Amplify Desmos Math NEW YORK

Student Edition Sampler

Grade 8

Inside you'll find:

- Complete student pages from Amplify Desmos Math
- Student pages from requested domains, partially designed

For Review Only. Not Final Format.

Amplify Desmos Math
NEW YORK

Grade 8

Student Edition Sampler

About Amplify

Amplify is dedicated to collaborating with educators to create learning experiences that are rigorous and riveting for all students. Amplify creates K–12 core and supplemental curriculum, assessment, and intervention programs for today's students.

A pioneer in K–12 education since 2000, Amplify is leading the way in next-generation curriculum and assessment. All of our programs provide teachers with powerful tools that help them understand and respond to the needs of every student.

Cover illustration by Caroline Hadilaksono.

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Brooklyn, NY 11201
www.amplify.com

Welcome reviewer

Welcome to your Amplify Desmos Math New York Student Edition sampler!

Amplify Desmos Math New York is the result of two groundbreaking research and development efforts in K–12 mathematics instruction led by the Amplify and Desmos Classroom teams. Merging the two teams in 2022 enabled us to build a new curriculum around the idea that all students deserve to engage in high-quality grade-level mathematics every day. Based on Illustrative Mathematics'® IM K–12 Math™, Amplify Desmos Math New York combines strong pedagogy, arresting design, and forward-looking collaborative technology to deliver a classroom experience that keeps students engaged and asking productive questions.

Every lesson in the Amplify Desmos Math digital platform has a corresponding lesson in the print teacher and student editions. While we are in the process of finalizing the print materials, we have provided exemplars highlighting the unique design and ease of use of the Amplify Desmos Math print resources. To provide content covering your specific domain requests, in this physical sampler we have included both robust Amplify Desmos Math student pages and partially designed student pages. However, all of the lessons can be reviewed in their complete forms online.

All Amplify Desmos Math lessons include:

- Easy-to-follow lesson plans, tested in classrooms across the country.
- Clear teaching suggestions and strategies, including math language routines.
- Recommended differentiation moves and practice sets.

Diagnostic, formative, and summative assessments are provided with each unit along with lesson-level checks for understanding.

Amplify and New York City have a long history of partnering to provide equitable, high-quality instruction to our next generation of leaders. We look forward to continuing this partnership with New York City Public Schools in middle school mathematics.

—Jason Zimba and the Amplify Desmos Math team

Amplify Desmos Math New York

Helping New York City teachers develop and celebrate student thinking

Deep and lasting learning occurs when students are able to make connections to prior thinking and experiences. This requires teachers to deliver math instruction that balances exploration and explanation, and that puts student thinking at the center of classroom instruction.

Amplify Desmos Math students are invited to explore the math that fills their everyday lives, while strengthening their knowledge of math facts, procedural skills, and conceptual knowledge. Using the Amplify Desmos Math print and digital lesson plans, teachers can confidently guide and instruct as they build on students' understandings to help them develop a better grasp of mathematics.

Amplify Desmos Math is **a truly student-centered program** built around three core tenets:

1 **A strong foundation in problem-based learning is critical to developing deep conceptual understanding, procedural fluency, and application.**

Students are introduced to interesting problems and leverage both their current understandings and problem-solving strategies to develop reasonable answers. The learning experience is an active one that leads students to explore, notice, question, solve, justify, explain, represent, and analyze. Teachers guide the process, supporting synthesis and sensemaking at the end of each lesson.

2 Technology can provide ongoing, enriched feedback that encourages students to persevere in problem solving.

Especially when new ideas are being introduced, Desmos Classroom technology shows students the meaning of their thinking in context, interpreting it mathematically rather than reducing it to a question of right or wrong. This creates a culture of going deep with mathematics and students as doers of mathematics, so that as learning progresses and correctness is the goal, incorrect answers become objects of curiosity rather than embarrassment. This information in response to student ideas is what we call "enriched feedback." Amplify Desmos Math New York offers more enriched feedback than any other math program.

The Effect of Desmos Math Curriculum on Middle School Mathematics Achievement in Nine States. WestEd., (McKinney, D., Strother, S., Walters, K. & Schneider, S., 2023).

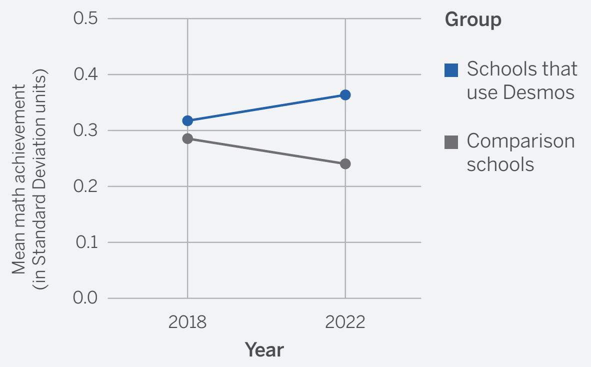
3 A commitment to access and equity should underpin every development decision.

All students can dive into problems on their own, and activities are designed to honor different approaches. Activities rely on collaboration and lots of hands-on, experiential learning.

And the program works.

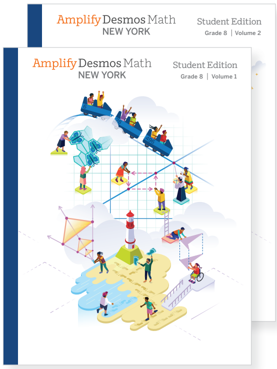
Amplify Desmos Math New York expands on the Desmos Math 6–8 curriculum, which was recently proven to increase average math achievement in a study of more than 900 schools in nine states led by WestEd.

Mean Math Achievement for Desmos Schools and Matched Comparison Schools in 2018 and 2022

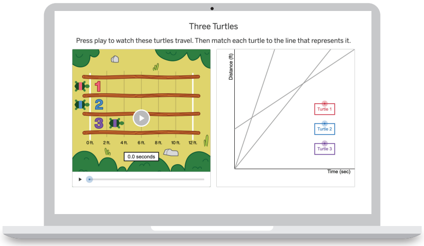


Amplify Desmos Math New York program resources

Student bundle includes:



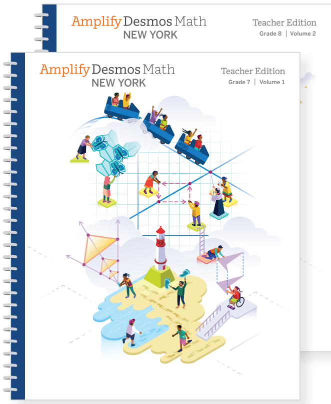
NY Student Edition,
multivolume, consumable



