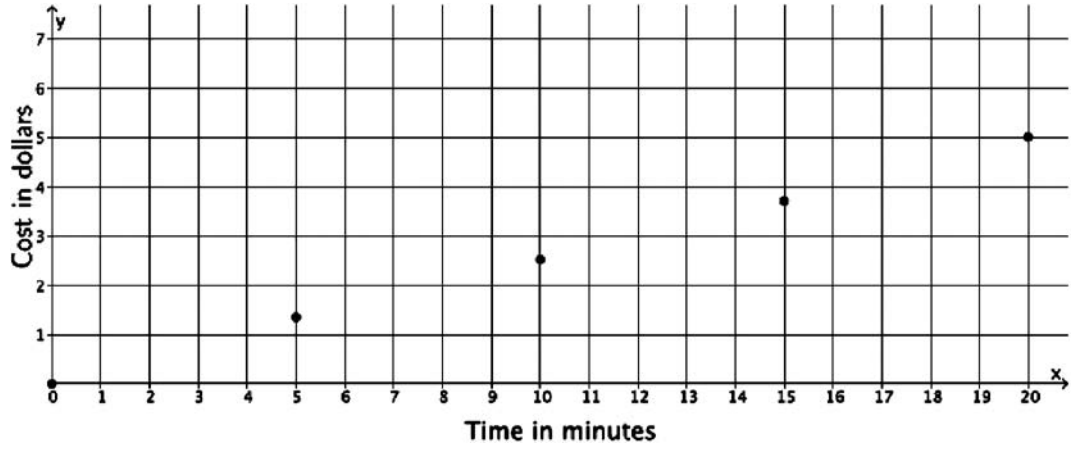
   Let C be the constant rate charged per minute. Then, $\frac{1.00}{4} = C$, and $\frac{d}{t} = C$; therefore, $\frac{1.00}{4} = \frac{d}{t}$.

$$\frac{1}{4} = \frac{d}{t}$$
$$4d = 1t$$
$$\frac{1}{4}(4)\,d = \frac{1}{4}(1)\,t$$
$$d = 0.25t$$

   b. Complete the table below.

t (time in minutes)	Linear Equation: $d = 0.25t$	d (cost in dollars)
0	$d = 0.25(0)$	**0**
5	$d = 0.25(5)$	**1.25**
10	$d = 0.25(10)$	**2.50**
15	$d = 0.25(15)$	**3.75**
20	$d = 0.25(20)$	**5.00**

   c. Graph the data as points on a coordinate plane.



d. You used your phone for 18 minutes. About how much will your bill be? Explain.

It will cost between $\$3.75$ ***and*** $\$5$***. I located*** 18 ***on the*** x***-axis because that is the number of minutes I used. That*** x***-value is between the known costs for*** 15 ***minutes and*** 20 ***minutes. So my bill will probably be closer*** **to** $\$5$ ***because*** 18 ***is closer to*** 20 ***than to*** 15***.***

1. A train travels at a constant rate of 45 miles per hour.
   a. What is the distance, d, in miles, that the train travels in t hours?
   b. How many miles will it travel in 2.5 hours?

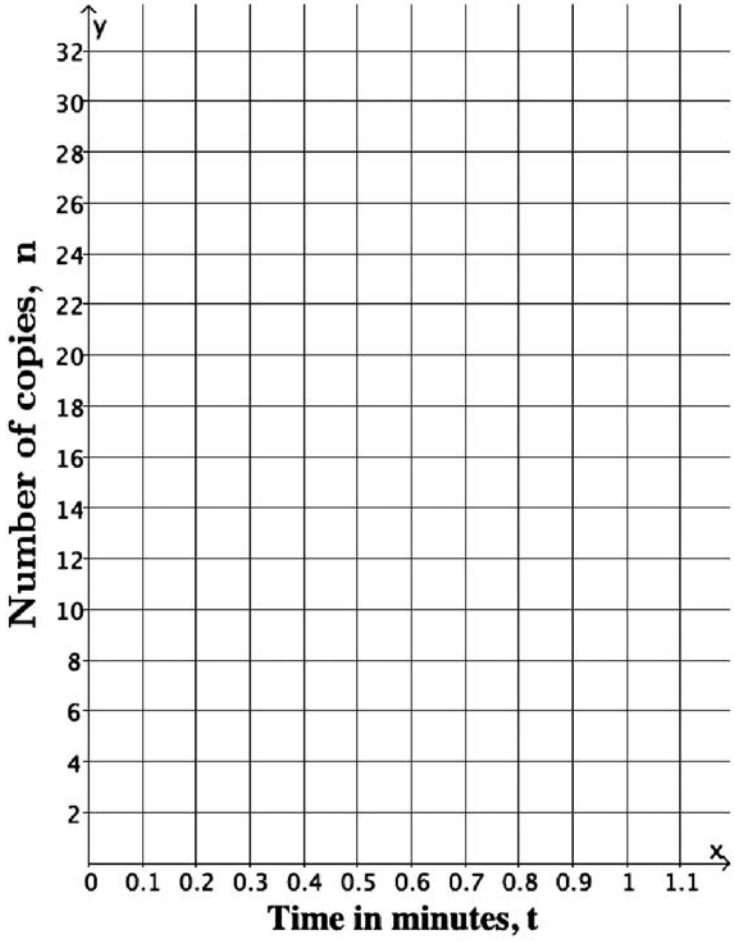
2. Water is leaking from a faucet at a constant rate of $\frac{1}{3}$ gallon per minute.
   a. What is the amount of water, w, in gallons per minute, that is leaked from the faucet after t minutes?
   b. How much water is leaked after an hour?

3. A car can be assembled on an assembly line in 6 hours. Assume that the cars are assembled at a constant rate.
   a. How many cars, y, can be assembled in t hours?
   b. How many cars can be assembled in a week?

4. A copy machine makes copies at a constant rate. The machine can make 80 copies in $2\frac{1}{2}$ minutes.
   a. Write an equation to represent the number of copies, n, that can be made over any time interval in minutes, t.
   b. Complete the table below.

t (time in minutes)	Linear Equation:	n (number of copies)
0		
0.25		
0.5		
0.75		
1		

c. Graph the data on a coordinate plane.



d. The copy machine runs for 20 seconds and then jams. About how many copies were made before the jam occurred? Explain.

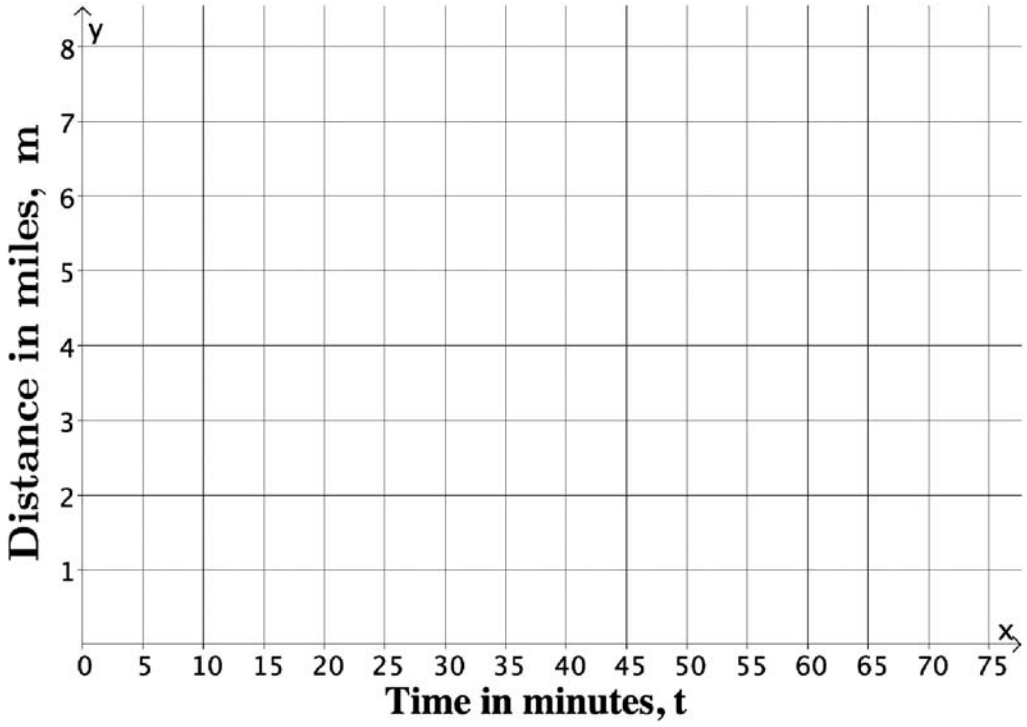
5. Connor runs at a constant rate. It takes him 34 minutes to run 4 miles.

   a. Write the linear equation in two variables that represents the number of miles Connor can run in any given time interval in minutes, t.

   b. Complete the table below. Use a calculator, and round answers to the tenths place.

t (time in minutes)	Linear Equation:	m (distance in miles)
0		
15		
30		
45		
60		

   c. Graph the data on a coordinate plane.



   d. Connor ran for 40 minutes before tripping and spraining his ankle. About how many miles did he run before he had to stop? Explain.

1. Consider the linear equation $x - \frac{2}{5}y = 4$.

   a. Will you choose to fix values for x or y? Explain.

   If I fix values for y, it will make the computations easier. Solving for x can be done in one step.

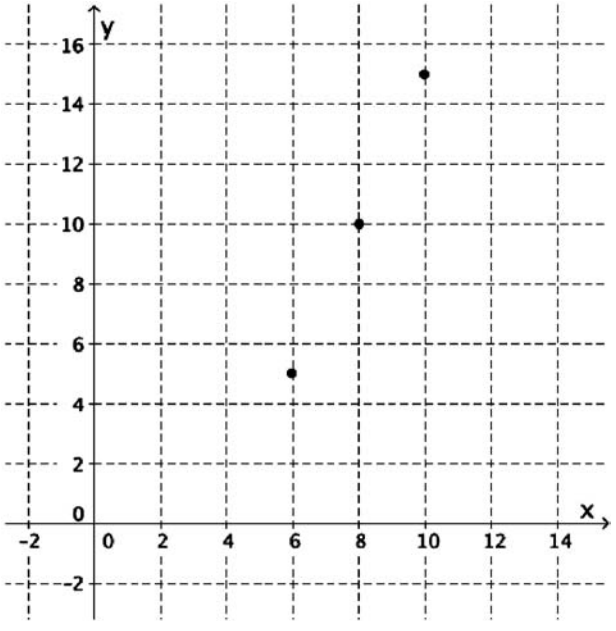
   b. Are there specific numbers that would make your computational work easier? Explain.

   Values for y that are multiples of 5 will make the computations easier. When I multiply $\frac{2}{5}$ by a multiple of 5, I will get a whole number.

   c. Find three solutions to the linear equation $x - \frac{2}{5}y = 4$, and plot the solutions as points on a coordinate plane.

I'll use the numbers 5, 10, and 15 for y in my table. Once substituted into the equation, I'll get the values for x. Then each pair of x and y will be a point on my graph.

x	**Linear Equation:** $x - \frac{2}{5}y = 4$	y
6	$x - \frac{2}{5}(5) = 4$ $x - 2 = 4$ $x = 6$	5
8	$x - \frac{2}{5}(10) = 4$ $x - 4 = 4$ $x = 8$	10
10	$x - \frac{2}{5}(15) = 4$ $x - 6 = 4$ $x = 10$	15



1. Consider the linear equation $x - \frac{3}{2}y = -2$.
   a. Will you choose to fix values for x or y? Explain.
   b. Are there specific numbers that would make your computational work easier? Explain.
   c. Find five solutions to the linear equation $x - \frac{3}{2}y = -2$, and plot the solutions as points on a coordinate plane.

x	**Linear Equation:** $x - \frac{3}{2}y = -2$	y

2. Find five solutions for the linear equation $\frac{1}{3}x + y = 12$, and plot the solutions as points on a coordinate plane.

3. Find five solutions for the linear equation $-x + \frac{3}{4}y = -6$, and plot the solutions as points on a coordinate plane.

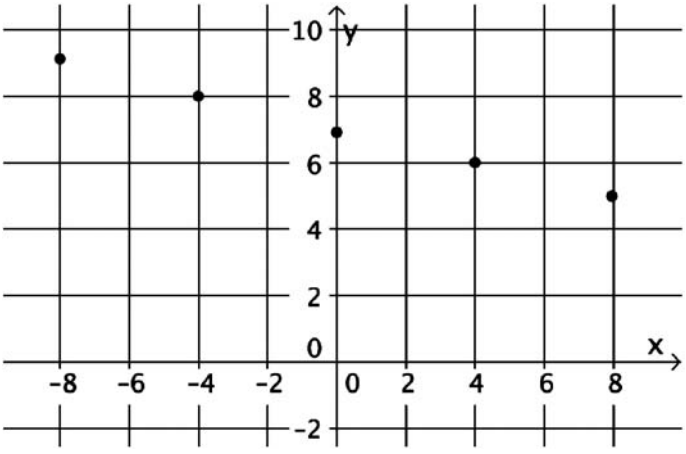
4. Find five solutions for the linear equation $2x + y = 5$, and plot the solutions as points on a coordinate plane.

5. Find five solutions for the linear equation $3x - 5y = 15$, and plot the solutions as points on a coordinate plane.

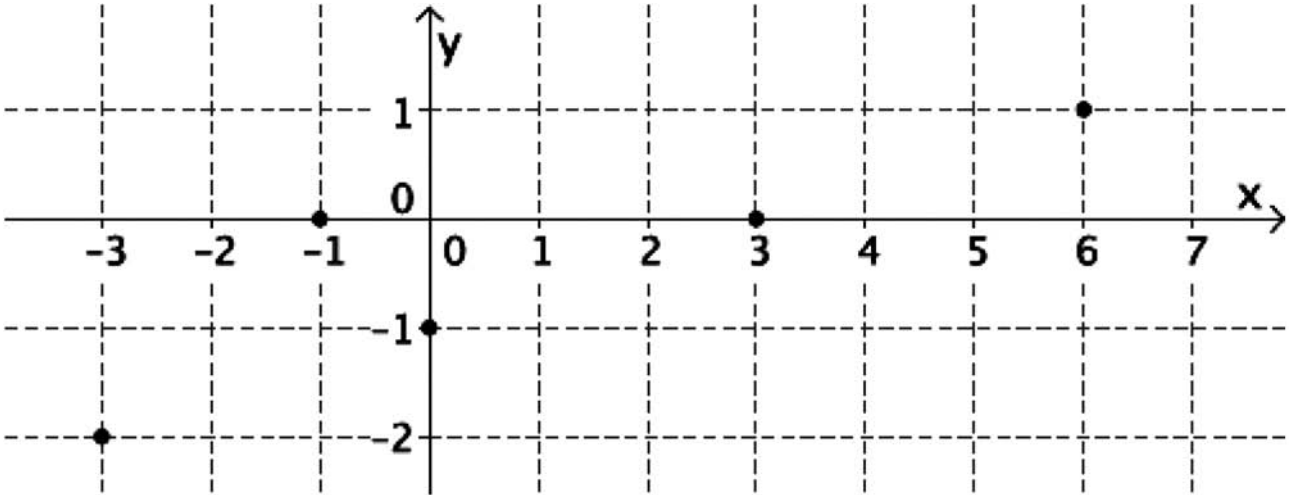
1. Find at least five solutions to the linear equation $\frac{1}{4}x + y = 7$, and plot the points on a coordinate plane. What shape is the graph of the linear equation taking?

I should choose values for x that are multiples of 4. I should also be sure to select some positive values for x as well as negative.

x	$\frac{1}{4}x + y = 7$	y
-8	$\frac{1}{4}(-8) + y = 7$ $-2 + y = 7$ $-2 + 2 + y = 7 + 2$ $y = 9$	9
-4	$\frac{1}{4}(-4) + y = 7$ $-1 + y = 7$ $-1 + 1 + y = 7 + 1$ $y = 8$	8
0	$\frac{1}{4}(0) + y = 7$ $0 + y = 7$ $y = 7$	7
4	$\frac{1}{4}(4) + y = 7$ $1 + y = 7$ $1 - 1 + y = 7 - 1$ $y = 6$	6
8	$\frac{1}{4}(8) + y = 7$ $2 + y = 7$ $2 - 2 + y = 7 - 2$ $y = 5$	5

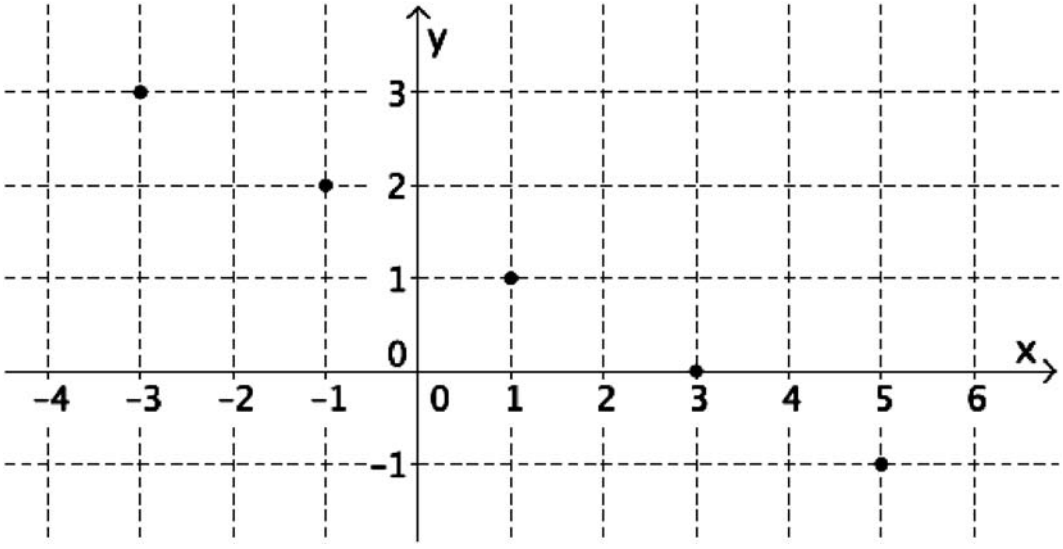


2. Can the following points be on the graph of the equation $x - 3y = 3$? Explain



The graph shown contains the point $(-1, 0)$. If $(-1, 0)$ is on the graph of the linear equation, then it will be a solution to the equation. It is not; therefore, the point cannot be on the graph of the equation, which means the graph shown cannot be the graph of the equation $x - 3y = 3$.

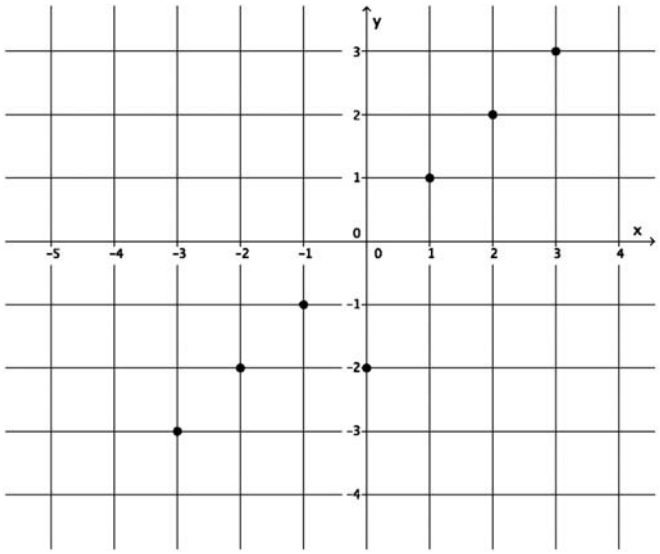
3. Can the following points be on the graph of the equation $2x + 4y = 6$? Explain



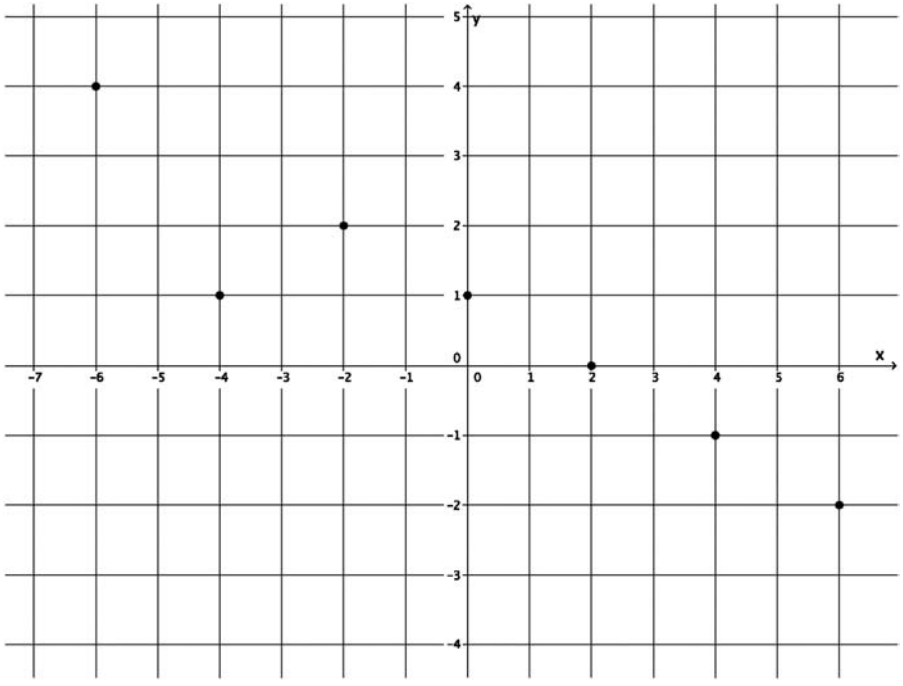
Yes, this graph is of the equation $2x + 4y = 6$ because each point on the graph represents a solution to the linear equation $2x + 4y = 6$.

1. Find at least ten solutions to the linear equation $\frac{1}{2}x + y = 5$, and plot the points on a coordinate plane. What shape is the graph of the linear equation taking?

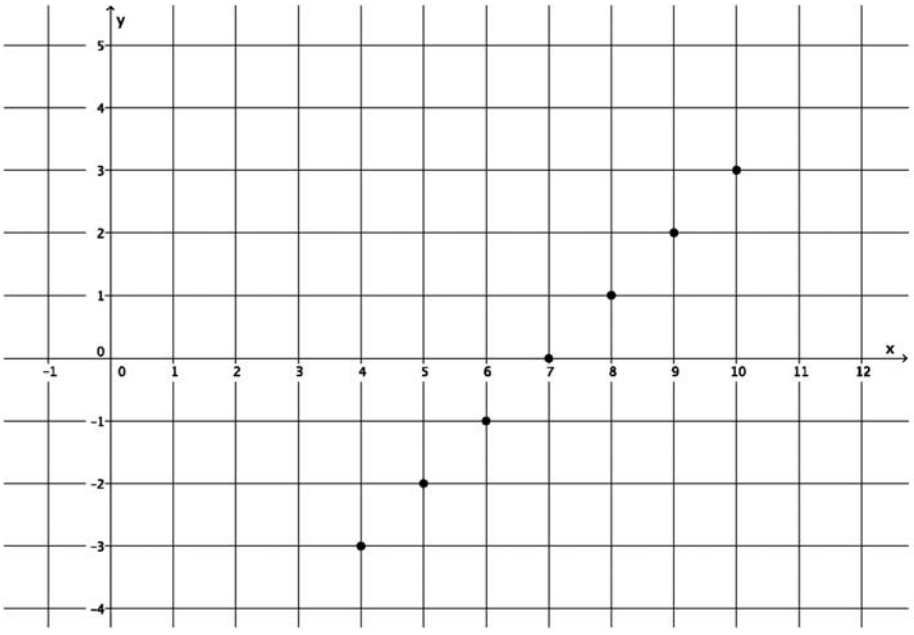
2. Can the following points be on the graph of the equation $x - y = 0$? Explain.



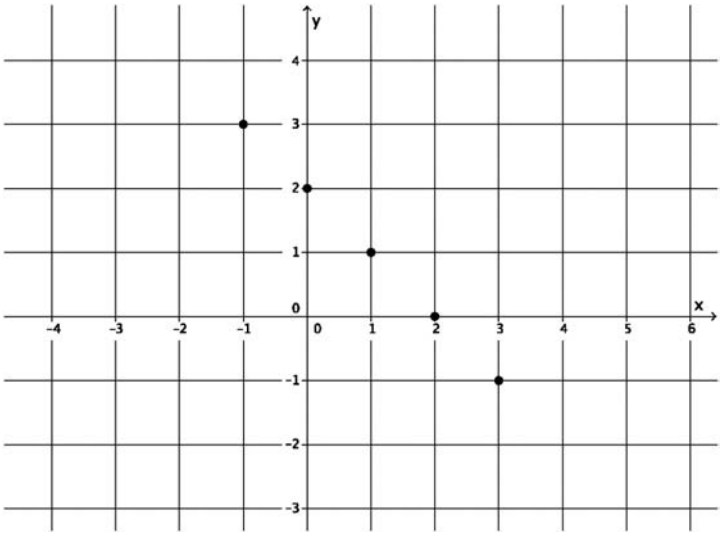
3. Can the following points be on the graph of the equation $x + 2y = 2$? Explain.



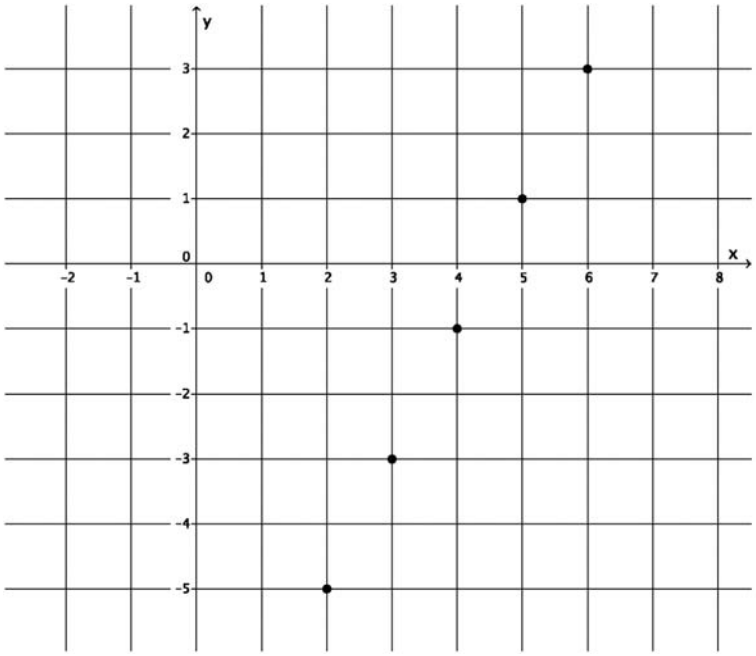
4. Can the following points be on the graph of the equation $x - y = 7$? Explain.



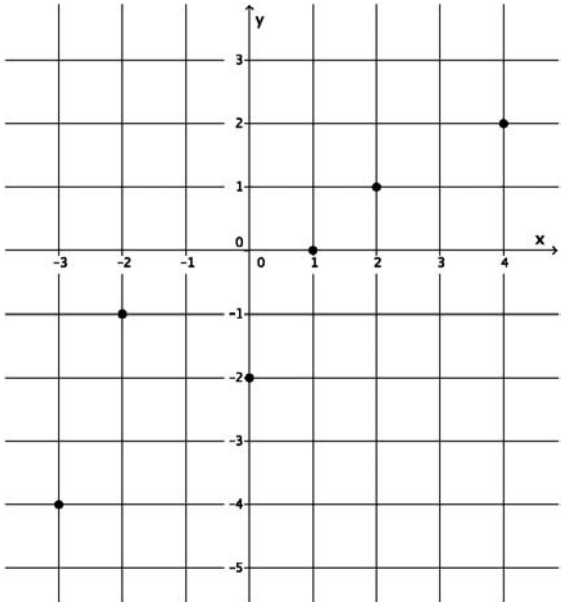
5. Can the following points be on the graph of the equation $x + y = 2$? Explain.



6. Can the following points be on the graph of the equation $2x - y = 9$? Explain.



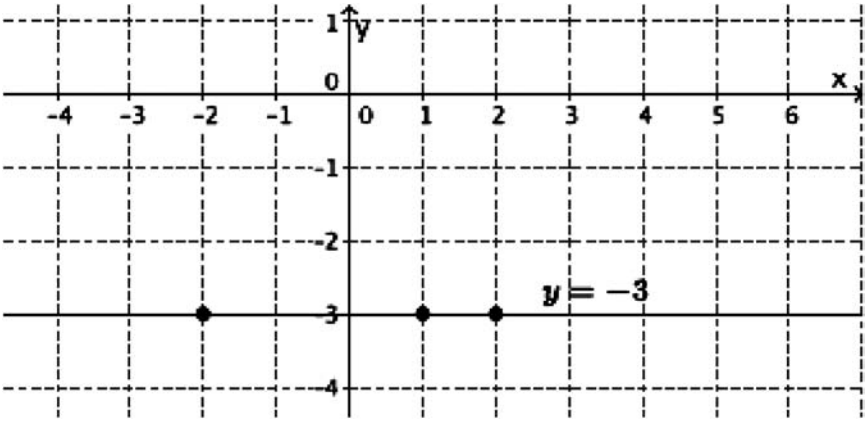
7. Can the following points be on the graph of the equation $x - y = 1$? Explain.



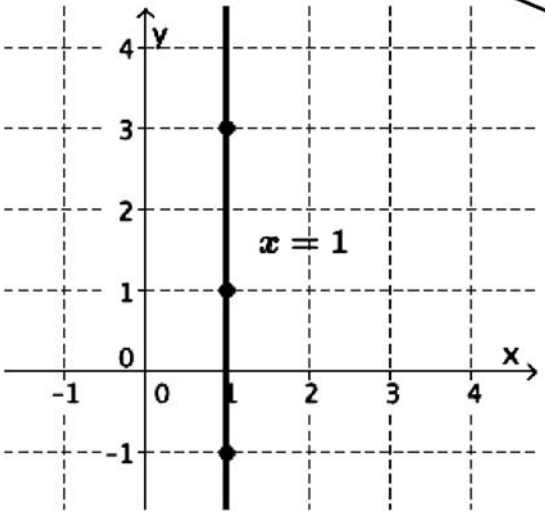
1. Graph the two-variable linear equation $ax + by = c$, where $a = 0$, $b = -2$, and $c = 6$.

$$\begin{aligned} ax + by &= c \\ 0x + (-2)y &= 6 \\ -2y &= 6 \\ y &= -3 \end{aligned}$$

I'm not sure how to graph this, so I'll find some solutions using a table like in the last lesson.



2. Graph the linear equation $x = 1$.



I know that this will either be a horizontal or vertical line. Since the equation is $x = 1$, that means that no matter what value I choose for y, the x-value will always be one.

3. Explain why the graph of a linear equation in the form of $x = c$ is the vertical line, parallel to the y-axis passing through the point $(c, 0)$.

The graph of $x = c$ passes through the point $(c, 0)$, which means the graph of $x = c$ cannot be parallel to the x-axis because the graph intersects it. For that reason, the graph of $x = c$ must be a vertical line parallel to the y-axis.

1. Graph the two-variable linear equation $ax + by = c$, where $a = 0$, $b = 1$, and $c = -4$.

2. Graph the two-variable linear equation $ax + by = c$, where $a = 1$, $b = 0$, and $c = 9$.

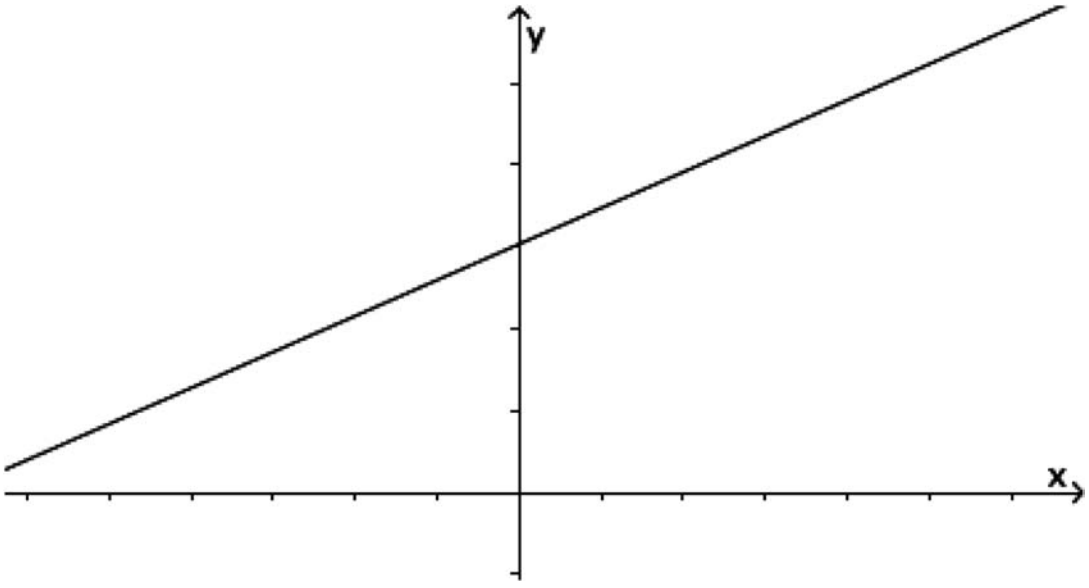
3. Graph the linear equation $y = 7$.

4. Graph the linear equation $x = 1$.

5. Explain why the graph of a linear equation in the form of $y = c$ is the horizontal line, parallel to the x-axis passing through the point $(0, c)$.

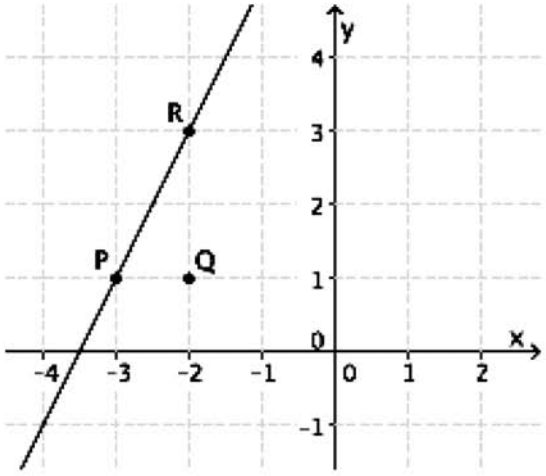
6. Explain why there is only one line with the equation $y = c$ that passes through the point $(0, c)$.

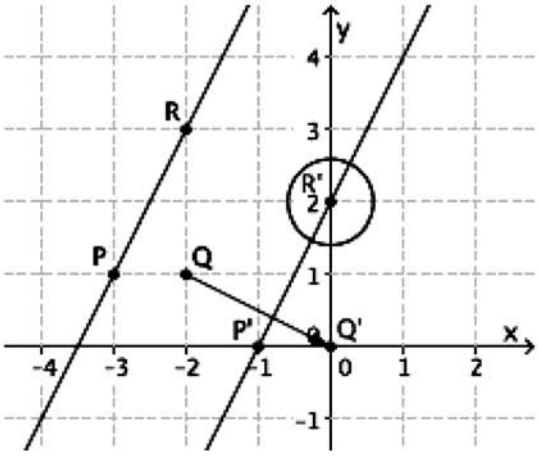
1. Does the graph of the line shown below have a positive or negative slope? Explain



The graph of this line has a positive slope. It is left-to-right inclining, which is an indication of positive slope.

2. What is the slope of this non-vertical line? Use your transparency if needed.

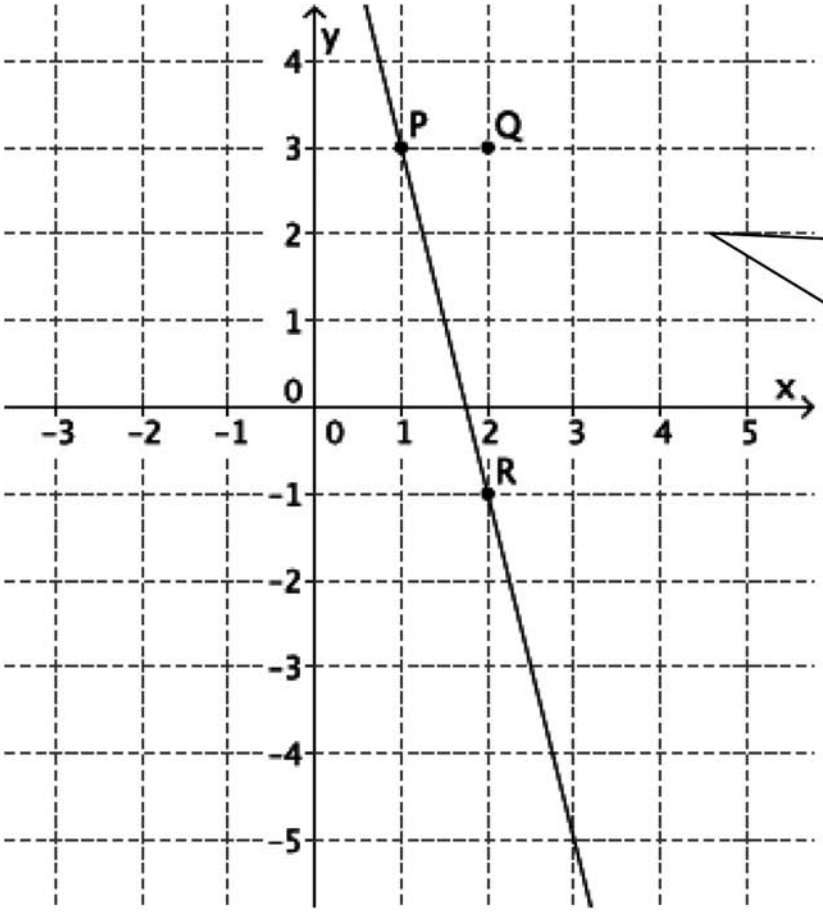




The slope of this line is 2, so $m = 2$.

Since the distance between points P and Q is 1 unit, I can trace everything onto a transparency and map point Q to the origin. The location of the translated point R gives me the slope of the line.

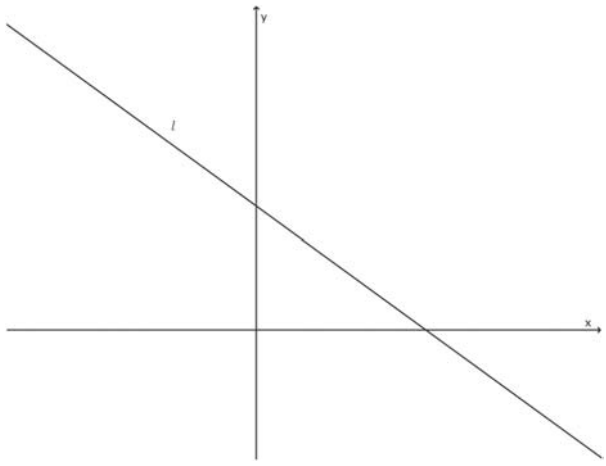
3. What is the slope of this non-vertical line? Use your transparency if needed.



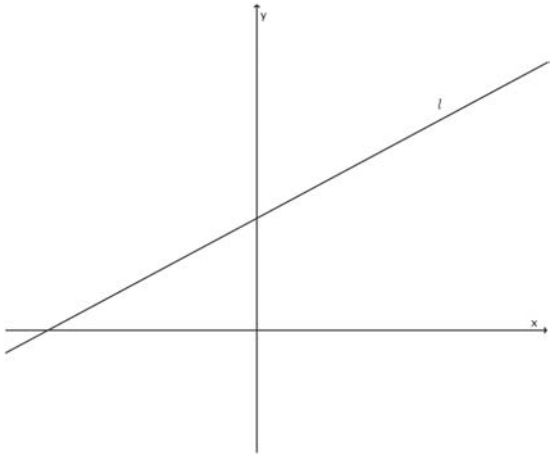
I can tell by the line that the slope will be negative. Just like I did in the last problem, I will use my transparency and translation to figure out the number that represents the slope.

The slope of this line is -4, so $m = -4$.

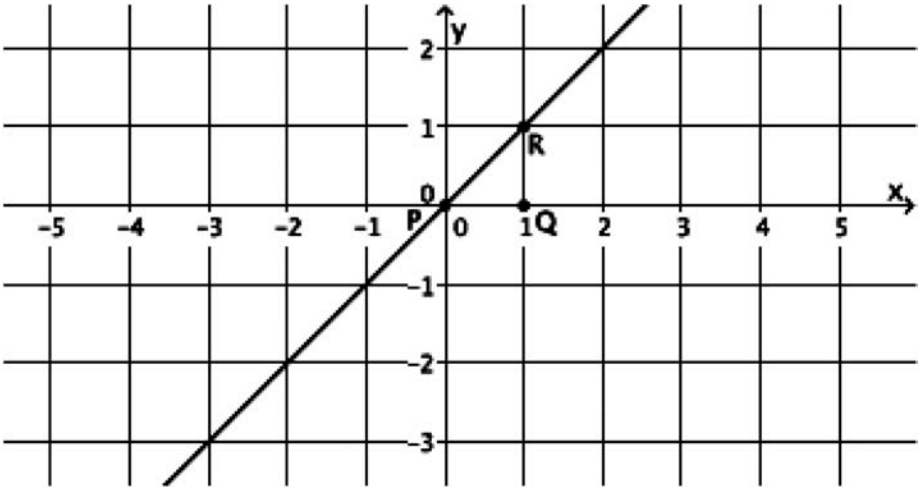
1. Does the graph of the line shown below have a positive or negative slope? Explain.



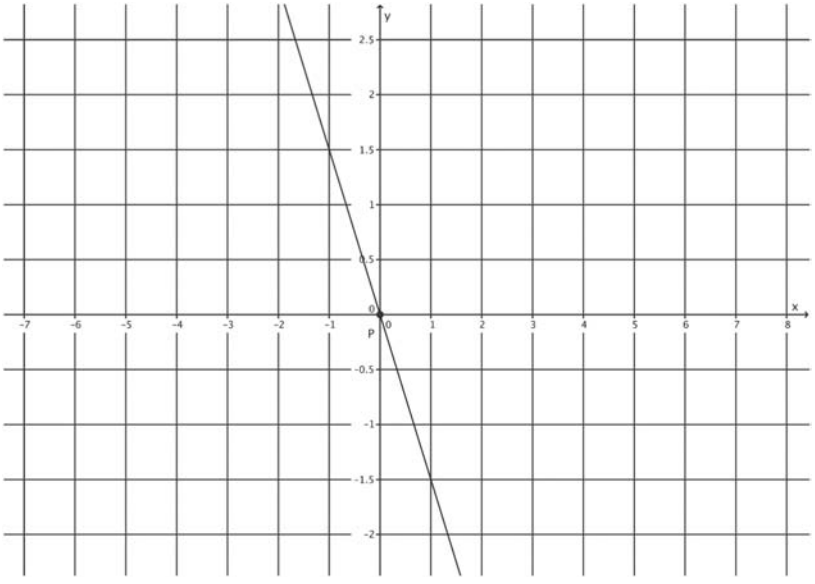
2. Does the graph of the line shown below have a positive or negative slope? Explain.