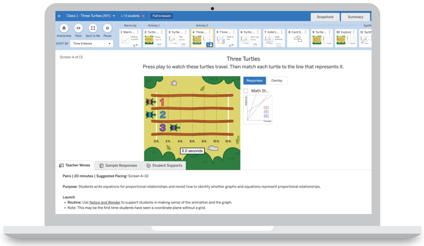
NY Digital Experience (English and Spanish), featuring:

- Interactive Student Activity Screens
- Enriched feedback
- Collaboration tools

Teacher bundle includes:



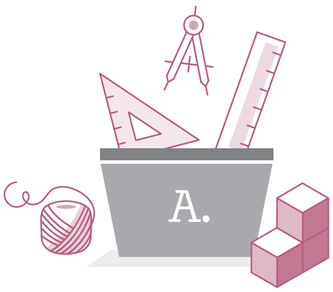
NY Teacher Edition,
multivolume, spiral-bound



NY Digital Experience (English and Spanish), featuring:

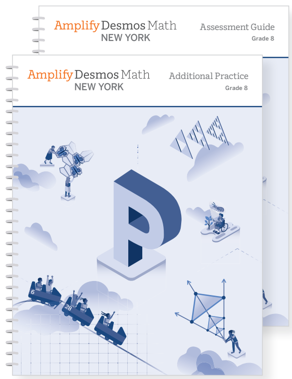
- Facilitation and progress monitoring tools
- Presentation Screens
- Instructional supports
- Assessment

Optional:



Middle School Manipulative Kit (Grades 6–8)

Extra Practice and Assessment Blackline Masters



Additional components and features may roll out over time.

Program architecture

Course

I — mCLASS beginning-of-year diagnostic screener

I — Interim Assesments

UNIT 1	UNIT 2	UNIT 3	UNIT 4	UNIT 5	UNIT 6	UNIT 7	UNIT 8
20 days	16 days	16 days	20 days	22 days	17 days	19 days	20 days

Unit

A — Pre-Unit Check

A — Sub-Unit Quiz

End-of-Unit Assessment — A

Sub-Unit 1	Sub-Unit 2 (Practice Day)	Sub-Unit 3 (Practice Day)
1, 2, 3, 4, 5, 6, 7	8, 9, 10, 11, 12, PD	13, 14, 15, 16, 17, 18, 19, 20, PD

Note: The number of sub-units and lessons vary from unit to unit; this depiction shows the general structure of a unit.

Lesson

Warm-up	Activity 1	Activity 2	Synthesis	Exit Ticket	Practice
5 min	15 min	15 min	5 min	5 min	timing varies
Independent, Pairs, Small Groups, Whole Class	Independent, Pairs, Small Groups, Whole Class	Independent, Pairs, Small Groups, Whole Class	Whole Class	Independent	Independent

Note: The number of activities and timing vary from lesson to lesson; this depiction shows the general structure of a lesson.

Key:

- Independent
- Pairs
- Small Groups
- Whole Class

Unit 1 Rigid Transformations and Congruence

Shapes are all around us. We find them in architecture, art, and even in forgeries of art. You have measured attributes of shapes, such as side lengths and angle measures. Will anything happen to these side lengths and angle measures when you slide, flip, or turn these shapes?

Unit 2 Dilations, Similarity, and Introducing Slope

The way our brain interprets how objects appear — how big or small they are, how near or far — comes back to dilation. Learn to dilate figures and uncover the magic of this special type of transformation.

Unit 3 Proportional and Linear Relationships

The slope tells us the steepness of a line, but did you know it can also tell us who is faster, the tortoise or the hare? A simple line on a graph holds endless information. Discover what a line can represent as you explore proportional and linear relationships.

Unit 4 Linear Equations and Linear Systems

Equations are useful tools for modeling and solving many real-world problems. You have solved lots of different kinds of equations. Now, you will approach equations with variables on both sides. But wait . . . what does it mean when an equation has no solutions? What does it mean when the graphs of two linear equations intersect?

Pre-Unit

Sub-Unit 1 Solving Linear Equations

Sub-Unit 2 Systems of Linear Equations

End-Unit

Unit 5 Functions and Volume

By studying functional relationships in this unit, you will soon be able to explain how height affects the volume of a sphere, calculate how the tortoise outran the hare, and determine how long it will take to charge a cell phone.

Unit 4 Associations in Data

Data literacy — being able to tell and interpret stories using data — is one of the most important skills you will ever need. In this unit, you will make sense of data in the world around you, represented in different forms.

Unit 7 Exponents and Scientific Notation

Imagine the smallest number you can think of. Now imagine the largest numberyou can think of. How can you write these numbers? How can you work with these numbers? In this unit, you'll learn about the power of exponents (pun intended), and how you can use them to work with numbers as small as the mass of a bacterium or as large as the number of atoms in the Universe.

Unit 8 The Pythagorean Theorem and Irrational Numbers

Discover how three squares can prove something radical about triangles that has captivated mathematicians for centuries.

GRADE 8

Amplify Desmos Math
NEW YORK

Student Edition Sample Lessons

In this section, two lesson samples showcase the full print support for all lessons in the program, including Student Edition pages for recommended digital lessons. All Student Edition lessons will be created following this structure and design for delivery prior to the 2024-2025 school year.

Contents of this lesson:

Equitable access with student materials

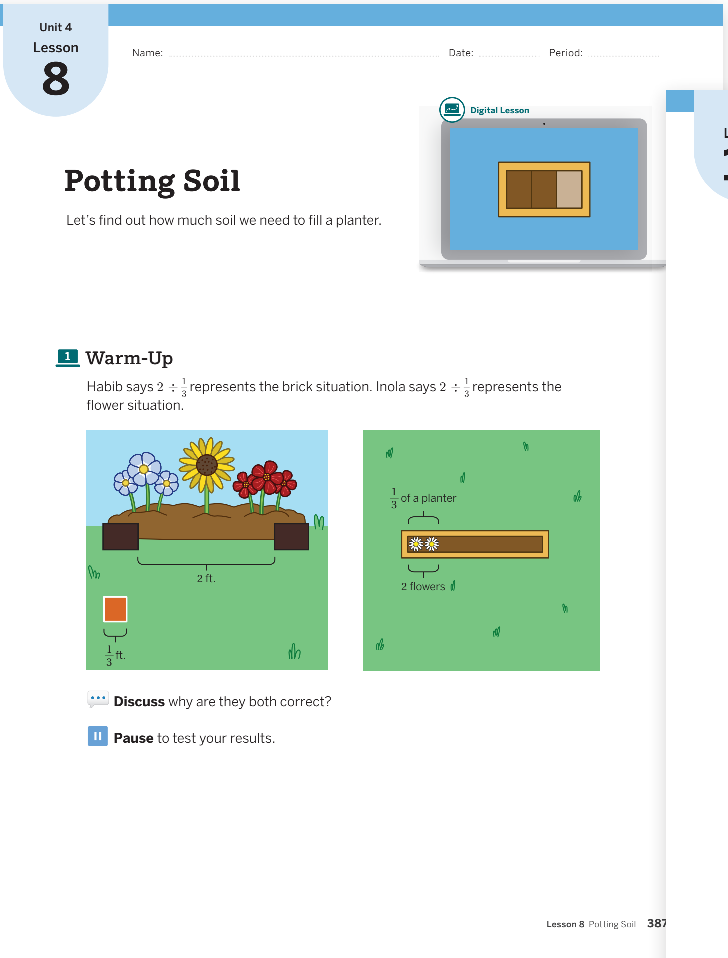
Every lesson in Amplify Desmos Math New York has a corresponding Student Edition page, ensuring equitable access for for all students.

- A print-based option is always available for students who need it, even for digital-recommended lessons.
- Student pages are closely aligned to digital Student Activity Screens, with screen-by-screen alignment in problem numbering.
- There's ample physical space provided for problem-solving and note-taking, even when students are on devices.

What if your students asked to do more math?

Amplify Desmos Math New York lessons are powerful in their ability to elicit student thinking and spark interesting and productive discussions.

The lessons pose problems that invite a variety of approaches with their dynamic and interactive learning experiences on computers, as well as experiences on paper that are flexible, creative, and engaging.



Unit 4
Lesson
8

Name: Date: Period:

Digital Lesson

Potting Soil

Let's find out how much soil we need to fill a planter.

1 Warm-Up

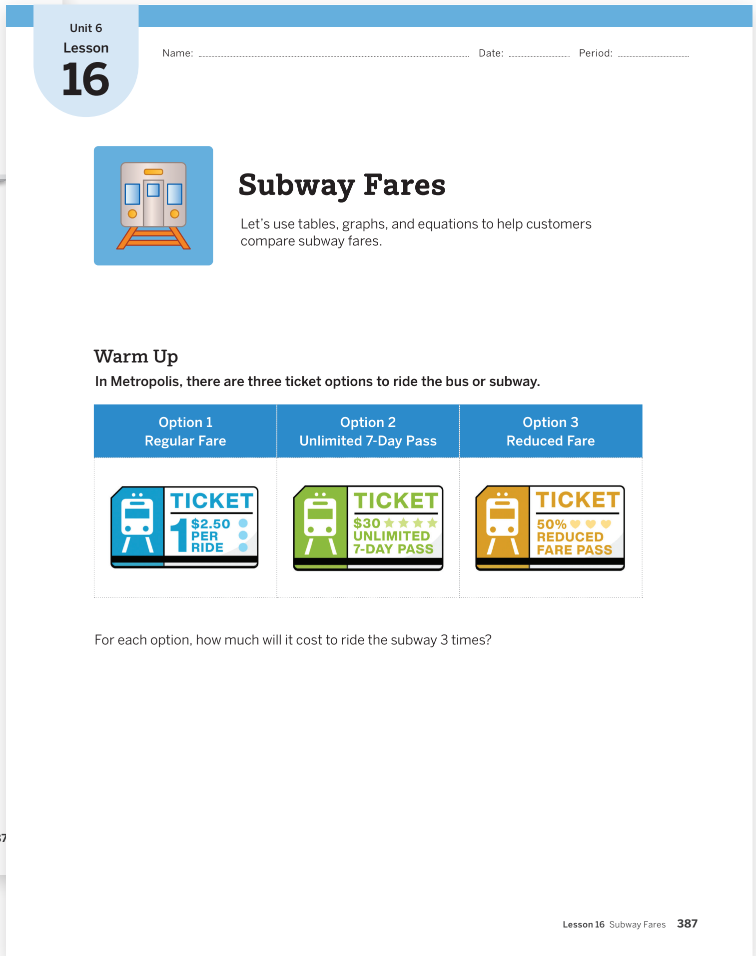
Habib says $2 \div \frac{1}{3}$ represents the brick situation. Inola says $2 \div \frac{1}{3}$ represents the flower situation.

Discuss why are they both correct?

Pause to test your results.

Lesson 8 Potting Soil 387

Digital recommended lesson



Unit 6
Lesson
16

Name: Date: Period:

Subway Fares

Let's use tables, graphs, and equations to help customers compare subway fares.

Warm Up

In Metropolis, there are three ticket options to ride the bus or subway.

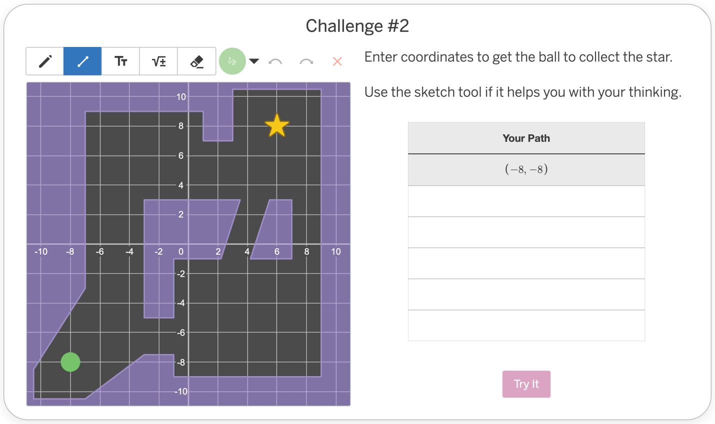
Option 1 Regular Fare	Option 2 Unlimited 7-Day Pass	Option 3 Reduced Fare
TICKET 1 $2.50 PER RIDE	TICKET $30 UNLIMITED 7-DAY PASS	TICKET 50% REDUCED FARE PASS

For each option, how much will it cost to ride the subway 3 times?