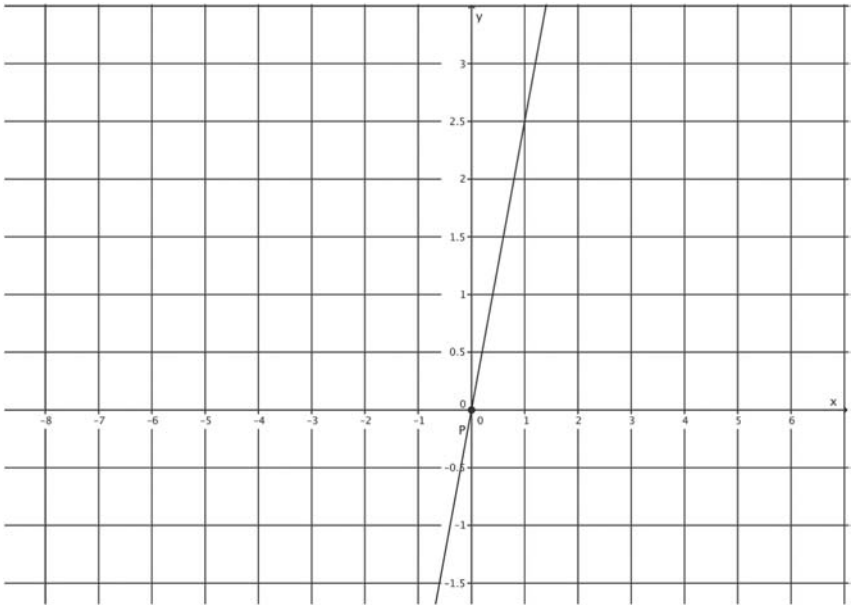
3. What is the slope of this non-vertical line? Use your transparency if needed.



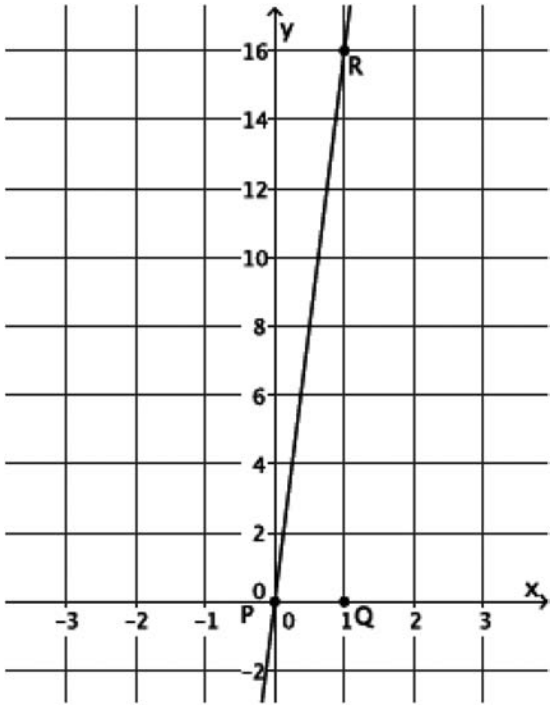
4. What is the slope of this non-vertical line? Use your transparency if needed.



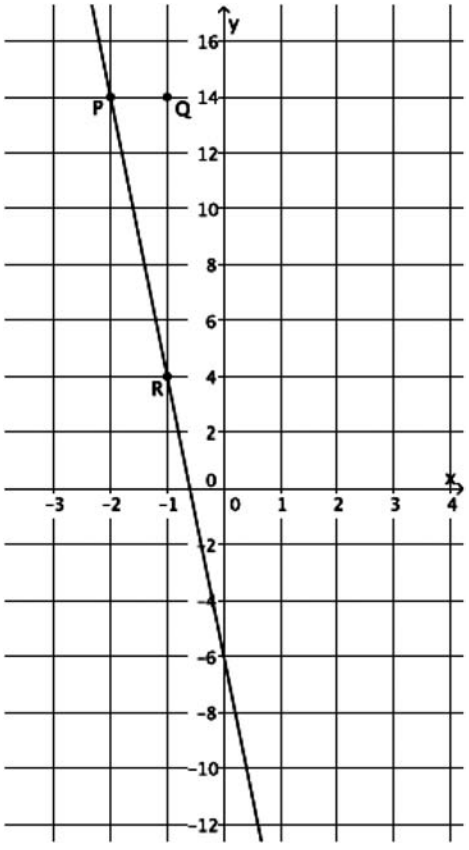
5. What is the slope of this non-vertical line? Use your transparency if needed.



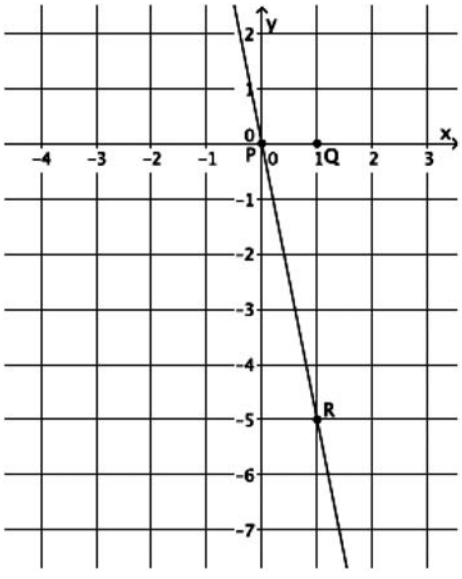
6. What is the slope of this non-vertical line? Use your transparency if needed.



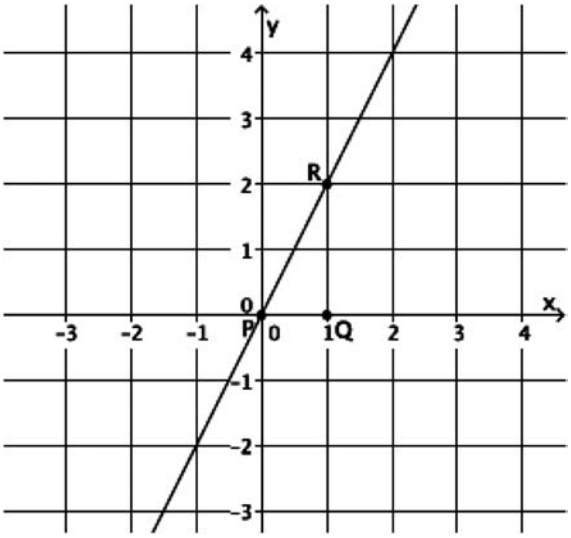
7. What is the slope of this non-vertical line? Use your transparency if needed.



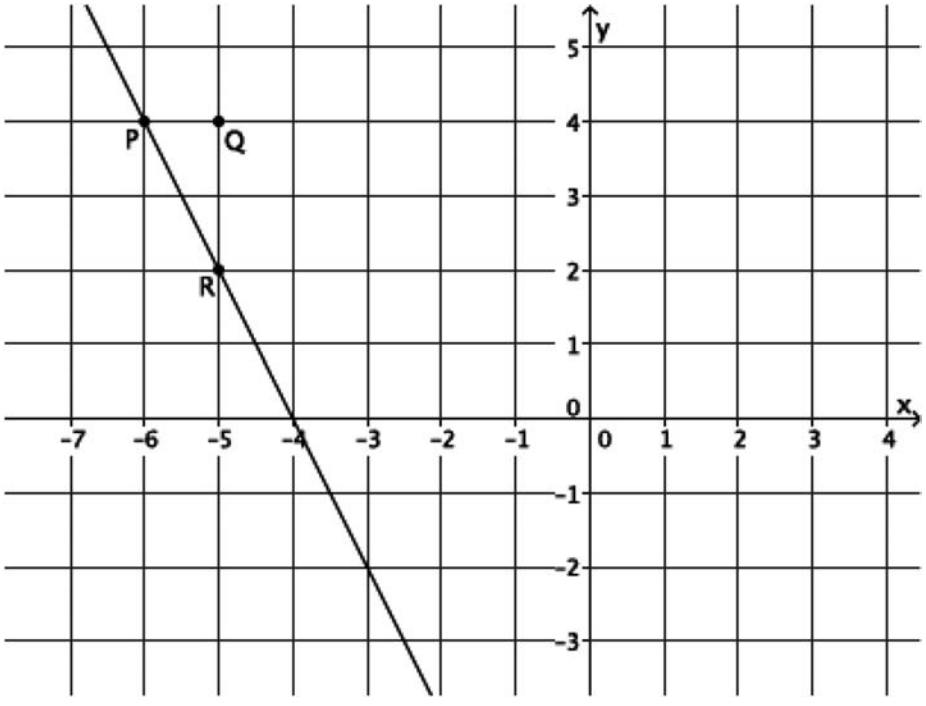
8. What is the slope of this non-vertical line? Use your transparency if needed.



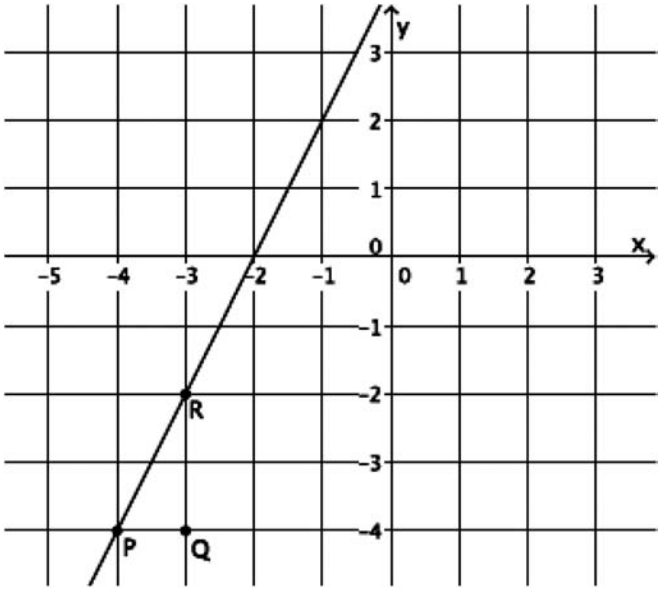
9. What is the slope of this non-vertical line? Use your transparency if needed.



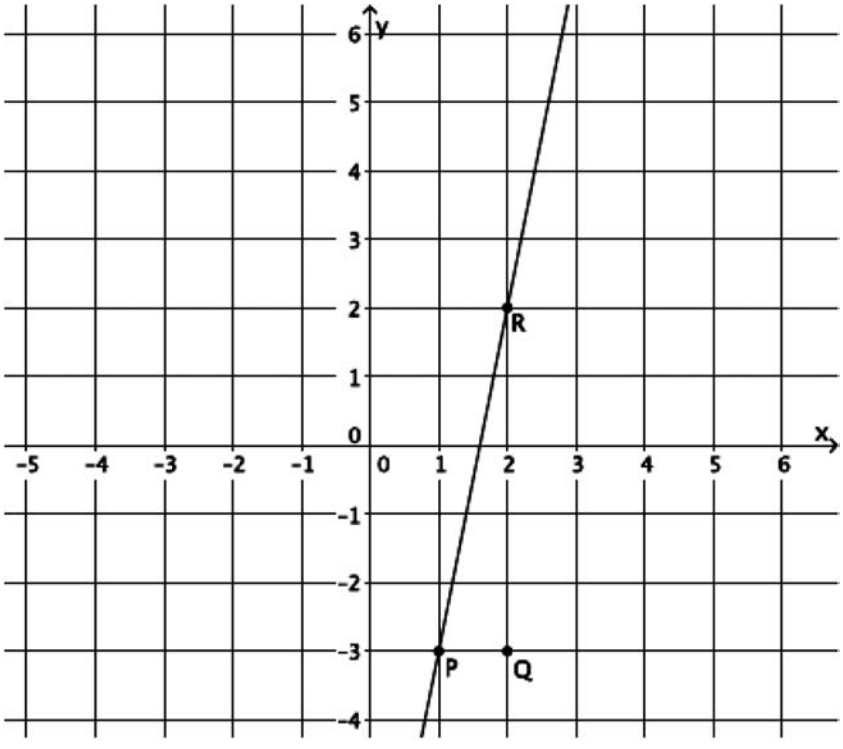
10. What is the slope of this non-vertical line? Use your transparency if needed.



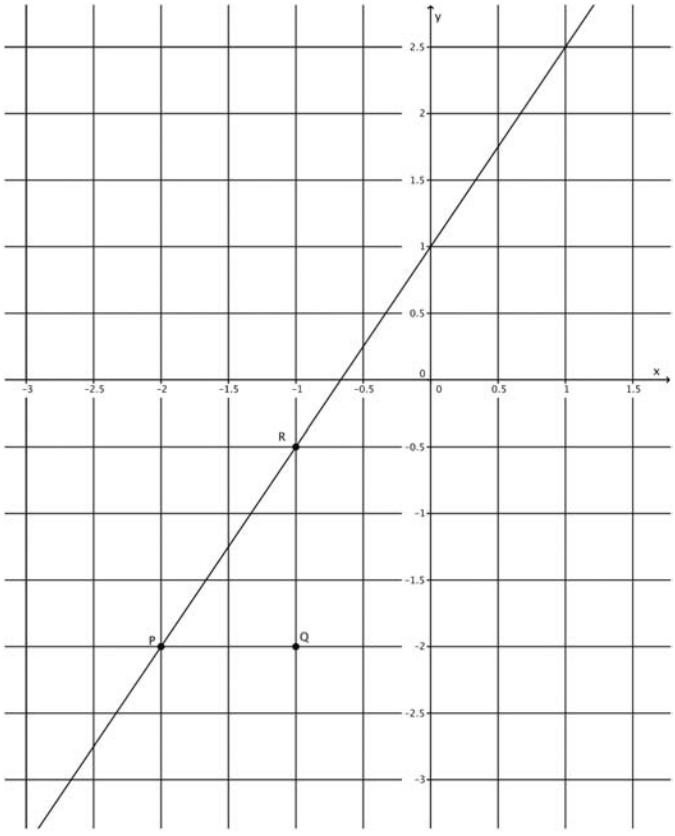
11. What is the slope of this non-vertical line? Use your transparency if needed.



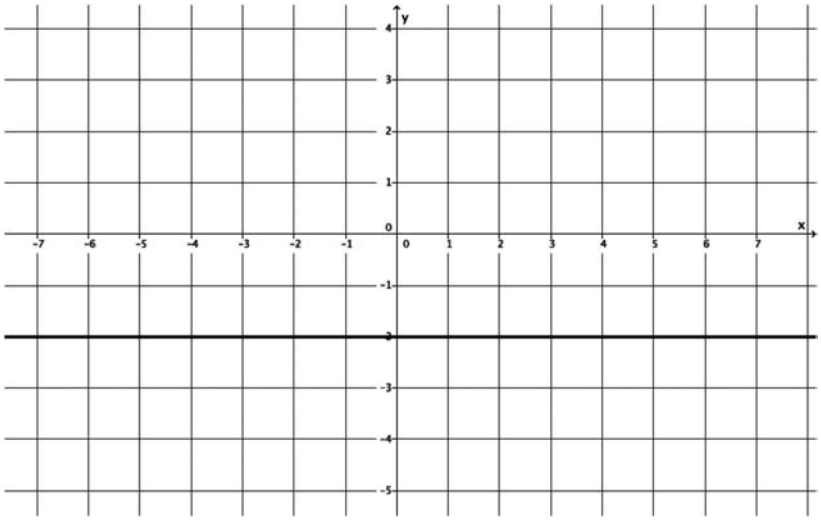
12. What is the slope of this non-vertical line? Use your transparency if needed.



13. What is the slope of this non-vertical line? Use your transparency if needed.



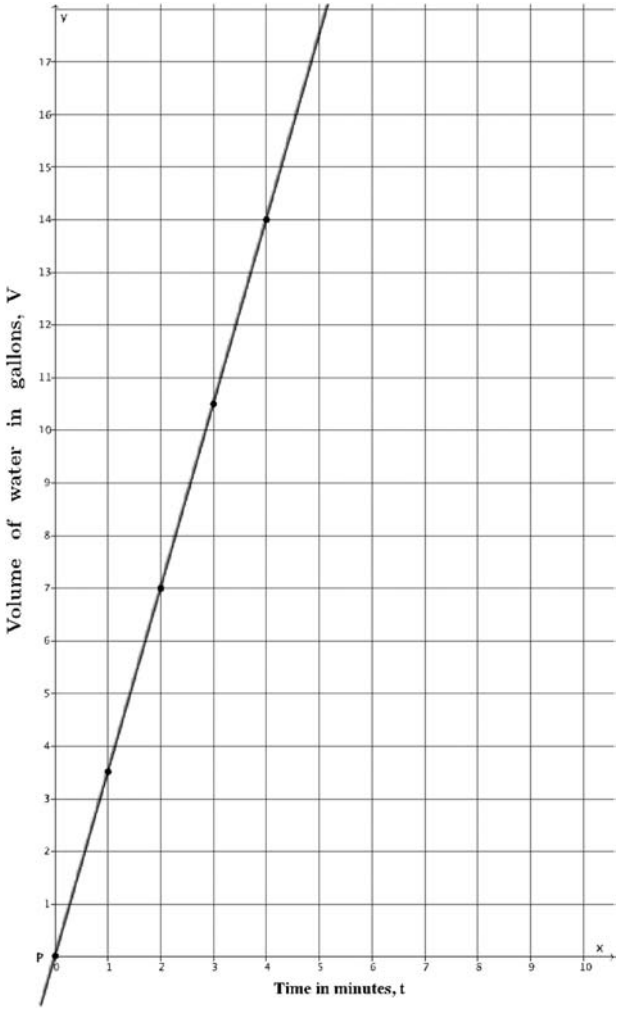
14. What is the slope of this non-vertical line? Use your transparency if needed.



In Lesson 11, you did the work below involving constant rate problems. Use the table and the graphs provided to answer the questions that follow.

15. Suppose the volume of water that comes out in three minutes is 10.5 gallons.

t (time in minutes)	Linear Equation: $V = \frac{10.5}{3}t$	V (in gallons)
0	$V = \frac{10.5}{3}(0)$	0
1	$V = \frac{10.5}{3}(1)$	$\frac{10.5}{3} = 3.5$
2	$V = \frac{10.5}{3}(2)$	$\frac{21}{3} = 7$
3	$V = \frac{10.5}{3}(3)$	$\frac{31.5}{3} = 10.5$
4	$V = \frac{10.5}{3}(4)$	$\frac{42}{3} = 14$

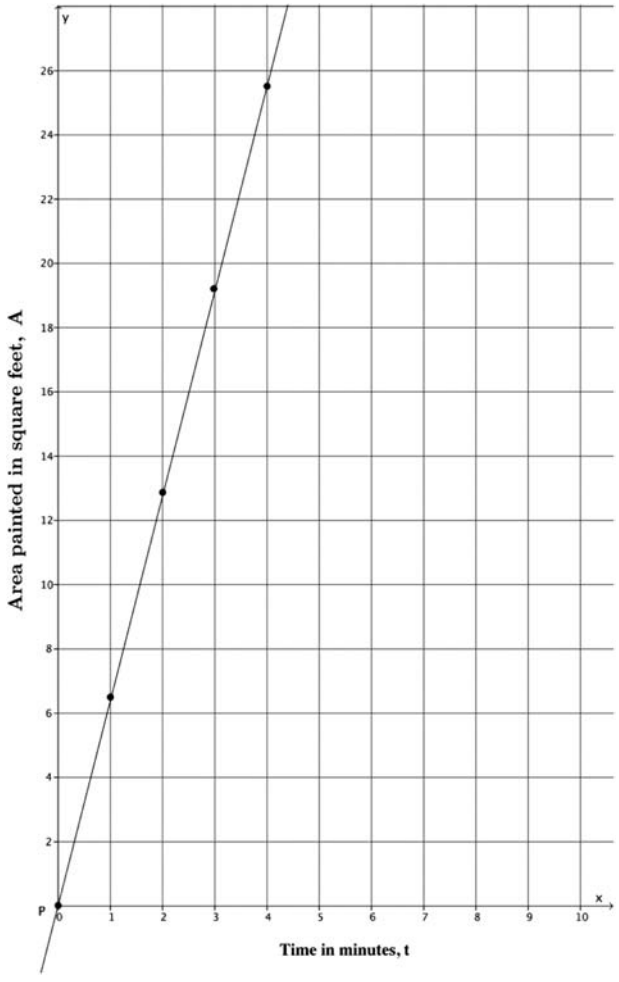


a. How many gallons of water flow out of the faucet per minute? In other words, what is the unit rate of water flow?

b. Assume that the graph of the situation is a line, as shown in the graph. What is the slope of the line?

16. Emily paints at a constant rate. She can paint 32 square feet in five minutes.

t (time in minutes)	Linear Equation: $A = \frac{32}{5}t$	A (area painted in square feet
0	$A = \frac{32}{5}(0)$	0
1	$A = \frac{32}{5}(1)$	$\frac{32}{5} = 6.4$
2	$A = \frac{32}{5}(2)$	$\frac{64}{5} = 12.8$
3	$A = \frac{32}{5}(3)$	$\frac{96}{5} = 19.2$
4	$A = \frac{32}{5}(4)$	$\frac{128}{5} = 25.6$



a. How many square feet can Emily paint in one minute? In other words, what is her unit rate of painting?

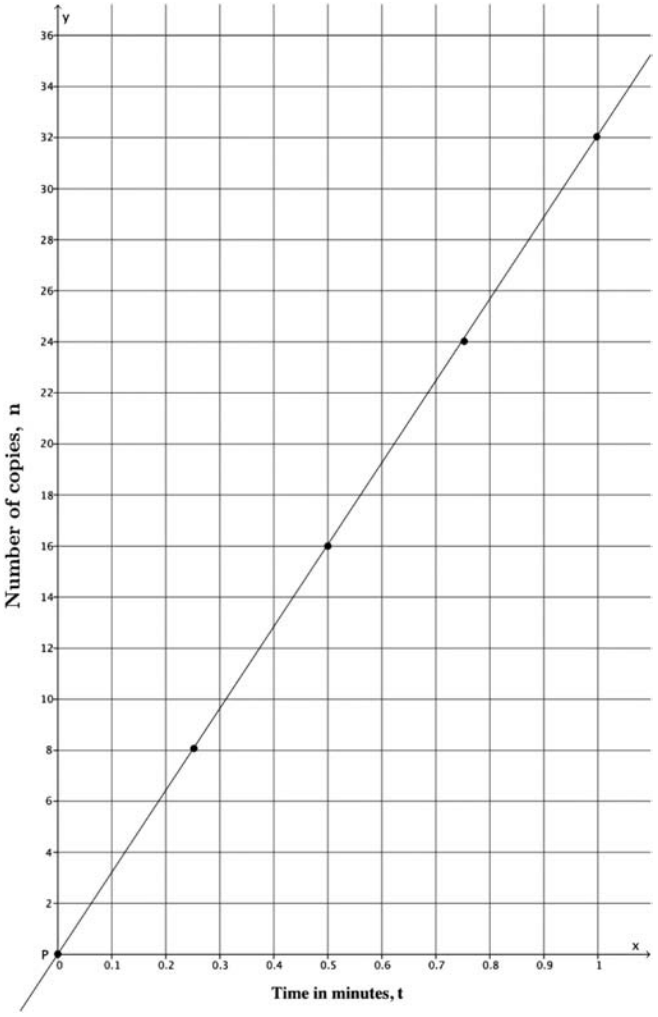
b. Assume that the graph of the situation is a line, as shown in the graph. What is the slope of the line?

17. A copy machine makes copies at a constant rate. The machine can make 80 copies in $2\frac{1}{2}$ minutes.

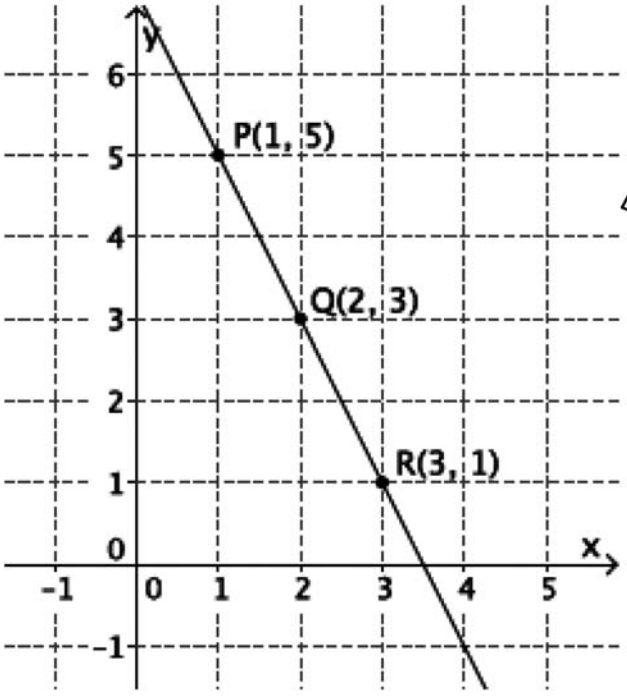
t (time in minutes)	Linear Equation: $n = 32t$	n (number of copies)
0	$n = 32(0)$	0
0.25	$n = 32(0.25)$	8
0.5	$n = 32(0.5)$	16
0.75	$n = 32(0.75)$	24
1	$n = 32(1)$	32

a. How many copies can the machine make each minute? In other words, what is the unit rate of the copy machine?

b. Assume that the graph of the situation is a line, as shown in the graph. What is the slope of the line?



1. Calculate the slope of the line using two different pairs of points.



I need to choose three points on the line. The points $P(p_1, p_2)$ and $Q(q_1, q_2)$ are used in my first slope equation. I need to remember that no matter how the slope is written, the difference in the 2^{nd} values (y-values) is in the numerator of the slope, and the difference in the 1^{st} values (x-values) is in the denominator of the slope. The equation $m = \frac{q_2 - p_2}{p_1 - q_1}$ would be wrong since the values of point Q do not come first in each difference.

$$m = \frac{p_2 - q_2}{p_1 - q_1}$$
$$= \frac{5 - 3}{1 - 2}$$
$$= \frac{2}{-1}$$
$$= -2$$

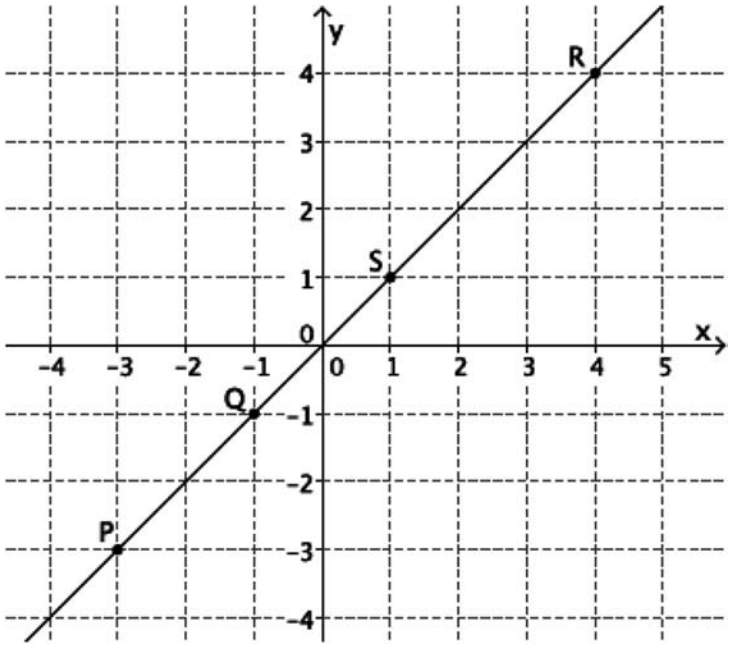
$$m = \frac{r_2 - q_2}{r_1 - q_1}$$
$$= \frac{1 - 3}{3 - 2}$$
$$= \frac{-2}{1}$$
$$= -2$$

2. Calculate the slope of the line using two different pairs of points.

   a. Select any two points on the line to compute the slope.

   Let the two points be $P(-3, -3)$ and $Q(-1, -1)$.

$$m = \frac{p_2 - q_2}{p_1 - q_1}$$
$$= \frac{-3 - (-1)}{-3 - (-1)}$$
$$= \frac{-2}{-2}$$
$$= 1$$



   b. Select two different points on the line to calculate the slope.

   Let the two points be $S(1, 1)$ and $R(4, 4)$.

$$m = \frac{s_2 - r_2}{s_1 - r_1}$$
$$= \frac{1 - 4}{1 - 4}$$
$$= \frac{-3}{-3}$$
$$= 1$$

   c. What do you notice about your answers in parts (a) and (b)? Explain.

   The slopes are equal in parts (a) and (b). This is true because of what we know about similar triangles. The slope triangle that is drawn between the two points selected in part (a) is similar to the slope triangle that is drawn between the two points in part (b) by the AA criterion. Then, because the corresponding sides of similar triangles are equal in ratio, the slopes are equal.

3. Your teacher tells you that a line goes through the points $\left(1, \frac{3}{4}\right)$ and $(-2, -3)$.

   a. Calculate the slope of this line.

$$\begin{aligned} m &= \frac{p_2 - r_2}{p_1 - r_1} \\ &= \frac{\frac{3}{4} - (-3)}{1 - (-2)} \\ &= \frac{3\frac{3}{4}}{3} \\ &= \frac{5}{4} \end{aligned}$$

   b. Do you think the slope will be the same if the order of the points is reversed? Verify by calculating the slope, and explain your result.

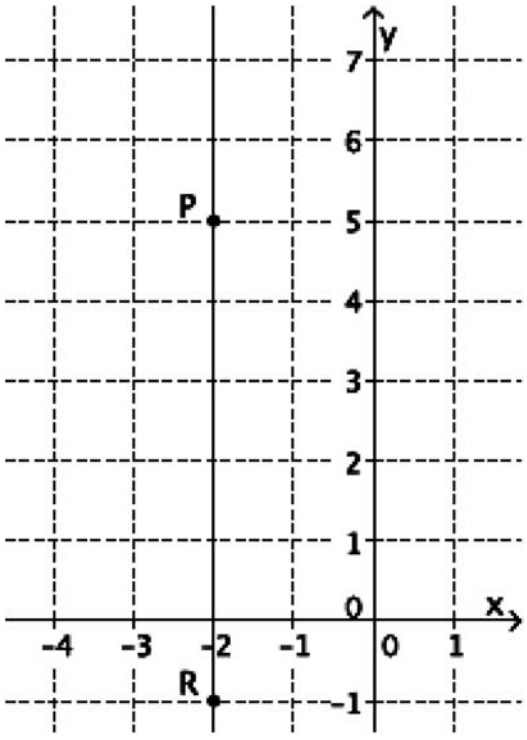
   The slope should be the same because we are joining the same two points. Since the slope of a line can be computed using any two points on the same line, it makes sense that it does not matter which point we name as P and which point we name as R.

$$\begin{aligned} m &= \frac{r_2 - p_2}{r_1 - p_1} \\ &= \frac{-3 - \frac{3}{4}}{-2 - 1} \\ &= \frac{-3\frac{3}{4}}{-3} \\ &= \frac{5}{4} \end{aligned}$$

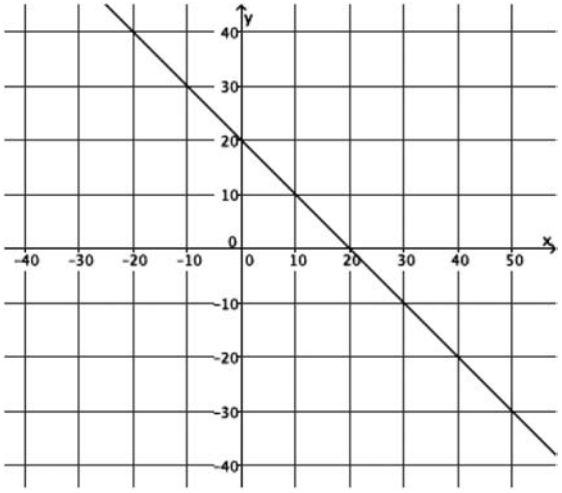
4. Each of the lines in the lesson was non-vertical. Consider the slope of a vertical line, $x = -2$. Select two points on the line to calculate slope. Based on your answer, why do you think the topic of slope focuses only on non-vertical lines?

$$m = \frac{r_2 - p_2}{r_1 - p_1}$$
$$= \frac{-1 - 5}{-2 - (-2)}$$
$$= \frac{-6}{0}$$

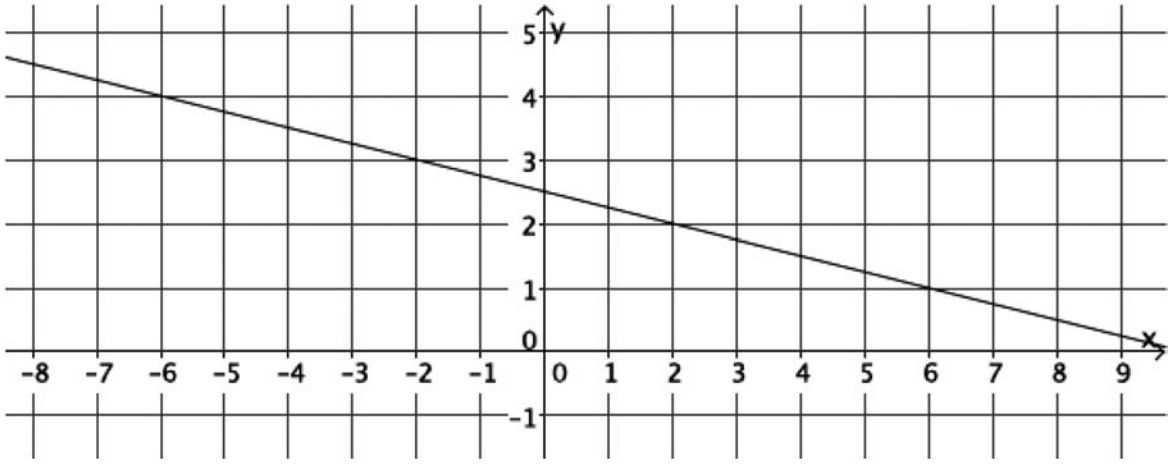
The computation of slope using the formula leads to a fraction with zero as its denominator, which is undefined. The topic of slope does not focus on vertical lines because the slope of a vertical line is undefined.



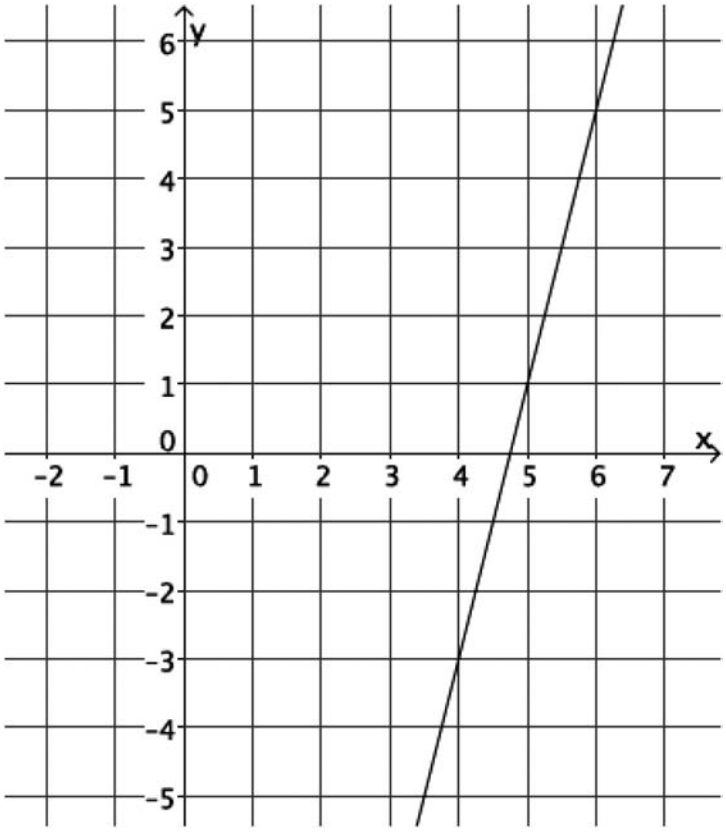
1. Calculate the slope of the line using two different pairs of points.



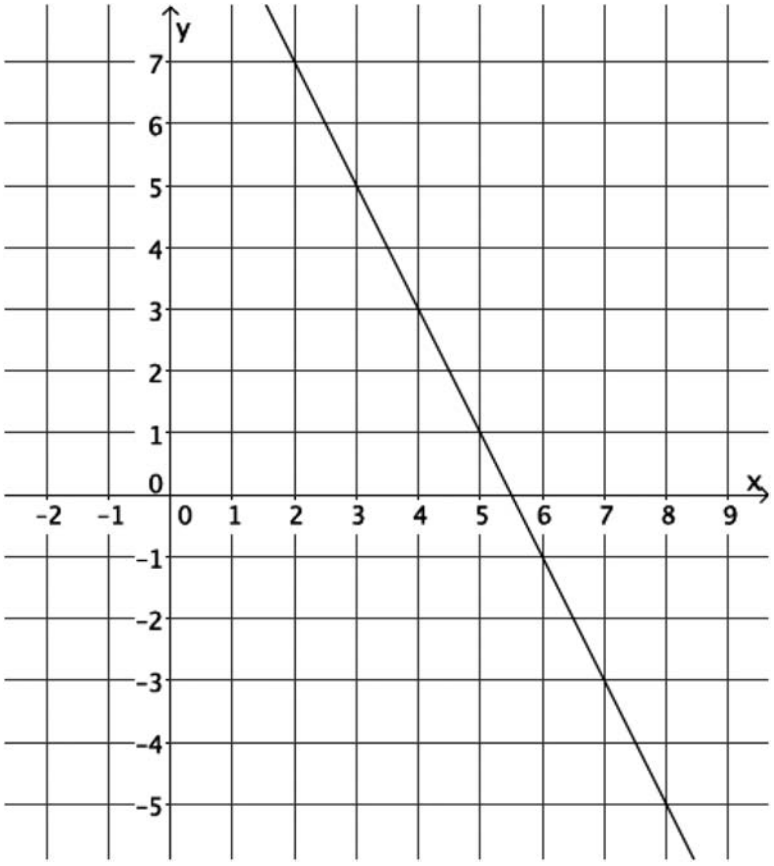
2. Calculate the slope of the line using two different pairs of points.



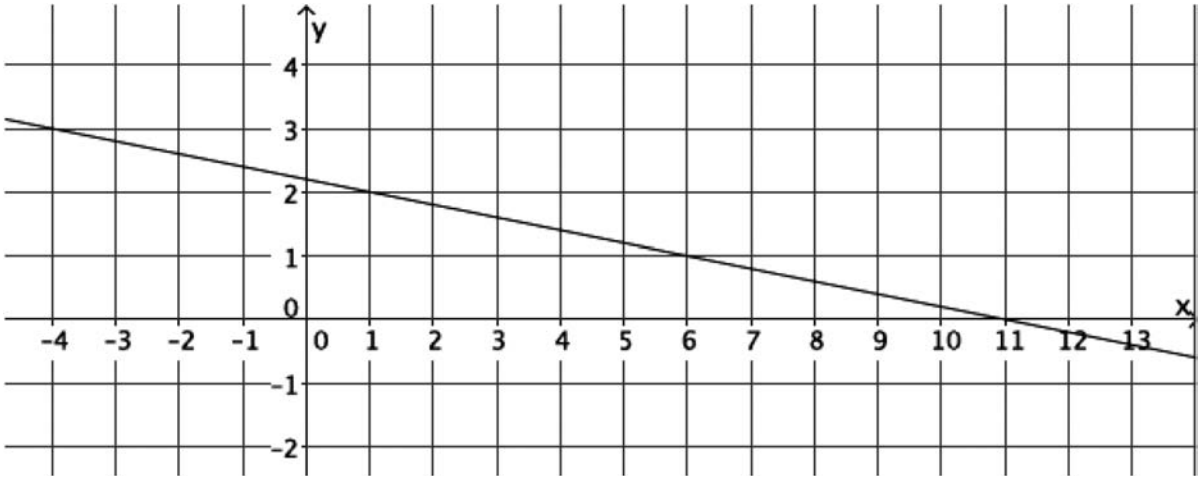
3. Calculate the slope of the line using two different pairs of points.



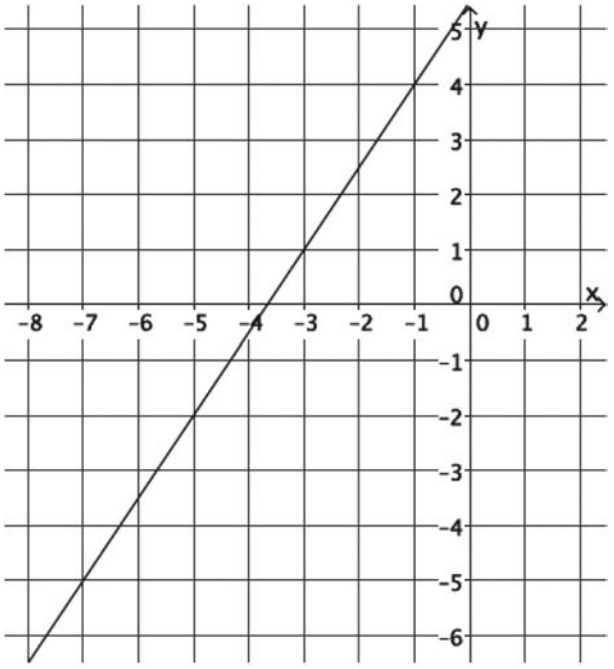
4. Calculate the slope of the line using two different pairs of points.



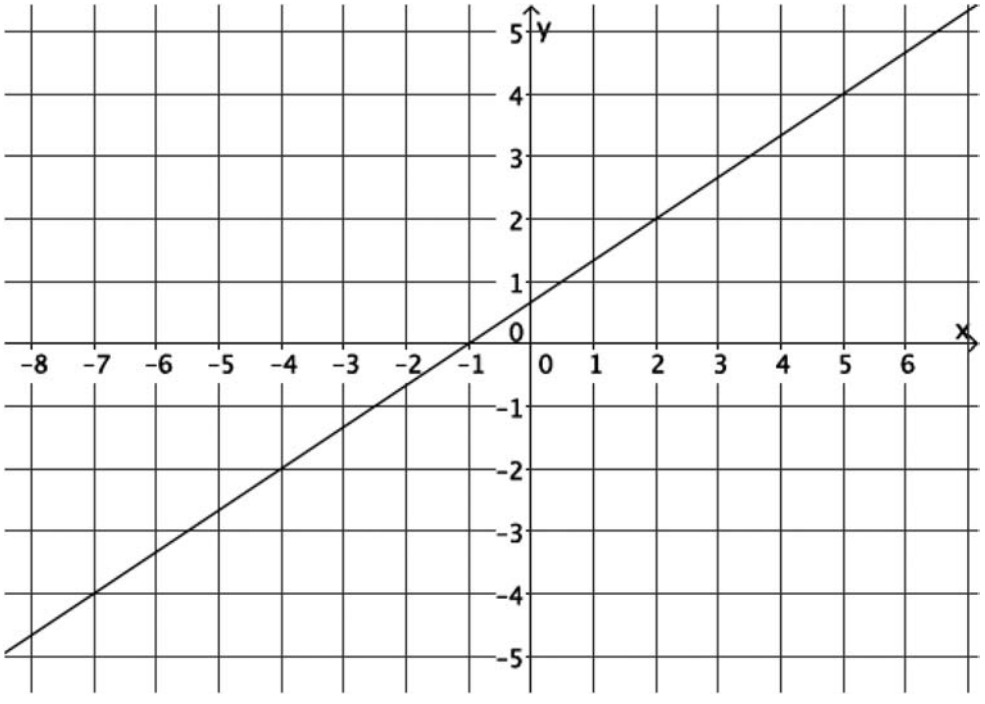
5. Calculate the slope of the line using two different pairs of points.



6. Calculate the slope of the line using two different pairs of points.
   a. Select any two points on the line to compute the slope.
   b. Select two different points on the line to calculate the slope.
   c. What do you notice about your answers in parts (a) and (b)? Explain.