Lesson 16 Subway Fares 387

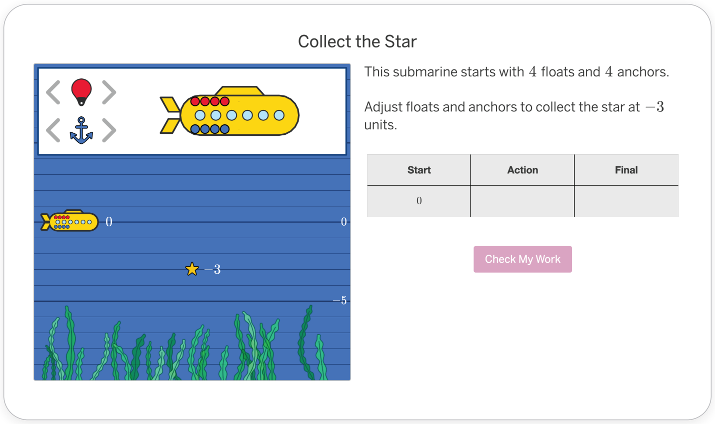
Print lesson

As students work online, they interact with visuals and simulations that show how their thinking and decisions play out. When appropriate, students will automatically see other students' responses and engage in collaborative math discussions.



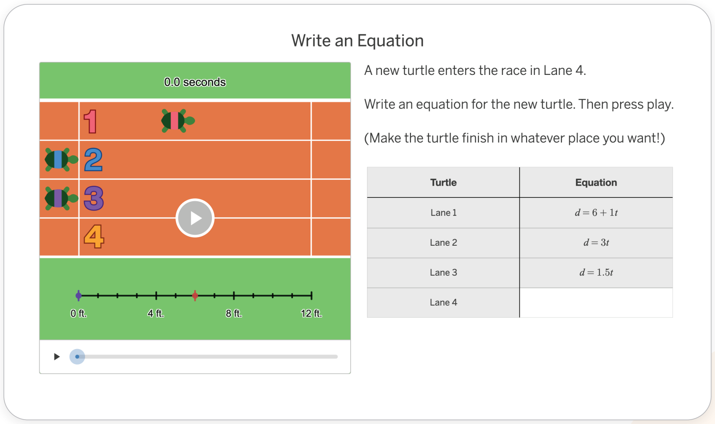
Grade 6

In this activity students plot points to navigate the marble through the maze to collect the star.



Grade 7

In this activity students explore positive and negative integer operations using the up and down movement of a submarine.



Grade 8

In this activity students create rate, distance, and time equations based on turtle races.

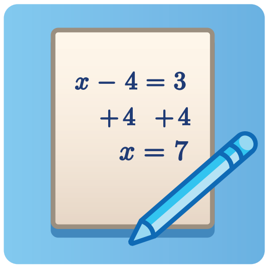
TRY IT OUT

Start your review at amplify.com/math-review-nyc

Unit 4
Lesson
4

Name: ________________ Date: ________ Period: ________

More Balanced Moves



Let's rewrite some more equations while keeping the same solutions.

Warm-Up

1. Here are four moves you could make to an equation. Determine whether each move results in an equivalent equation.

Move	Results in an equivalent equation?
Add 4 to one side of the equation and 5 to the other.	
Subtract the same number from each side of the equation.	
Divide each side of the equation by 7.	
Multiply one side of the equation by 3.	

2. Write a new move you could make to an equation that results in an equivalent equation. Why does your move result in an equivalent equation?

Activity 1

Step by Step by Step by Step

Sadia and Amir solved the same equation. Their work is shown.

Sadia's work	Amir's work
$2x + \frac{1}{2} = \frac{1}{4}(5x + 4)$ $2x + \frac{1}{2} = \frac{5}{4}x + \frac{4}{4}$ $8x + 2 = 5x + 4$ $2 = -3x + 4$ $-2 = -3x$ $\frac{2}{3} = x$	$2x + \frac{1}{2} = \frac{1}{4}(5x + 4)$ $2x + \frac{1}{2} = \frac{5}{4}x + \frac{4}{4}$ $2x + \frac{1}{2} = \frac{5}{4}x + 1$ $\frac{3}{4}x + \frac{1}{2} = 1$ $\frac{3}{4}x = \frac{1}{2}$ $x = \frac{2}{3}$

3. Are both of their solutions correct? Explain your thinking.

4. **Discuss:** In what ways are the steps they took alike and different?

Activity 1

Name: .... Date: .... Period: ....

Step by Step by Step by Step (continued)

5. Caleb and Roberto also solved the equation, but they each made an error. Circle the incorrect step in each student's work.

Caleb's work	Roberto's work
$2x + \frac{1}{2} = \frac{1}{4}(5x + 4)$	$2x + \frac{1}{2} = \frac{1}{4}(5x + 4)$
$-3x + \frac{1}{2} = \frac{1}{4}(4)$	$2x + \frac{1}{2} = \frac{5}{4}x + \frac{4}{4}$
$-3x + \frac{1}{2} = 1$	$8x + 2 = 5x + 4$
$-3x = \frac{1}{2}$	$13x + 2 = 4$
$x = -\frac{1}{6}$	$13x = 2$
	$x = \frac{2}{13}$

6. Explain Caleb's error.

7. Explain Roberto's error.

Activity 2

Make Your Own Steps

Solve each equation for x. Show your thinking.

8. $8x + 7 = 6x - 13$

9. $-3x + 12 = 9x - 4$

10. $-4(x - 3) = 6x - 3$

11. $0.2x + 5 = x - 7$

12. $x - 4 = \frac{1}{3}(6x - 54)$

13. $\frac{2}{3}(6x - 1) = -(x - 2)$

You're invited to explore more.

There are 24 pencils and 3 cups. Each cup contains a certain number of pencils. There is one more pencil in the second cup than in the first cup, and there is one more pencil in the third cup than in the second cup.

How many pencils are in each cup?

STOP

Synthesis

Consider the equation $2x - 6 = 4 - 8x$. There are several ways to solve this equation. What are some different steps that you could take to solve it? Explain your thinking.

Summary

A **solution** to an equation is a value that makes the equation true.

For example, consider the equation $-x - 8 = 4x + 7$.

Because each operation shown was performed on both sides, all four of these equations are equivalent to each other.

$-x - 8 = 4x + 7$

$-8 = 5x + 7$ Add x to each side.

$-15 = 5x$ Subtract 7 from each side.

$-3 = x$ Divide both sides by 5.

The value $x = -3$ can be substituted into the original equation to check that it is indeed a solution.

Solution check:

$-(-3) - 8 = 4(-3) + 7$

$3 - 8 = -12 + 7$

$-5 = -5$

True; therefore, $x = -3$ is a solution.

Practice

Name: ______________________ Date: __________ Period: __________

1. Anushka and Lukas are each solving the equation $\frac{2}{5}b + 1 = -11$. Anuska's solution is $b = -25$ and Lukas's solution is $b = -28$. Their work is shown. Do you agree with either solution? Explain your thinking.