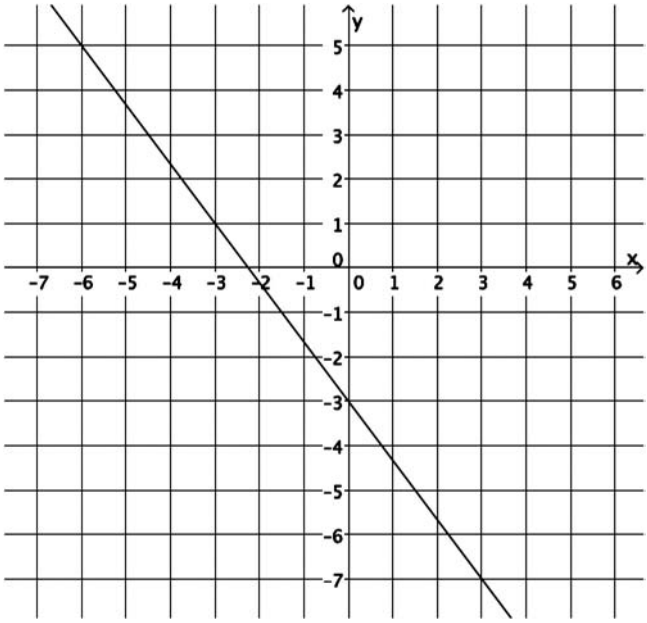


7. Calculate the slope of the line in the graph below.

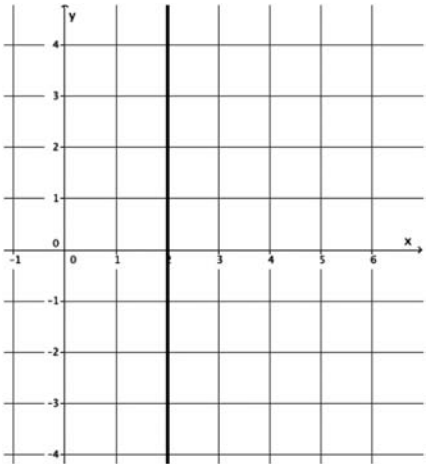


8. Your teacher tells you that a line goes through the points $\left(-6, \frac{1}{2}\right)$ and $(-4,3)$.
   a. Calculate the slope of this line.
   b. Do you think the slope will be the same if the order of the points is reversed? Verify by calculating the slope, and explain your result.

9. Use the graph to complete parts (a)–(c).
   a. Select any two points on the line to calculate the slope.
   b. Compute the slope again, this time reversing the order of the coordinates.
   c. What do you notice about the slopes you computed in parts (a) and (b)?
   d. Why do you think $m = \frac{(p_2 - r_2)}{(p_1 - r_1)} = \frac{(r_2 - p_2)}{(r_1 - p_1)}$?



10. Each of the lines in the lesson was non-vertical. Consider the slope of a vertical line, $x = 2$. Select two points on the line to calculate slope. Based on your answer, why do you think the topic of slope focuses only on non-vertical lines?



Challenge:

11. A certain line has a slope of $\frac{1}{2}$. Name two points that may be on the line.

1. Solve the following equation for y: $-3x + 9y = 18$. Then, answer the questions that follow.

$$\begin{aligned} -3x + 9y &= 18 \\ -3x + 3x + 9y &= 18 + 3x \\ 9y &= 18 + 3x \\ \frac{9}{9}y &= \frac{18}{9} + \frac{3}{9}x \\ y &= 2 + \frac{1}{3}x \\ y &= \frac{1}{3}x + 2 \end{aligned}$$

   a. Based on your transformed equation, what is the slope of the linear equation $-3x + 9y = 18$?

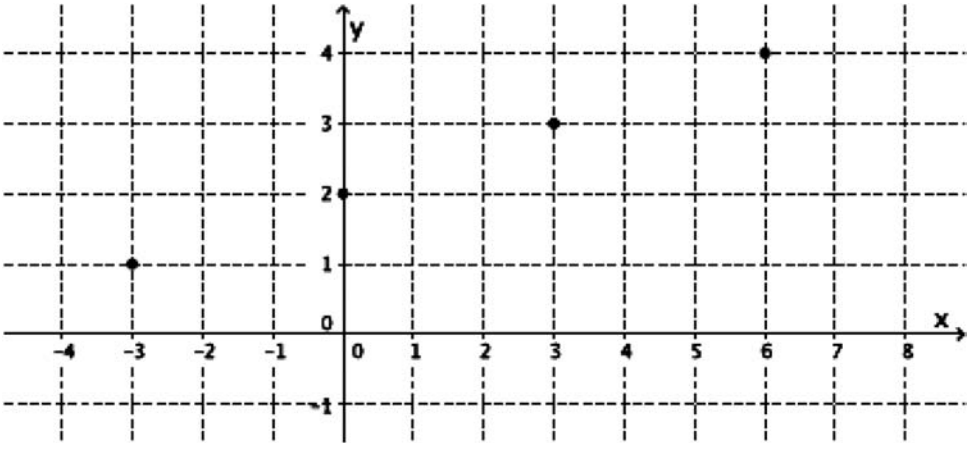
   The slope is $\frac{1}{3}$.

b. Complete the table to find solutions to the linear equation.

Since the slope is a fraction, $\frac{1}{3}$, I need to choose x-values that are multiples of 3.

x	**Transformed Equation:** $y = \frac{1}{3}x + 2$	y
-3	$y = \frac{1}{3}(-3) + 2$ $= -1 + 2$ $= 1$	1
0	$y = \frac{1}{3}(0) + 2$ $= 2$	2
3	$y = \frac{1}{3}(3) + 2$ $= 1 + 2$ $= 3$	3
6	$y = \frac{1}{3}(6) + 2$ $= 2 + 2$ $= 4$	4

c. Graph the points on the coordinate plane.



d. Find the slope between any two points.

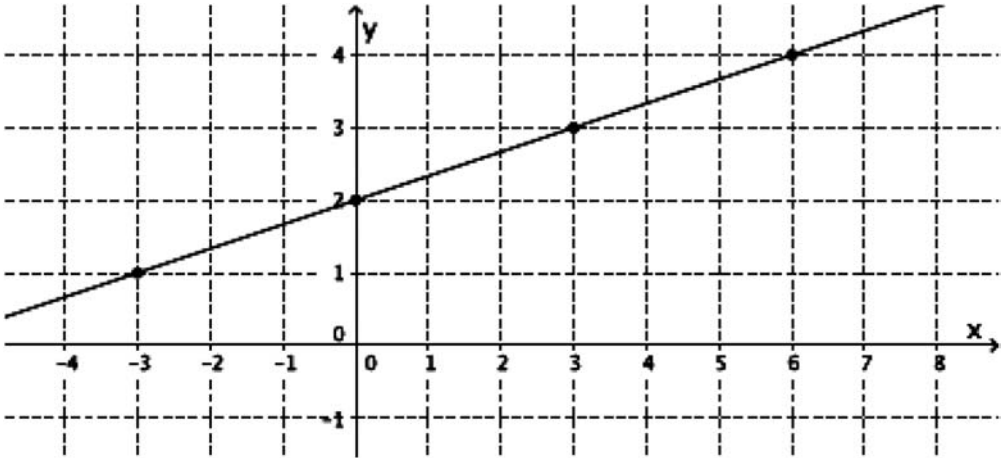
Using the points $(-3, 1)$ ***and*** $(3, 3)$,

$$m = \frac{1-3}{-3-3}$$

$$= \frac{-2}{-6}$$

$$= \frac{1}{3}$$

e. The slope you found in part (d) should be equal to the slope you noted in part (a). If so, connect the points to make the line that is the graph of an equation of the form $y = mx + b$ that has slope m.



f. Note the location (ordered pair) that describes where the line intersects the y-axis.

$(0, 2)$ ***is the location where the line intersects the*** y***-axis.***

1. Solve the following equation for y: $-4x + 8y = 24$. Then, answer the questions that follow.

   a. Based on your transformed equation, what is the slope of the linear equation $-4x + 8y = 24$?

   b. Complete the table to find solutions to the linear equation.

x	**Transformed Linear Equation:**	y

   c. Graph the points on the coordinate plane.

   d. Find the slope between any two points.

   e. The slope you found in part (d) should be equal to the slope you noted in part (a). If so, connect the points to make the line that is the graph of an equation of the form $y = mx + b$ that has slope m.

   f. Note the location (ordered pair) that describes where the line intersects the y-axis.

2. Solve the following equation for y: $9x + 3y = 21$. Then, answer the questions that follow.

   a. Based on your transformed equation, what is the slope of the linear equation $9x + 3y = 21$?

   b. Complete the table to find solutions to the linear equation.

x	**Transformed Linear Equation:**	y

   c. Graph the points on the coordinate plane.

   d. Find the slope between any two points.

   e. The slope you found in part (d) should be equal to the slope you noted in part (a). If so, connect the points to make the line that is the graph of an equation of the form $y = mx + b$ that has slope m.

   f. Note the location (ordered pair) that describes where the line intersects the y-axis.

3. Solve the following equation for y: $2x + 3y = -6$. Then, answer the questions that follow.

   a. Based on your transformed equation, what is the slope of the linear equation $2x + 3y = -6$?

   b. Complete the table to find solutions to the linear equation.

x	**Transformed Linear Equation:**	y

   c. Graph the points on the coordinate plane.

   d. Find the slope between any two points.

   e. The slope you found in part (d) should be equal to the slope you noted in part (a). If so, connect the points to make the line that is the graph of an equation of the form $y = mx + b$ that has slope m.

   f. Note the location (ordered pair) that describes where the line intersects the y-axis.

4. Solve the following equation for y: $5x - y = 4$. Then, answer the questions that follow.

   a. Based on your transformed equation, what is the slope of the linear equation $5x - y = 4$?

   b. Complete the table to find solutions to the linear equation.

x	**Transformed Linear Equation:**	y

   c. Graph the points on the coordinate plane.

   d. Find the slope between any two points.

   e. The slope you found in part (d) should be equal to the slope you noted in part (a). If so, connect the points to make the line that is the graph of an equation of the form $y = mx + b$ that has slope m.

   f. Note the location (ordered pair) that describes where the line intersects the y-axis.

Graph each equation on a separate pair of x- and y-axes. Students need graph paper to complete the Problem Set.

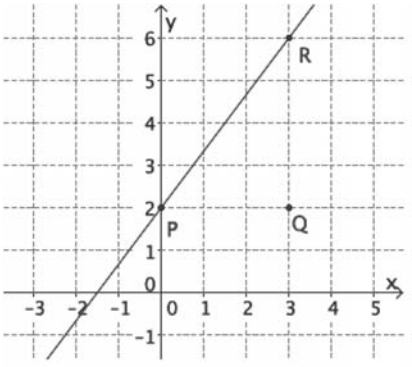
1. Graph the equation $y = \frac{4}{3}x + 2$.

I know the equation is in slope-intercept form, $y = mx + b$, the number m represents the slope of the graph, and the point $(0, b)$ is the location where the graph of the line intersects the y-axis.

a. Name the slope and the y-intercept point.

The slope is $\boldsymbol{m = \frac{4}{3}}$, and the y-intercept point is $(0, 2)$.

b. Graph the known point, and then use the slope to find a second point before drawing the line.



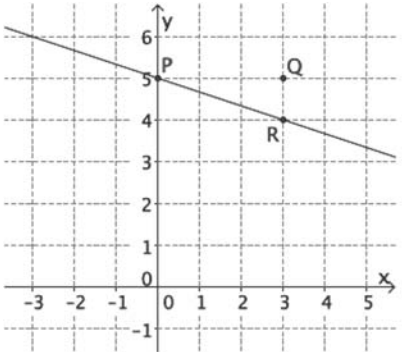
I know that $m = \frac{|QR|}{|PQ|}$. Since $|PQ| = 3$, I need to go 3 units from the right of point P, the y-intercept, to find point Q. Since $|QR| = 4$ and the slope is positive, I need to go up 4 units from point Q to find point R.

2. Graph the equation $y = -\frac{1}{3}x + 5$.

a. Name the slope and the y-intercept point.

The slope is $\boldsymbol{m = -\frac{1}{3}}$, and the y-intercept point is $(0, 5)$.

b. Graph the known point, and then use the slope to find a second point before drawing the line.



I need to go three units to the right of point P and mark point Q. Since the slope is negative, I need to go down 1 unit from point Q to find point R.

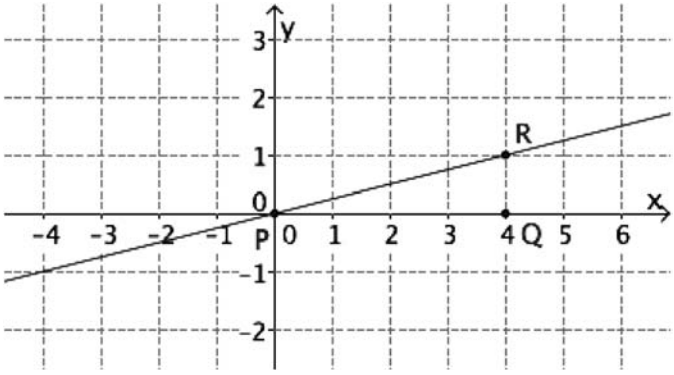
3. Graph the equation $y = \frac{1}{4}x$.

Rewriting the equation in slope-intercept form, $y = \frac{1}{4}x + 0$, helps me to see the y-intercept point is $(0, 0)$.

a. Name the slope and the y-intercept point.

The slope is $m = \frac{1}{4}$, and the y-intercept point is $(0, 0)$.

b. Graph the known point, and then use the slope to find a second point before drawing the line.



4. Graph the equation $2x + 2y = 2$.

a. Name the slope and the y-intercept point.

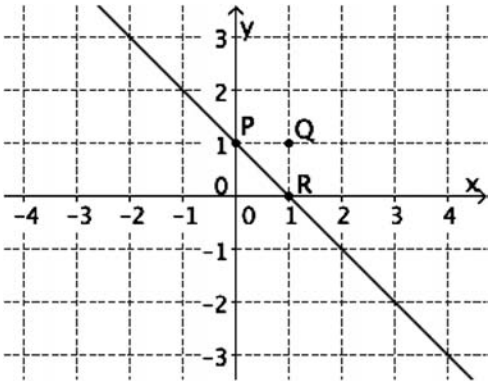
I need to rewrite the equation in slope-intercept form to help me name the slope and y-intercept point more easily.

$$\begin{aligned} 2x + 2y &= 2 \\ 2x - 2x + 2y &= -2x + 2 \\ 2y &= -2x + 2 \\ \frac{2}{2}y &= -\frac{2}{2}x + \frac{2}{2} \\ y &= -x + 1 \end{aligned}$$

The slope -1 is equivalent to the fraction $-\frac{1}{1}$.

The slope is $m = -1$, and the y-intercept point is $(0, 1)$.

b. Graph the known point, and then use the slope to find a second point before drawing the line.



Graph each equation on a separate pair of x- and y-axes.

1. Graph the equation $y = \frac{4}{5}x - 5$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

2. Graph the equation $y = x + 3$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

3. Graph the equation $y = -\frac{4}{3}x + 4$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

4. Graph the equation $y = \frac{5}{2}x$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

5. Graph the equation $y = 2x - 6$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

6. Graph the equation $y = -5x + 9$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

7. Graph the equation $y = \frac{1}{3}x + 1$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

8. Graph the equation $5x + 4y = 8$. (Hint: Transform the equation so that it is of the form $y = mx + b$.)
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

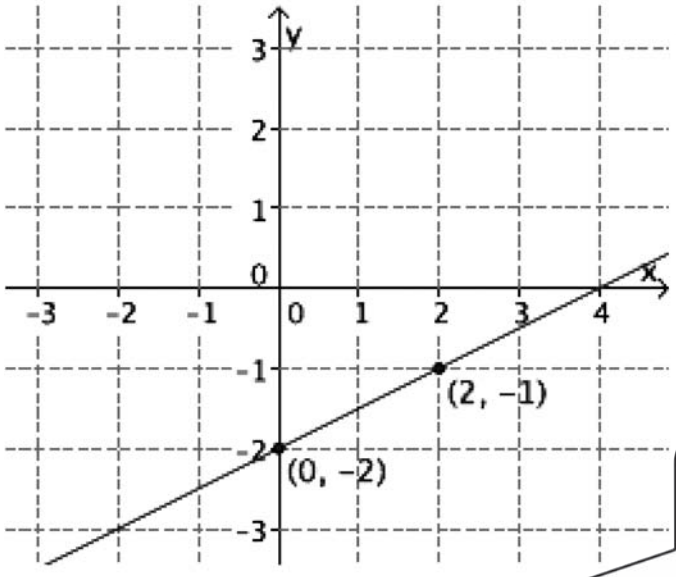
9. Graph the equation $-2x + 5y = 30$.
   a. Name the slope and the y-intercept point.
   b. Graph the known point, and then use the slope to find a second point before drawing the line.

10. Let l and l' be two lines with the same slope m passing through the same point P. Show that there is only one line with a slope m, where $m < 0$, passing through the given point P. Draw a diagram if needed.

Students need graph paper to complete the Problem Set.

1. Graph the equation: $y = \frac{1}{2}x - 2$.

This is a linear equation in slope-intercept form. I will use the slope $m = \frac{1}{2}$ and the y-intercept point $(0, -2)$ to graph the linear equation.



2. Graph the equation: $4x + 8y = 16$.

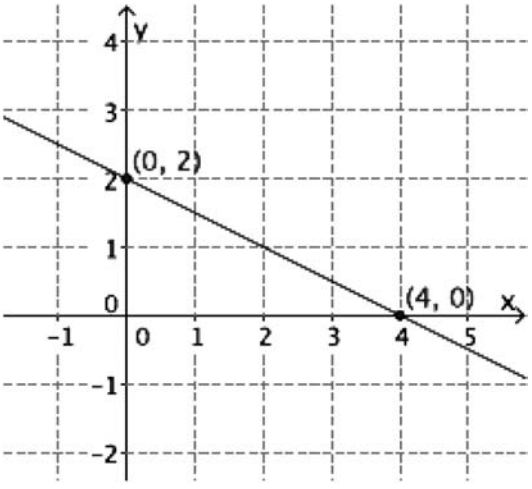
This is a linear equation in standard form. I will find the y-intercept point by replacing the x with 0. I will find the x-intercept point by replacing the y with 0.

$$\begin{aligned} 4(0) + 8y &= 16 \\ 8y &= 16 \\ y &= 2 \end{aligned}$$

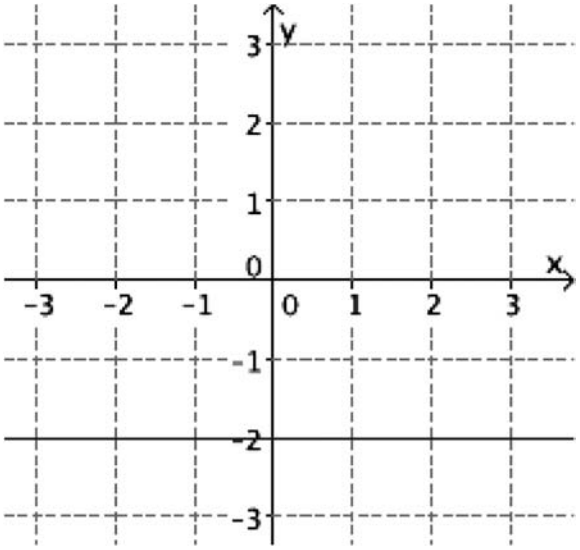
The y-intercept point is $(0, 2)$.

$$\begin{aligned} 4x + 8(0) &= 16 \\ 4x &= 16 \\ x &= 4 \end{aligned}$$

The x-intercept point is $(4, 0)$.



3. Graph the equation: $y = -2$. What is the slope of the graph of this line?



I remember that equations of the form $y = b$ are horizontal lines passing through the point $(0, b)$ where b is a constant.

The slope of this line is zero.

I can calculate the slope by using any two points on the graph of the line.

4. Is the graph of $x^2 - 6y = 11$ a line? Explain.

The graph of the given equation is not a line. The equation $6x^2 - 6y = 11$ is not a linear equation because the expression on the left side of the equal sign is not a linear expression. If this were a linear equation, then I would be sure that it graphs as a line, but because it is not, I am not sure what the graph of this equation would look like.

Linear expressions are constants like -1 or 5. Linear expressions can be a product of constants and an x like $5x$ or $-2x$, or a product of constants and a y like $9y$ or $-11y$.

Graph each of the equations in the Problem Set on a different pair of x- and y-axes.

1. Graph the equation: $y = -6x + 12$.

2. Graph the equation: $9x + 3y = 18$.

3. Graph the equation: $y = 4x + 2$.

4. Graph the equation: $y = -\frac{5}{7}x + 4$.

5. Graph the equation: $\frac{3}{4}x + y = 8$.

6. Graph the equation: $2x - 4y = 12$.

7. Graph the equation: $y = 3$. What is the slope of the graph of this line?

8. Graph the equation: $x = -4$. What is the slope of the graph of this line?

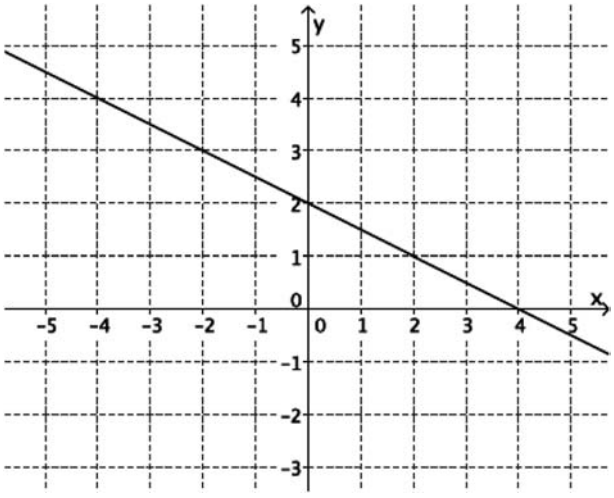
9. Is the graph of $4x + 5y = \frac{3}{7}$ a line? Explain.

10. Is the graph of $6x^2 - 2y = 7$ a line? Explain.

1. Write the equation that represents the line shown.

$$y = -\frac{1}{2}x + 2$$

I identified point P as the y-intercept, which is $(0, 2)$. I can use any point on the graph for point R, so I will use $(-4, 4)$. Point Q will be $(-4, 2)$. This will help me find the slope of $-\frac{2}{4}$, which is equivalent to $-\frac{1}{2}$. I will substitute the information into the slope-intercept form of the equation.



a. Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

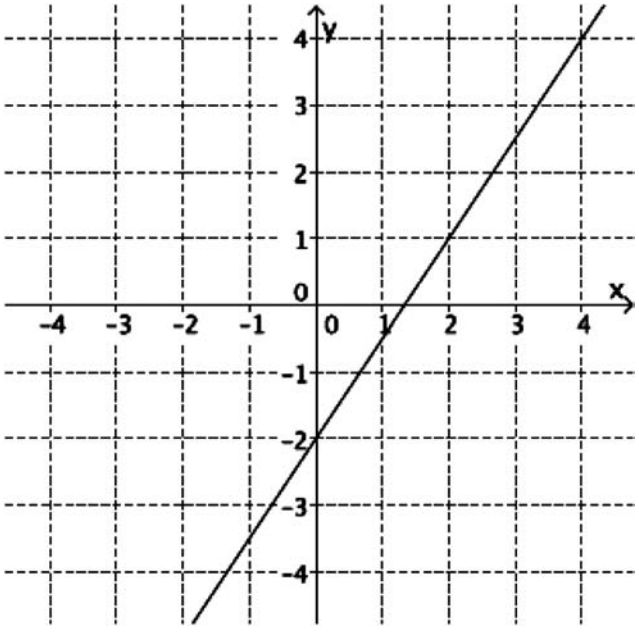
$$y = -\frac{1}{2}x + 2$$
$$\left(y = -\frac{1}{2}x + 2\right)2$$
$$2y = -x + 4$$
$$x + 2y = -x + x + 4$$
$$x + 2y = 4$$

What number can I multiply the equation by so that $-\frac{1}{2}$ will become an integer?

2. Write the equation that represents the line shown.

$$y = \frac{3}{2}x - 2$$

I need to calculate the slope and determine the y-intercept like I did in Problem 1.



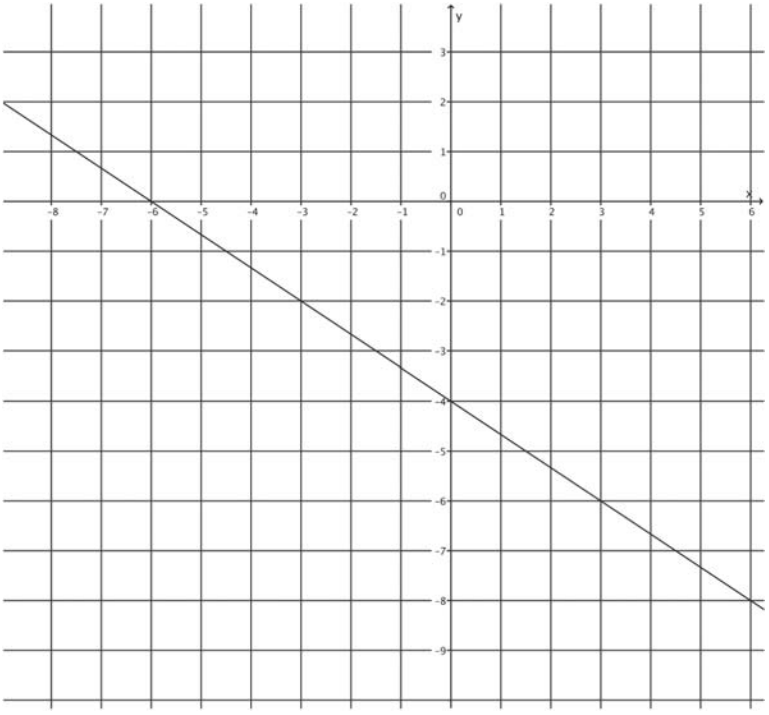
a. Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

$$y = \frac{3}{2}x - 2$$
$$\left(y = \frac{3}{2}x - 2\right)2$$
$$2y = 3x - 4$$
$$-3x + 2y = 3x - 3x - 4$$
$$-3x + 2y = -4$$
$$-1(-3x + 2y = -4)$$
$$3x - 2y = 4$$

I need to multiply each term on both the right and the left sides of the equation by -1 so that a is not negative.

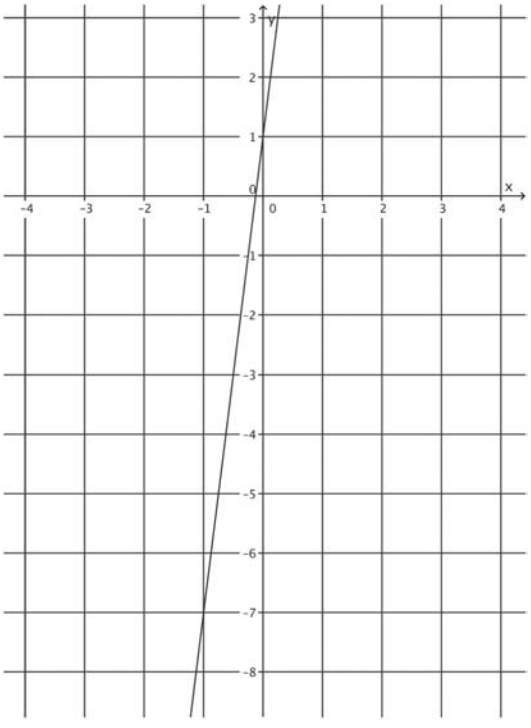
1. Write the equation that represents the line shown.

   Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

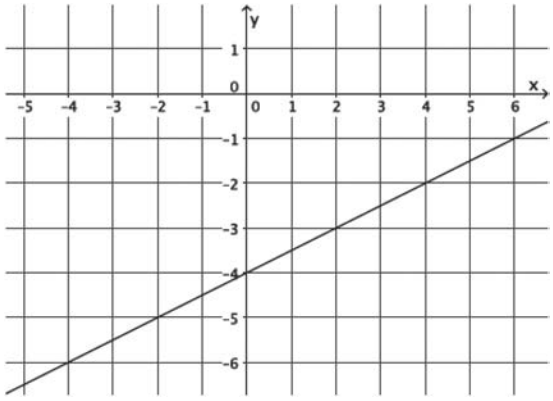


2. Write the equation that represents the line shown.

   Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

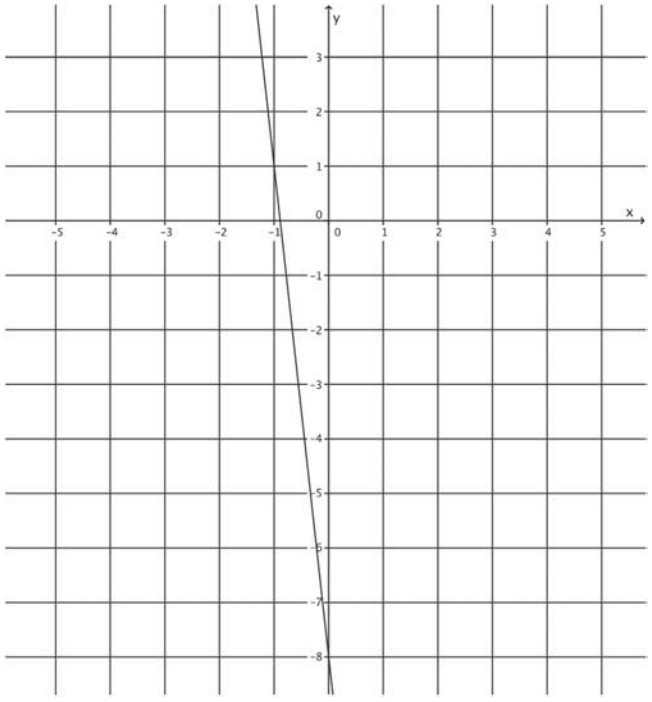


3. Write the equation that represents the line shown.



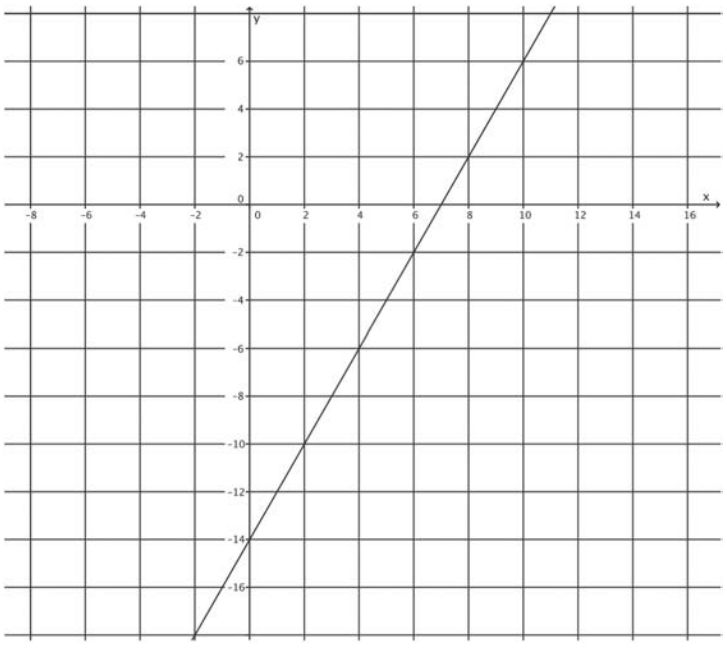
Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

4. Write the equation that represents the line shown.



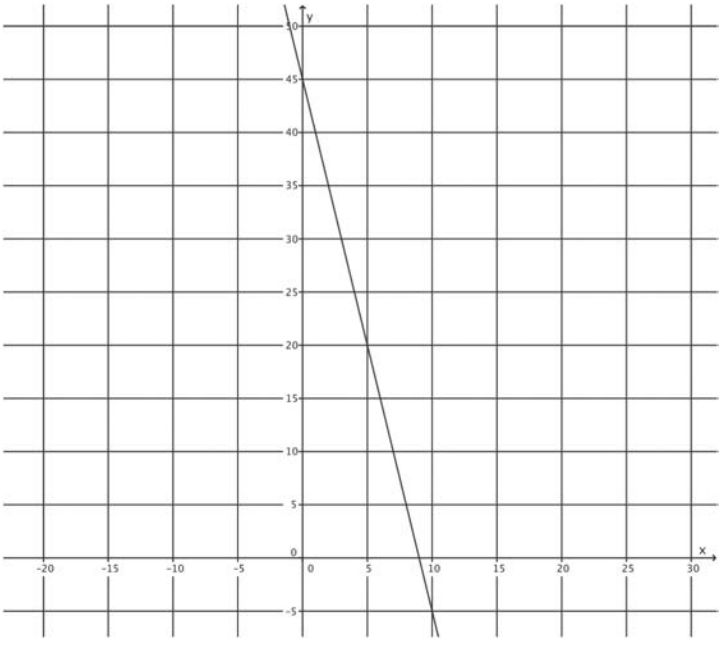
Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

5. Write the equation that represents the line shown.



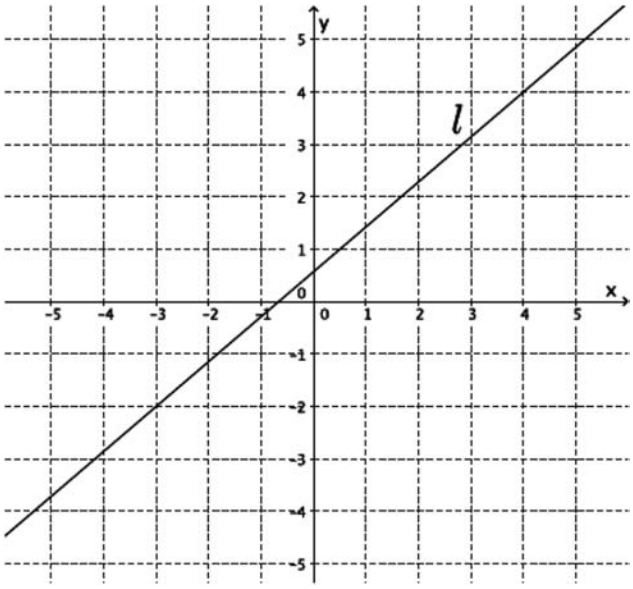
Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

6. Write the equation that represents the line shown.



Use the properties of equality to change the equation from slope-intercept form, $y = mx + b$, to standard form, $ax + by = c$, where a, b, and c are integers, and a is not negative.

1. Write the equation for the line l shown in the figure.



I need to identify two points to find the slope. I will use $(-3, -2)$ and $(4, 4)$ because they have integer coordinates.

Using the points $(-3, -2)$ ***and*** $(4, 4)$***, the slope of the line is***

$$m = \frac{4 - (-2)}{4 - (-3)}$$
$$= \frac{6}{7}$$

The y***-intercept point of the line is***

$$4 = \frac{6}{7}(4) + b$$
$$4 = \frac{24}{7} + b$$
$$4 - \frac{24}{7} = \frac{24}{7} - \frac{24}{7} + b$$
$$\frac{4}{7} = b$$

The equation of the line is $y = \frac{6}{7}x + \frac{4}{7}$.

I can see that the line doesn't intersect the y-axis at integer coordinates, so I need to calculate the y-intercept, $(0, b)$. I can use either point to substitute into my equation $y = mx + b$.

2. Write the equation for the line that goes through point $(11, -8)$ with slope $m = 5$.

$$-8 = 5(11) + b$$
$$-8 = 55 + b$$
$$-63 = b$$

The equation of the line is $y = 5x - 63$.

I know the slope. I only need to calculate the y-intercept.

3. Determine the equation of the line that goes through points $(-7,3)$ and $(5,-6)$.

The slope of the line is

$$m = \frac{-6-3}{5-(-7)}$$
$$= \frac{-9}{12}$$
$$= -\frac{3}{4}$$

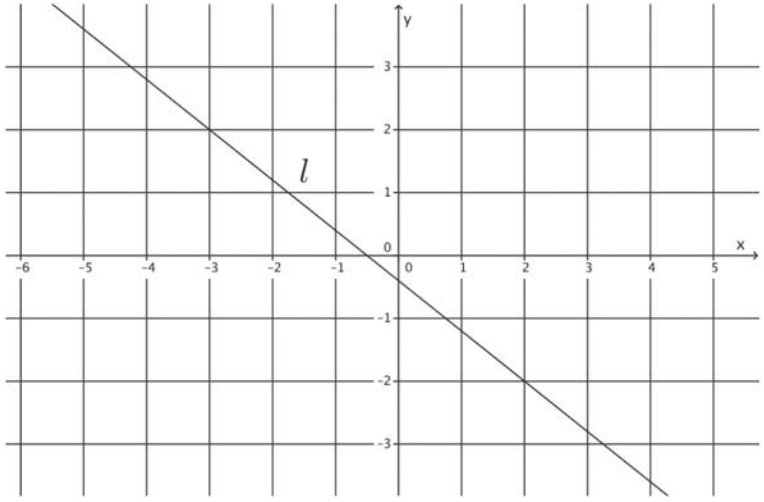
This problem is similar to Problem 1, but without a graph.

The y-intercept point of the line is

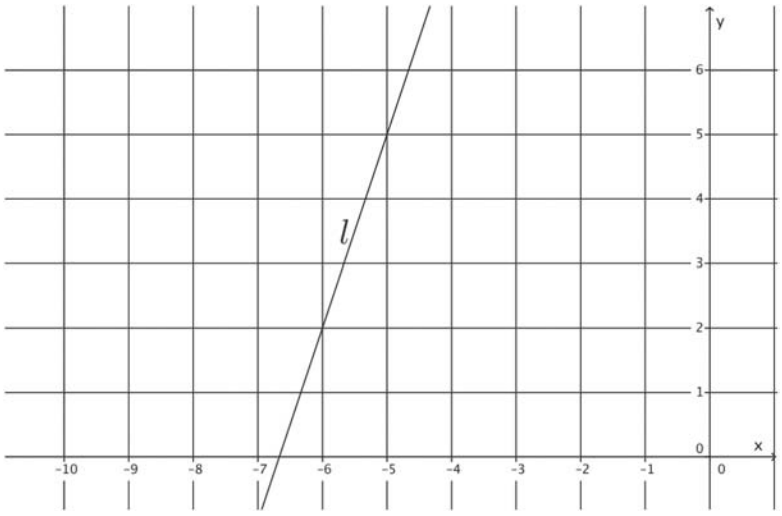
$$-6 = -\frac{3}{4}(5) + b$$
$$-6 = -\frac{15}{4} + b$$
$$-\frac{9}{4} = b$$

The equation of the line is $y = -\frac{3}{4}x - \frac{9}{4}$.

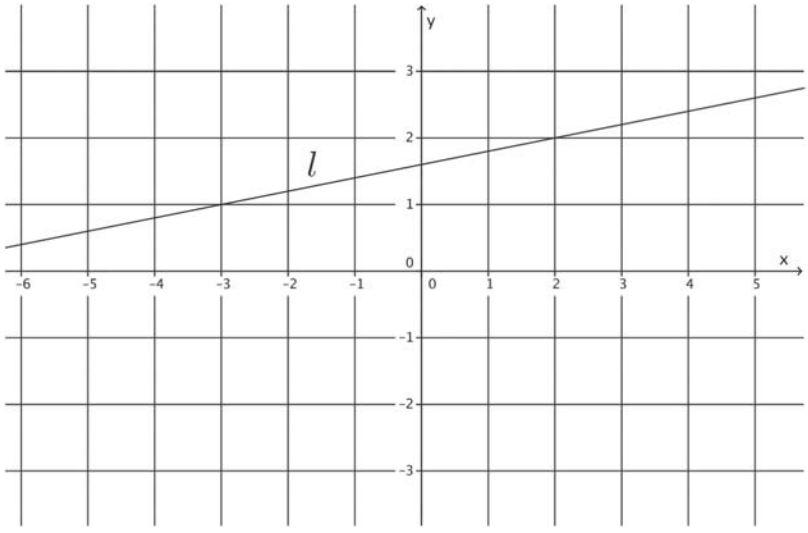
1. Write the equation for the line l shown in the figure.



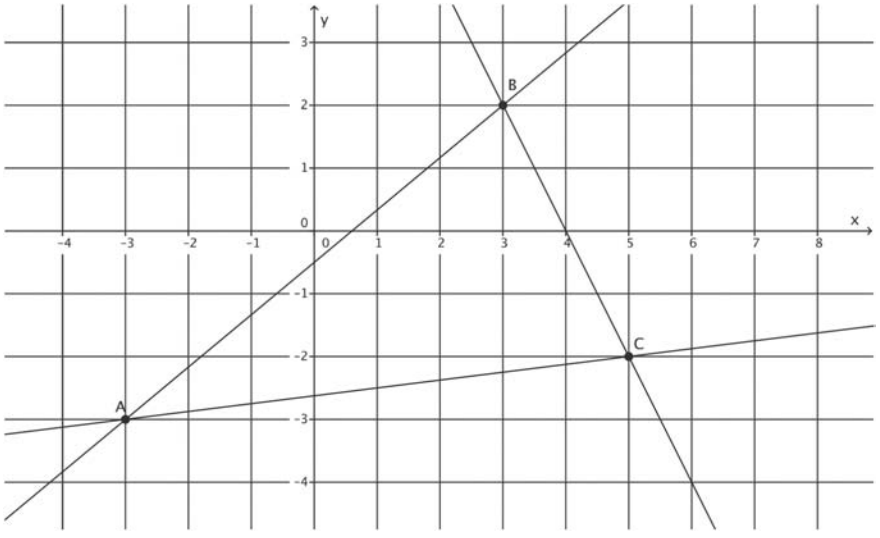
2. Write the equation for the line l shown in the figure.



3. Write the equation for the line l shown in the figure.



4. Triangle ABC is made up of line segments formed from the intersection of lines L_{AB}, L_{BC}, and L_{AC}. Write the equations that represent the lines that make up the triangle.



5. Write the equation for the line that goes through point $(-10, 8)$ with slope $m = 6$.

6. Write the equation for the line that goes through point $(12, 15)$ with slope m $= -2$.

7. Write the equation for the line that goes through point $(1, 1)$ with slope $m = -9$.

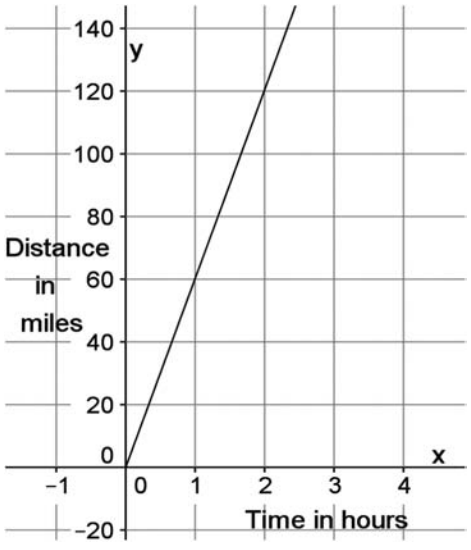
8. Determine the equation of the line that goes through points $(1, 1)$ and $(3, 7)$.

1. Train A can travel a distance of 450 miles in 7 hours.

   a. Assuming the train travels at a constant rate, write the linear equation that represents the situation.

   Let y represent the total number of miles Train A travels in x hours. We can write $\frac{y}{x} = \frac{450}{7}$ and $y = \frac{450}{7}x$.

   b. The figure represents the constant rate of travel for Train B. Which train is faster? Explain.



   To see which train is faster, I need to compare the slopes or rates of change.

   Train A is faster than Train B. The slope, or rate, for Train A is $\frac{450}{7}$, and the slope of the line for Train B is $\frac{60}{1}$. When you compare the slopes, you see that $\frac{450}{7} > 60$.

2. Norton and Sylvia read the same book. Norton can read 33 pages in 8 minutes.

   a. Assuming he reads at a constant rate, write the linear equation that represents the situation.

   Let y represent the total number of pages Norton can read in x minutes. We can write $\frac{y}{x} = \frac{33}{8}$ and $y = \frac{33}{8}x$.

   b. The table of values below represents the number of pages read by Sylvia for a few selected time intervals. Assume Sylvia is reading at a constant rate. Who reads faster? Explain.