Anushka's work:

$$\frac{2}{5}b + 1 = -11$$
$$\frac{2}{5}b = -10$$
$$b = -10 \cdot \frac{5}{2}$$
$$b = -25$$

Lukas's work:

$$\frac{2}{5}b + 1 = -11$$
$$2b + 1 = -55$$
$$2b = -56$$
$$b = -28$$

2. Solve the equation $3(x - 4) = 12x$. Show your thinking. Remember to check your solution.

3. Liam solved the equation shown, but when he checked his solution, he realized it was incorrect. He knows he made a mistake, but he cannot find it. Circle Liam's mistake and then correctly solve the equation.

$$-2(3x - 5) = 4(x + 3) + 8$$
$$-6x + 10 = 4x + 12 + 8$$
$$-6x + 10 = 4x + 20$$
$$10 = -2x + 20$$
$$-10 = -2x$$
$$5 = x$$

Additional Practice for this lesson is avilable online.

Name: ______ Date: ______ Period: ______

Practice

4. Elena solved the equation $2(-3x + 4) = 5x + 2$. Describe what Elena did in each step.

Step	Description
$-6x + 8 = 5x + 2$	Multiply $-3x + 4$ by 2.
$8 = 11x + 2$	
$6 = 11x$	
$\frac{6}{11} = x$	

For Problems 5–7, determine whether $x = -3$ is a solution for each equation. Show your thinking.

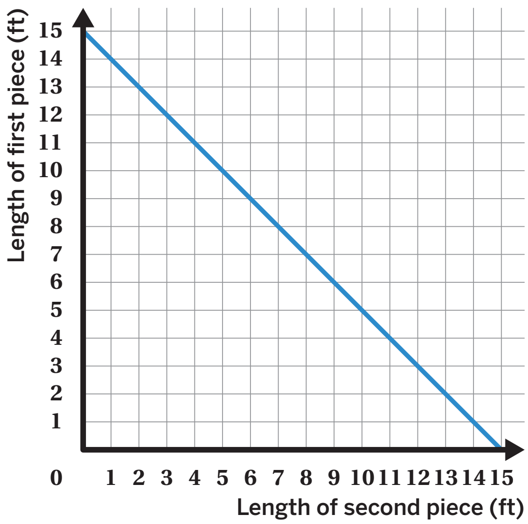
5. $4(x + 7) - 9 = 7$

6. $-2(x + 2) = -10$

7. $8(x - 1) = 18x + 22$

Spiral Review

For Problems 8–10, use this information. A length of ribbon is cut into two pieces to use in a craft project. The graph shows the length of the first piece for each length of the second piece.



8. How long is the ribbon? Explain your thinking.

9. What is the slope of the line?

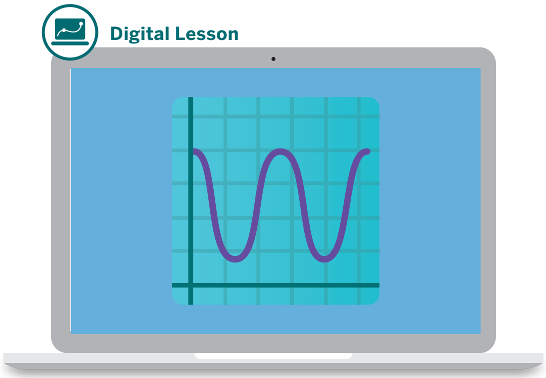
10. Explain what the slope of the line represents in context of the scenario.

Reflection

1. Put a smiley face next to a question you were stuck on and then figured out.

2. Use the space below to ask one question you have or to share something you are proud of.

Name: ______ Date: ______ Period: ______



Graphing Stories

Let's make connections between scenarios and the graphs that represent them.

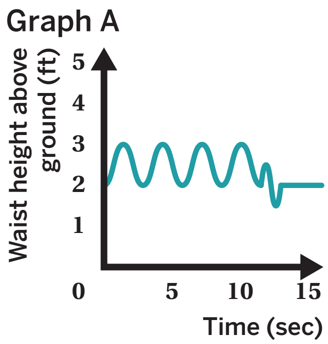
Warm-Up

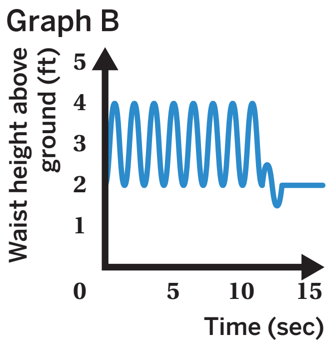
1 Clem loves to play on the playground. Let's watch a short video of him on the swings.

What different quantities are changing in this video?

2 Here are two graphs of Clem's waist height vs. time.

Discuss: How are these graphs alike? How are they different?



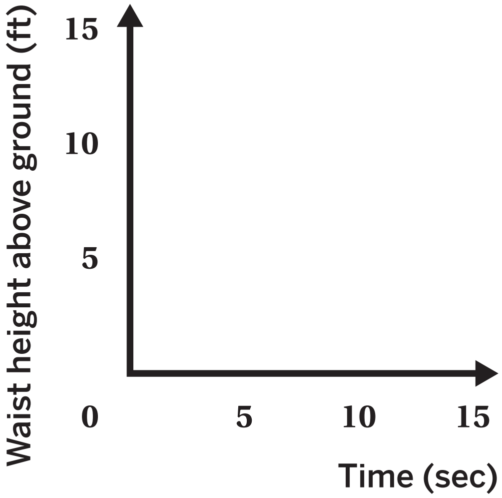


Activity 1

Tyler and the Slide

3 Let's watch a video.

Sketch a graph representing Tyler's waist height vs. time.



4 Let's look at an answer sketch of the graph that represents Tyler's waist height vs. time.

Discuss: What feature(s) of this answer do you like?

Discuss: What feature(s) of this answer do you want to revise?

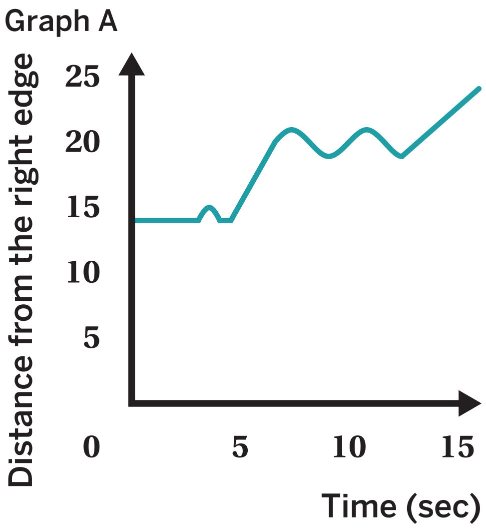
Activity 1

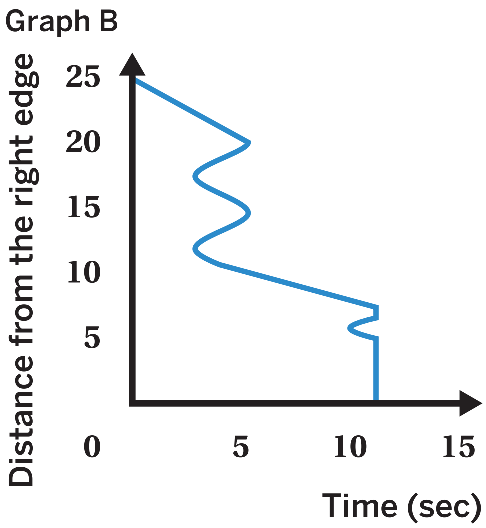
Name: ________ Date: ________ Period: ________

Tyler and the Slide (continued)

5 Let's watch the video of Tyler again.

Which graph could represent the relationship between Tyler's distance from the right edge of the screen and time? Explain your thinking.



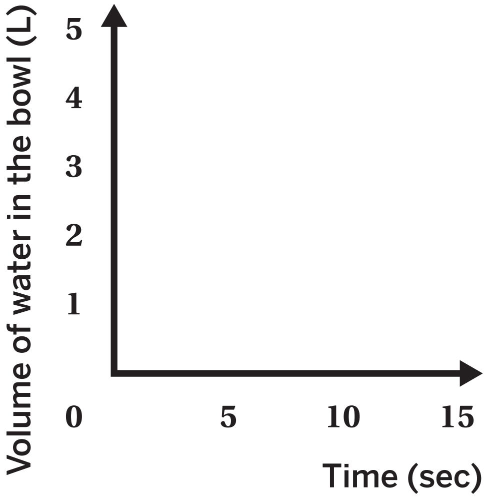


Activity 2

Water in the Bowl

6 Let's watch a video of a bowl being filled with water.

Sketch a graph representing the volume of water in the 5-liter bowl vs. time.



7 Let's look at the answer sketch of the graph that represents the volume of water in the bowl vs. time.

Discuss: What feature(s) of this answer do you like?

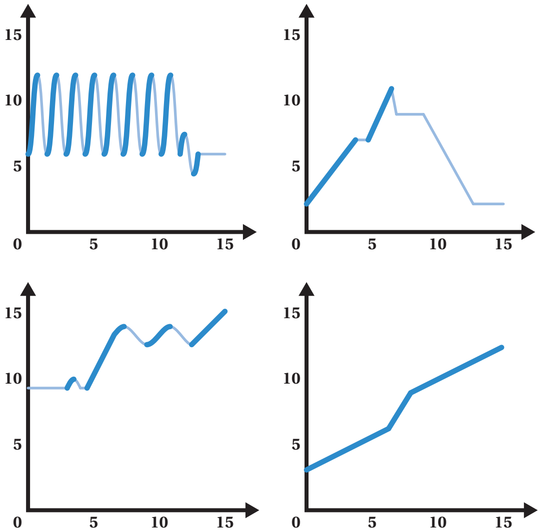
Discuss: What feature(s) of this answer do you want to revise?

Name: ________________ Date: ________ Period: ________

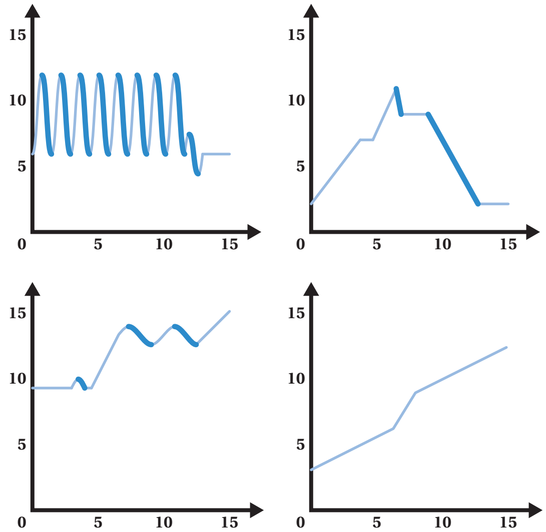
Describing Graphs

8 Here are some graphs from this lesson. Parts of the graph are bolded to show where they are either increasing, decreasing, linear, or non-linear.

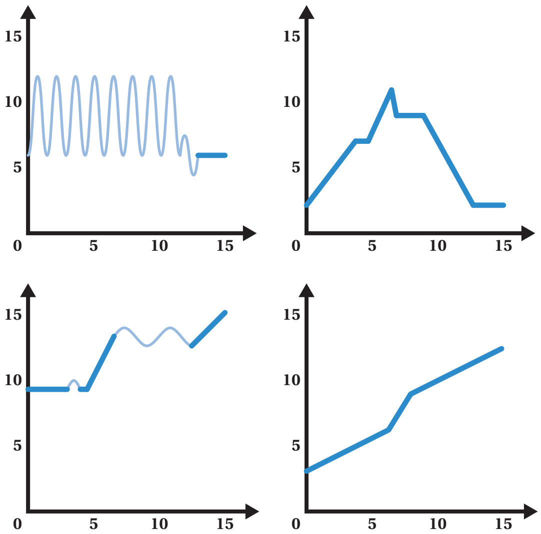
Increasing



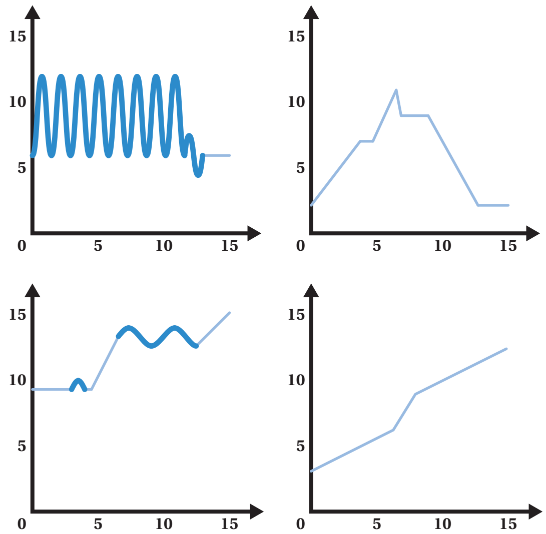
Decreasing



Linear



Non-linear



Discuss: What do you think each of these terms mean?

- Increasing?
- Decreasing?
- Linear?
- Non-linear?