Minutes (x)	**Pages Read** (y)
3	11
5	$\frac{55}{3}$
6	22
8	$\frac{88}{3}$

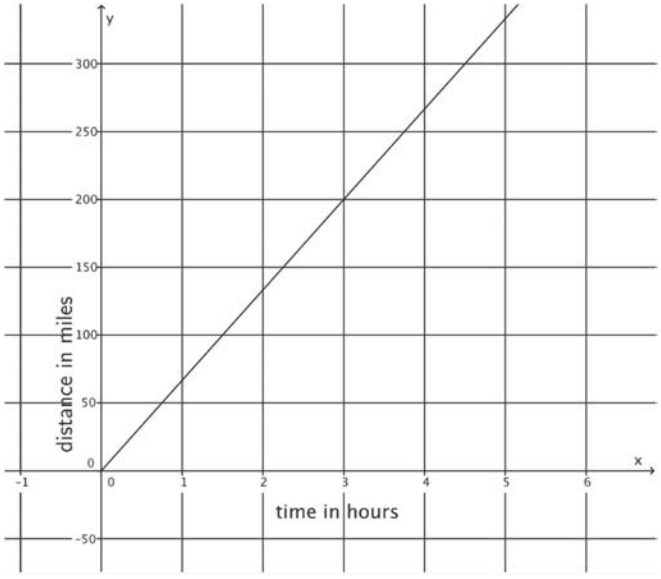
Since Sylvia is reading at a constant rate, I can use any two points to calculate the slope or rate of change.

Norton reads faster. Using the table of values, I can find the slope that represents Sylvia's constant rate of reading: $\frac{11}{3}$. The slope or rate for Norton is $\frac{33}{8}$. When you compare the slopes, you see that $\frac{33}{8} > \frac{11}{3}$.

1.

a. Train A can travel a distance of 500 miles in 8 hours. Assuming the train travels at a constant rate, write the linear equation that represents the situation.

b. The figure represents the constant rate of travel for Train B.



Which train is faster? Explain.

2.

a. Natalie can paint 40 square feet in 9 minutes. Assuming she paints at a constant rate, write the linear equation that represents the situation.

b. The table of values below represents the area painted by Steven for a few selected time intervals. Assume Steven is painting at a constant rate.

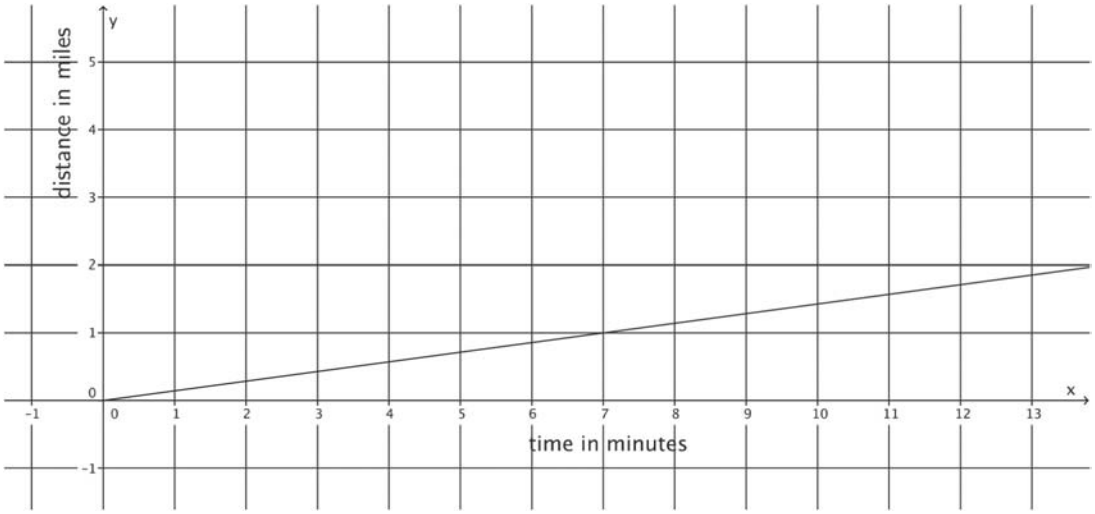
Minutes (x)	**Area Painted** (y)
3	10
5	$\frac{50}{3}$
6	20
8	$\frac{80}{3}$

Who paints faster? Explain.

3.

a. Bianca can run 5 miles in 41 minutes. Assuming she runs at a constant rate, write the linear equation that represents the situation.

b. The figure below represents Cynthia's constant rate of running.



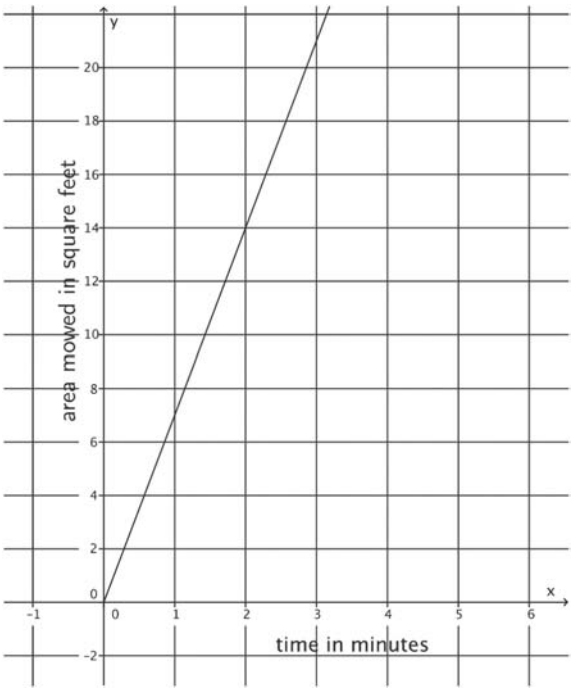
Who runs faster? Explain.

4.

a. Geoff can mow an entire lawn of 450 square feet in 30 minutes. Assuming he mows at a constant rate, write the linear equation that represents the situation.

b. The figure represents Mark's constant rate of mowing a lawn.

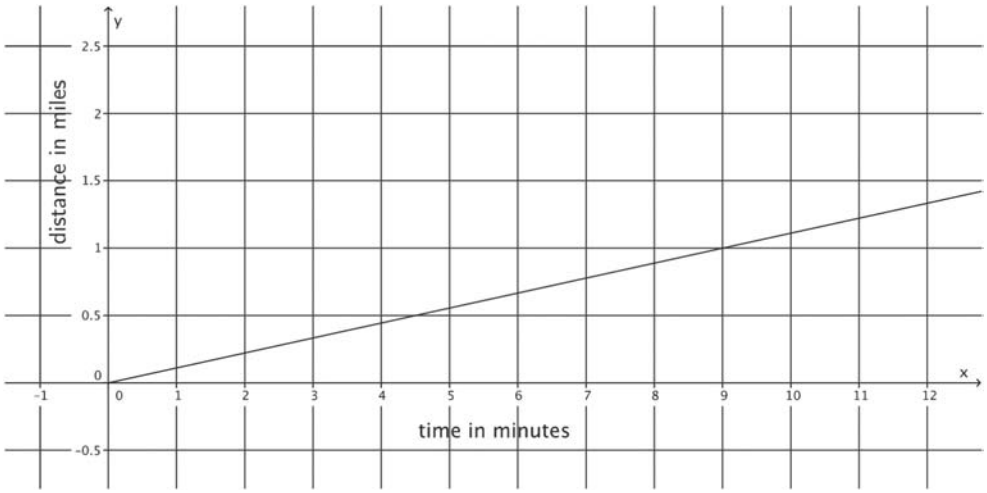
Who mows faster? Explain.



5.

a. Juan can walk to school, a distance of 0.75 mile, in 8 minutes. Assuming he walks at a constant rate, write the linear equation that represents the situation.

b. The figure below represents Lena's constant rate of walking.



Who walks faster? Explain.

1. Do the equations $3x - 5y = 8$ and $6x - 10y = 16$ define the same line? Explain.

Yes, these equations define the same line. When you compare the constants from each equation, you get

$\frac{a'}{a} = \frac{6}{3} = 2, \frac{b'}{b} = \frac{-10}{-5} = 2,$ ***and*** $\frac{c'}{c} = \frac{16}{8} = 2.$

When I multiply the first equation by 2, I get the second equation.

$$(3x - 5y = 8)2$$
$$6x - 10y = 16$$

Therefore, these equations define the same line.

They define the same line when $\frac{a'}{a} = \frac{b'}{b} = \frac{c'}{c}$ is true. In $3x - 5y = 8$, $a = 3, b = -5$, and $c = 8$. In $6x - 10y = 16$, $a' = 6, b' = -10$, and $c' = 16$.

2. Do the equations $y = -\frac{7}{5}x - 4$ and $14x + 10y = -40$ define the same line? Explain.

I need to rewrite the first equation in standard form before I can determine if they define the same line.

Yes, these equations define the same line. When you rewrite the first equation in standard form:

$$y = -\frac{7}{5}x - 4$$
$$\left(y = -\frac{7}{5}x - 4\right)5$$
$$5y = -7x - 20$$
$$7x + 5y = -20$$

When you compare the constants from each equation:

$\frac{a'}{a} = \frac{14}{7} = 2, \frac{b'}{b} = \frac{10}{5} = 2,$ ***and*** $\frac{c'}{c} = \frac{-40}{-20} = 2.$

When I multiply the first equation by 2, I get the second equation.

$$(7x + 5y = -20)2$$
$$14x + 10y = -40$$

Therefore, these equations define the same line.

3. Write an equation that would define the same line as $9x - 12y = 15$.

Answers will vary. When you multiply the equation by 2:

$$(9x - 12y = 15)2$$
$$18x - 24y = 30$$

When you compare the constants from each equation:

$$\frac{a'}{a} = \frac{18}{9} = 2, \frac{b'}{b} = \frac{-24}{-12} = 2, \text{ and } \frac{c'}{c} = \frac{30}{15} = 2.$$

Therefore, these equations define the same line.

I can multiply the equation by any number other than zero and then make sure that $\frac{a'}{a}, \frac{b'}{b}, \frac{c'}{c}$ are all equal to the same number.

4. Challenge: Show that if the two lines given by $ax + by = c$ and $a'x + b'y = c'$ are the same when $b = 0$ (vertical lines), then there exists a nonzero number s so that $a' = sa$, $b' = sb$, and $c' = sc$.

When $b = 0$, then $b' = 0$, and the equations are $ax = c$ and $a'x = c'$.

We can rewrite the equations as $x = \frac{c}{a}$ and $x = \frac{c'}{a'}$. Because the equations graph as the same line, then we know that

$$\frac{c}{a} = \frac{c'}{a'}$$

and we can rewrite those fractions as

$$\frac{a'}{a} = \frac{c'}{c}.$$

I need to write the equations when $b = 0$. Since the problem said they were the same line, I will solve for x in both equations so that I can use substitution.

I can use properties of equality to rewrite in the form I need.

These fractions are equal to the same number. Let that number be s. Then $\frac{a'}{a} = s$ and $\frac{c'}{c} = s$. Therefore, $a' = sa$ and $c' = sc$.

1. Do the equations $x + y = -2$ and $3x + 3y = -6$ define the same line? Explain.

2. Do the equations $y = -\frac{5}{4}x + 2$ and $10x + 8y = 16$ define the same line? Explain.

3. Write an equation that would define the same line as $7x - 2y = 5$.

4. Challenge: Show that if the two lines given by $ax + by = c$ and $a'x + b'y = c'$ are the same when $b = 0$ (vertical lines), then there exists a nonzero number s so that $a' = sa$, $b' = sb$, and $c' = sc$.

5. Challenge: Show that if the two lines given by $ax + by = c$ and $a'x + b'y = c'$ are the same when $a = 0$ (horizontal lines), then there exists a nonzero number s so that $a' = sa$, $b' = sb$, and $c' = sc$.

1. Allen and Regina walk at constant speeds. Allen can walk 1 mile in 60 minutes, and Regina can walk 2 miles in 90 minutes. Regina started walking 10 minutes after Allen. Assuming they walk the same path, when will Regina catch up to Allen?

   a. Write the linear equation that represents Regina's constant speed.

   Regina's rate is $\frac{2}{90}$ miles per minute, which is the same as $\frac{1}{45}$ miles per minute. If Regina continues walking y miles in x minutes at a constant speed, then $y = \frac{1}{45}x$

   Since they are walking at constant speeds, I can write equations using average speed like I did in Lesson 10.

   I need to define my variables for the equations to make sense.

   b. Write the linear equation that represents Allen's constant speed. Make sure to include in your equation the extra time that Allen was able to walk.

   Allen's rate is $\frac{1}{60}$ miles per minute. If Allen continues walking y miles in x minutes at a constant speed, then $y = \frac{1}{60}x$. To account for the extra time that Allen gets to walk, we write the equation

   To account for the extra time, I need to add 10 minutes to Allen's time of x minutes.

   $$y = \frac{1}{60}(x + 10)$$
   $$y = \frac{1}{60}x + \frac{1}{6}$$

   When I distribute $\frac{1}{60}$ to 10, I can write it as $\frac{10}{60}$, or $\frac{1}{6}$.

   c. Write the system of linear equations that represents this situation.

   Writing a system means to write both of the equations with the bracket in front.

   $$\begin{cases} y = \frac{1}{45}x \\ y = \frac{1}{60}x + \frac{1}{6} \end{cases}$$

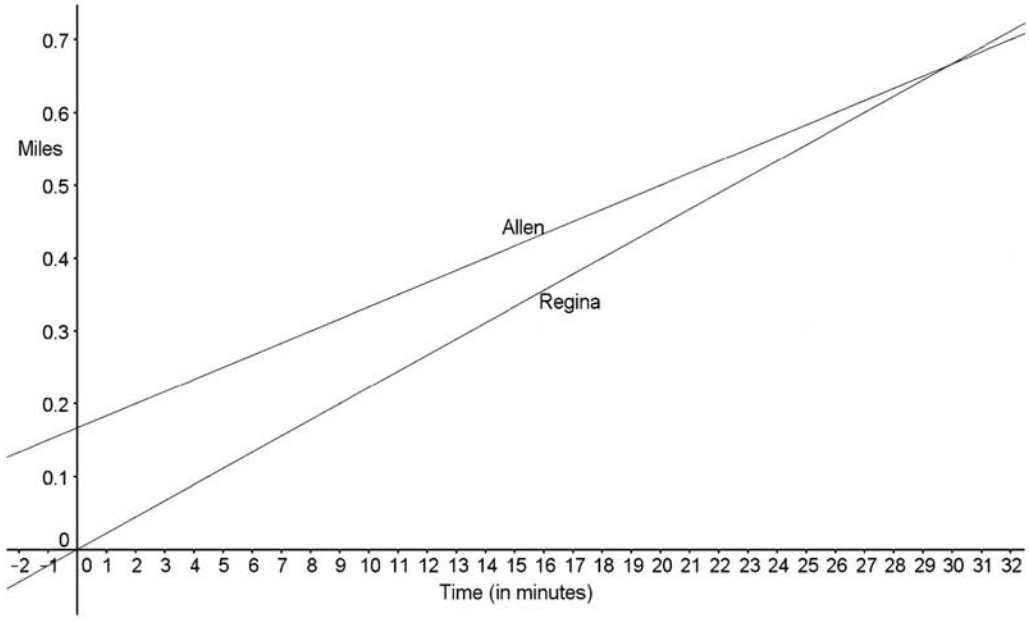
d. Sketch the graphs of the two equations.

I put information about Regina's walk in a table to help me graph.

Number of Minutes (x)	Miles Walked (y)
0	0
9	0.2
18	0.4

I can do the same with information about Allen's walk.

I will label the axis according to how I defined my variables. I need to label the graph of each line.



e. Will Regina ever catch up to Allen? If so, approximately when?

Yes, Regina will catch up to Allen after about 30 minutes or about 0.65 miles.

f. At approximately what point do the graphs of the lines intersect?

The lines intersect at approximately $(30, 0.65)$.

I can use the graph to see at what point the graphs of the lines intersect. This will tell me when Regina will catch up to Allen.

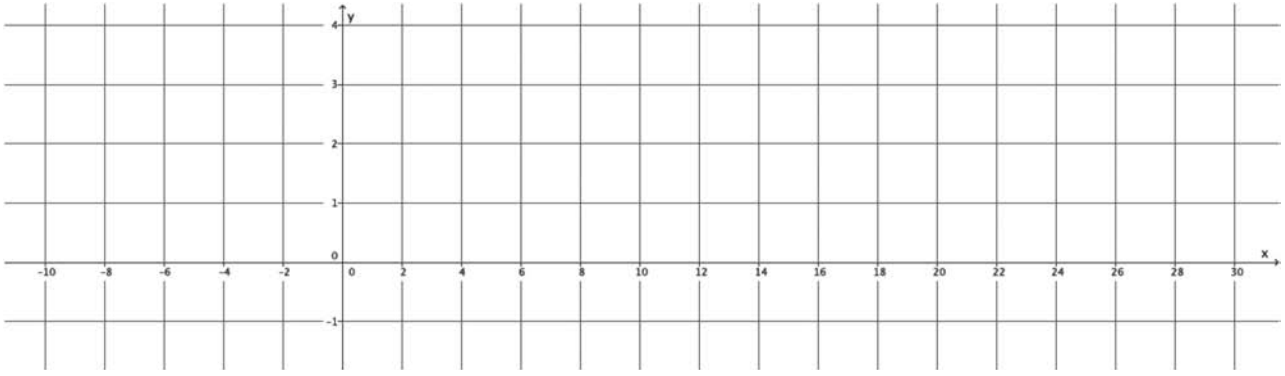
1. Jeremy and Gerardo run at constant speeds. Jeremy can run 1 mile in 8 minutes, and Gerardo can run 3 miles in 33 minutes. Jeremy started running 10 minutes after Gerardo. Assuming they run the same path, when will Jeremy catch up to Gerardo?

   a. Write the linear equation that represents Jeremy's constant speed.

   b. Write the linear equation that represents Gerardo's constant speed. Make sure to include in your equation the extra time that Gerardo was able to run.

   c. Write the system of linear equations that represents this situation.

   d. Sketch the graphs of the two equations.

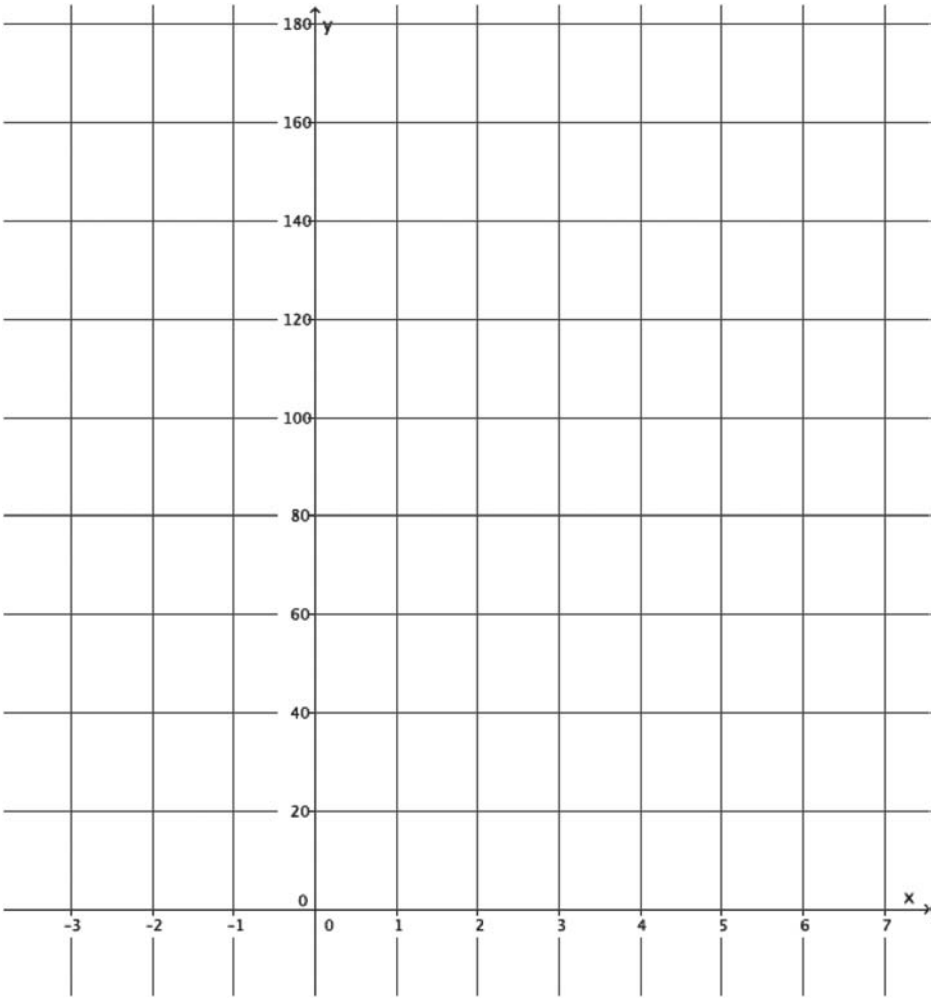


   e. Will Jeremy ever catch up to Gerardo? If so, approximately when?

   f. At approximately what point do the graphs of the lines intersect?

2. Two cars drive from town A to town B at constant speeds. The blue car travels 25 miles per hour, and the red car travels 60 miles per hour. The blue car leaves at 9:30 a.m., and the red car leaves at noon. The distance between the two towns is 150 miles.

   a. Who will get there first? Write and graph the system of linear equations that represents this situation.



   b. At approximately what point do the graphs of the lines intersect?

1. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} y = -\frac{1}{9}x - 3 \\ -2x + 3y = 12 \end{cases}$

I will use the slope and y-intercept to help me graph the equation of this line.

For the equation : $y = -\frac{1}{9}x - 3$

The slope is $-\frac{1}{9}$, and the y-intercept is $(0, -3)$.

Since this equation is in standard form, I will fix $x = 0$ to find y (the y-intercept) and fix $y = 0$ to find x (the x-intercept) to help me graph the line of this equation.

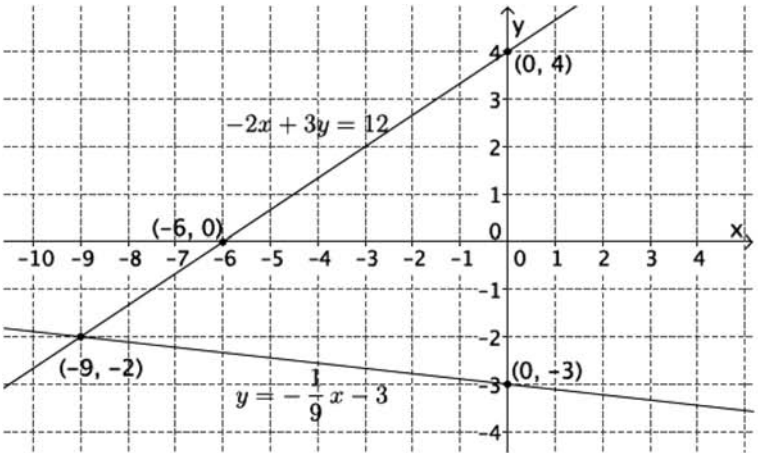
For the equation $-2x + 3y = 12$;

$$\begin{aligned} -2(0) + 3y &= 12 \\ 3y &= 12 \\ y &= 4 \end{aligned}$$

The y-intercept is $(0, 4)$.

$$\begin{aligned} -2x + 3(0) &= 12 \\ -2x &= 12 \\ x &= -6 \end{aligned}$$

The x-intercept is $(-6, 0)$.



To locate where the graphs of the lines intersect, I will use graph paper so that I can be as accurate as possible.

a. Name the ordered pair where the graphs of the two linear equations intersect.

$(-9, -2)$

b. Verify that the ordered pair named in part (a) is a solution to $y = -\frac{1}{9}x - 3$.

$$-2 = -\frac{1}{9}(-9) - 3$$
$$-2 = 1 - 3$$
$$-2 = -2$$

The left and right sides of the equation are equal.

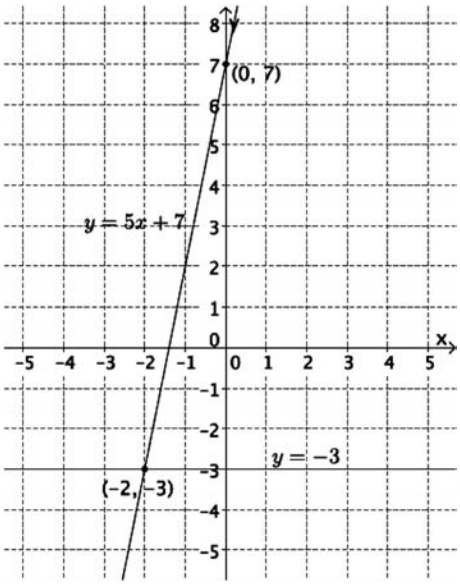
If the solutions I found on the graph of the lines satisfies both equations, then I have found an ordered pair of the system.

c. Verify that the ordered pair named in part (a) is a solution to $-2x + 3y = 12$.

$$-2(-9) + 3(-2) = 12$$
$$18 - 6 = 12$$
$$12 = 12$$

The left and right sides of the equation are equal.

2. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} y = 5x + 7 \\ y = -3 \end{cases}$



The equation of the form $y = c$, where c is a constant, is a horizontal line passing though the point $(0, c)$. I know that -3 will be the y-coordinate of my intersection point.

For the equation $y = 5x + 7$:

The slope is $\frac{5}{1}$, and the y-intercept is $(0, 7)$.

I can write the slope of 5 with the denominator of 1 as the fraction $\frac{5}{1}$.

I need to verify that the ordered pair is a solution to both of the equations.

Name the ordered pair where the graphs of the two linear equations intersect.

$(-2, -3)$

1. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} y = \frac{1}{3}x + 1 \\ y = -3x + 11 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in part (a) is a solution to $y = \frac{1}{3}x + 1$.
   c. Verify that the ordered pair named in part (a) is a solution to $y = -3x + 11$.

2. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} y = \frac{1}{2}x + 4 \\ x + 4y = 4 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in part (a) is a solution to $y = \frac{1}{2}x + 4$.
   c. Verify that the ordered pair named in part (a) is a solution to $x + 4y = 4$.

3. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} y = 2 \\ x + 2y = 10 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in part (a) is a solution to $y = 2$.
   c. Verify that the ordered pair named in part (a) is a solution to $x + 2y = 10$.

4. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} -2x + 3y = 18 \\ 2x + 3y = 6 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in part (a) is a solution to $-2x + 3y = 18$.
   c. Verify that the ordered pair named in part (a) is a solution to $2x + 3y = 6$.

5. Sketch the graphs of the linear system on a coordinate plane: $\begin{cases} x + 2y = 2 \\ y = \frac{2}{3}x - 6 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in part (a) is a solution to $x + 2y = 2$.
   c. Verify that the ordered pair named in part (a) is a solution to $y = \frac{2}{3}x - 6$.

6. Without sketching the graph, name the ordered pair where the graphs of the two linear equations intersect.

$$\begin{cases} x = 2 \\ y = -3 \end{cases}$$

Answer Problems 1–2 without graphing the equations.

1. Does the system of linear equations shown below have a solution? Explain.

I need to determine if the graphs of the lines are parallel. Parallel lines do not intersect, which means parallel lines have no solution.

$$\begin{cases} 2x + 5y = 9 \\ -4x - 10y = 4 \end{cases}$$

Standard form is $ax + by = c$, where a, b, c are constants and a and b are not both zero.

I learned from Lesson 23 that when equations are written in standard form, I know the slope is $m = -\frac{a}{b}$, and the y-intercept is $\frac{c}{b}$.

No, this system does not have a solution. The slope of the first equation is $-\frac{2}{5}$, and the slope of the second equation is $-\frac{4}{10}$, which is equivalent to $-\frac{2}{5}$. Since the slopes are the same and the lines are distinct, these equations will graph as parallel lines. Parallel lines never intersect, which means this system has no solution.

2. Does the system of linear equations shown below have a solution? Explain.

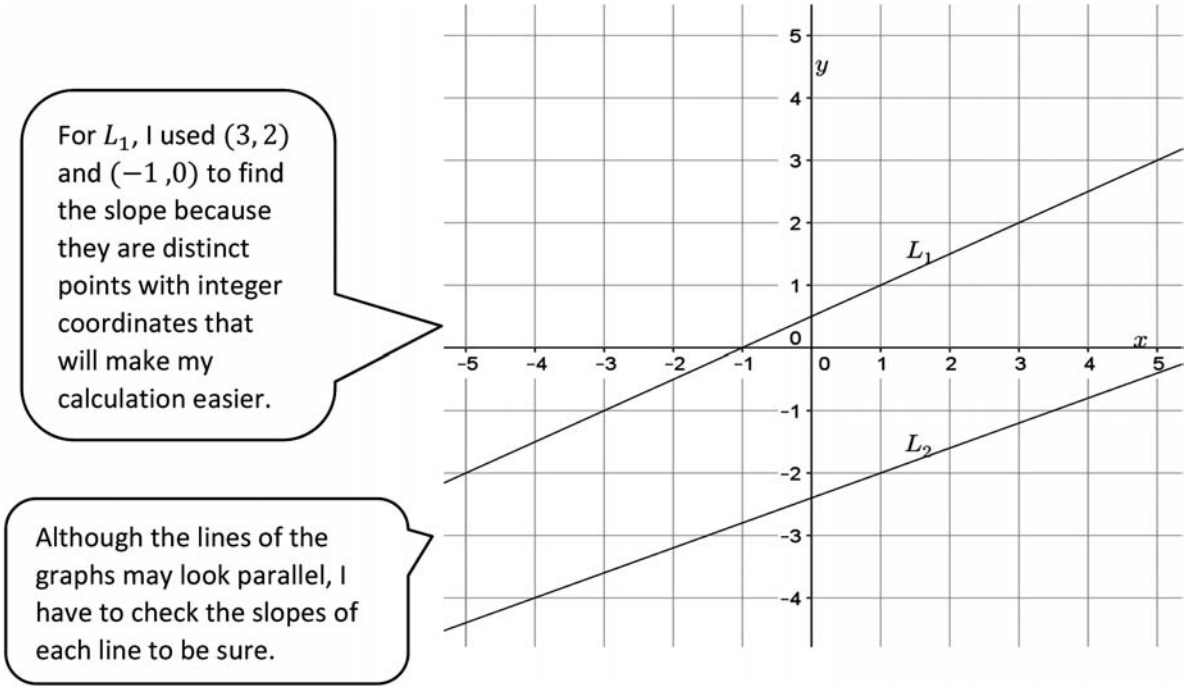
If the slopes are different, these equations will graph as non-parallel lines and intersect at some point. That means they will have a solution.

$$\begin{cases} \frac{7}{4}x + 2 = y \\ x + 2y = 4 \end{cases}$$

The first equation is written in slope-intercept form. The slope is $\frac{7}{4}$.

Yes, this system does have a solution. The slope of the first equation is $\frac{7}{4}$, and the slope of the second equation is $-\frac{1}{2}$. Since the slopes are different, these equations will graph as non-parallel lines, which means they will intersect at some point

3. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



The slope of L_1 is $\frac{1}{2}$, and the slope of L_2 is $\frac{2}{5}$. Since the slopes are different, these lines are nonparallel lines, which means they will intersect at some point. Therefore, the system of linear equations whose graphs are the given lines will have a solution.

Answer Problems 1–5 without graphing the equations.

1. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} 2x + 5y = 9 \\ -4x - 10y = 4 \end{cases}$$

2. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} \frac{3}{4}x - 3 = y \\ 4x - 3y = 5 \end{cases}$$

3. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} x + 7y = 8 \\ 7x - y = -2 \end{cases}$$

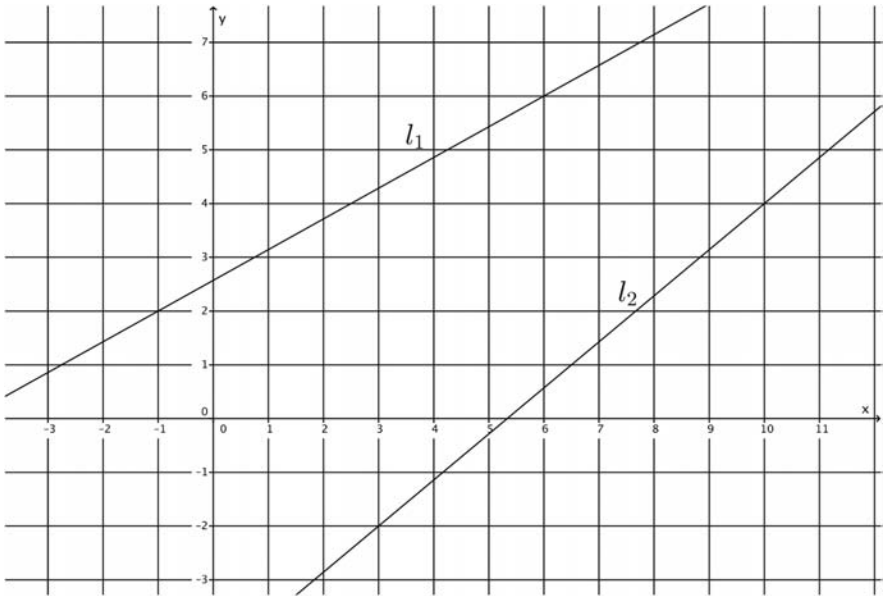
4. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} y = 5x + 12 \\ 10x - 2y = 1 \end{cases}$$

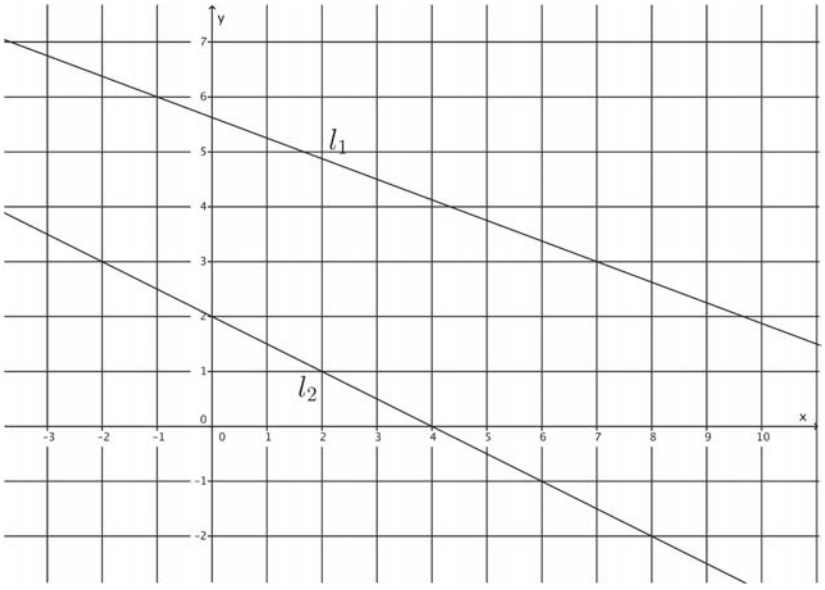
5. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} y = \frac{5}{3}x + 15 \\ 5x - 3y = 6 \end{cases}$$

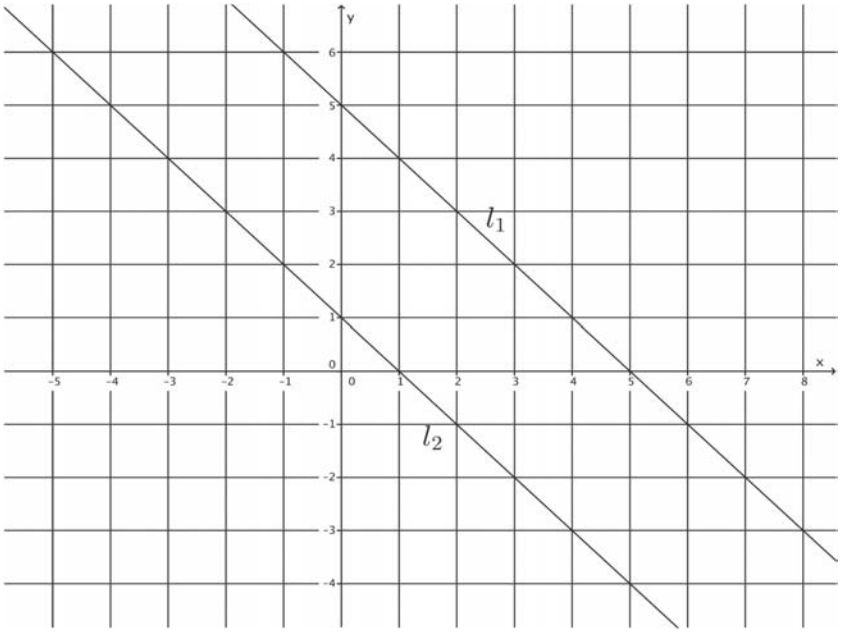
6. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



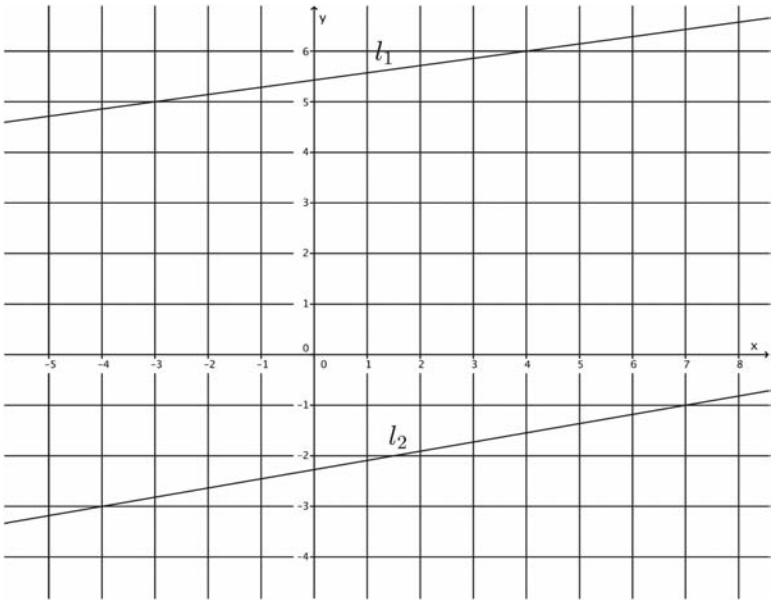
7. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



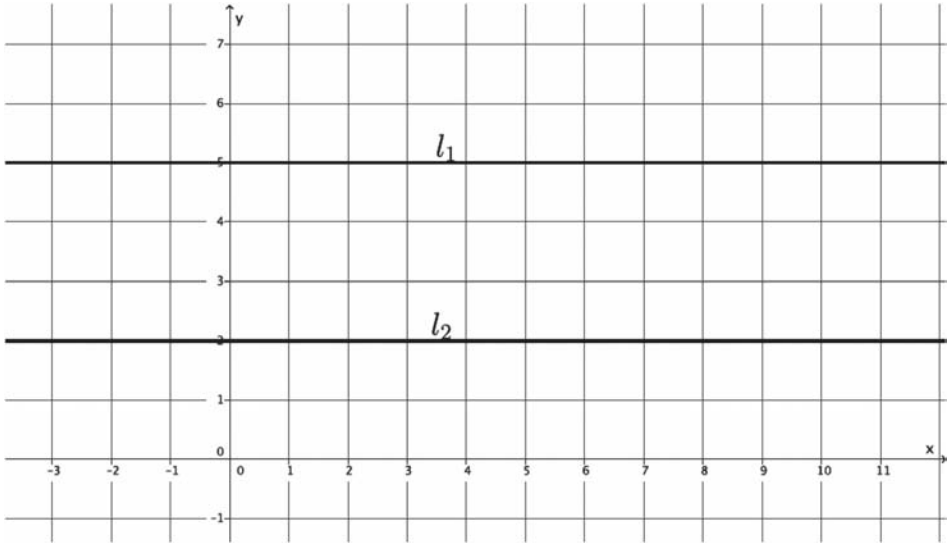
8. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



9. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



10. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



Determine the nature of the solution to each system of linear equations. If the system has a solution, find it algebraically, and then verify that your solution is correct by graphing.

1. $\begin{cases} y = -\frac{4}{5}x + 9 \\ 4x + 5y = 9 \end{cases}$

If the equations have the same slope and different y-intercepts, then the equations graph as parallel lines, which means the system doesn't have a solution.

The slopes of these two equations are the same, and the y-intercepts are different, which means they graph as parallel lines. Therefore, this system will have no solutions.

2. $\begin{cases} 2x - 3y = 12 \\ y = \frac{2}{3}x - 4 \end{cases}$

I notice that if I multiply the second equation by 3, the result is $3y = 2x - 12$. When I use my properties of equality, I see the second equation is the same as the first. This means that I have the same line; therefore, I have infinitely many solutions.

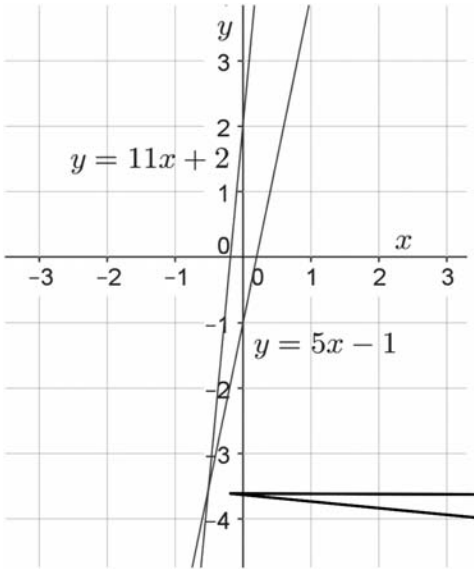
These equations define the same line. Therefore, this system will have infinitely many solutions.

3. $\begin{cases} y = 5x - 1 \\ y = 11x + 2 \end{cases}$

Since the equations are both equal to y, I can use substitution, and write the equations equal to each other and solve for x.

$$\mathbf{5}x - \mathbf{1} = \mathbf{11}x + \mathbf{2}$$
$$-\mathbf{3} = \mathbf{6}x$$
$$-\frac{\mathbf{1}}{\mathbf{2}} = x$$

Once I solve for x, then I can use substitution again in either equation and solve for y.



$$y = 5\left(-\frac{1}{2}\right) - 1$$
$$y = -\frac{5}{2} - 1$$
$$y = -\frac{7}{2}$$

The solution is $\left(-\frac{1}{2}, -\frac{7}{2}\right)$

I see that the graphs of the lines intersect at $\left(-\frac{1}{2}, -\frac{7}{2}\right)$.

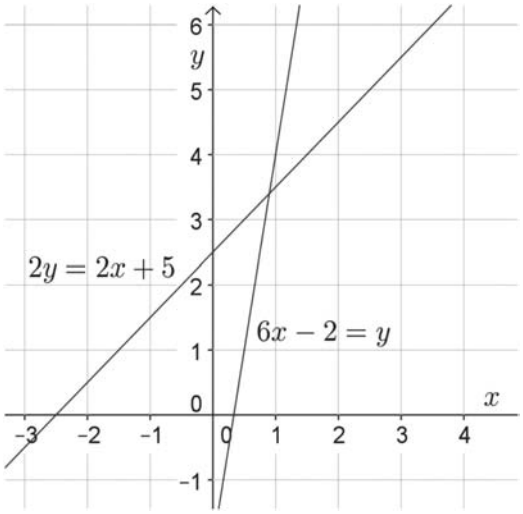
4. $\begin{cases} 6x - 2 = y \\ 2y = 2x + 5 \end{cases}$

I can multiply the first equation by 2 to produce an equivalent equation, namely $12x - 4 = 2y$. Now that both equations are equal to $2y$, the expressions $12x - 4$ and $2x + 5$ can be written equal to one another.

$$(6x - 2 = y)2$$
$$12x - 4 = 2y$$

I can write the system as $\begin{cases} 12x - 4 = 2y \\ 2y = 2x + 5. \end{cases}$

$$\begin{cases} 12x - 4 = 2y \\ 2y = 2x + 5 \end{cases}$$
$$12x - 4 = 2x + 5$$
$$10x = 9$$
$$x = \frac{9}{10}$$



$$6\left(\frac{9}{10}\right) - 2 = y$$
$$\frac{54}{10} - 2 = y$$
$$\frac{17}{5} = y$$

The solution is $\left(\frac{9}{10}, \frac{17}{5}\right)$.

Determine the nature of the solution to each system of linear equations. If the system has a solution, find it algebraically, and then verify that your solution is correct by graphing.

1. $\begin{cases} y = \frac{3}{7}x - 8 \\ 3x - 7y = 1 \end{cases}$

2. $\begin{cases} 2x - 5 = y \\ -3x - 1 = 2y \end{cases}$

3. $\begin{cases} x = 6y + 7 \\ x = 10y + 2 \end{cases}$

4. $\begin{cases} 5y = \frac{15}{4}x + 25 \\ y = \frac{3}{4}x + 5 \end{cases}$

5. $\begin{cases} x + 9 = y \\ x = 4y - 6 \end{cases}$

6. $\begin{cases} 3y = 5x - 15 \\ 3y = 13x - 2 \end{cases}$

7. $\begin{cases} 6x - 7y = \frac{1}{2} \\ 12x - 14y = 1 \end{cases}$

8. $\begin{cases} 5x - 2y = 6 \\ -10x + 4y = -14 \end{cases}$

9. $\begin{cases} y = \frac{3}{2}x - 6 \\ 2y = 7 - 4x \end{cases}$

10. $\begin{cases} 7x - 10 = y \\ y = 5x + 12 \end{cases}$

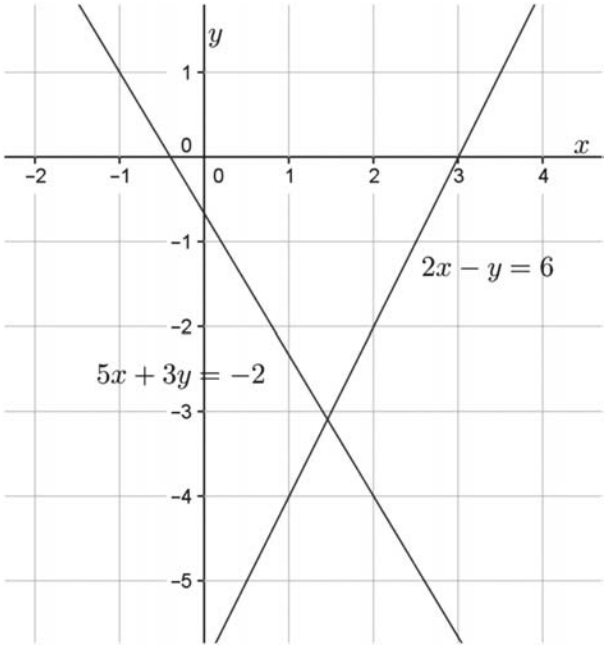
11. Write a system of linear equations with $(-3, 9)$ as its solution.

I can determine if the solutions exist by checking the slope and the y-intercepts like I did in the previous lesson's Problem Set.

Determine the solution, if it exists, for each system of linear equations. Verify your solution on the coordinate plane.

1. $\begin{cases} 5x + 3y = -2 \\ 2x - y = 6 \end{cases}$

If I multiply the second equation by 3, then I will eliminate x and be able to solve for y.



$$\mathbf{3}(\mathbf{2}x - y = \mathbf{6})$$
$$\mathbf{6}x - \mathbf{3}y = \mathbf{18}$$
$$\begin{cases} \mathbf{5}x + \mathbf{3}y = -\mathbf{2} \\ \mathbf{6}x - \mathbf{3}y = \mathbf{18} \end{cases}$$
$$\mathbf{5}x + \mathbf{3}y + \mathbf{6}x - \mathbf{3}y = -\mathbf{2} + \mathbf{18}$$
$$\mathbf{11}x = \mathbf{16}$$
$$x = \frac{\mathbf{16}}{\mathbf{11}}$$

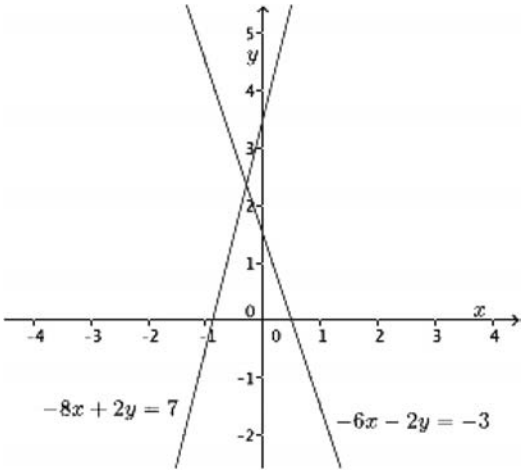
$$\mathbf{2}\left(\frac{\mathbf{16}}{\mathbf{11}}\right) - y = \mathbf{6}$$
$$-y = \frac{\mathbf{34}}{\mathbf{11}}$$
$$y = -\frac{\mathbf{34}}{\mathbf{11}}$$

The solution is $\left(\frac{\mathbf{16}}{\mathbf{11}}, -\frac{\mathbf{34}}{\mathbf{11}}\right)$.

2. $\begin{cases} -6x - 2y = -3 \\ -8x + 2y = 7 \end{cases}$

I notice that since the first equation has $-2y$ and the second equation has $+2y$, when I add the equations together, y will be eliminated, and I can solve for x first.

$$-6x - 2y - 8x + 2y = -3 + 7$$
$$-14x = 4$$
$$x = -\frac{4}{14}$$

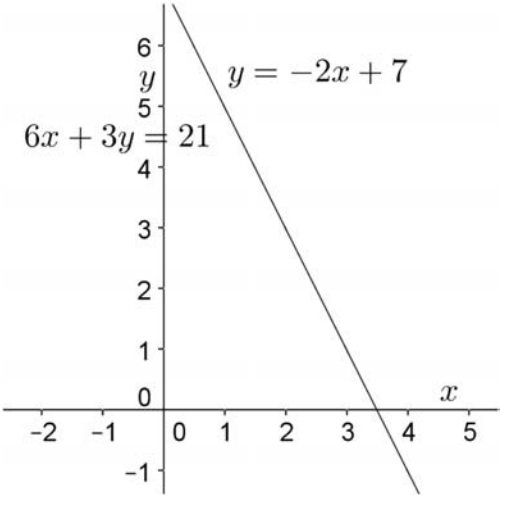


$$-6\left(-\frac{4}{14}\right) - 2y = -3$$
$$\frac{12}{7} - 2y = -3$$
$$-2y = -\frac{33}{7}$$
$$y = \frac{33}{14}$$

The solution is $\left(-\frac{4}{14}, \frac{33}{14}\right)$.

3. $\begin{cases} y = -2x + 7 \\ 6x + 3y = 21 \end{cases}$

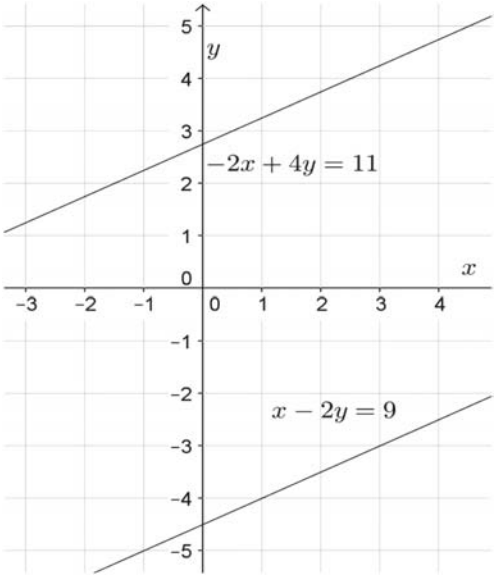
When I substituted for y with the first equation into the second equation, $6x + 3(-2x + 7) = 21$, it resulted in an identity, namely $21 = 21$. This means the two equations will graph the same line.



These equations define the same line. Therefore, this system will have infinitely many solutions.

4. $\begin{cases} -2x + 4y = 11 \\ x - 2y = 9 \end{cases}$

When I multiplied the second equation by 2, I eliminated both x and y. The result was an untrue statement, namely $0 \neq 29$. I should check the slopes and y-intercepts.



The equations graph as distinct lines. The slopes of these two equations are the same, and the y-intercepts are different, which means they graph as parallel lines. Therefore, this system will have no solution.

Determine the solution, if it exists, for each system of linear equations. Verify your solution on the coordinate plane.

1. $\begin{cases} \frac{1}{2}x + 5 = y \\ 2x + y = 1 \end{cases}$

2. $\begin{cases} 9x + 2y = 9 \\ -3x + y = 2 \end{cases}$

3. $\begin{cases} y = 2x - 2 \\ 2y = 4x - 4 \end{cases}$

4. $\begin{cases} 8x + 5y = 19 \\ -8x + y = -1 \end{cases}$

5. $\begin{cases} x + 3 = y \\ 3x + 4y = 7 \end{cases}$

6. $\begin{cases} y = 3x + 2 \\ 4y = 12 + 12x \end{cases}$

7. $\begin{cases} 4x - 3y = 16 \\ -2x + 4y = -2 \end{cases}$

8. $\begin{cases} 2x + 2y = 4 \\ 12 - 3x = 3y \end{cases}$

9. $\begin{cases} y = -2x + 6 \\ 3y = x - 3 \end{cases}$

10. $\begin{cases} y = 5x - 1 \\ 10x = 2y + 2 \end{cases}$

11. $\begin{cases} 3x - 5y = 17 \\ 6x + 5y = 10 \end{cases}$

12. $\begin{cases} y = \frac{4}{3}x - 9 \\ y = x + 3 \end{cases}$

13. $\begin{cases} 4x - 7y = 11 \\ x + 2y = 10 \end{cases}$

14. $\begin{cases} 21x + 14y = 7 \\ 12x + 8y = 16 \end{cases}$

1. Two numbers have a sum of 853 and a difference of 229. What are the two numbers?

Let x represent one number and y represent the other number.

$$\begin{cases} x + y = 853 \\ x - y = 229 \end{cases}$$

$$x + y + x - y = 853 + 229$$

$$2x = 1082$$

$$x = 541$$

$$541 + y = 853$$

$$y = 312$$

I can check my answer mentally.

Sum means I add the two numbers together, and difference means I subtract one number from the other. Since I don't know either number, I need to define my variables with two different letters.

The solution is $(541, 312)$. The two numbers are 541 and 312.

2. The sum of the ages of two sisters is 36. The younger sister is 6 more than a fifth of the older sister's age. How old is each sister?

Let x represent the age of the younger sister and y represent the age of the older sister.

$$\begin{cases} x + y = 36 \\ x = 6 + \frac{1}{5}y \end{cases}$$

$$6 + \frac{1}{5}y + y = 36$$

$$6 + \frac{6}{5}y = 36$$

$$\frac{6}{5}y = 30$$

$$y = 25$$

$$x + 25 = 36$$

$$x = 11$$

A fifth of the older sister's age means to multiply $\frac{1}{5}$ times y, the age of the older sister.

I will use the substitution method since x is isolated. I will replace x with $6 + \frac{1}{5}y$ in the first equation.

If I let x represent the age of the older sister and y represent the age of the younger sister, the second equation would be $y = 6 + \frac{1}{5}x$. I would use the same method to solve.

Check:

$$11 = 6 + \frac{1}{5}(25)$$

$$11 = 6 + 5$$

$$11 = 11$$

The solution is $(11, 25)$. The older sister is 25 years old, and the younger sister is 11 years old.

3. Some friends went to the local movie theater and bought three buckets of large popcorn and four boxes of candy. The total for the snacks was $\$30.50$. The last time you were at the theater, you bought a large popcorn and two boxes of candy, and the total was $\$12.50$. How much would 2 large buckets of popcorn and 3 boxes of candy cost?

Let x represent the cost of a large bucket of popcorn and y represent the cost of a box of candy.

I have choices. I could eliminate x by multiplying the second equation by -3 or eliminate y by multiplying the second equation by -2.

$$\begin{cases} 3x+4y=30.50 \\ x+2y=12.50 \end{cases}$$
$$-2(x+2y=12.50)$$
$$-2x-4y=-25$$
$$\begin{cases} 3x+4y=30.50 \\ -2x-4y=-25 \end{cases}$$
$$3x+4y-2x-4y=30.50-25$$
$$3x-2x=5.50$$
$$x=5.50$$

The question is asking about the *cost* of items, not the number of items. I need to define my variables as the *cost* of each item.

$$5.50+2y=12.50$$
$$2y=7$$
$$y=3.50$$

The solution is $(5.50, 3.50)$.

Check:

$$3(5.50)+4(3.50)=30.50$$
$$16.50+14=30.50$$
$$30.50=30.50$$

Once I find out the cost of each item, I can determine the cost for 2 large popcorns and 3 boxes of candy.

Since a large bucket of popcorn costs $\$5.50$ and a box of candy costs $\$3.50$, then the equation to find the cost of two large buckets of popcorn and three boxes of candy is $2(5.50)+3(3.50)=11+10.50$, which is equal to 21.50. Therefore, the cost of two large buckets of popcorn and three boxes of candy is $\$21.50$.

1. Two numbers have a sum of $1{,}212$ and a difference of 518. What are the two numbers?

2. The sum of the ages of two brothers is 46. The younger brother is 10 more than a third of the older brother's age. How old is the younger brother?

3. One angle measures 54 more degrees than 3 times another angle. The angles are supplementary. What are their measures?

4. Some friends went to the local movie theater and bought four large buckets of popcorn and six boxes of candy. The total for the snacks was $\$46.50$. The last time you were at the theater, you bought a large bucket of popcorn and a box of candy, and the total was $\$9.75$. How much would 2 large buckets of popcorn and 3 boxes of candy cost?

5. You have 59 total coins for a total of $\$12.05$. You only have quarters and dimes. How many of each coin do you have?

6. A piece of string is 112 inches long. Isabel wants to cut it into 2 pieces so that one piece is three times as long as the other. How long is each piece?

1. Does the equation $t°\text{C} = (32 + 1.8t)°\text{F}$ work for any rational number t? Check that it does with $t = 12\frac{1}{5}$ and $t = -12\frac{1}{5}$.

I will use substitution with $t = 12\frac{1}{5}$ and $t = -12\frac{1}{5}$.

$$\left(\mathbf{12\frac{1}{5}}\right)°\boldsymbol{C} = \left(\mathbf{32 + 1.8 \times 12\frac{1}{5}}\right)°\boldsymbol{F} = (\mathbf{32 + 21.96})°\boldsymbol{F} = \boldsymbol{53.96}\,°\boldsymbol{F}$$

This means that $12\frac{1}{5}$°C is the same as 53.96°F.

$$\left(\mathbf{-12\frac{1}{5}}\right)°\boldsymbol{C} = \left(\mathbf{32 + 1.8 \times \left(-12\frac{1}{5}\right)}\right)°\boldsymbol{F} = (\mathbf{32 - 21.96})°\boldsymbol{F} = \mathbf{10.04}°\boldsymbol{F}$$

2. Knowing that $t°\text{C} = \left(32 + \frac{9}{5}t\right)°\text{F}$ for any rational number t, show that for any rational number d, $d°\text{F} = \left(\frac{5}{9}(d - 32)\right)°\text{C}$.

I will write down everything I know from the problem and lesson.

From the lesson, I know that $d°\text{F} = \left(32 + \frac{9}{5}t\right)°\text{F}$.

That implies that $d = \left(32 + \frac{9}{5}t\right)$.

From the problem, I know that $t°\text{C} = \left(32 + \frac{9}{5}t\right)°\text{F}$.

From the lesson, I know that $t°\text{C} = d°\text{F}$.

I will use these equations to help me show that $d°\text{F} = \left(\frac{5}{9}(d - 32)\right)°\text{C}$.

I will start by solving for t.

Since $d°F$ can be found by $\left(32+\frac{9}{5}t\right)°F$, then $d=\left(32+\frac{9}{5}t\right)$, and $d°F=t°C$. Substituting $d=\left(32+\frac{9}{5}t\right)$ into $d°F$ we get

$$\begin{aligned} d°F &= \left(32+\frac{9}{5}t\right)°F \\ d &= 32+\frac{9}{5}t \\ d-32 &= \frac{9}{5}t \\ \frac{5}{9}(d-32) &= t \end{aligned}$$

Now that we know $t=\frac{5}{9}(d-32)$, then $d°F=\left(\frac{5}{9}(d-32)\right)°C$.

Once I know t, I can substitute into $t°\text{C}=d°\text{F}$ to show that for any rational number d, $d°\text{F}=\left(\frac{5}{9}(d-32)\right)°\text{C}$.

1. Does the equation $t°\text{C} = (32 + 1.8t)°\text{F}$ work for any rational number t? Check that it does with $t = 8\frac{2}{3}$ and $t = -8\frac{2}{3}$.

2. Knowing that $t°\text{C} = \left(32 + \frac{9}{5}t\right)°\text{F}$ for any rational number t, show that for any rational number d, $d°\text{F} = \left(\frac{5}{9}(d - 32)\right)°\text{C}$.

3. Drake was trying to write an equation to help him predict the cost of his monthly phone bill. He is charged $\$35$ just for having a phone, and his only additional expense comes from the number of texts that he sends. He is charged $\$0.05$ for each text. Help Drake out by completing parts (a)–(f).
   a. How much was his phone bill in July when he sent 750 texts?
   b. How much was his phone bill in August when he sent 823 texts?
   c. How much was his phone bill in September when he sent 579 texts?
   d. Let y represent the total cost of Drake's phone bill. Write an equation that represents the total cost of his phone bill in October if he sends t texts.
   e. Another phone plan charges $\$20$ for having a phone and $\$0.10$ per text. Let y represent the total cost of the phone bill for sending t texts. Write an equation to represent his total bill.
   f. Write your equations in parts (d) and (e) as a system of linear equations, and solve. Interpret the meaning of the solution in terms of the phone bill.

Lesson Notes

Any three numbers, a, b, and c, that satisfy $a^2 + b^2 = c^2$ are considered a triple. A Pythagorean triple is a set of three *whole numbers*, a, b, and c, that satisfy the equation $a^2 + b^2 = c^2$.

Examples

1. Identify a Pythagorean triple (numbers that satisfy $a^2 + b^2 = c^2$), using the known Pythagorean triple $5, 12, 13$.

   ***Answers will vary*.**

   ***A triple is* $10, 24, 26$. *I found these by multiplying each of* $5, 12,$ *and* 13 *by* 2.**

I need to multiply the known triple by a whole number to ensure that I produce a Pythagorean triple.

2. Identify a triple (numbers that satisfy $a^2 + b^2 = c^2$), using the known Pythagorean triple $5, 12, 13$.

   ***Answers will vary*.**

   ***A triple is* $3.5, 8.4, 9.1$. *I found these by multiplying each of* $5, 12,$ *and* 13 *by* 0.7.**

To produce a triple, I will multiply each number in the known triple by a number between 0 and 1.

3. Use the system $\begin{cases} x + y = \frac{t}{s} \\ x - y = \frac{s}{t} \end{cases}$ to find Pythagorean triples for the given values of s and t. Recall that the solution, in the form of $\left(\frac{c}{b}, \frac{a}{b}\right)$, is the triple, a, b, c.

$s = 2, t = 5$

This system will produce triples only if $t > s$.

$$\begin{cases} x + y = \frac{5}{2} \\ x - y = \frac{2}{5} \end{cases}$$

I will use elimination to solve the system by summing two equations.

$$x + y + x - y = \frac{5}{2} + \frac{2}{5}$$
$$2x = \frac{29}{10}$$
$$x = \frac{29}{20}$$

$$\frac{29}{20} + y = \frac{5}{2}$$
$$y = \frac{5}{2} - \frac{29}{20}$$
$$y = \frac{21}{20}$$

Then the solution is $\left(\frac{29}{20}, \frac{21}{20}\right)$***, and the triple is*** $20, 21, 29$.

I write the numerators and denominator in ascending order. The denominator of both equations is b, the smaller numerator is a, and the larger numerator is c.

4. Use a calculator to verify that you found a Pythagorean triple in Problem 2. Show your work below.

For the triple $20, 21, 29$**:**

The longest side of the right triangle is the hypotenuse identified by c.

$$20^2 + 21^2 = 29^2$$
$$400 + 441 = 841$$
$$841 = 841$$

If the triple I found in Problem 2 cannot be verified, I will need to go back and check my work.

1. Explain in terms of similar triangles why it is that when you multiply the known Pythagorean triple $3, 4, 5$ by 12, it generates a Pythagorean triple.

2. Identify three Pythagorean triples using the known triple $8, 15, 17$.

3. Identify three triples (numbers that satisfy $a^2 + b^2 = c^2$, but a, b, c are not whole numbers) using the triple $8, 15, 17$.

Use the system $\begin{cases} x + y = \frac{t}{s} \\ x - y = \frac{s}{t} \end{cases}$ to find Pythagorean triples for the given values of s and t. Recall that the solution, in the form of $\left(\frac{c}{b}, \frac{a}{b}\right)$, is the triple a, b, c.

4. $s = 2, t = 9$

5. $s = 6, t = 7$

6. $s = 3, t = 4$

7. Use a calculator to verify that you found a Pythagorean triple in each of the Problems 4–6. Show your work.

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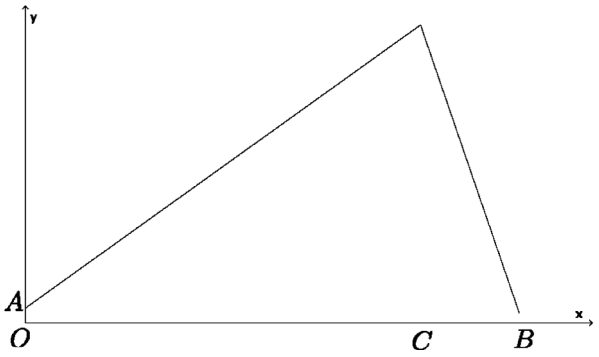
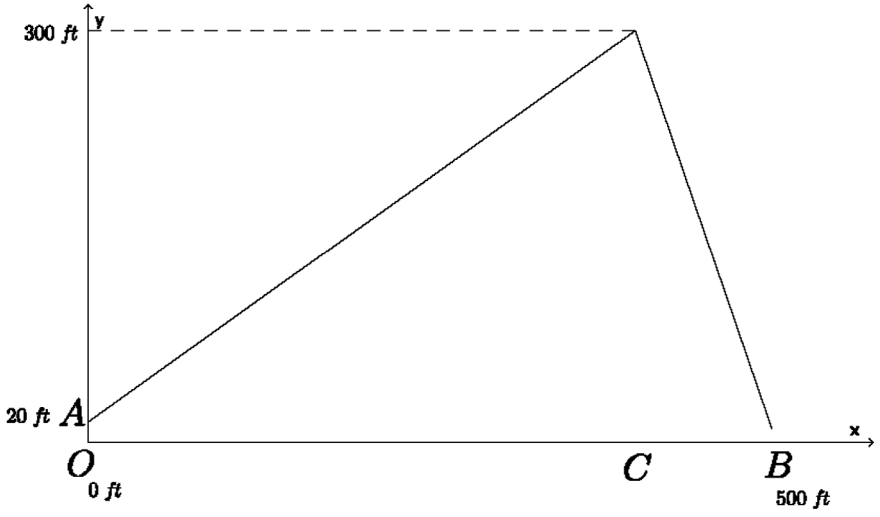
Consider the path of the first 10 seconds of a roller coaster ride, graphed below on a coordinate plane. The x-axis represents the horizontal distance traveled, and the y-axis represents the height of the roller coaster.



- Include the information below on the graph.
  - Point A represents the platform, 20 ft. from the ground, where you get onto the ride.
  - The length of segment OB is approximately 500 ft.
  - The highest point on this part of the ride, 300 ft. from the ground, is reached 8 seconds after the ride begins.



a. How much time has passed if the roller coaster is at point A? Explain.

No time, $t = 0$, because this is where we get on the ride.

b. How much time has passed as the roller coaster moves from point A to point B?

10 seconds. We were told that the graph represents the first 10 seconds of the ride.

c. Approximate the coordinates of the roller coaster for the following values of t: 0, 2, 5, 8, and 10.

At $t = 0$, the coordinates are $(0, 20)$. The coaster is on the platform, and the ride hasn't started yet.

At $t = 2$, the coordinates are approximately $(100, 90)$.

At $t = 5$, the coordinates are approximately $\left(\frac{5}{10} \times 500, 200\right) = (250, 200)$.

At $t = 8$, the coordinates are approximately $\left(\frac{8}{10} \times 500, 300\right) = (400, 300)$. We were given the height at 8 seconds as 300 ft.

At $t = 10$, the coordinates are approximately $(500, 5)$.

I can estimate the x-value as 100. The reason is that the total distance traveled in 10 seconds is 500 ft., and then $\frac{2}{10}$ of 500 is 100. I estimate the y-value to be 90 by looking at the graph. The height after two seconds must be between 20 and 300 but closer to 20.

d. What ordered pair represents point C? Explain how you know.

Point C appears to be on the x-axis, below the highest point on the graph, which we said was at $(400, 300)$. Therefore, point C is approximately at $(400, 0)$.

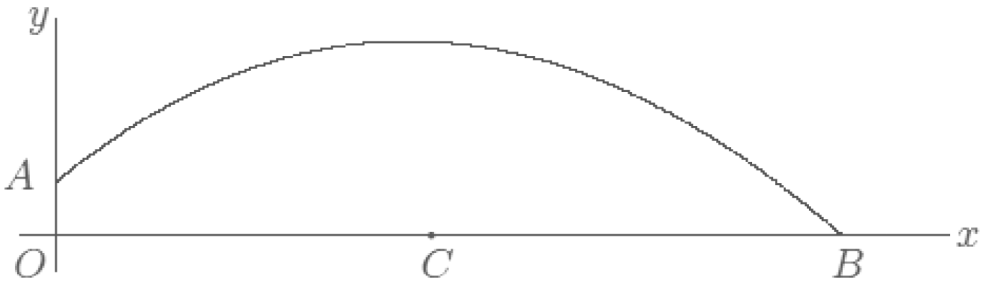
e. Functions allow us to make predictions about the world around us. In this case, the graph represents the location of the roller coaster as a function of time. We can make predictions about the location of the roller coaster in the first 10 seconds of the ride because we have information about the distance and height of the coaster from the starting point (platform). Use your answers from part (d) to make two predictions about the path of the roller coaster.

After 1 second, the roller coaster is approximately 50 ft. from the starting point and about 55 ft. up.

After 9 seconds, the roller coaster is approximately 450 ft. from the starting point and about 100 ft. up.

Use the graph to make predictions about the roller coaster's distance from the starting point and its height for *any* point on the graph of its path.

A ball is thrown across the field from point A to point B. It hits the ground at point B. The path of the ball is shown in the diagram below. The x-axis shows the horizontal distance the ball travels in feet, and the y-axis shows the height of the ball in feet. Use the diagram to complete parts (a)–(f).



a. Suppose point A is approximately 6 feet above ground and that at time $t = 0$ the ball is at point A. Suppose the length of OB is approximately 88 feet. Include this information on the diagram.

b. Suppose that after 1 second, the ball is at its highest point of 22 feet (above point C) and has traveled a horizontal distance of 44 feet. What are the approximate coordinates of the ball at the following values of t: $0.25, 0.5, 0.75, 1, 1.25, 1.5, 1.75$, and 2.

c. Use your answer from part (b) to write two predictions.

d. What is happening to the ball when it has coordinates $(88, 0)$?

e. Why do you think the ball is at point $(0, 6)$ when $t = 0$? In other words, why isn't the height of the ball 0?

f. Does the graph allow us to make predictions about the height of the ball at all points?

1. The table below represents the number of minutes Esmeralda reads each day for a week. Do the data shown below represent values of a function? Explain.

Day (x)	1	2	3	4	5	6	7
Time in Minutes (y)	85	30	60	30	15	80	10

Each input has exactly one output; therefore, these data represent a function.

Check each x-value (input) to make sure each has only one unique y-value (output).

2. The table below represents the total number of steps that Jamar has taken for various months in the past two years. Examine the data in the table below, and determine whether or not they could represent a function. Explain.

Month (x)	March	July	March	February	June	October
Number of Steps (y)	215,760	235,842	201,388	197,094	220,972	200,578

These data <u>cannot</u> represent a function because there are two values given for the month of March. Jamar cannot take $215,760$ and $201,388$ steps in the same month.

3. A function can be described by the rule $y = x^2 - 1$. Determine the corresponding output for each given input.

I just substitute the x-value into the equation $y = x^2 - 1$. The answer I get, y, is the output.

Input (x)	-3	-1	0	1	3
Output (y)	$(-3)^2 - 1$ $= 9 - 1$ $= 8$	$(-1)^2 - 1$ $= 1 - 1$ $= 0$	$0^2 - 1$ $= 0 - 1$ $= -1$	$1^2 - 1$ $= 1 - 1$ $= 0$	$3^2 - 1$ $= 9 - 1$ $= 8$

4. Examine the data in the table below. The inputs represent the number of cans of corn purchased, and the outputs represent the cost. Determine the cost of one can of corn, assuming the price per can is the same no matter how many cans are purchased. Then, complete the table.

Cans of Corn (x)	1	2	3	4	5	6	7
Cost in Dollars (y)	$\mathbf{0.50}$	$\mathbf{1.00}$	1.50	$\mathbf{2.00}$	2.50	$\mathbf{3.00}$	$\mathbf{3.50}$

a. Write the rule that describes the function.

Let y be the cost of x cans of corn.

Write each part of the proportion as $\frac{\text{cost}}{\text{cans of corn}}$.

$$\frac{y}{x} = \frac{1.50}{3}$$
$$y = \frac{1.50}{3}x$$
$$y = 0.50x$$

First, I define my variables x and y. Then, I write a proportion using data from the table and the variables. Once I solve the proportion for y, I'll have the rule.

Now, this problem is just like the last one!

b. Can you determine the value of the output for an input of $x = -10$? If so, what is it?

Yes, just substitute -10 in for x to determine the output.

$$y = 0.50x$$
$$y = 0.50(-10)$$
$$y = -5.00$$

c. Does an input of -10 make sense in this situation? Explain.

An input of -10 means that -10 cans of corn were purchased. Only a positive number of cans can be purchased, so no, an input of -10 does not make sense in this situation.

1. The table below represents the number of minutes Francisco spends at the gym each day for a week. Does the data shown below represent values of a function? Explain.

Day (x)	1	2	3	4	5	6	7
Time in minutes (y)	35	45	30	45	35	0	0

2. Can the table shown below represent values of a function? Explain.

Input (x)	9	8	7	8	9
Output (y)	11	15	19	24	28

3. Olivia examined the table of values shown below and stated that a possible rule to describe this function could be $y = -2x + 9$. Is she correct? Explain.

Input (x)	−4	0	4	8	12	16	20	24
Output (y)	17	9	1	−7	−15	−23	−31	−39

4. Peter said that the set of data in part (a) describes a function, but the set of data in part (b) does not. Do you agree? Explain why or why not.

   a.

Input (x)	1	2	3	4	5	6	7	8
Output (y)	8	10	32	6	10	27	156	4

   b.

Input (x)	−6	−15	−9	−3	−2	−3	8	9
Output (y)	0	−6	8	14	1	2	11	41

5. A function can be described by the rule $y = x^2 + 4$. Determine the corresponding output for each given input.

Input (x)	−3	−2	−1	0	1	2	3	4
Output (y)								

6. Examine the data in the table below. The inputs and outputs represent a situation where constant rate can be assumed. Determine the rule that describes the function.

Input (x)	–1	0	1	2	3	4	5	6
Output (y)	3	8	13	18	23	28	33	38

7. Examine the data in the table below. The inputs represent the number of bags of candy purchased, and the outputs represent the cost. Determine the cost of one bag of candy, assuming the price per bag is the same no matter how much candy is purchased. Then, complete the table.

Bags of candy (x)	1	2	3	4	5	6	7	8
Cost in Dollars (y)				5.00	6.25			10.00

   a. Write the rule that describes the function.

   b. Can you determine the value of the output for an input of $x = -4$? If so, what is it?

   c. Does an input of -4 make sense in this situation? Explain.

8. Each and every day a local grocery store sells 2 pounds of bananas for $\$1.00$. Can the cost of 2 pounds of bananas be represented as a function of the day of the week? Explain.

9. Write a brief explanation to a classmate who was absent today about why the table in part (a) is a function and the table in part (b) is not.

   a.

Input (x)	–1	–2	–3	–4	4	3	2	1
Output (y)	81	100	320	400	400	320	100	81

   b.

Input (x)	1	6	–9	–2	1	–10	8	14
Output (y)	2	6	–47	–8	19	–2	15	31

1. A particular linear function has the table of values below.

Input (x)	-2	4	6	12	15	16	19
Output (y)	$\mathbf{-14}$	16	26	**56**	71	**76**	91

a. What is the equation that describes the function?

Any pair of data can be used to determine the rate of change. We will use $(\mathbf{4, 16})$ ***as*** $(\boldsymbol{x_1, y_1})$ ***and*** $(\mathbf{6, 26})$ ***as*** $(\boldsymbol{x_2, y_2})$**.**

$$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{26 - 16}{6 - 4} = \frac{10}{2} = 5}$$

To write the equation, I must first determine the rate of change, m. Next, I will substitute the values of x, y, and m into the linear equation $y = mx + b$ to determine the value of b.

To write the equation, we select a pair of data and use $\boldsymbol{m = 5}$ ***in the equation*** $\boldsymbol{y = mx + b}$**.**

We can select any input to use as $\boldsymbol{x}$***, but we must use the corresponding output as the*** $\boldsymbol{y}$***-value. Using*** $(\mathbf{4, 16})$ ***will work because*** $\mathbf{16}$ ***corresponds to the input of*** $\mathbf{4}$***. Using*** $(\mathbf{4, 71})$ ***will not work because*** $\mathbf{71}$ ***corresponds to the input of*** $\mathbf{15}$***, not*** $\mathbf{4}$**.**

$$\begin{aligned} \boldsymbol{y} &= \boldsymbol{mx + b} \\ \mathbf{16} &= \mathbf{5(4) + b} \\ \mathbf{16} &= \mathbf{20 + b} \\ \mathbf{16 - 20} &= \mathbf{20 - 20 + b} \\ \mathbf{-4} &= \mathbf{0 + b} \\ \mathbf{-4} &= \boldsymbol{b} \end{aligned}$$

The equation that describes this function is $\boldsymbol{y = 5x + (-4)}$ ***or the equivalent equation*** $\boldsymbol{y = 5x - 4}$**.**

b. Complete the table using the rule (the equation you wrote in part (a)).

We need the outputs that correspond to the inputs of $-2, 12,$ and 16. To determine them, substitute the value of each input, x, into the equation we found in part (a).

For $x = -2$:	*For $x = 12$:*	*For $x = 16$:*
$y = 5x - 4$	$y = 5x - 4$	$y = 5x - 4$
$y = 5(-2) - 4$	$y = 5(12) - 4$	$y = 5(16) - 4$
$y = -10 - 4$	$y = 60 - 4$	$y = 80 - 4$
$y = -14$	$y = 56$	$y = 76$

2. A linear function has the table of values below. The data in the table shows the time, in hours, that a car travels and the corresponding distance traveled in miles. Assume the car travels at a constant speed.

Number of Hours Traveled (x)	1.75	3.25	4
Distance in Miles (y)	101.5	188.5	232

a. Describe the function in terms of distance and time.

The distance the car travels is a function of the time it spends traveling.

Is distance a function of the time the car travels, or is time a function of the distance traveled? I normally say that the output is a function of the input.

b. Write the rule that represents the linear function that describes the distance traveled in miles, y, in x hours.

This is just like part (a) of the previous problem!

$$m = \frac{232 - 188.5}{4 - 3.25} = \frac{43.5}{0.75} = 58$$

Using $(x, y) = (4, 232)$ and $m = 58$ in the equation $y = mx + b$:

$$232 = 58(4) + b$$
$$232 = 232 + b$$
$$232 - 232 = 232 - 232 + b$$
$$0 = b$$

The equation for this function is $y = 58x$.

1. A food bank distributes cans of vegetables every Saturday. The following table shows the total number of cans they have distributed since the beginning of the year. Assume that this total is a linear function of the number of weeks that have passed.

Number of weeks (x)	1	12	20	45
Total number of cans of vegetables distributed (y)	180	2,160	3,600	8,100

   a. Describe the function being considered in words.
   b. Write the linear equation that describes the total number of cans handed out, y, in terms of the number of weeks, x, that have passed.
   c. Assume that the food bank wants to distribute $20{,}000$ cans of vegetables. How long will it take them to meet that goal?
   d. The manager had forgotten to record that they had distributed $35{,}000$ cans on January 1. Write an adjusted linear equation to reflect this forgotten information.
   e. Using your function in part (d), determine how long in years it will take the food bank to hand out $80{,}000$ cans of vegetables.

2. A linear function has the table of values below. It gives the number of miles a plane travels over a given number of hours while flying at a constant speed.

Number of hours traveled (x)	2.5	4	4.2
Distance in miles (y)	1,062.5	1,700	1,785

   a. Describe in words the function given in this problem.
   b. Write the equation that gives the distance traveled, y, in miles, as a linear function of the number of hours, x, spent flying.
   c. Assume that the airplane is making a trip from New York to Los Angeles, which is a journey of approximately $2{,}475$ miles. How long will it take the airplane to get to Los Angeles?
   d. If the airplane flies for 8 hours, how many miles will it cover?

3. A linear function has the table of values below. It gives the number of miles a car travels over a given number of hours.

Number of hours traveled (x)	3.5	3.75	4	4.25
Distance in miles (y)	203	217.5	232	246.5

   a. Describe in words the function given.
   b. Write the equation that gives the distance traveled, in miles, as a linear function of the number of hours spent driving.
   c. Assume that the person driving the car is going on a road trip to reach a location 500 miles from her starting point. How long will it take the person to get to the destination?

4. A particular linear function has the table of values below.

Input (x)	2	3	8	11	15	20	23
Output (y)	7	10		34		61	

   a. What is the equation that describes the function?
   b. Complete the table using the rule.

5. A particular linear function has the table of values below.

Input (x)	0	5	8	13	15	18	21
Output (y)	6	11	14		21		

   a. What is the rule that describes the function?
   b. Complete the table using the rule.

1. A function has the table of values to the right that shows the total cost for a certain number of football tickets purchased.

Number of Tickets (x)	Total Cost in Dollars (y)
3	18.75
7	43.75
8	50
15	93.75

   a. Is the function a linear function? Explain.

   Sample Student Response:

   Yes, the function is linear because the cost of each ticket is the same no matter how many are purchased. For example, 3 tickets cost $\$18.75$, or $\$6.25$ each. No matter how many tickets are purchased, the cost is $\$6.25$ per ticket.

   b. Describe the limitations of x and y.

   The input is a specific number of tickets, so it doesn't make sense for that number to be negative or fractional. The inputs (x-values) must be positive integers. The output is the cost, which is okay to be fractional but not negative. The outputs (y-values) must be positive rational numbers.

   I need to think about what kinds of inputs would make sense in this situation. For example, does it make sense for the values of x and y to be negative or fractional?

   c. Is the function discrete or continuous?

   The function is discrete because you cannot purchase part of a ticket. That is, there is no output that would correspond to 5.25 tickets.

   I need to use my answer from part (b) for this. Continuous rates can be measured for any input of x. Discrete rates are separate and distinct and cannot include fractional parts of an input.

   d. Is it reasonable to assume that this function could be used to predict the cost of purchasing 10 billion tickets? Explain.

   Yes, the function can predict the cost of purchasing 10 billion tickets. However, it is unlikely that a football stadium could be large enough to hold 10 billion people.

2. A function has the table of values below. Examine the information in the table to answer the questions that follow.

Input	Output
8:00 a.m.	Breakfast
10:00 a.m.	Snack
12:00 p.m.	Lunch
3:00 p.m.	Snack
6:00 p.m.	Dinner

a. Describe the function.

It appears that the function describes what kind of meal may be eaten at a particular time of day.

b. What output would the function assign to the input 8:15 a.m.?

The function would probably assign breakfast to the input of 8:15 a.m.

c. Can this function be described using a mathematical rule? Explain.

Sample Student Response:

No, a mathematical rule cannot describe this function. It can be described in words, but there is no formula or rule that can be written.

I remember my teacher saying that some functions can only be described in words, not numbers or equations, like the problem about fruit and the color of its skin that we did in class.

1. The costs of purchasing certain volumes of gasoline are shown below. We can assume that there is a linear relationship between x, the number of gallons purchased, and y, the cost of purchasing that many gallons.

Number of gallons (x)	5.4	6	15	17
Total cost in dollars (y)	19.71	21.90	54.75	62.05

   a. Write an equation that describes y as a linear function of x.
   b. Are there any restrictions on the values x and y can adopt?
   c. Is the function discrete?
   d. What number does the linear function assign to 20? Explain what your answer means.

2. A function has the table of values below. Examine the information in the table to answer the questions below.

Input	**Output**
one	3
two	3
three	5
four	4
five	4
six	3
seven	5

   a. Describe the function.
   b. What number would the function assign to the word *eleven*?

3. The table shows the distances covered over certain counts of hours traveled by a driver driving a car at a constant speed.

Number of hours driven (x)	3	4	5	6
Total miles driven (y)	141	188	235	282

   a. Write an equation that describes y, the number of miles covered, as a linear function of x, number of hours driven.
   b. Are there any restrictions on the value x and y can adopt?
   c. Is the function discrete?
   d. What number does the function assign to 8? Explain what your answer means.
   e. Use the function to determine how much time it would take to drive 500 miles.

4. Consider the function that assigns to each time of a particular day the air temperature at a specific location in Ithaca, NY. The following table shows the values of this function at some specific times.

12:00 noon	$92°\text{F}$
1:00 p.m.	$90.5°\text{F}$
2:00 p.m.	$89°\text{F}$
4:00 p.m.	$86°\text{F}$
8:00 p.m.	$80°\text{F}$

   a. Let y represent the air temperature at time x hours past noon. Verify that the data in the table satisfies the linear equation $y = 92 - 1.5x$.

   b. Are there any restrictions on the types of values x and y can adopt?

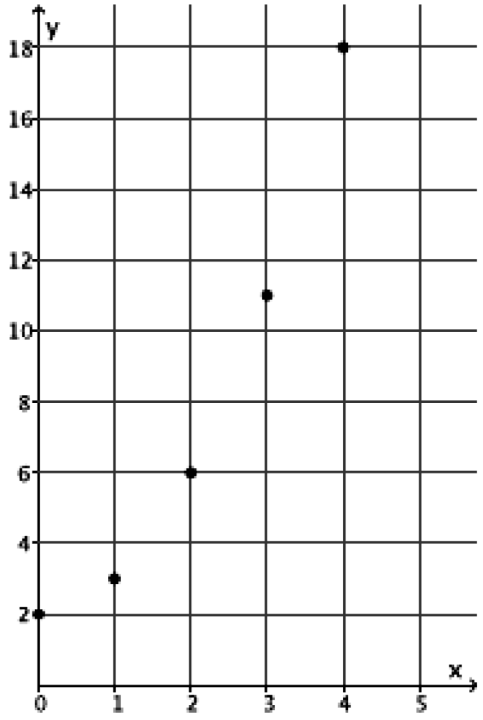
   c. Is the function discrete?

   d. According to the linear function of part (a), what will the air temperature be at 5:30 p.m.?

   e. Is it reasonable to assume that this linear function could be used to predict the temperature for 10:00 a.m. the following day or a temperature at any time on a day next week? Give specific examples in your explanation.