STOP

Synthesis

9 What are some important things to consider when graphing a function that represents a real-world situation?

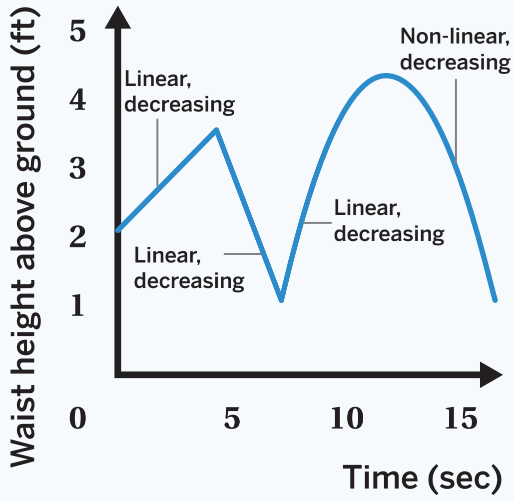
Summary

Graphs can be used to represent a context. When drawing a graph, carefully choose and label variables for the axes. Depending on the independent and dependent variables, distinct graphs can describe different aspects of the same story.

The intervals and the overall shape of a graph can be used to interpret the function.

For example, when part of the graph is:

- Going up from left to right, the values of the function are *increasing*.
- Going down from left to right, the values of the function are *decreasing*.
- A straight, non-vertical line, this part of the function is *linear*.
- Not a straight line, this part of the function is *non-linear*.



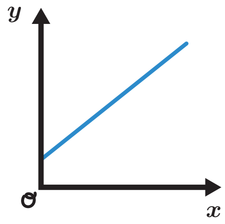
Name: .... Date: .... Period: ....

Practice

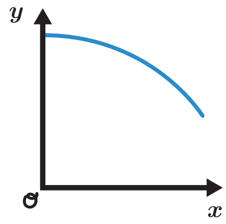
1. Determine which graph best represents the description.

Description	Graph
a Linear and decreasing	....
b Non-linear and increasing	....
c Linear and increasing	....
d Non-linear and decreasing	....

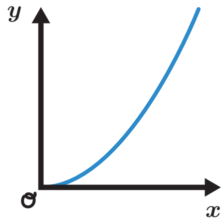
Graph A



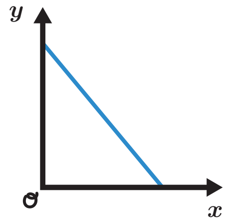
Graph B



Graph C

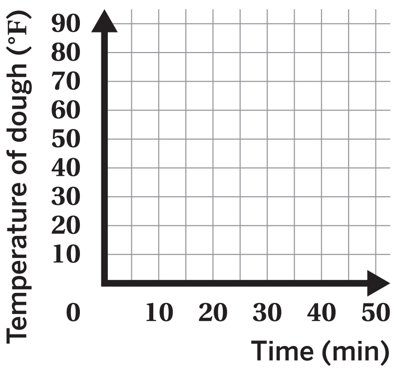


Graph D

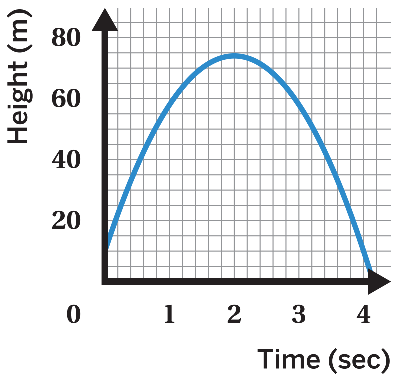


2. David places a batch of homemade pretzel dough in the refrigerator. The pretzel dough takes 15 minutes to cool from $70°F$ to $40°F$. Once it is cool, the pretzel dough stays in the refrigerator for another 30 minutes. David then places the pretzel dough into the oven to bake. After 5 minutes in the oven, the temperature of the pretzel dough is $80°F$.

Sketch a graph that represents this situation.



For Problems 3–6, use this information. The graph represents the height of an object that is launched upwards from a tower and then falls to the ground.



3. How tall is the tower from which the object was launched?

4. Plot the point that represents the greatest height of the object and the time it took the object to reach that height.

5. Determine one time interval when the height of the object was increasing.

6. Determine one time interval when the height of the object was decreasing.

Additional Practice for this lesson is avilable online.

GRADE 8

Unit 2
Student Lessons

Student lessons from Unit 2 are included here to provide NYC reviewers with access to the specific lessons in Amplify Desmos Math New York that demonstrate coverage of the **Expressions, Equations, and Inequalities** domain.

These lessons are partially designed and will be updated to match the exemplar Student Edition lessons included earlier in this sampler.

NOTE: *We have included only those lessons from Unit 2 that cover the standards in the Expressions, Equations, and Inequalities domain.*

Grade 8 Unit 2

Student Edition Sampler

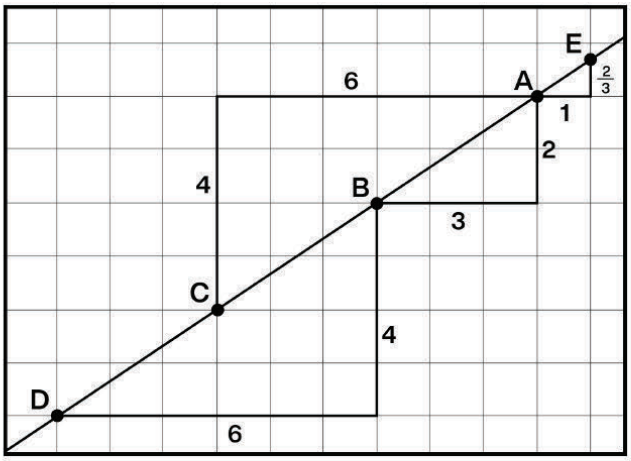
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.2, Lesson 9: Notes Name ______________________________

Learning Goal(s):

Definition	Facts/Characteristics
Slope	
Examples	Non-Examples

Here is a line drawn on a grid. There are also four right triangles.
Show how the slope is calculated using the slope triangles between each pair of points:



Points A and B:	
Points D and B:	
Points A and C:	
Points A and E:	

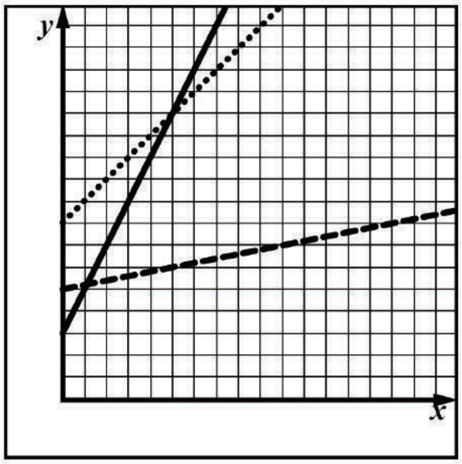
Summary Question
What do all of the right triangles drawn along the same line have in common?