1. Graph the equation $y = x^2 + 2$ for positive values of x. Organize your work using the table below, and then answer the questions that follow.

x	y
0	$\mathbf{0^2 + 2 = 2}$
1	$\mathbf{1^2 + 2 = 3}$
2	$\mathbf{2^2 + 2 = 6}$
3	$\mathbf{3^2 + 2 = 11}$
4	$\mathbf{4^2 + 2 = 18}$



a. Plot the ordered pairs on the coordinate plane.

The ordered pairs are $(\mathbf{0, 2})$, $(\mathbf{1, 3})$, $(\mathbf{2, 6})$, $(\mathbf{3, 11})$ ***and*** $(\mathbf{4, 18})$.

b. What shape does the graph of the points appear to take?

It appears to be a curve.

Does the graph appear to take the shape of a line or a curve? Can I draw one straight line using my straightedge through all of the points?

c. Is this the graph of a linear equation? Explain.

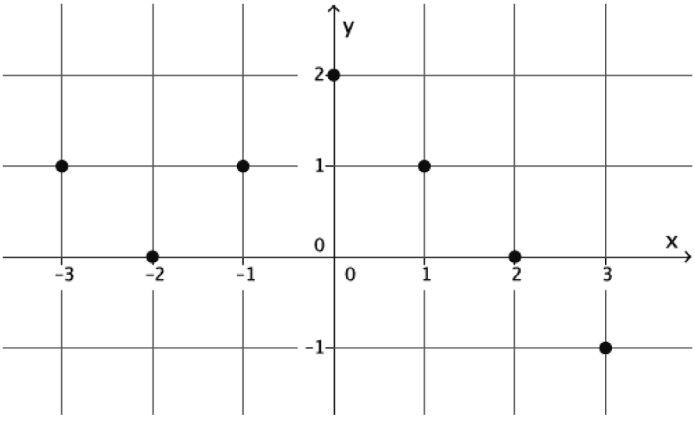
No. A graph that is linear would have the shape of a line. This graph is a curve.

d. A function has the rule so that it assigns to each input, x, the output, $x^2 + 2$. The rule for this function is $y = x^2 + 2$. What do you think the graph of this function will look like? Explain.

Since the function has the same rule as the equation, the graph of the function will be identical to the graph of the equation. I can verify this by taking each input, x, and substituting it into the equation that describes the function $y = x^2 + 2$ to get the output. Then, I would graph the ordered pairs (input, output).

The equation $y = x^2 + 2$ and the rule for this function are the same. What will that mean about their graphs?

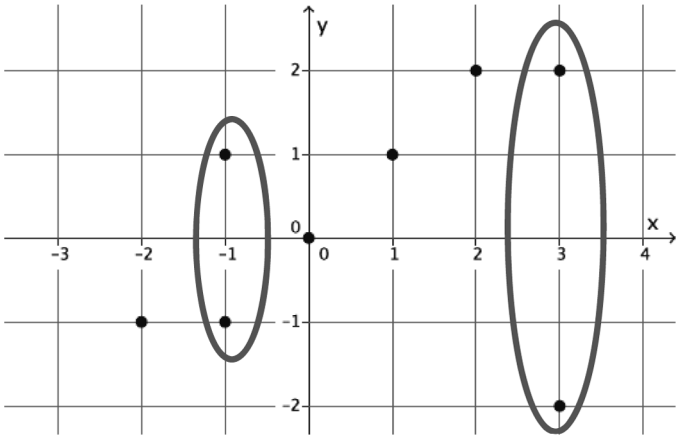
2. Examine the graph below. Could the graph represent the graph of a function? Explain why or why not.



The definition of a function will help me. I need to check that every input (x-value) has only one output (y-value).

This is the graph of a function because every x-value has just one corresponding y-value.

3. Examine the graph below. Could the graph represent the graph of a function? Explain why or why not.



In this graph, I see that $x = -1$ has two y-values and so does $x = 3$.

This is <u>not</u> the graph of a function because there are some values of x (inputs) that have more than one corresponding y-value (outputs). For example, the input of -1 corresponds to both 1 and -1. Another example is the input of 3; it corresponds to the outputs of 2 and -2.

1. The distance that Scott walks is a function of the time he spends walking. Scott can walk $\frac{1}{2}$ mile every 8 minutes. Assume he walks at a constant rate.

   a. Predict the shape of the graph of the function. Explain.

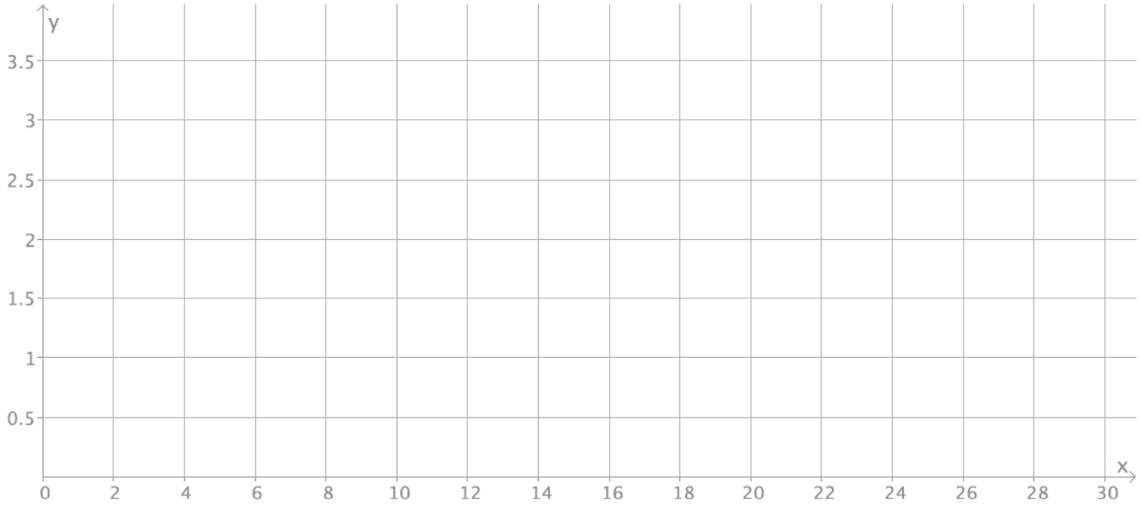
   b. Write an equation to represent the distance that Scott can walk in miles, y, in x minutes.

   c. Use the equation you wrote in part (b) to determine how many miles Scott can walk in 24 minutes.

   d. Use the equation you wrote in part (b) to determine how many miles Scott can walk in 12 minutes.

   e. Use the equation you wrote in part (b) to determine how many miles Scott can walk in 16 minutes.

   f. Write your inputs and corresponding outputs as ordered pairs, and then plot them on a coordinate plane.

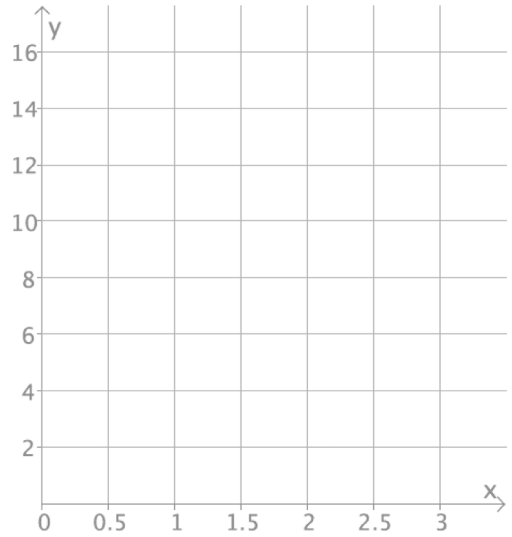


   g. What shape does the graph of the points appear to take? Does it match your prediction?

   h. Connect the points to make a line. What is the equation of the line?

2. Graph the equation $y = x^3$ for positive values of x. Organize your work using the table below, and then answer the questions that follow.

x	y
0	
0.5	
1	
1.5	
2	
2.5	



a. Plot the ordered pairs on the coordinate plane.

b. What shape does the graph of the points appear to take?

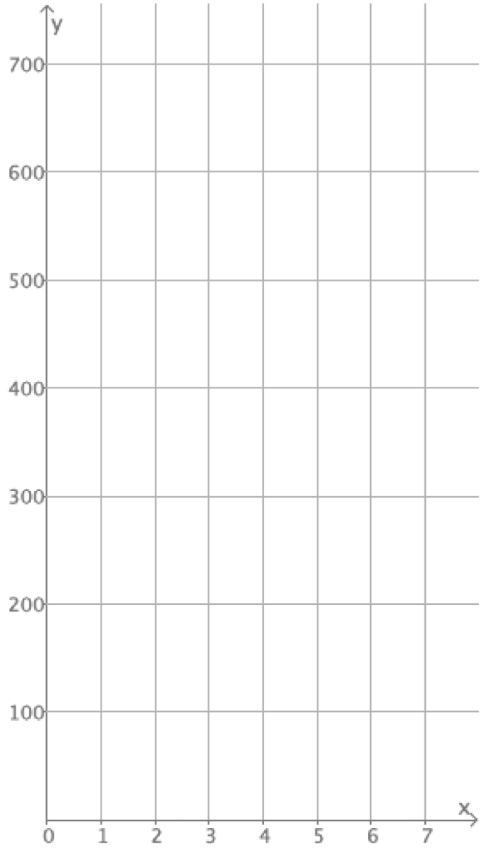
c. Is this the graph of a linear function? Explain.

d. Consider the function that assigns to each positive real number s the volume V of a cube with side length s units. An equation that describes this function is $V = s^3$. What do you think the graph of this function will look like? Explain.

e. Use the function in part (d) to determine the volume of a cube with side length of 3 units. Write the input and output as an ordered pair. Does this point appear to belong to the graph of $y = x^3$?

3. Sketch the graph of the equation $y = 180(x - 2)$ for whole numbers. Organize your work using the table below, and then answer the questions that follow.

x	y
3	
4	
5	
6	



a. Plot the ordered pairs on the coordinate plane.

b. What shape does the graph of the points appear to take?

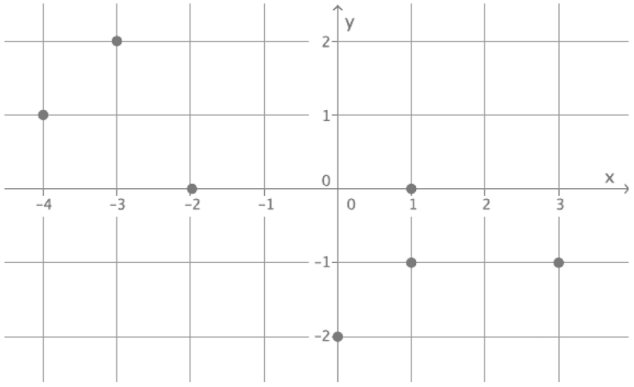
c. Is this graph a graph of a function? How do you know?

d. Is this a linear equation? Explain.

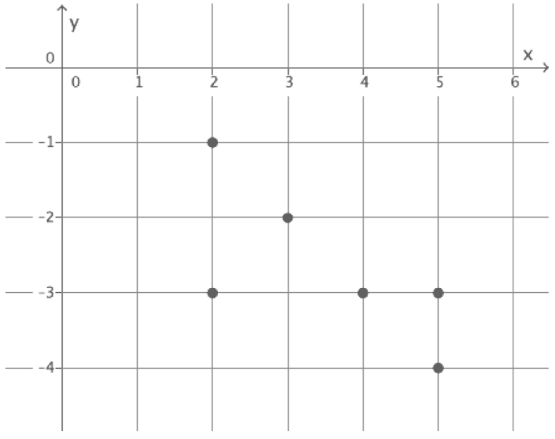
e. The sum S of interior angles, in degrees, of a polygon with n sides is given by $S = 180(n - 2)$. If we take this equation as defining S as a function of n, how do think the graph of this S will appear? Explain.

f. Is this function discrete? Explain.

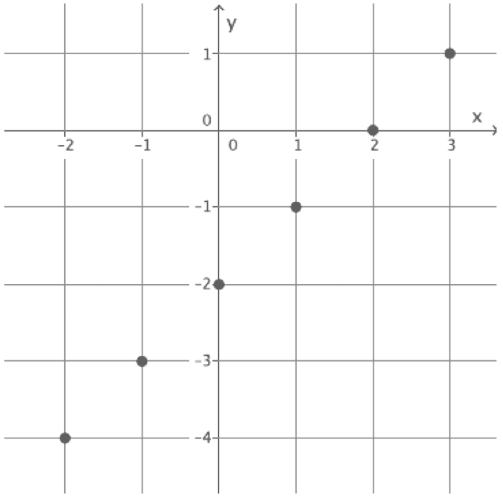
4. Examine the graph below. Could the graph represent the graph of a function? Explain why or why not.



5. Examine the graph below. Could the graph represent the graph of a function? Explain why or why not.



6. Examine the graph below. Could the graph represent the graph of a function? Explain why or why not.



1. A function assigns to the inputs the corresponding outputs shown in the table below.

Input (x)	Output (y)
–3	5
–1	7
1	9
3	11

a. Is the function a linear function? Check at least three pairs of inputs and their corresponding outputs.

$$\frac{7-5}{-1-(-3)}=\frac{2}{2}=1 \quad \frac{11-7}{3-(-1)}=\frac{4}{4}=1 \quad \frac{11-9}{3-1}=\frac{2}{2}=1$$

I need to make sure the rate of change is the same value for each of the three pairs that I check. If they are the same, then I know the function is a linear function.

b. What equation describes the function?

Using the input and corresponding output $(1, 9)$:

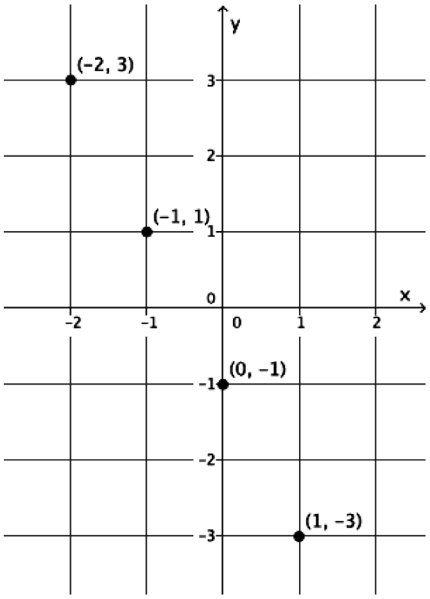
$$\begin{aligned} y &= mx + b \\ 9 &= 1(1) + b \\ 9 &= 1 + b \\ 9 - 1 &= 1 - 1 + b \\ 8 &= b \end{aligned}$$

Since $m = 1$ ***and*** $b = 8$***, the equation that describes this function is*** $y = 1x + 8$ ***or just*** $y = x + 8$.

c. What will the graph of the function look like? Explain.

Since the function is described by a linear function, and I know from the last lesson that the graph of the function will be identical to the graph of the equation that describes it, then the graph of this function is a line. Linear equations graph as lines; therefore, linear functions will also graph as lines.

2. Is the following graph a graph of a linear function? How would you determine if it is a linear function?



This is just like part (a) of the last problem. The only difference is that my inputs and outputs are graphed instead of in a table.

If the rate of change is the same, then this is a linear function.

$$\frac{3-1}{-2-(-1)} = \frac{2}{-1} = -2$$

$$\frac{-3-(-1)}{1-0} = \frac{-2}{1} = -2$$

$$\frac{-1-1}{0-(-1)} = \frac{-2}{1} = -2$$

Since the rate of change is the same, -2, this is the graph of a linear function.

3. Xander says you really only need to check two pairs of inputs and outputs to determine if the function is linear. Is he correct? Explain. Hint: Show an example with a table where this is not true.

It is always a good idea to check three pairs of inputs and outputs.

The table below demonstrates why.

I need to develop a table of values where two pairs of inputs and outputs give the same value, but a third pair would give a different value.

Input (x)	*Output (y)*
3	7
-1	-1
0	1
5	6

$$\frac{7-(-1)}{3-(-1)} = \frac{8}{4} = 2 \qquad \frac{1-(-1)}{0-(-1)} = \frac{2}{1} = 2 \qquad \frac{6-1}{5-0} = \frac{5}{5} = 1$$

Since the third pair gave a different value than the first two pairs, it shows that Xander's statement is incorrect.

1. A function assigns to the inputs given the corresponding outputs shown in the table below.

Input	Output
3	9
9	17
12	21
15	25

   a. Does the function appear to be linear? Check at least three pairs of inputs and their corresponding outputs.
   b. Find a linear equation that describes the function.
   c. What will the graph of the function look like? Explain.

2. A function assigns to the inputs given the corresponding outputs shown in the table below.

Input	Output
–1	2
0	0
1	2
2	8
3	18

   a. Is the function a linear function?
   b. What equation describes the function?

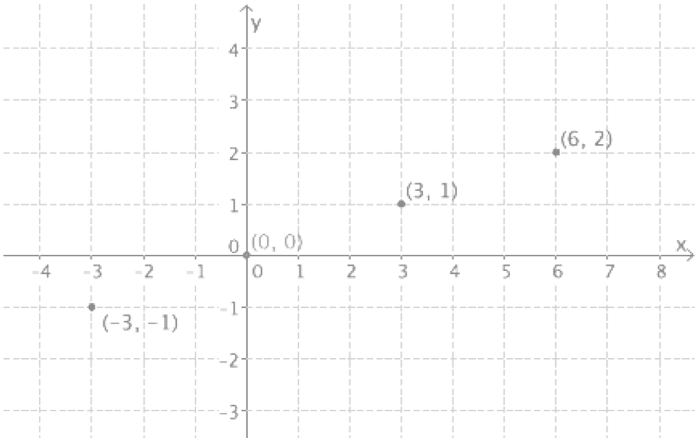
3. A function assigns the inputs and corresponding outputs shown in the table below.

Input	Output
0.2	2
0.6	6
1.5	15
2.1	21

   a. Does the function appear to be linear? Check at least three pairs of inputs and their corresponding outputs.
   b. Find a linear equation that describes the function.
   c. What will the graph of the function look like? Explain.

4. Martin says that you only need to check the first and last input and output values to determine if the function is linear. Is he correct? Explain.

5. Is the following graph a graph of a linear function? How would you determine if it is a linear function?



6. A function assigns to the inputs given the corresponding outputs shown in the table below.

Input	Output
−6	−6
−5	−5
−4	−4
−2	−2

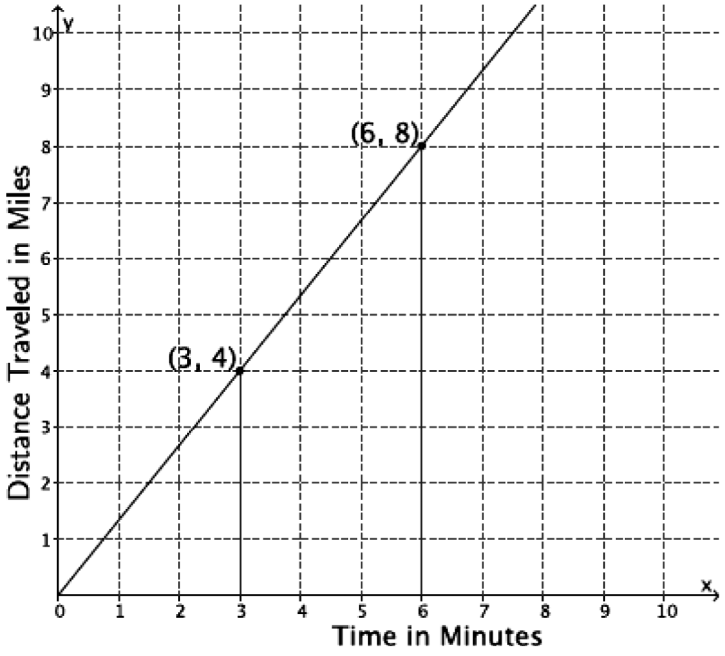
a. Does the function appear to be a linear function?

b. What equation describes the function?

c. What will the graph of the function look like? Explain.

1. The graph below represents the distance, y, Car A travels in x minutes. The table represents the distance, y, Car B travels in x minutes.

Car A:



If this car is traveling at a constant rate, I can compute its rate by using the slope formula or looking at the fraction that compares the vertical distance to the horizontal distance between any pair of points.

Car B:

Time in Minutes (x)	Distance in Miles (y)
15	13.5
25	22.5
35	31.5

To figure out if this car is traveling at a constant rate, I need to check various pairs of data using the slope formula to see if they are equal to the same value. That value, if constant, will be the rate the car travels.

a. Is Car A traveling at a constant rate? Explain how you know.

Since the graph of the data related to Car A is a line, the equation that describes the function must be a linear equation. Therefore, this car is traveling at a constant rate.

b. Is Car B traveling at a constant rate? Explain how you know.

$\frac{22.5-13.5}{25-15}=\frac{9}{10}$ $\frac{31.5-22.5}{35-25}=\frac{9}{10}$ $\frac{31.5-13.5}{35-15}=\frac{18}{20}=\frac{9}{10}$

Car B is traveling at a constant rate because all pairs of data have the same slope value, or rate of change.

c. Which car is traveling at a slower rate? Explain.

Using the graph or the slope formula, Car A travels at a rate of $\frac{4}{3}$. By inspecting the rate of change for the data within the table, Car B travels at a rate of $\frac{9}{10}$. Since $\frac{9}{10}<\frac{4}{3}$, Car B is traveling at a slower rate.

2. The rule $y=6.67x+35$ describes the cost function for a phone plan at Company A. Company A charges a flat fee of \$35 for phone service, plus \$6.67 per gigabyte of data used each month. Company B has a similar function that assigns the values shown in the table below.

Gigabytes of Data (x)	Total Cost in Dollars (y)
1	39.50
3	54.50
5	69.50

If the data in this table represent a linear function, I can write the equation that describes the function in the form of $y=mx+b$. Then, I can compare the rates for data, m, and the flat fee, b.

We need to check that the data in the table represent a linear function.

$\frac{54.50-39.50}{3-1}=\frac{15}{2}=7.5$ $\frac{69.50-54.50}{5-3}=\frac{15}{2}=7.5$ $\frac{69.50-39.50}{5-1}=\frac{30}{4}=7.5$

Since the rate of change is equal to the same constant, 7.5, I can write the equation that describes the cost function for Company B. Using the input, x, and output, y, $(1, 39.50)$:

$$y=mx+b$$
$$39.50=7.5(1)+b$$
$$39.50=7.5+b$$
$$39.50-7.50=7.50-7.50+b$$
$$32=b$$

The equation that describes the cost function for Company B is $y=7.5x+32$.

a. Which company charges a higher rate for data usage?

Comparing the rates, $7.5>6.67$, we can conclude that Company B charges a higher rate for data usage.

b. Which company charges a higher flat fee for phone service?

Comparing the flat fees, $35 > 32$, we can conclude that Company A charges a higher flat fee.

c. At what number of gigabytes of data used would both companies charge the same amount of money? How much will the total cost be for that amount of gigabytes used?

$$\begin{cases} y = 6.67x + 35 \\ y = 7.5x + 32 \end{cases}$$

Since both equations are equal to y, I can write the expressions on the right of the equal sign as equal to one another and then solve.

$$\begin{aligned} 6.67x + 35 &= 7.5x + 32 \\ 6.67x - 6.67x + 35 - 32 &= 7.5x - 6.67x + 32 - 32 \\ 3 &= 0.83x \\ \frac{3}{0.83} &= x \\ 3.61 &\approx x \end{aligned}$$

If the data related to both companies were graphed on the same coordinate plane, then the point of intersection of their lines would be when the costs were equal. I should write and solve a system of equations to answer this question.

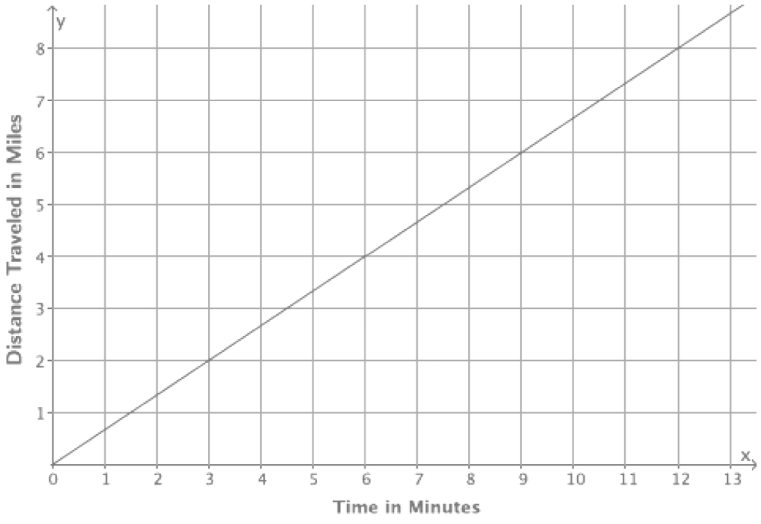
Now, substitute the value of x into the first equation and solve.

$$\begin{aligned} y &\approx 6.67(3.61) + 35 \\ y &\approx 59.08 \end{aligned}$$

At about 3.61 gigabytes, the cost would be the same at both companies. That cost would be about $\$59.08$.

1. The graph below represents the distance in miles, y, Car A travels in x minutes. The table represents the distance in miles, y, Car B travels in x minutes. It is moving at a constant rate. Which car is traveling at a greater speed? How do you know?

Car A:



Car B:

Time in minutes (x)	Distance in miles (y)
15	12.5
30	25
45	37.5

2. The local park needs to replace an existing fence that is 6 feet high. Fence Company A charges $\$7{,}000$ for building materials and $\$200$ per foot for the length of the fence. Fence Company B charges are based solely on the length of the fence. That is, the total cost of the six-foot high fence will depend on how long the fence is. The table below represents some inputs and their corresponding outputs that the cost function for Fence Company B assigns. It is a linear function.

Input (length of fence in feet)	Output (cost of bill in dollars)
100	26,000
120	31,200
180	46,800
250	65,000

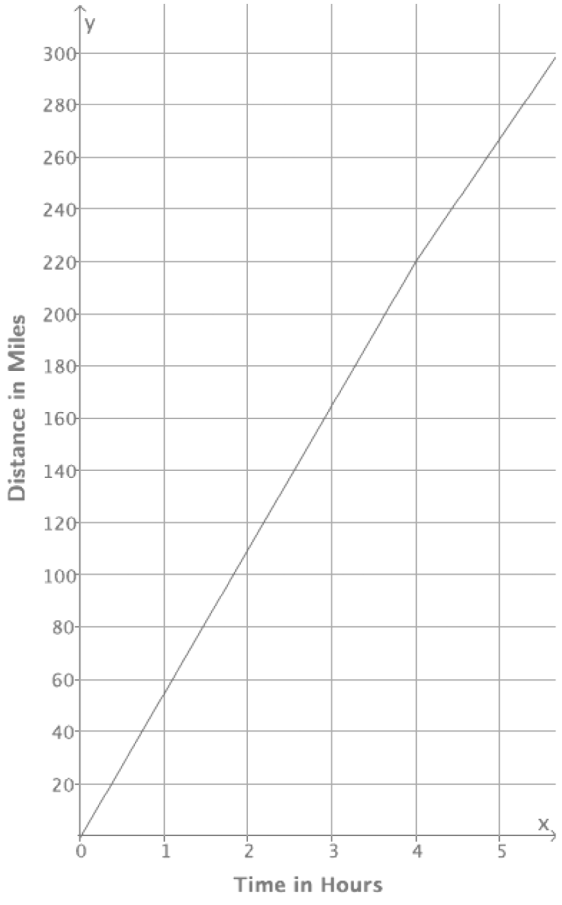
   a. Which company charges a higher rate per foot of fencing? How do you know?

   b. At what number of the length of the fence would the cost from each fence company be the same? What will the cost be when the companies charge the same amount? If the fence you need were 190 feet in length, which company would be a better choice?

3. The equation $y = 123x$ describes the function for the number of toys, y, produced at Toys Plus in x minutes of production time. Another company, #1 Toys, has a similar function, also linear, that assigns the values shown in the table below. Which company produces toys at a slower rate? Explain.

Time in minutes (x)	Toys Produced (y)
5	600
11	1,320
13	1,560

4. A train is traveling from City A to City B, a distance of 320 miles. The graph below shows the number of miles, y, the train travels as a function of the number of hours, x, that have passed on its journey. The train travels at a constant speed for the first four hours of its journey and then slows down to a constant speed of 48 miles per hour for the remainder of its journey.



a. How long will it take the train to reach its destination?

b. If the train had not slowed down after 4 hours, how long would it have taken to reach its destination?

c. Suppose after 4 hours, the train increased its constant speed. How fast would the train have to travel to complete the destination in 1.5 hours?

5.

a. A hose is used to fill up a $1{,}200$ gallon water truck. Water flows from the hose at a constant rate. After 10 minutes, there are 65 gallons of water in the truck. After 15 minutes, there are 82 gallons of water in the truck. How long will it take to fill up the water truck? Was the tank initially empty?

b. The driver of the truck realizes that something is wrong with the hose he is using. After 30 minutes, he shuts off the hose and tries a different hose. The second hose flows at a constant rate of 18 gallons per minute. How long now does it take to fill up the truck?

1. A function has the rule so that each input of x is assigned an output of $x^3 + 1$.

In Module 4, we analyzed linear and nonlinear equations. I remember that to be linear, the exponent of the variable, x, had to be equal to 1.

a. Do you think the function is linear or nonlinear? Explain.

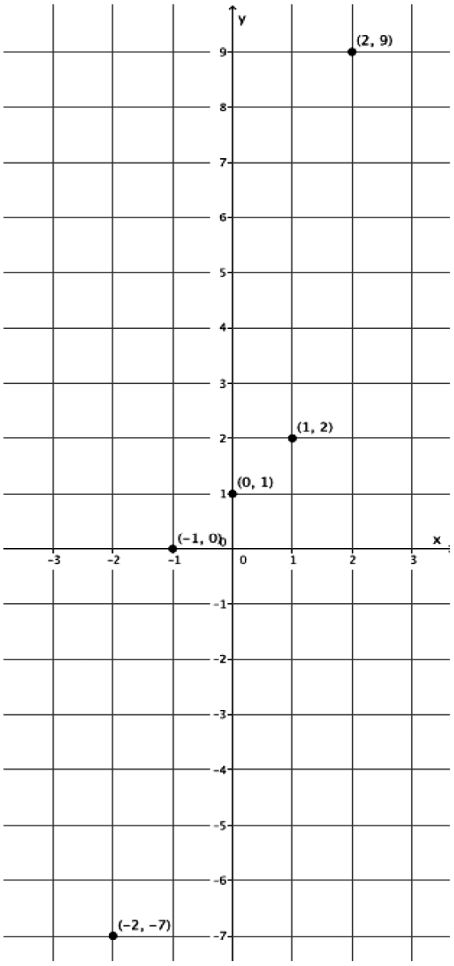
The equation that describes this function is nonlinear because the exponent of the variable, x, is not equal to 1, so I think this is a nonlinear function.

b. What shape do you expect the graph of the function to be?

The graph won't be a line because it's not linear, so it probably has a curve to it.

c. Develop a list of inputs and outputs for this function. Plot the inputs and outputs as points on the coordinate plane where the output is the y-coordinate.

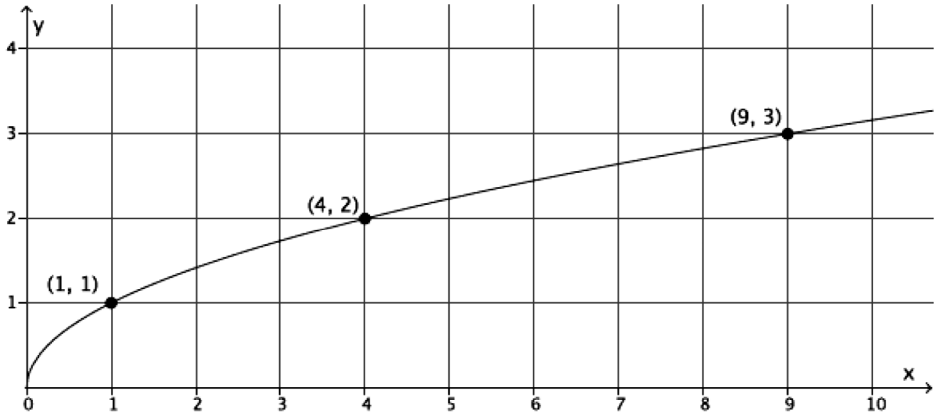
Input (x)	Output $(x^3 + 1)$
–2	$(-2)^3 + 1 = -8 + 1 = -7$
–1	$(-1)^3 + 1 = -1 + 1 = 0$
0	$0^3 + 1 = 0 + 1 = 1$
1	$1^3 + 1 = 1 + 1 = 2$
2	$2^3 + 1 = 8 + 1 = 9$



d. Was your prediction correct?

I was right! There is no way to draw one straight line through all of the points on the graph. Therefore, this function is nonlinear.

2. Is the function that is represented by this graph linear or nonlinear? Explain. Show work that supports your claim.



This graph doesn't look linear at all. The way to show work to support my claim is by showing that the rate of change between each pair of points is not equal to the same value.

$$\frac{3-2}{9-4} = \frac{1}{5}$$

$$\frac{2-1}{4-1} = \frac{1}{3}$$

$$\frac{3-1}{9-1} = \frac{2}{8} = \frac{1}{4}$$

Since the rate of change was equal to a different value for all three pairs of inputs and outputs that were checked, the function represented by this graph is a nonlinear function.

1. Consider the function that assigns to each number x the value $x^2 - 4$.

   a. Do you think the function is linear or nonlinear? Explain.

   b. Do you expect the graph of this function to be a straight line?

   c. Develop a list of inputs and matching outputs for this function. Use them to begin a graph of the function.

   d. Was your prediction to (b) correct?

Input (x)	Output $(x^2 - 4)$
-3	
-2	
-1	
0	
1	
2	
3	

2. Consider the function that assigns to each number x greater than -3 the value $\frac{1}{x+3}$.

   a. Is the function linear or nonlinear? Explain.

   b. Do you expect the graph of this function to be a straight line?

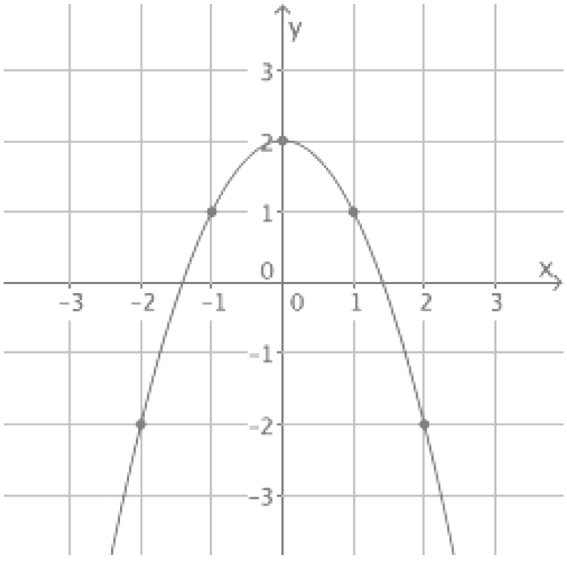
   c. Develop a list of inputs and matching outputs for this function. Use them to begin a graph of the function.

   d. Was your prediction to (b) correct?

Input (x)	Output $\left(\frac{1}{x+3}\right)$
-2	
-1	
0	
1	
2	
3	

3.

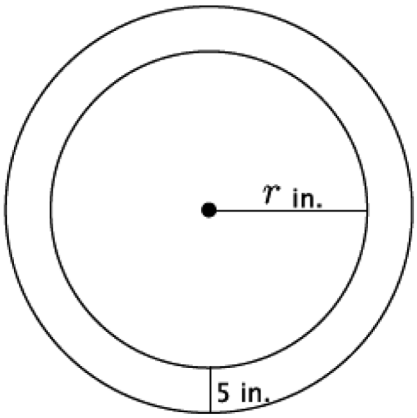
a. Is the function represented by this graph linear or nonlinear? Briefly justify your answer.



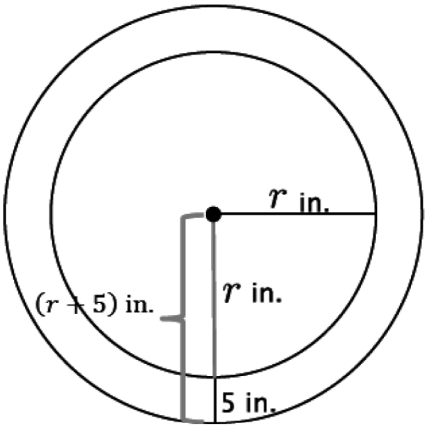
b. What is the average rate of change for this function from an input of $x = -2$ to an input of $x = -1$?

c. What is the average rate of change for this function from an input of $x = -1$ to an input of $x = 0$?

1. Write a function that would allow you to calculate the area, A, of a 5-inch thick outer ring for any sized dartboard with radius r inches. Write an exact answer that uses π (*do not* approximate your answer by using 3.14 for π).



This is a lot like the problem we did in class. I need to write an expression that shows the difference of the areas in the two circles, the circle with radius r in. and the circle with radius $(r + 5)$ in.



The area of the inner, smaller, circle in square inches is found by calculating πr^2.

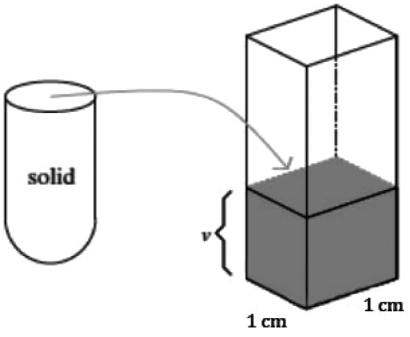
The area of the outer, larger, circle in square inches is found by calculating $\pi(r + 5)^2$.

To find the area of the outer ring, we have to find the difference of the two areas.

$$A = \pi(r + 5)^2 - \pi r^2$$

The area of the outer ring is $(\pi(r + 5)^2 - \pi r^2)$ in^2.

2. The shell of the solid was filled with water and then poured into the standard rectangular prism, as shown. The height that the volume reaches is 74.68 cm. What is the volume of the solid?



The volume formula for a rectangular prism is $V = Bh$, where B is the area of the base.

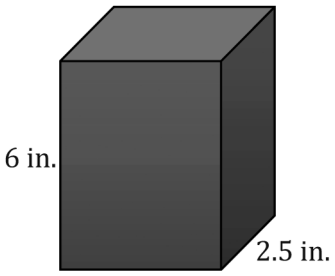
The area of the base of this prism is 1 cm^2 because the length and width of the base are both equal to 1 cm.

$$B = 1 \text{ and } h = 74.68, \text{ so}$$

$$V = (1)(74.68)$$
$$V = 74.68$$

The volume is 74.68 cm^3.

3. The volume of the prism shown below is 60 in^3. What is its length?

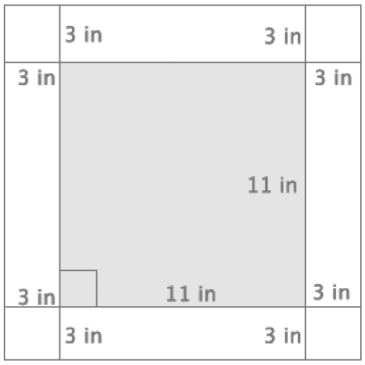


The area of the base, B, is found by multiplying the length of the base, l, by the width of the base, w.

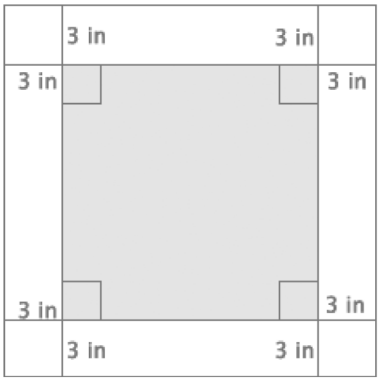
$$V = Bh$$
$$V = l \times w \times h$$
$$60 = l \times 2.5 \times 6$$
$$60 = l \times 15$$
$$\frac{60}{15} = l\left(\frac{15}{15}\right)$$
$$4 = l$$

The length of the prism is 4 in.

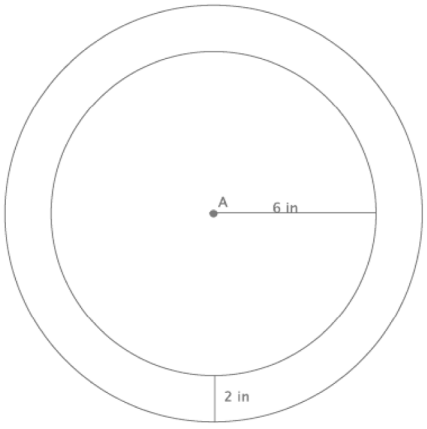
1. Calculate the area of the 3-inch white border of the square figure below.



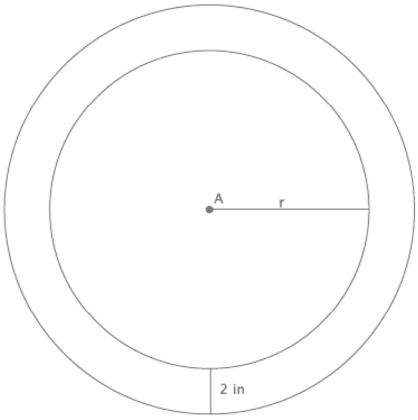
2. Write a function that would allow you to calculate the area, A, of a 3-inch white border for any sized square picture measured in inches.



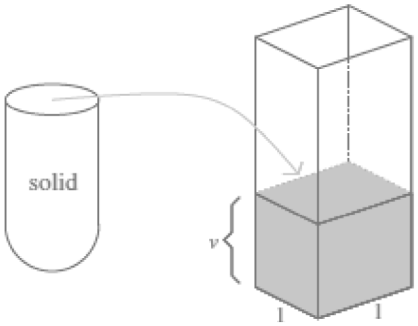
3. Dartboards typically have an outer ring of numbers that represent the number of points a player can score for getting a dart in that section. A simplified dartboard is shown below. The center of the circle is point A. Calculate the area of the outer ring. Write an exact answer that uses π (*do not* approximate your answer by using 3.14 for π).



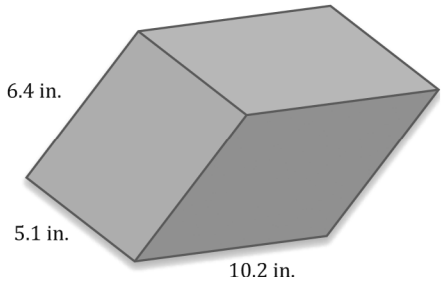
4. Write a function that would allow you to calculate the area, A, of the outer ring for any sized dartboard with radius r. Write an exact answer that uses π (*do not* approximate your answer by using 3.14 for π).



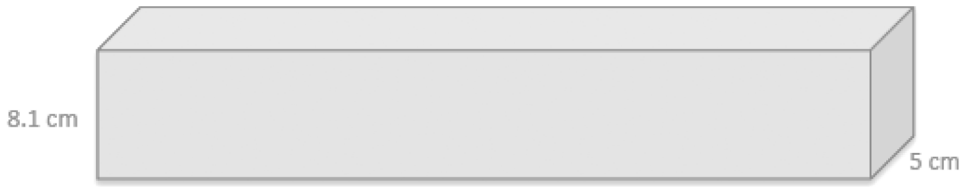
5. The shell of the solid shown was filled with water and then poured into the standard rectangular prism, as shown. The height that the volume reaches is 14.2 in. What is the volume of the shell of the solid?



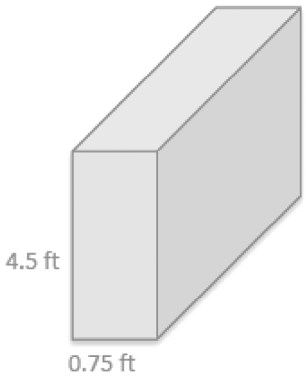
6. Determine the volume of the rectangular prism shown below.



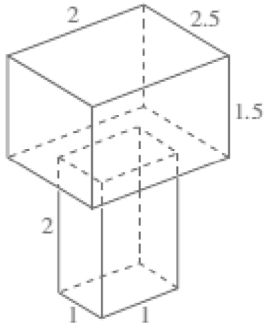
7. The volume of the prism shown below is $972\ \text{cm}^3$. What is its length?



8. The volume of the prism shown below is $32.7375\ \text{ft}^3$. What is its width?



9. Determine the volume of the 3-dimensional figure below. Explain how you got your answer.



1. Dayna wants to add water to a bucket that is the shape of a right circular cylinder. The bucket has a 4-inch radius and 8-inch height. She uses a scoop that has the shape of right circular cone with a 2-inch radius and 3-inch height. How many scoops will it take Dayna to fill the bucket up level with the top?

If I take the volume of the cylinder and divide it by the volume of the cone, the answer will be the number of scoops it takes Dayna to fill that cylinder.

$$V = \pi r^2 h$$
$$V = \pi(4)^2(8)$$
$$V = 128\pi$$

The volume of the cylinder is 128π in^3.

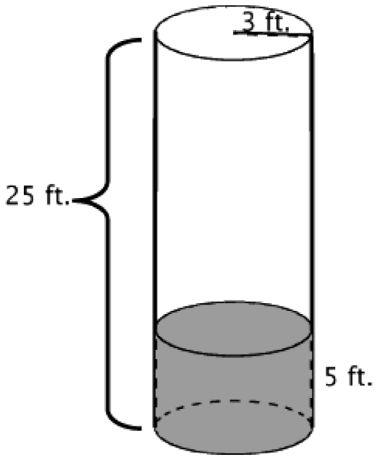
$$V = \frac{1}{3}\pi r^2 h$$
$$V = \frac{1}{3}\pi(2)^2(3)$$
$$V = 4\pi$$

The volume of the cone is 4π in^3.

$$\frac{128\pi}{4\pi} = 32$$

The number of scoops needed to fill the cylinder is 32.

2. A cylindrical tank (with dimensions shown below) contains water that is 5 feet deep. If water is poured into the tank at a constant rate of $24 \frac{\text{ft}^3}{\text{min}}$ for 18 min., will the tank overflow? Use 3.14 to estimate π.



I need to figure out the total volume of the cylinder and what is already filled. Then, I need to compare the difference to the amount of water that is being poured into the tank.

$$V = \pi r^2 h$$
$$V = \pi(3)^2(25)$$
$$V \approx (3.14)(9)(25)$$
$$V \approx 706.5$$

The volume of the tank is approximately 706.5 ft^3.

$$V = \pi r^2 h$$
$$V = \pi(3)^2(5)$$
$$V \approx (3.14)(9)(5)$$
$$V \approx 141.3$$

The volume of the part of the tank that is already filled is approximately 141.3 ft^3.

$$706.5 - 141.3 = 565.2$$

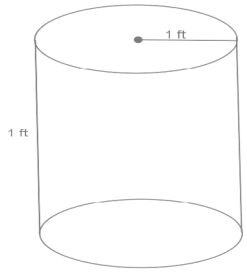
The volume of the tank that is not filled is approximately 565.2 ft^3.

$$24 \times 18 = 432$$

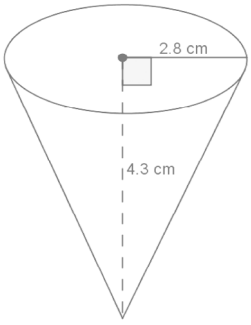
The volume of water poured into the tank is 432 ft^3.

Since the volume of water going into the tank is less than the volume that remains in the tank, it will not overflow.

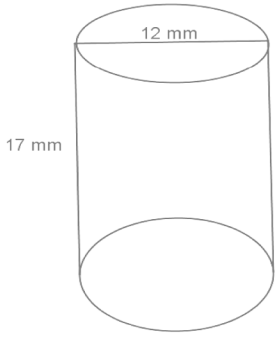
1. Use the diagram to help you find the volume of the right circular cylinder.



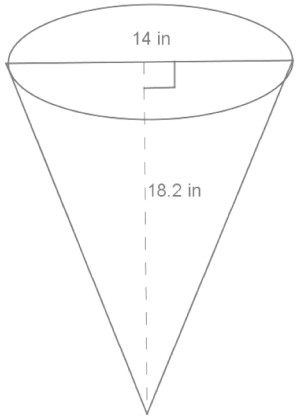
2. Use the diagram to help you find the volume of the right circular cone.



3. Use the diagram to help you find the volume of the right circular cylinder.

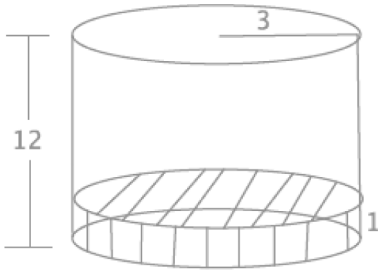


4. Use the diagram to help you find the volume of the right circular cone.

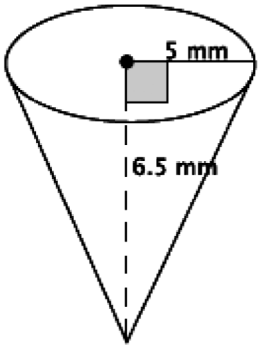


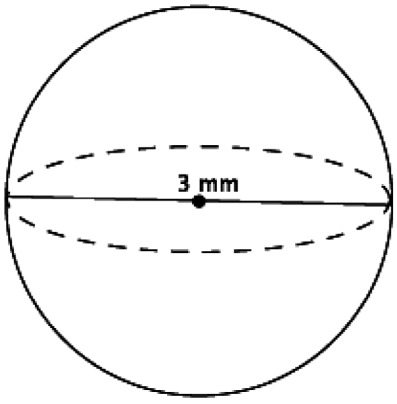
5. Oscar wants to fill with water a bucket that is the shape of a right circular cylinder. It has a 6-inch radius and 12-inch height. He uses a shovel that has the shape of a right circular cone with a 3-inch radius and 4-inch height. How many shovelfuls will it take Oscar to fill the bucket up level with the top?

6. A cylindrical tank (with dimensions shown below) contains water that is 1-foot deep. If water is poured into the tank at a constant rate of $20 \frac{\text{ft}^3}{\text{min}}$ for 20 min., will the tank overflow? Use 3.14 to estimate π.



1. Which of the two figures below has the lesser volume? (Note: Figures are not drawn to scale.)





The volume formula for the sphere is $V = \frac{4}{3}\pi r^3$. All I have to do is calculate the volume of each figure and then compare.

$$V = \frac{1}{3}\pi(5)^2(6.5)$$

$$V = \frac{162.5}{3}\pi$$

The volume of the cone is $\frac{162.5}{3}\pi \text{ mm}^3$.

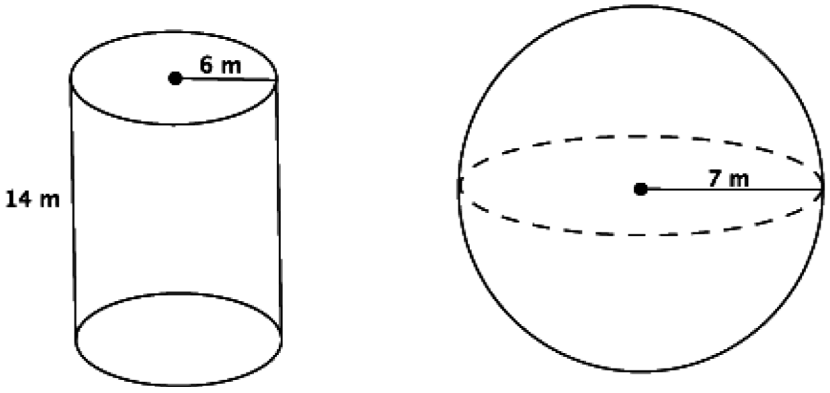
$$V = \frac{4}{3}\pi(1.5)^3$$

$$V = \frac{13.5}{3}\pi$$

The volume of the sphere is $\frac{13.5}{3}\pi \text{ mm}^3$.

Since $\frac{13.5}{3}\pi < \frac{162.5}{3}\pi$*, the sphere has the lesser volume.*

2. Which of the two figures below has the greater volume? (Note: Figures are not drawn to scale.)



$$V = \pi(6)^2(14)$$
$$V = 504\pi$$

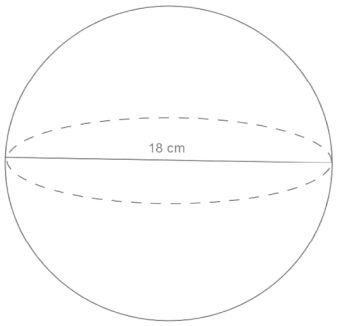
The volume of the cylinder is $504\pi \text{ m}^3$.

$$V = \frac{4}{3}\pi(7)^3$$
$$V = \frac{1372}{3}\pi$$
$$V \approx 457.3\pi$$

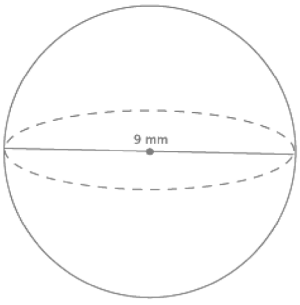
The volume of the sphere is approximately $457.3\pi \text{ m}^3$.

Since $504\pi > 457.3\pi$, *the cylinder has the greater volume.*

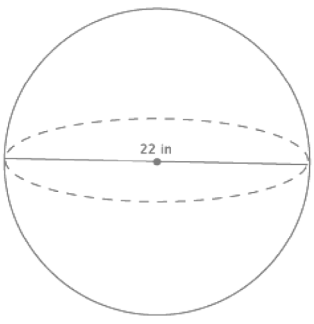
1. Use the diagram to find the volume of the sphere.



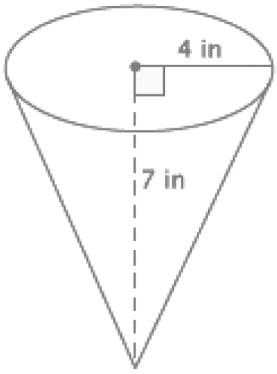
2. Determine the volume of a sphere with diameter 9 mm, shown below.

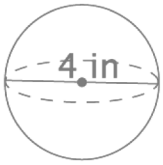


3. Determine the volume of a sphere with diameter 22 in., shown below.

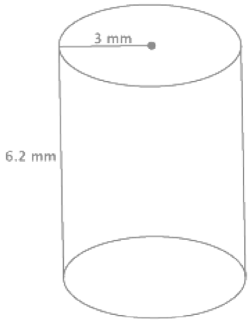


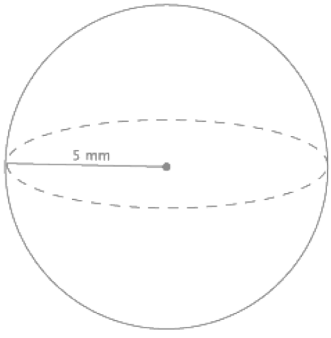
4. Which of the two figures below has the lesser volume?





5. Which of the two figures below has the greater volume?





6. Bridget wants to determine which ice cream option is the best choice. The chart below gives the description and prices for her options. Use the space below each item to record your findings.

$2.00	$3.00	$4.00
One scoop in a cup	Two scoops in a cup	Three scoops in a cup
Half a scoop on a cone filled with ice cream		A cup filled with ice cream (level to the top of the cup)

A scoop of ice cream is considered a perfect sphere and has a 2-inch diameter. A cone has a 2-inch diameter and a height of 4.5 inches. A cup, considered a right circular cylinder, has a 3-inch diameter and a height of 2 inches.

a. Determine the volume of each choice. Use 3.14 to approximate π.

b. Determine which choice is the best value for her money. Explain your reasoning.

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Grade 8

Module 6

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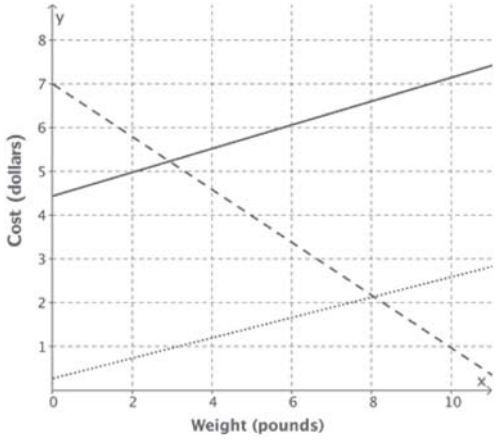
1. Recall that Lenore was investigating two wireless access plans. Her friend in Europe says that he uses a plan in which he pays a monthly fee of 30 euro plus 0.02 euro per minute of use.
   a. Construct a table of values for his plan's monthly cost based on 100 minutes of use for the month, 200 minutes of use, and so on up to $1{,}000$ minutes of use. (The charge of 0.02 euro per minute of use is equivalent to 2 euro per 100 minutes of use.)
   b. Plot these 10 points on a carefully labeled graph, and draw the line that contains these points.
   c. Let x represent minutes of use and y represent the total monthly cost in euro. Construct a linear function that determines monthly cost based on minutes of use.
   d. Use the function to calculate the cost under this plan for 750 minutes of use. If this point were added to the graph, would it be above the line, below the line, or on the line?

2. A shipping company charges a $\$4.45$ handling fee in addition to $\$0.27$ per pound to ship a package.
   a. Using x for the weight in pounds and y for the cost of shipping in dollars, write a linear function that determines the cost of shipping based on weight.
   b. Which line (solid, dotted, or dashed) on the following graph represents the shipping company's pricing method? Explain.



3. Kelly wants to add new music to her MP3 player. Another subscription site offers its downloading service using the following: Total Monthly Cost $= 5.25 + 0.30$ (number of songs).
   a. Write a sentence (all words, no math symbols) that the company could use on its website to explain how it determines the price for MP3 downloads for the month.
   b. Let x represent the number of songs downloaded and y represent the total monthly cost in dollars. Construct a function to model the relationship between the number of songs downloaded and the total monthly cost.
   c. Determine the cost of downloading 10 songs.

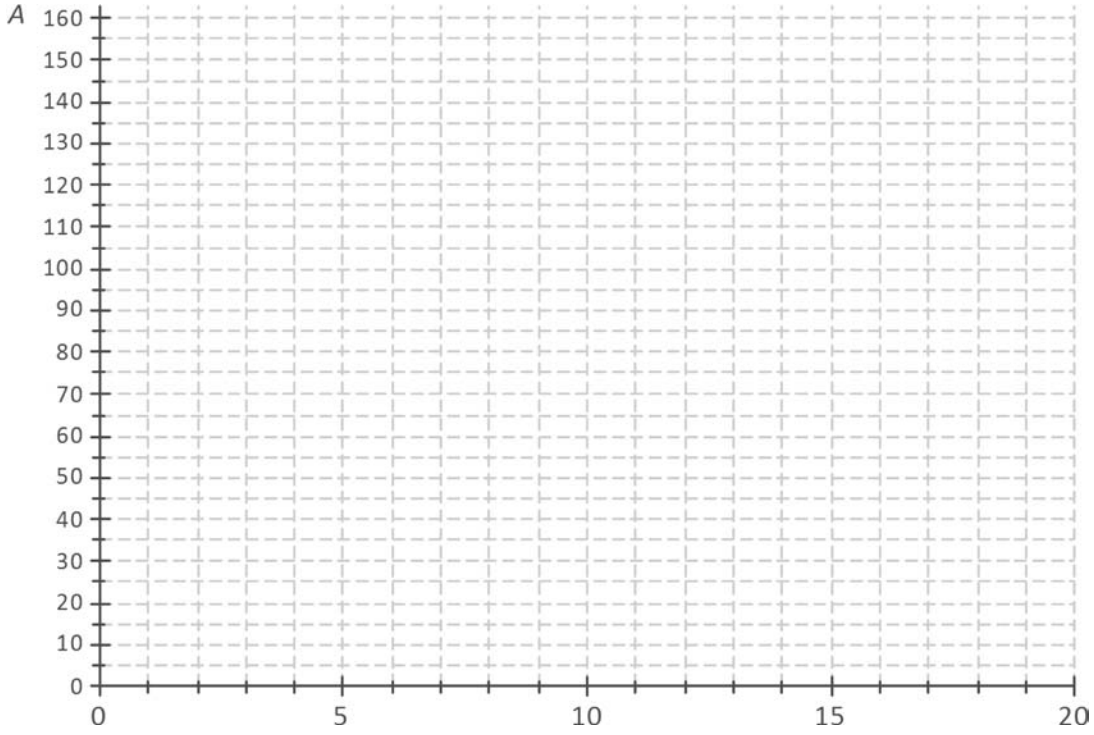
4. Li Na is saving money. Her parents gave her an amount to start, and since then she has been putting aside a fixed amount each week. After six weeks, Li Na has a total of $\$82$ of her own savings in addition to the amount her parents gave her. Fourteen weeks from the start of the process, Li Na has $\$118$.

   a. Using x for the number of weeks and y for the amount in savings (in dollars), construct a linear function that describes the relationship between the number of weeks and the amount in savings.

   b. How much did Li Na's parents give her to start?

   c. How much does Li Na set aside each week?

   d. Draw the graph of the linear function below (start by plotting the points for $x = 0$ and $x = 20$).



1. A rental car company offers the following two pricing methods for its customers to choose from for a one-month rental:

   Method 1: Pay $\$400$ for the month, or

   Method 2: Pay $\$0.30$ per mile plus a standard maintenance fee of $\$35$.

   a. Construct a linear function that models the relationship between the miles driven and the total rental cost for Method 2. Let x represent the number of miles driven and y represent the rental cost (in dollars).

   b. If you plan to drive $1{,}100$ miles for the month, which method would you choose? Explain your reasoning.

2. Recall from a previous lesson that Kelly wants to add new music to her MP3 player. She was interested in a monthly subscription site that offered its MP3 downloading service for a monthly subscription fee *plus* a fee per song. The linear function that modeled the total monthly cost in dollars (y) based on the number of songs downloaded (x) is $y = 5.25 + 0.30x$.

   The site has suddenly changed its monthly price structure. The linear function that models the new total monthly cost in dollars (y) based on the number of songs downloaded (x) is $y = 0.35x + 4.50$.

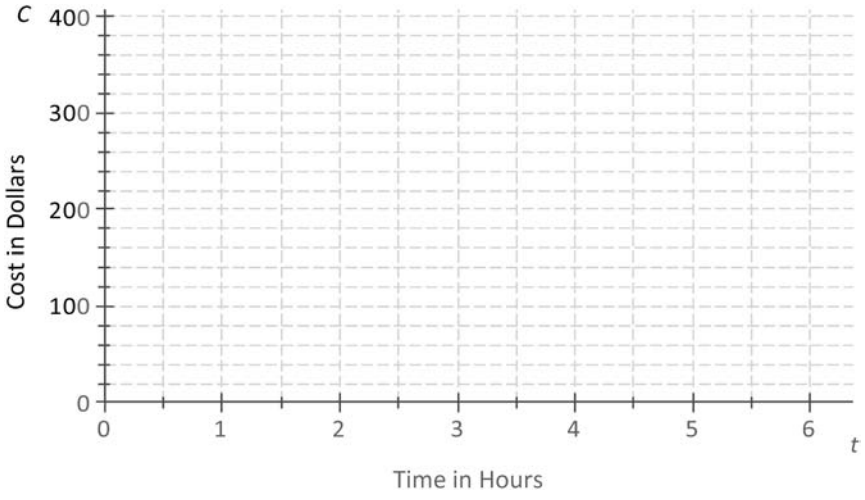
   a. Explain the meaning of the value 4.50 in the new equation. Is this a better situation for Kelly than before?

   b. Explain the meaning of the value 0.35 in the new equation. Is this a better situation for Kelly than before?

   c. If you were to graph the two equations (old versus new), which line would have the steeper slope? What does this mean in the context of the problem?

   d. Which subscription plan provides the better value if Kelly downloads fewer than 15 songs per month?

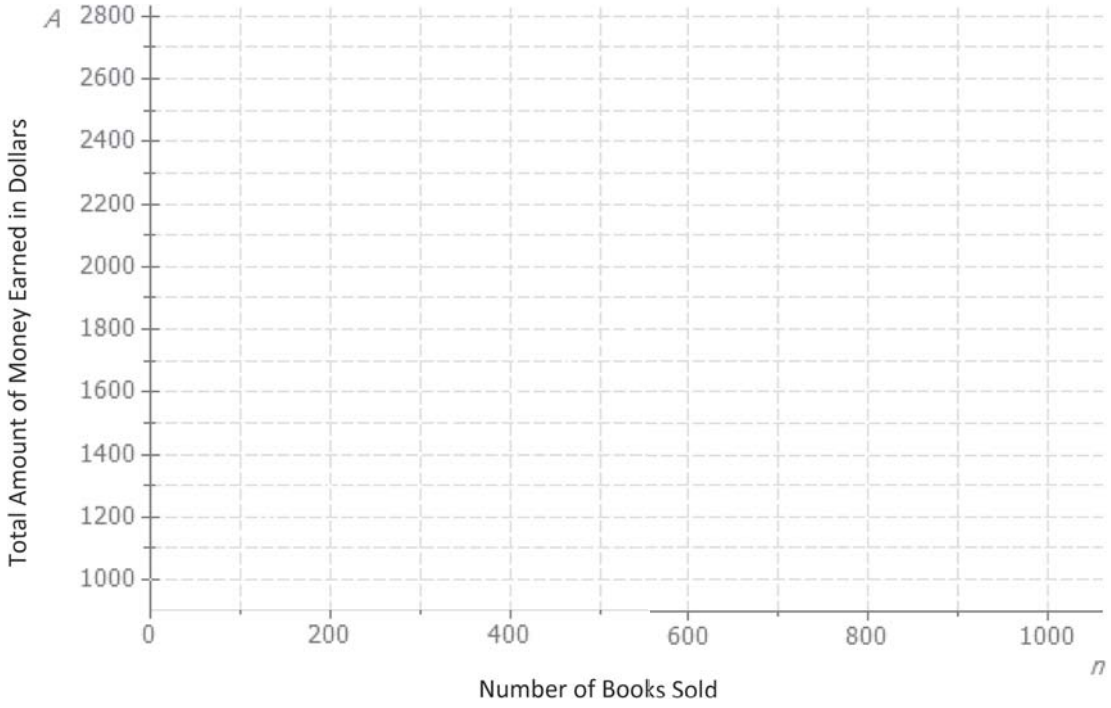
1. A plumbing company charges a service fee of $\$120$, plus $\$40$ for each hour worked. Sketch the graph of the linear function relating the cost to the customer (in dollars), C, to the time worked by the plumber (in hours), t, on the axes below.



   a. If the plumber works for 0 hours, what is the cost to the customer? How is this shown on the graph?
   b. What is the rate of change that relates cost to time?
   c. Write a linear function that models the relationship between the hours worked and the cost to the customer.
   d. Find the cost to the customer if the plumber works for each of the following number of hours.
      i. 1 hour
      ii. 2 hours
      iii. 6 hours
   e. Plot the points for these times on the coordinate plane, and use a straightedge to draw the line through the points.

2. An author has been paid a writer's fee of $\$1{,}000$ plus $\$1.50$ for every copy of the book that is sold.

   a. Sketch the graph of the linear function that relates the total amount of money earned in dollars, A, to the number of books sold, n, on the axes below.

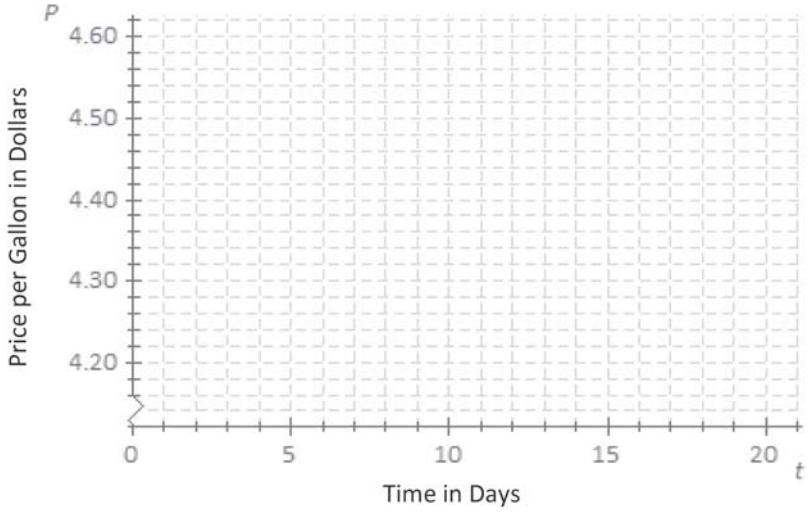


   b. What is the rate of change that relates the total amount of money earned to the number of books sold?

   c. What is the initial value of the linear function based on the graph?

   d. Let the number of books sold be n and the total amount earned be A. Construct a linear function that models the relationship between the number of books sold and the total amount earned.

3. Suppose that the price of gasoline has been falling. At the beginning of last month ($t = 0$), the price was $\$4.60$ per gallon. Twenty days later ($t = 20$), the price was $\$4.20$ per gallon. Assume that the price per gallon, P, fell at a constant rate over the twenty days.



a. Identify the ordered pairs given in the problem. Plot both points on the coordinate plane above.

b. Using a straightedge, draw the line that contains the two points.

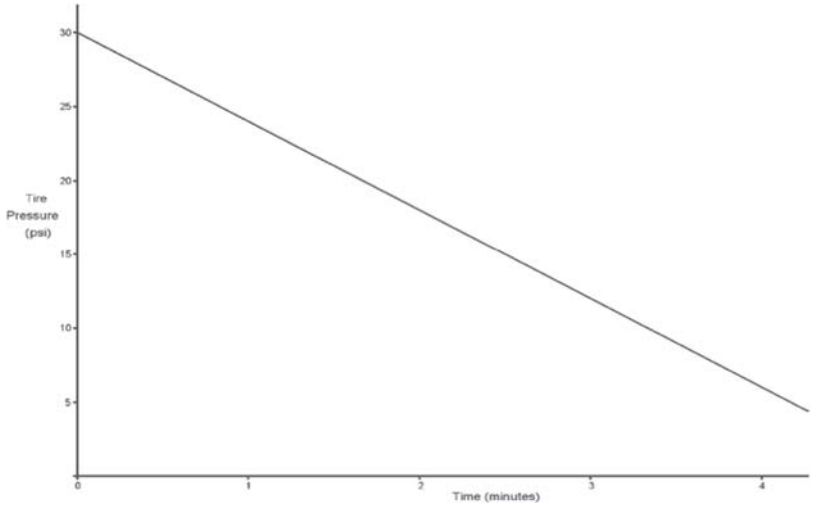
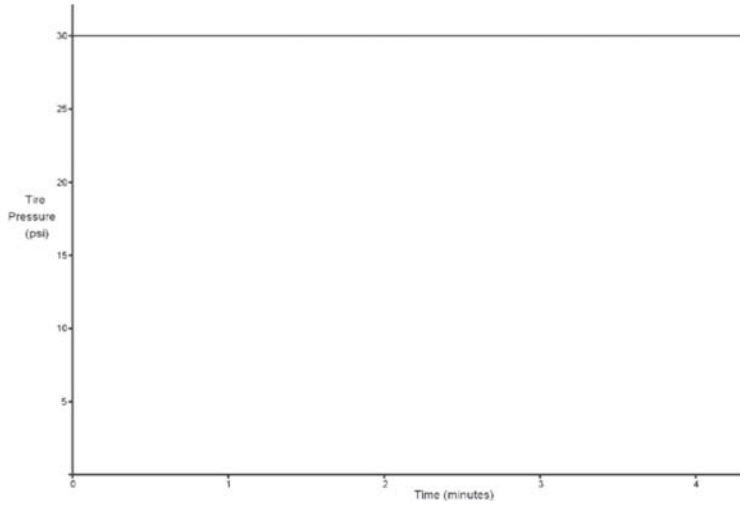
c. What is the rate of change? What does it mean within the context of the problem?

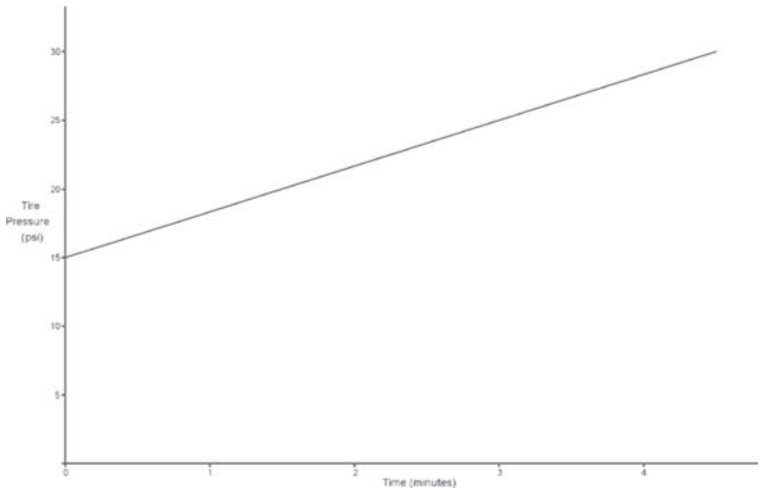
d. What is the function that models the relationship between the number of days and the price per gallon?

e. What was the price of gasoline after 9 days?

f. After how many days was the price $\$4.32$?

1. Read through each of the scenarios, and choose the graph of the function that best matches the situation. Explain the reason behind each choice.
   a. The tire pressure on Regina's car remains at 30 psi.
   b. Carlita inflates her tire at a constant rate for 4 minutes.
   c. Air is leaking from Courtney's tire at a constant rate.

	**Scenario:** **Explanation:**
	**Scenario:** **Explanation:**

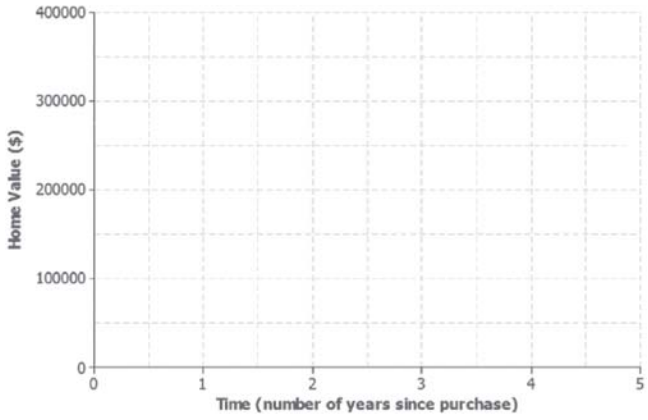


Scenario:

Explanation:

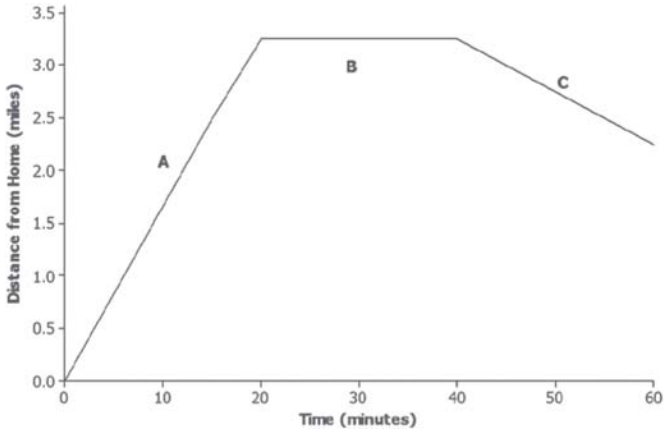
2. A home was purchased for $\$275{,}000$. Due to a recession, the value of the home fell at a constant rate over the next 5 years.

   a. Sketch a graph of a function that models the situation.



   b. Based on your graph, how is the home value changing with respect to time?

3. The graph below displays the first hour of Sam's bike ride.



Match each part of the graph (A, B, and C) to its verbal description. Explain the reasoning behind your choice.

i. Sam rides his bike to his friend's house at a constant rate.

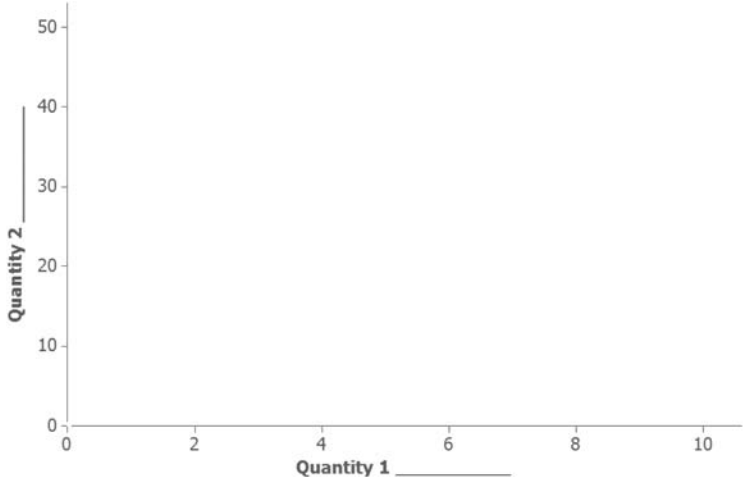
ii. Sam and his friend bike together to an ice cream shop that is between their houses.

iii. Sam plays at his friend's house.

4. Using the axes below, create a story about the relationship between two quantities.

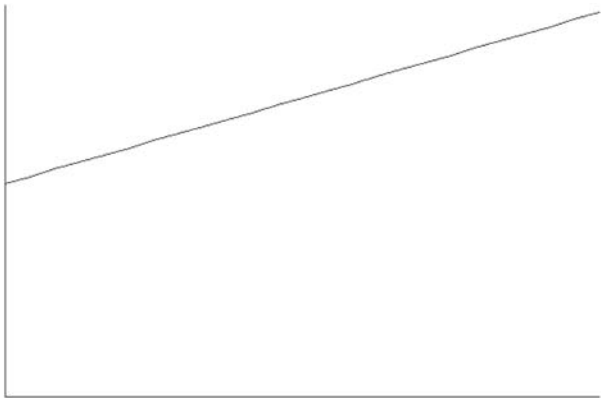
a. Write a story about the relationship between two quantities. Any quantities can be used (e.g., distance and time, money and hours, age and growth). Be creative. Include keywords in your story such as *increase* and *decrease* to describe the relationship.

b. Label each axis with the quantities of your choice, and sketch a graph of the function that models the relationship described in the story.

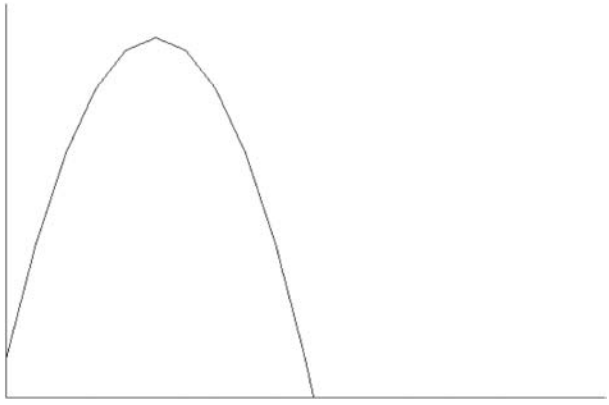


1. Read through the following scenarios, and match each to its graph. Explain the reasoning behind your choice.
   a. This shows the change in a smartphone battery charge as a person uses the phone more frequently.
   b. A child takes a ride on a swing.
   c. A savings account earns simple interest at a constant rate.
   d. A baseball has been hit at a Little League game.

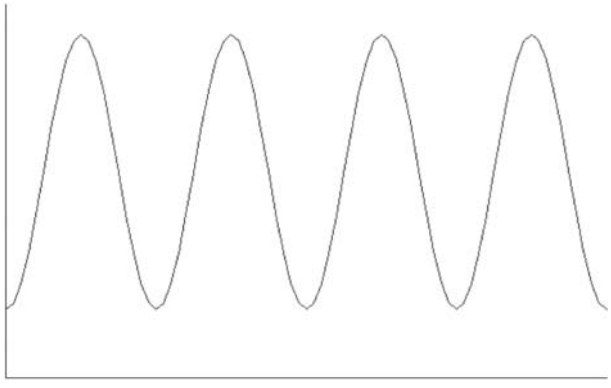
Scenario: ___



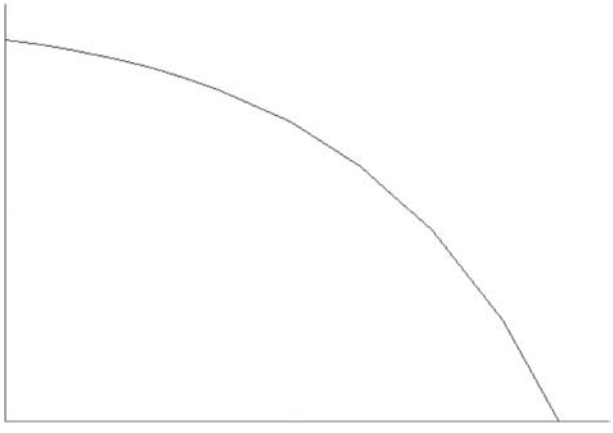
Scenario: ___



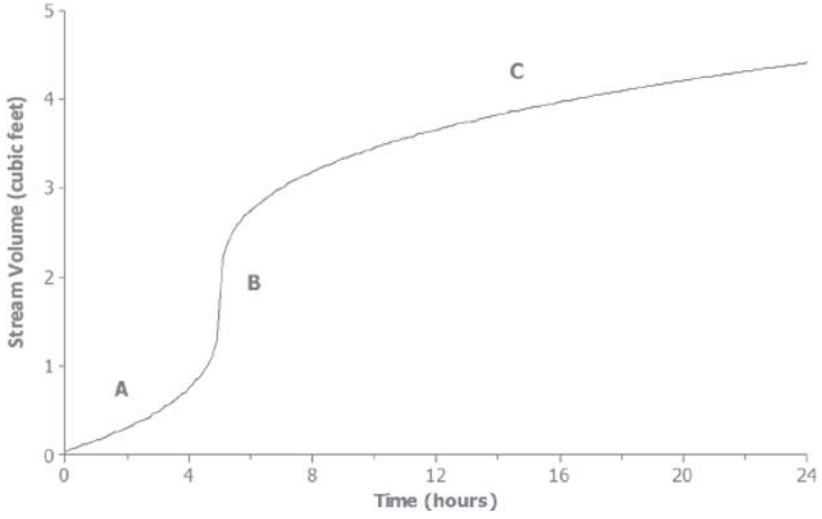
Scenario: ___



Scenario: ___



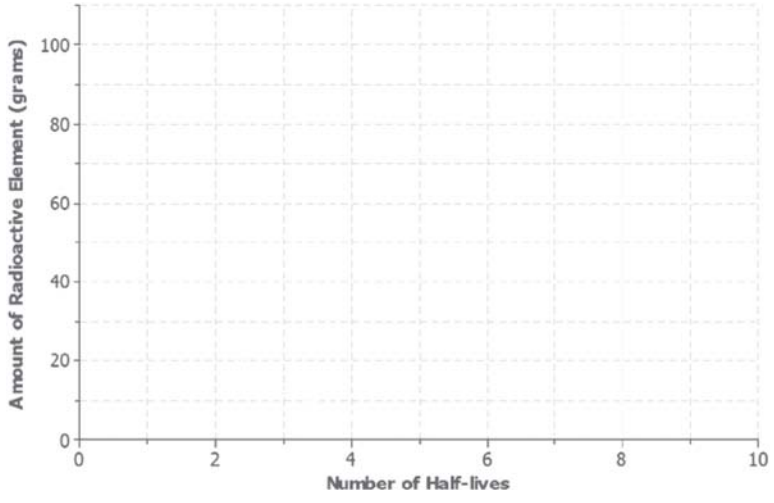
2. The graph below shows the volume of water for a given creek bed during a 24-hour period. On this particular day, there was wet weather with a period of heavy rain.



Describe how each part (A, B, and C) of the graph relates to the scenario.

3. Half-life is the time required for a quantity to fall to half of its value measured at the beginning of the time period. If there are 100 grams of a radioactive element to begin with, there will be 50 grams after the first half-life, 25 grams after the second half-life, and so on.

   a. Sketch a graph that represents the amount of the radioactive element left with respect to the number of half-lives that have passed.

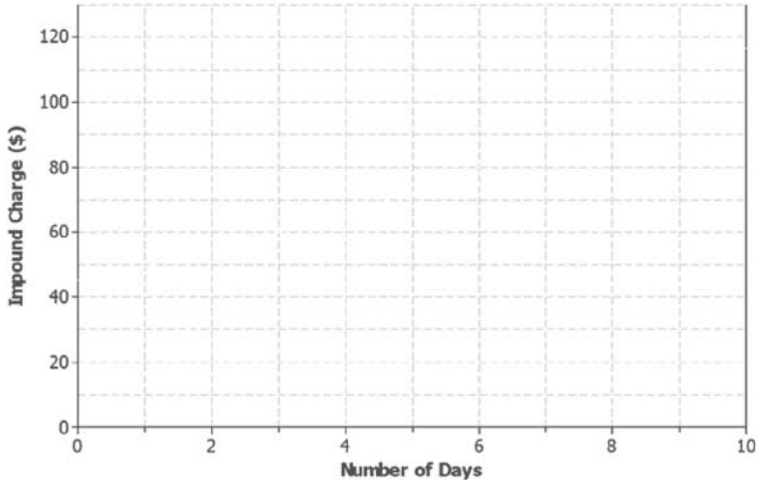


   b. Is the function represented by the graph linear or nonlinear? Explain.

   c. Is the function represented by the graph increasing or decreasing?

4. Lanae parked her car in a no-parking zone. Consequently, her car was towed to an impound lot. In order to release her car, she needs to pay the impound lot charges. There is an initial charge on the day the car is brought to the lot. However, 10% of the previous day's charges will be added to the total charge for every day the car remains in the lot.

   a. Sketch a graph that represents the total charges with respect to the number of days a car remains in the impound lot.

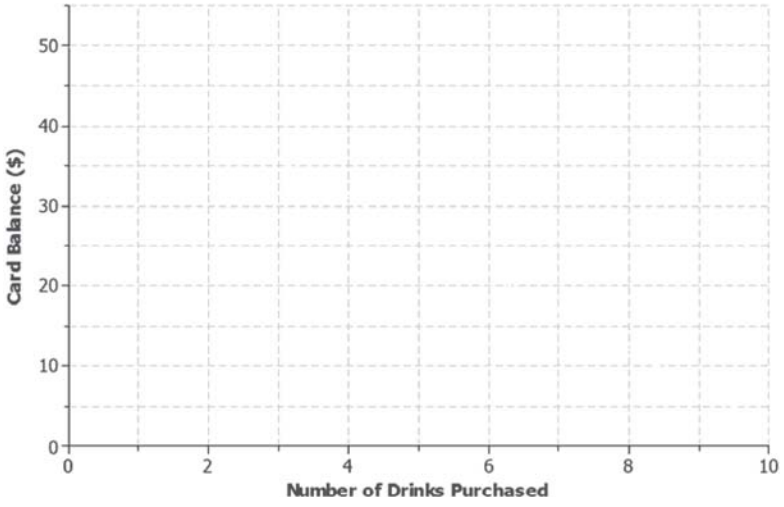


   b. Is the function represented by the graph linear or nonlinear? Explain.

   c. Is the function represented by the graph increasing or decreasing? Explain.

5. Kern won a $\$50$ gift card to his favorite coffee shop. Every time he visits the shop, he purchases the same coffee drink.

   a. Sketch a graph of a function that can be used to represent the amount of money that remains on the gift card with respect to the number of drinks purchased.



   b. Is the function represented by the graph linear or nonlinear? Explain.

   c. Is the function represented by the graph increasing or decreasing? Explain.

6. Jay and Brooke are racing on bikes to a park 8 miles away. The tables below display the total distance each person biked with respect to time.

Jay

Time (minutes)	Distance (miles)
0	0
5	0.84
10	1.86
15	3.00
20	4.27
25	5.67

Brooke

Time (minutes)	Distance (miles)
0	0
5	1.2
10	2.4
15	3.6
20	4.8
25	6.0

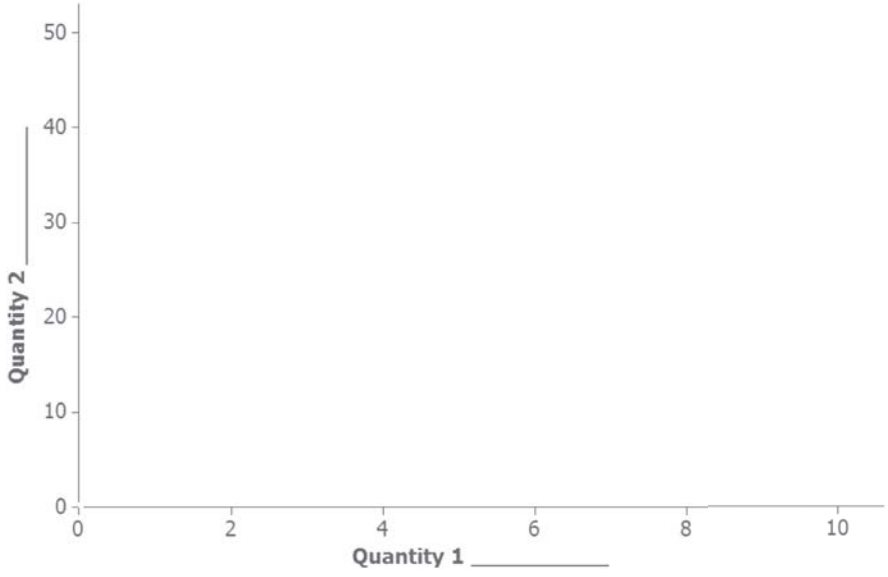
   a. Which person's biking distance could be modeled by a nonlinear function? Explain.

   b. Who would you expect to win the race? Explain.

7. Using the axes in Problem 7(b), create a story about the relationship between two quantities.

   a. Write a story about the relationship between two quantities. Any quantities can be used (e.g., distance and time, money and hours, age and growth). Be creative! Include keywords in your story such as *increase* and *decrease* to describe the relationship.

   b. Label each axis with the quantities of your choice, and sketch a graph of the function that models the relationship described in the story.



1. The table below shows the price and overall quality rating for 15 different brands of bike helmets.
   Data source: www.consumerreports.org

Helmet	Price (dollars)	Quality Rating
A	35	65
B	20	61
C	30	60
D	40	55
E	50	54
F	23	47
G	30	47
H	18	43
I	40	42
J	28	41
K	20	40
L	25	32
M	30	63
N	30	63
0	40	53

   Construct a scatter plot of price (x) and quality rating (y). Use the grid below.

2. Do you think that there is a statistical relationship between price and quality rating? If so, describe the nature of the relationship.

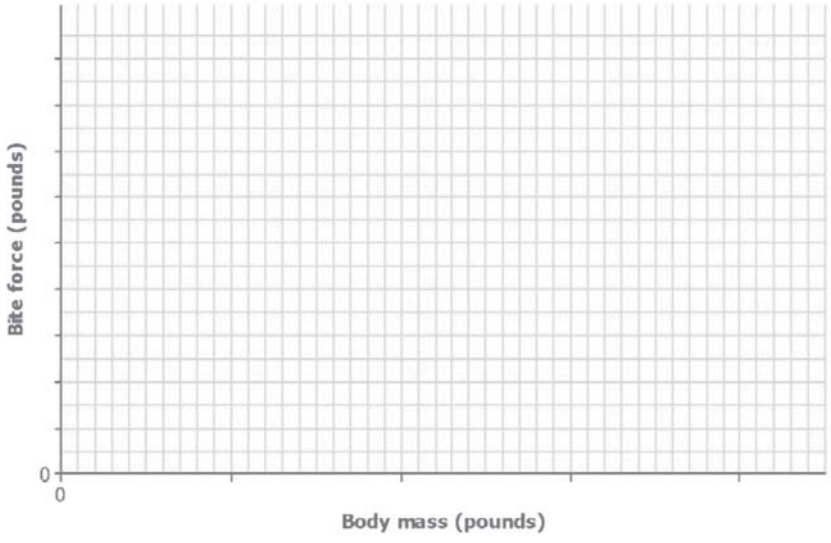
3. Scientists are interested in finding out how different species adapt to finding food sources. One group studied crocodilian species to find out how their bite force was related to body mass and diet. The table below displays the information they collected on body mass (in pounds) and bite force (in pounds).

Species	Body Mass (pounds)	Bite Force (pounds)
Dwarf crocodile	35	450
Crocodile F	40	260
Alligator A	30	250
Caiman A	28	230
Caiman B	37	240
Caiman C	45	255
Crocodile A	110	550
Nile crocodile	275	650
Crocodile B	130	500
Crocodile C	135	600
Crocodile D	135	750
Caiman D	125	550
Indian Gharial crocodile	225	400
Crocodile G	220	1,000
American croc	270	900
Crocodile E	285	750
Crocodile F	425	1,650
American alligator	300	1,150
Alligator B	325	1,200
Alligator C	365	1,450

Data Source: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0031781#pone-0031781-t001

(Note: Body mass and bite force have been converted to pounds from kilograms and newtons, respectively.)

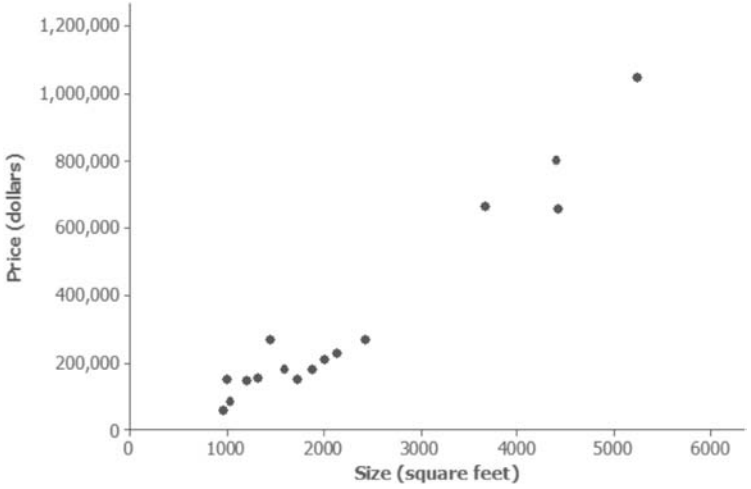
Construct a scatter plot of body mass (x) and bite force (y). Use the grid below, and be sure to add an appropriate scale to the axes.



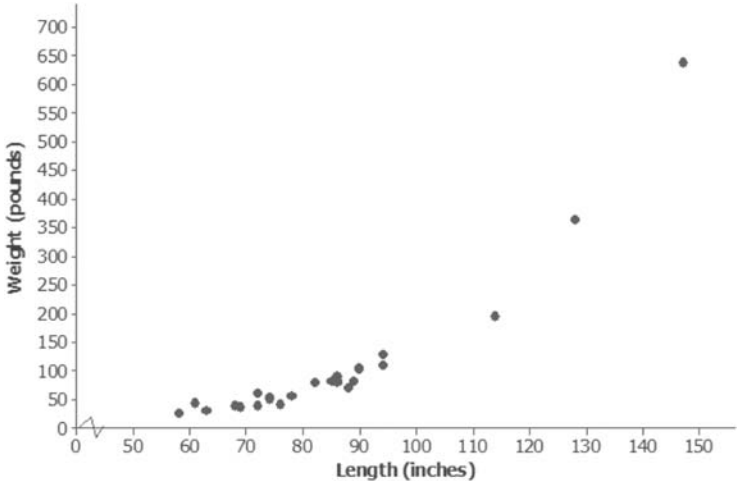
4. Do you think that there is a statistical relationship between body mass and bite force? If so, describe the nature of the relationship.

5. Based on the scatter plot, can you conclude that increased body mass causes increased bite force? Explain.

1. Suppose data was collected on size in square feet (x) of several houses and price in dollars (y). The data was then used to construct the scatterplot below. Write a few sentences describing the relationship between price and size for these houses. Are there any noticeable clusters or outliers?

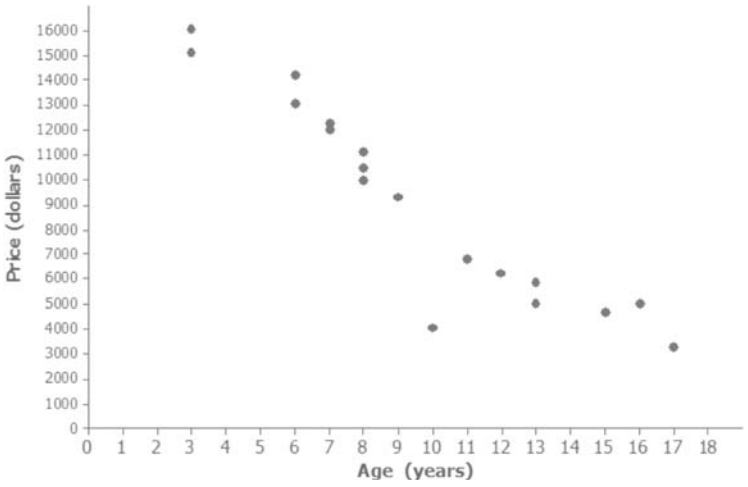


2. The scatter plot below was constructed using data on length in inches (x) of several alligators and weight in pounds (y). Write a few sentences describing the relationship between weight and length for these alligators. Are there any noticeable clusters or outliers?



Data Source: Exploring Data, Quantitative Literacy Series, James Landwehr and Ann Watkins, 1987.

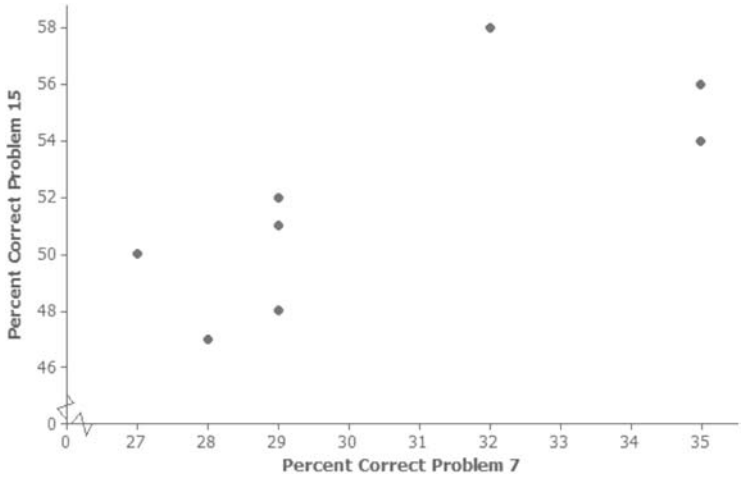
3. Suppose the scatter plot below was constructed using data on age in years (x) of several Honda Civics and price in dollars (y). Write a few sentences describing the relationship between price and age for these cars. Are there any noticeable clusters or outliers?



4. Samples of students in each of the U.S. states periodically take part in a large-scale assessment called the National Assessment of Educational Progress (NAEP). The table below shows the percent of students in the northeastern states (as defined by the U.S. Census Bureau) who answered Problems 7 and 15 correctly on the 2011 eighth-grade test. The scatter plot shows the percent of eighth-grade students who got Problems 7 and 15 correct on the 2011 NAEP.

State	Percent Correct Problem 7	Percent Correct Problem 15
Connecticut	29	51
New York	28	47
Rhode Island	29	52
Maine	27	50
Pennsylvania	29	48
Vermont	32	58
New Jersey	35	54
New Hampshire	29	52
Massachusetts	35	56

Percent Correct for Problems 7 and 15 on 2011 Eighth-Grade NAEP



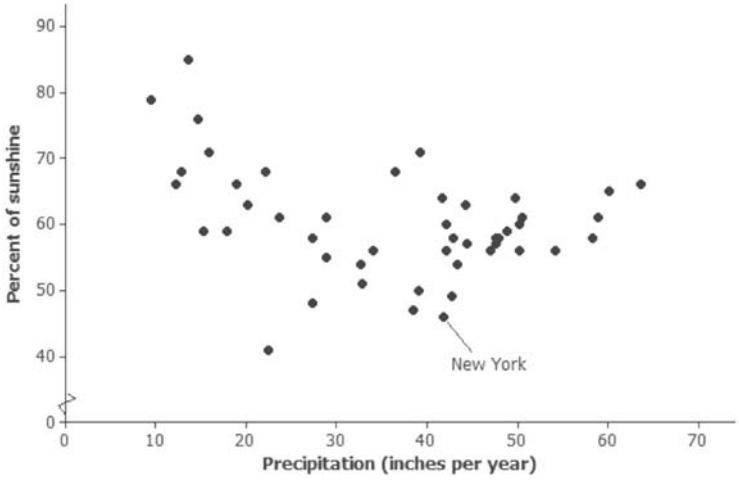
a. Why does it appear that there are only eight points in the scatter plot for nine states?

b. What is true of the states represented by the cluster of five points in the lower left corner of the graph?

c. Which state did the best on these two problems? Explain your reasoning.

d. Is there a trend in the data? Explain your thinking.

5. The plot below shows the mean percent of sunshine during the year and the mean amount of precipitation in inches per year for the states in the United States.



Data source: www.currentresults.com/Weather/US/average-annual-state-sunshine.php
www.currentresults.com/Weather/US/average-annual-state-precipitation.php

a. Where on the graph are the states that have a large amount of precipitation and a small percent of sunshine?

b. The state of New York is the point $(46, 41.8)$. Describe how the mean amount of precipitation and percent of sunshine in New York compare to the rest of the United States.

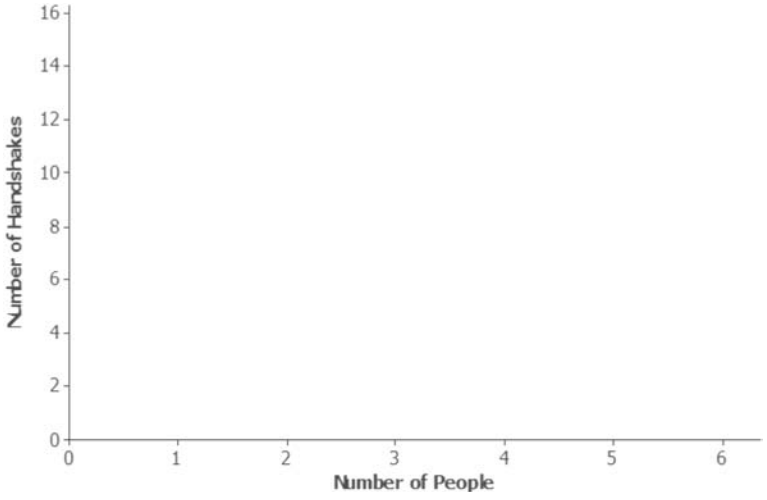
c. Write a few sentences describing the relationship between mean amount of precipitation and percent of sunshine.

6. At a dinner party, every person shakes hands with every other person present.
   a. If three people are in a room and everyone shakes hands with everyone else, how many handshakes take place?
   b. Make a table for the number of handshakes in the room for one to six people. You may want to make a diagram or list to help you count the number of handshakes.

Number People	Handshakes

Number People	Handshakes

   c. Make a scatter plot of number of people (x) and number of handshakes (y). Explain your thinking.



   d. Does the trend seem to be linear? Why or why not?

1. The table below shows the mean temperature in July and the mean amount of rainfall per year for 14 cities in the Midwest.

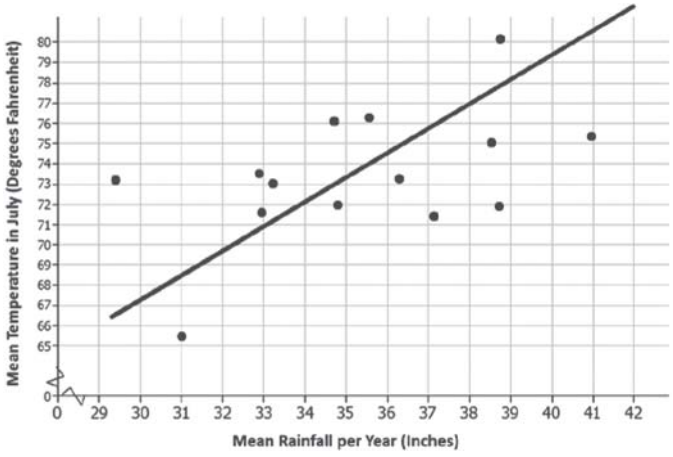
City	Mean Temperature in July (degrees Fahrenheit)	Mean Rainfall per Year (inches)
Chicago, IL	73.3	36.27
Cleveland, OH	71.9	38.71
Columbus, OH	75.1	38.52
Des Moines, IA	76.1	34.72
Detroit, MI	73.5	32.89
Duluth, MN	65.5	31.00
Grand Rapids, MI	71.4	37.13
Indianapolis, IN	75.4	40.95
Marquette, MI	71.6	32.95
Milwaukee, WI	72.0	34.81
Minneapolis–St. Paul, MN	73.2	29.41
Springfield, MO	76.3	35.56
St. Louis, MO	80.2	38.75
Rapid City, SD	73.0	33.21

Data Source: http://countrystudies.us/united-states/weather/

a. What do you observe from looking at the data in the table?

b. Look at the scatter plot below. A line is drawn to fit the data. The plot in the Exit Ticket had the mean July temperatures for the cities on the horizontal axis. How is this plot different, and what does it mean for the way you think about the relationship between the two variables—temperature and rain?

July Rainfall and Temperatures in Selected Midwestern Cities

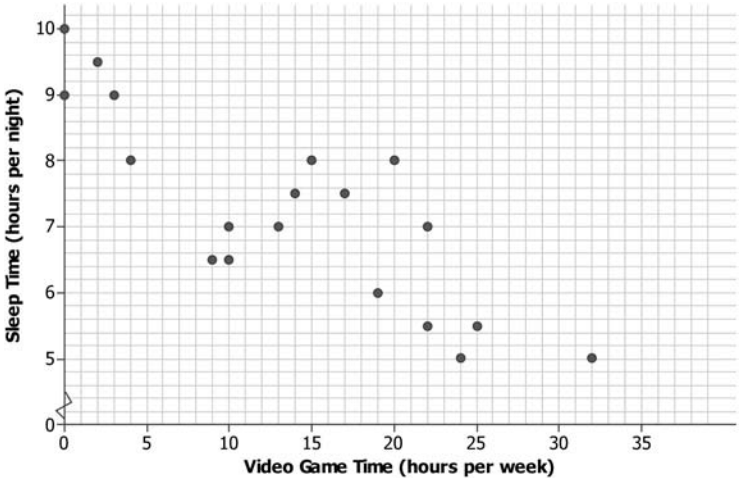


c. The line has been drawn to model the relationship between the amount of rain and the temperature in those midwestern cities. Use the line to predict the mean July temperature for a midwestern city that has a mean of 32 inches of rain per year.

d. For which of the cities in the sample does the line do the worst job of predicting the mean temperature? The best? Explain your reasoning with as much detail as possible.

2. The scatter plot below shows the results of a survey of eighth-grade students who were asked to report the number of hours per week they spend playing video games and the typical number of hours they sleep each night.

Mean Hours Sleep per Night Versus Mean Hours Playing Video Games per Week



a. What trend do you observe in the data?

b. What was the fewest number of hours per week that students who were surveyed spent playing video games? The most?

c. What was the fewest number of hours per night that students who were surveyed typically slept? The most?

d. Draw a line that seems to fit the trend in the data, and find its equation. Use the line to predict the number of hours of sleep for a student who spends about 15 hours per week playing video games.

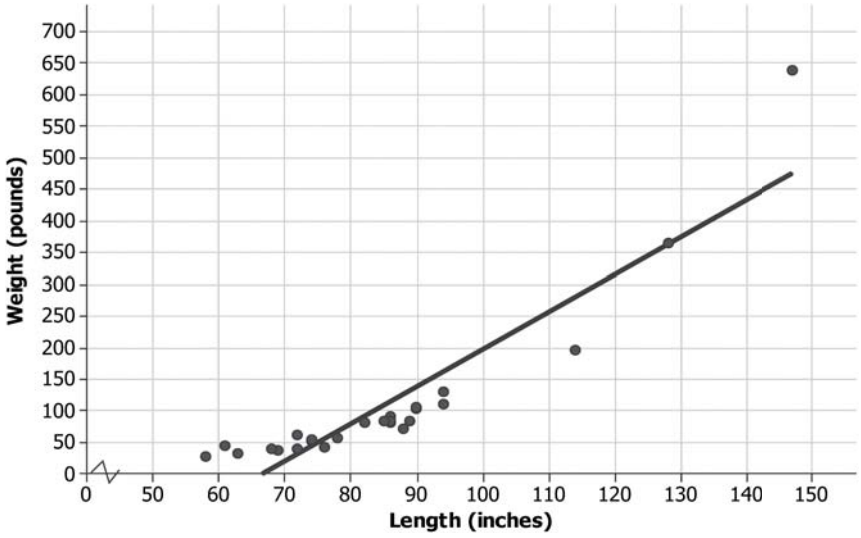
3. Scientists can take very good pictures of alligators from airplanes or helicopters. Scientists in Florida are interested in studying the relationship between the length and the weight of alligators in the waters around Florida.

a. Would it be easier to collect data on length or weight? Explain your thinking.

b. Use your answer to decide which variable you would want to put on the horizontal axis and which variable you might want to predict.

4. Scientists captured a small sample of alligators and measured both their length (in inches) and weight (in pounds). Torre used their data to create the following scatter plot and drew a line to capture the trend in the data. She and Steve then had a discussion about the way the line fit the data. What do you think they were discussing, and why?

Alligator Length (inches) and Weight (pounds)



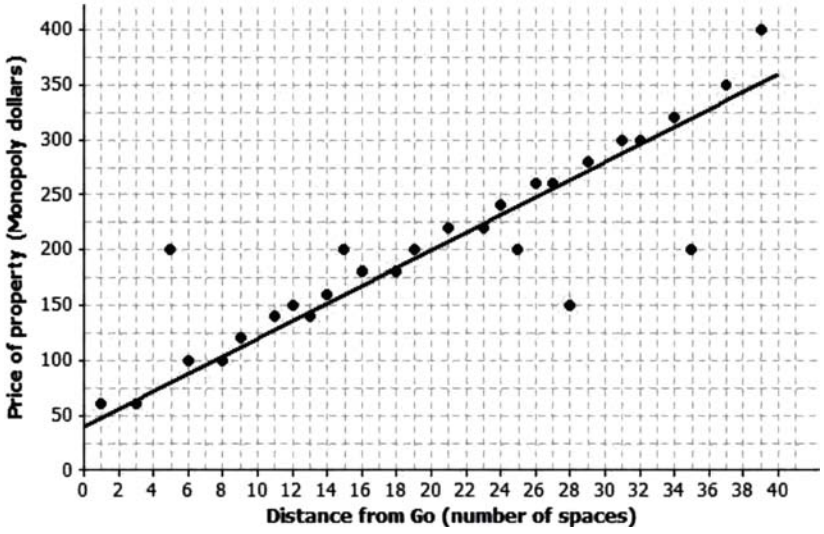
Data Source: James Landwehr and Ann Watkins, *Exploring Data*, Quantitative Literacy Series (Dale Seymour, 1987).

1. The Monopoly board game is popular in many countries. The scatter plot below shows the distance from "Go" to a property (in number of spaces moving from "Go" in a clockwise direction) and the price of the properties on the Monopoly board. The equation of the line is $P = 8x + 40$, where P represents the price (in Monopoly dollars) and x represents the distance (in number of spaces).

Distance from "Go" (number of spaces)	Price of Property (Monopoly dollars)
1	60
3	60
5	200
6	100
8	100
9	120
11	140
12	150
13	140
14	160
15	200
16	180
18	180
19	200

Distance from "Go" (number of spaces)	Price of Property (Monopoly dollars)
21	220
23	220
24	240
25	200
26	260
27	260
28	150
29	280
31	300
32	300
34	320
35	200
37	350
39	400

Price of Property Versus Distance from "Go" in Monopoly



a. Use the equation to find the difference (observed value—predicted value) for the most expensive property and for the property that is 35 spaces from "Go."

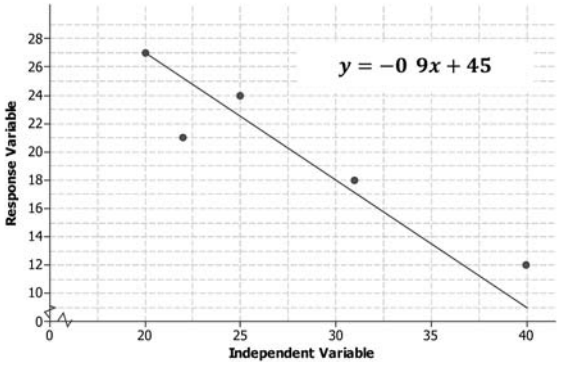
b. Five of the points seem to lie in a horizontal line. What do these points have in common? What is the equation of the line containing those five points?

c. Four of the five points described in part (b) are the railroads. If you were fitting a line to predict price with distance from "Go," would you use those four points? Why or why not?

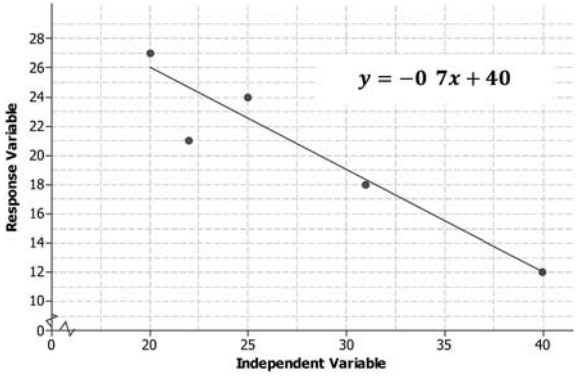
2. The table below gives the coordinates of the five points shown in the scatter plots that follow. The scatter plots show two different lines.

Data Point	Independent Variable	Response Variable
A	20	27
B	22	21
C	25	24
D	31	18
E	40	12

Line 1



Line 2



a. Find the predicted response values for each of the two lines.

Independent	Observed Response	Response Predicted by Line 1	Response Predicted by Line 2

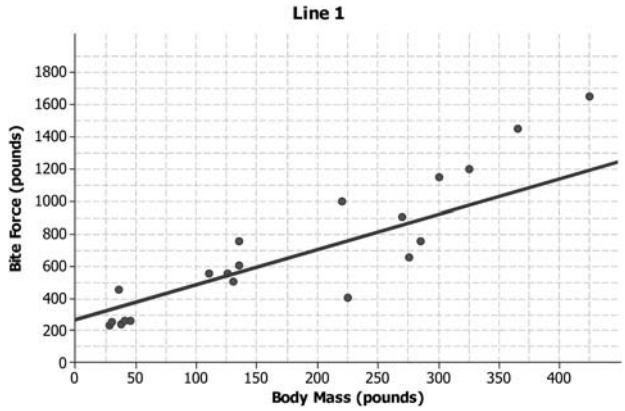
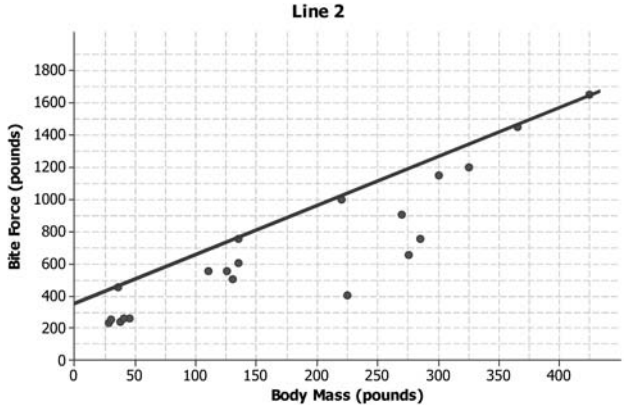
b. For which data points is the prediction based on Line 1 closer to the actual value than the prediction based on Line 2?

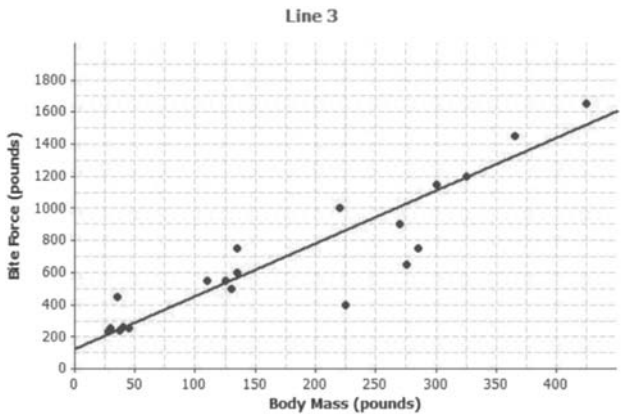
c. Which line (Line 1 or Line 2) would you select as a better fit? Explain.

3. The scatter plots below show different lines that students used to model the relationship between body mass (in pounds) and bite force (in pounds) for crocodilians.

   a. Match each graph to one of the equations below, and explain your reasoning. Let B represent bite force (in pounds) and W represent body mass (in pounds).

Equation 1	Equation 2	Equation 3
$B = 3.28W + 126$	$B = 3.04W + 351$	$B = 2.16W + 267$

Equation:	
Equation:	

Equation:	

b. Which of the lines would best fit the trend in the data? Explain your thinking.

4. Comment on the following statements:
   a. A line modeling a trend in a scatter plot always goes through the origin.
   b. If the response variable increases as the independent variable decreases, the slope of a line modeling the trend is negative.

1. The Mathematics Club at your school is having a meeting. The advisor decides to bring bagels and his award-winning strawberry cream cheese. To determine his cost, from past experience he figures 1.5 bagels per student. A bagel costs 65 cents, and the special cream cheese costs $\$3.85$ and will be able to serve all of the anticipated students attending the meeting.
   a. Find an equation that relates his total cost to the number of students he thinks will attend the meeting.
   b. In the context of the problem, interpret the slope of the equation in words.
   c. In the context of the problem, interpret the *y*-intercept of the equation in words. Does interpreting the intercept make sense? Explain.

2. John, Dawn, and Ron agree to walk/jog for 45 minutes. John has arthritic knees but manages to walk $1\frac{1}{2}$ miles. Dawn walks $2\frac{1}{4}$ miles, while Ron manages to jog 6 miles.
   a. Draw an appropriate graph, and connect the points to show that there is a linear relationship between the distance that each traveled based on how fast each traveled (speed). Note that the speed for a person who travels 3 miles in 45 minutes, or $\frac{3}{4}$ hour, is found using the expression $3 \div \frac{3}{4}$, which is 4 miles per hour.
   b. Find an equation that expresses distance in terms of speed (how fast one goes).
   c. In the context of the problem, interpret the slope of the equation in words.
   d. In the context of the problem, interpret the *y*-intercept of the equation in words. Does interpreting the intercept make sense? Explain.

3. Simple interest is money that is paid on a loan. Simple interest is calculated by taking the amount of the loan and multiplying it by the rate of interest per year and the number of years the loan is outstanding. For college, Jodie's older brother has taken out a student loan for $\$4{,}500$ at an annual interest rate of 5.6%, or 0.056. When he graduates in four years, he has to pay back the loan amount plus interest for four years. Jodie is curious as to how much her brother has to pay.
   a. Jodie claims that her brother has to pay a total of $\$5{,}508$. Do you agree? Explain. As an example, a $\$1{,}200$ loan has an 8% annual interest rate. The simple interest for one year is $\$96$ because $(0.08)(1200) = 96$. The simple interest for two years would be $\$192$ because $(2)(96) = 192$.
   b. Write an equation for the total cost to repay a loan of $\$P$ if the rate of interest for a year is *r* (expressed as a decimal) for a time span of *t* years.
   c. If P and r are known, is the equation a linear equation?
   d. In the context of the problem, interpret the slope of the equation in words.
   e. In the context of the problem, interpret the *y*-intercept of the equation in words. Does interpreting the intercept make sense? Explain.

1. From the United States Bureau of Census website, the population sizes (in millions of people) in the United States for census years 1790–2010 are as follows.

Year	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890
Population Size	3.9	5.3	7.2	9.6	12.9	17.1	23.2	31.4	38.6	50.2	63.0

Year	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010
Population Size	76.2	92.2	106.0	123.2	132.2	151.3	179.3	203.3	226.5	248.7	281.4	308.7

   a. If you wanted to be able to predict population size in a given year, which variable would be the independent variable, and which would be the dependent variable?

   b. Draw a scatter plot. Does the relationship between year and population size appear to be linear?

   c. Consider the data only from 1950 to 2010. Does the relationship between year and population size for these years appear to be linear?

   d. One line that could be used to model the relationship between year and population size for the data from 1950 to 2010 is $y = -4875.021 + 2.578x$. Suppose that a sociologist believes that there will be negative consequences if population size in the United States increases by more than $2\frac{3}{4}$ million people annually. Should she be concerned? Explain your reasoning.

   e. Assuming that the linear pattern continues, use the line given in part (d) to predict the size of the population in the United States in the next census.

2. In search of a topic for his science class project, Bill saw an interesting YouTube video in which dropping mint candies into bottles of a soda pop caused the soda pop to spurt immediately from the bottle. He wondered if the height of the spurt was linearly related to the number of mint candies that were used. He collected data using 1, 3, 5, and 10 mint candies. Then, he used two-liter bottles of a diet soda and measured the height of the spurt in centimeters. He tried each quantity of mint candies three times. His data are in the following table.

Number of Mint Candies	1	1	1	3	3	3	5	5	5	10	10	10
Height of Spurt (centimeters)	40	35	30	110	105	90	170	160	180	400	390	420

   a. Identify which variable is the independent variable and which is the dependent variable.

   b. Draw a scatter plot that could be used to determine whether the relationship between height of spurt and number of mint candies appears to be linear.

   c. Bill sees a slight curvature in the scatter plot, but he thinks that the relationship between the number of mint candies and the height of the spurt appears close enough to being linear, and he proceeds to draw a line. His eyeballed line goes through the mean of the three heights for three mint candies and the mean of the three heights for 10 candies. Bill calculates the equation of his eyeballed line to be

$$y = -27.617 + (43.095)x,$$

   where the height of the spurt (y) in centimeters is based on the number of mint candies (x). Do you agree with this calculation? He rounded all of his calculations to three decimal places. Show your work.

   d. In the context of this problem, interpret in words the slope and intercept for Bill's line. Does interpreting the intercept make sense in this context? Explain.

   e. If the linear trend continues for greater numbers of mint candies, what do you predict the height of the spurt to be if 15 mint candies are used?

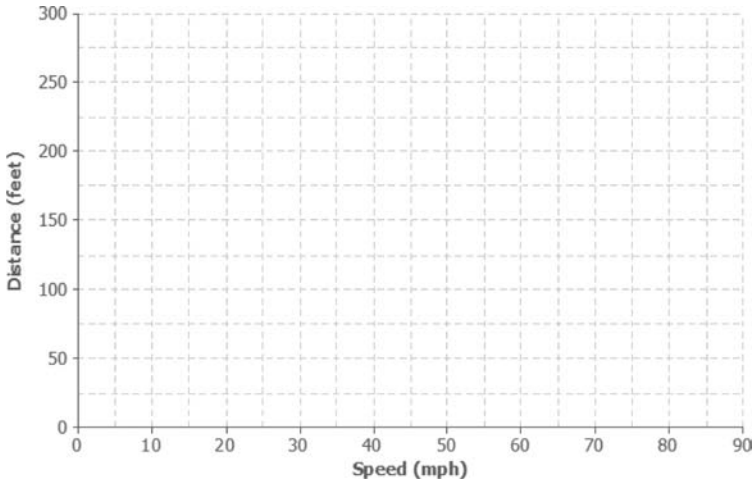
1. Once the brakes of the car have been applied, the car does not stop immediately. The distance that the car travels after the brakes have been applied is called the *braking distance*. The table below shows braking distance (how far the car travels once the brakes have been applied) and the speed of the car.

Speed (miles per hour)	Braking Distance (feet)
10	5
20	17
30	37
40	65
50	105
60	150
70	205
80	265

Data Source: http://forensicdynamics.com/stopping-braking-distance-calculator

(Note: Data has been rounded.)

a. Construct a scatter plot of braking distance versus speed on the grid below.



b. Find the amount of additional distance a car would travel after braking for each speed increase of 10 mph. Record your answers in the table below.

Speed (miles per hour)	Braking Distance (feet)	Amount of Distance Increase
10	5	–
20	17	
30	37	
40	65	
50	105	
60	150	
70	205	
80	265	

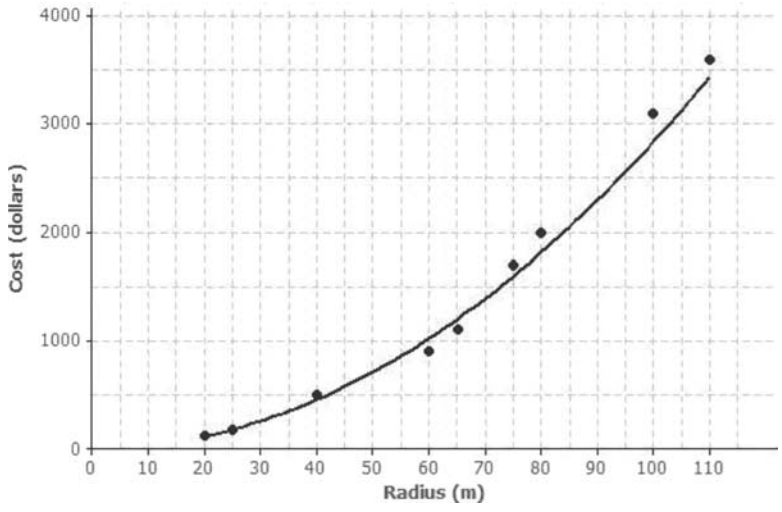
c. Based on the table, do you think the data follow a linear pattern? Explain your answer.

d. Describe how the distance it takes a car to stop changes as the speed of the car increases.

e. Sketch a smooth curve that you think describes the relationship between braking distance and speed.

f. Estimate braking distance for a car traveling at 52 mph. Estimate braking distance for a car traveling at 75 mph. Explain how you made your estimates.

2. The scatter plot below shows the relationship between cost (in dollars) and radius length (in meters) of fertilizing different-sized circular fields. The curve shown was drawn to describe the relationship between cost and radius.



a. Is the curve a good fit for the data? Explain.

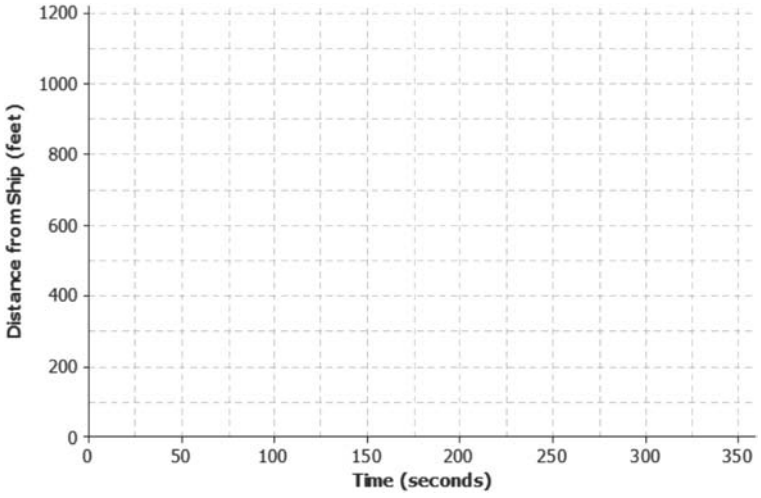
b. Use the curve to estimate the cost for fertilizing a circular field of radius 30 m. Explain how you made your estimate.

c. Estimate the radius of the field if the fertilizing cost was $\$2{,}500$. Explain how you made your estimate.

3. Suppose a dolphin is fitted with a GPS that monitors its position in relationship to a research ship. The table below contains the time (in seconds) after the dolphin is released from the ship and the distance (in feet) the dolphin is from the research ship.

Time (seconds)	Distance from the Ship (feet)	Increase in Distance from the Ship
0	0	–
50	85	
100	190	
150	398	
200	577	
250	853	
300	1,122	

a. Construct a scatter plot of distance versus time on the grid below.



b. Find the additional distance the dolphin traveled for each increase of 50 seconds. Record your answers in the table above.

c. Based on the table, do you think that the data follow a linear pattern? Explain your answer.

d. Describe how the distance that the dolphin is from the ship changes as the time increases.

e. Sketch a smooth curve that you think fits the data reasonably well.

f. Estimate how far the dolphin will be from the ship after 180 seconds. Explain how you made your estimate.

Every student at Abigail Douglas Middle School is enrolled in exactly one extracurricular activity. The school counselor recorded data on extracurricular activity and gender for all 254 eighth-grade students at the school.

The counselor's findings for the 254 eighth-grade students are the following:

- Of the 80 students enrolled in band, 42 are male.
- Of the 65 students enrolled in choir, 20 are male.
- Of the 88 students enrolled in sports, 30 are female.
- Of the 21 students enrolled in art, 9 are female.

1. Complete the table below.

		Extracurricular Activities				
		Band	**Choir**	**Sports**	**Art**	**Total**
Gender	**Female**					
	Male					
	Total					

2. Write a sentence explaining the meaning of the frequency 38 in this table.

Use the table provided above to calculate the following relative frequencies.

3. What proportion of students are male and enrolled in choir?

4. What proportion of students are enrolled in a musical extracurricular activity (i.e., band or choir)?

5. What proportion of male students are enrolled in sports?

6. What proportion of students enrolled in sports are male?

Pregnant women often undergo ultrasound tests to monitor their babies' health. These tests can also be used to predict the gender of the babies, but these predictions are not always accurate. Data on the gender predicted by ultrasound and the actual gender of the baby for $1{,}000$ babies are summarized in the two-way table below.

		Predicted Gender	
		Female	**Male**
Actual Gender	**Female**	432	48
	Male	130	390

7. Write a sentence explaining the meaning of the frequency 130 in this table.

Use the table provided above to calculate the following relative frequencies.

8. What is the proportion of babies who were predicted to be male but were actually female?

9. What is the proportion of incorrect ultrasound gender predictions?

10. For babies predicted to be female, what proportion of the predictions were correct?

11. For babies predicted to be male, what proportion of the predictions were correct?

A sample of 200 middle school students was randomly selected from the middle schools in a large city. Answers to several survey questions were recorded for each student. The tables below summarize the results of the survey.

For each table, calculate the row relative frequencies for the Female row and for the Male row. Write the row relative frequencies beside the corresponding frequencies in each table below.

1. This table summarizes the results of the survey data for the two variables, gender and which sport the students prefer to play. Is there an association between gender and which sport the students prefer to play? Explain.

		Sport				
		Football	**Basketball**	**Volleyball**	**Soccer**	**Total**
Gender	**Female**	2	29	28	38	97
	Male	35	26	8	24	103
	Total	37	65	36	62	200

2. This table summarizes the results of the survey data for the two variables, gender and the students' T-shirt sizes. Is there an association between gender and T-shirt size? Explain.

		School T-Shirt Sizes				
		Small	**Medium**	**Large**	**X-Large**	**Total**
Gender	**Female**	47	35	13	2	97
	Male	11	41	42	9	103
	Total	58	76	55	11	200

3. This table summarizes the results of the survey data for the two variables, gender and favorite type of music. Is there an association between gender and favorite type of music? Explain

		Favorite Type of Music				
		Pop	**Hip-Hop**	**Alternative**	**Country**	**Total**
Gender	**Female**	35	28	11	23	97
	Male	37	30	13	23	103
	Total	72	58	24	46	200