Unit 8.2, Lesson 9: Practice Problems Name ______________________________

1. Here are three lines.

   Their slopes are 1, 2, and $\frac{1}{5}$.

   Label each line with its slope.

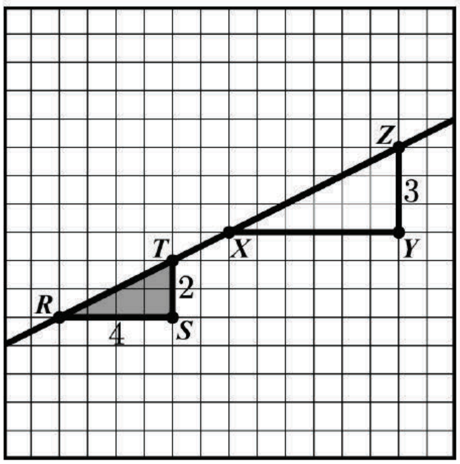


Here are two right triangles.

The longest side of each triangle is on the line.

2.1 How long is segment XY?

2.2 Explain how you know the triangles are similar.



2.3 What is the slope of the line?

Explain your thinking.

Unit 8.2, Lesson 9: Practice Problems

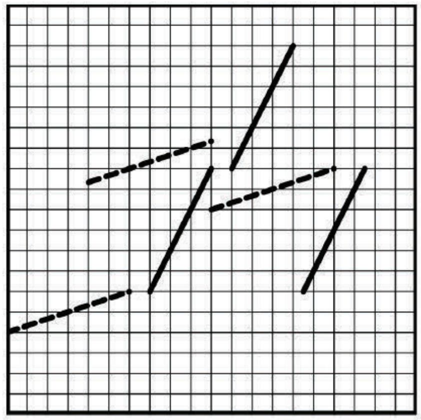
3. The slope of all of the solid lines are the same.

   The slope of all of the dashed lines are the same.

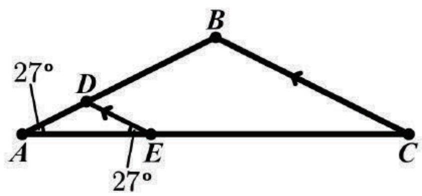
   What is the slope of each?

   Slope of solid lines: ________

   Slope of dashed lines: ________



4. In this figure, line BC is parallel to line DE. Explain why triangle ABC is similar to triangle ADE.



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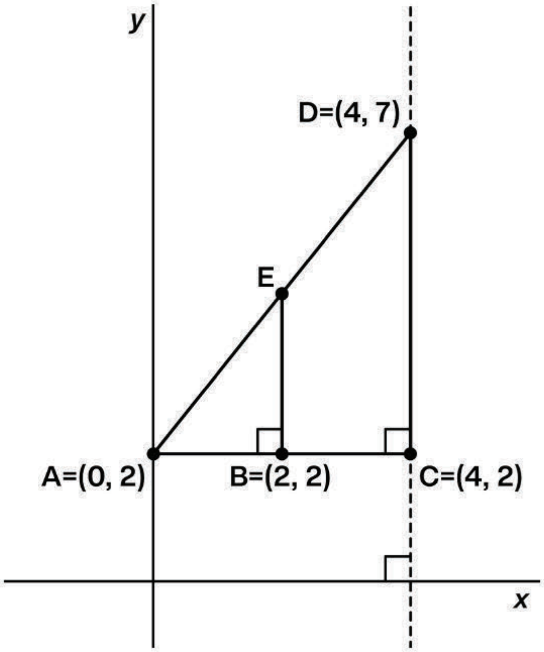
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.2, Lesson 10: Notes Name ___________________________

Learning Goal(s):

We can use what we know about slope to decide if a point lies on a line.
Here is a line with a few points labeled.



What are the coordinates of point E?

Is the point $(20,\ 25)$ also on this line?

Summary Question
How can you use two points to decide if a third point is on the same line?

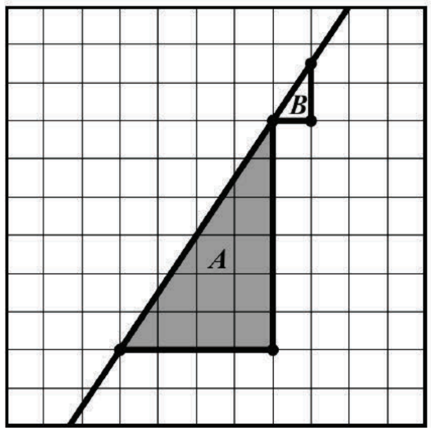
Unit 8.2, Lesson 10: Practice Problems Name ______________________________

1. Sydney says the slope of this line is $\frac{6}{4}$.

   Deja says, “No, the slope of this line is 1.5.”

   Who is correct?

   Explain your thinking.

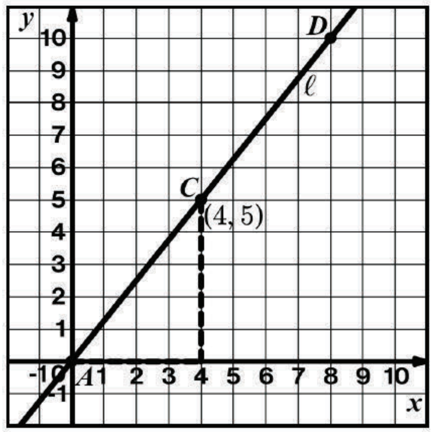


Line l is shown in the coordinate plane.

2.1 What are the coordinates of D?

2.2 Is the point $(16, 20)$ on line l?

Explain your thinking.



2.3 Is the point $(20, 24)$ on line l?

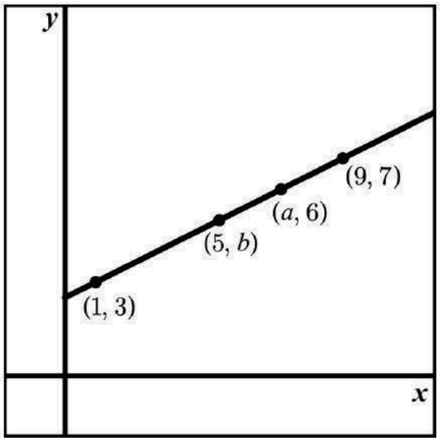
Explain your thinking.

2.4 Is the point $(80, 100)$ on line l?

Explain your thinking.

Unit 8.2, Lesson 10: Practice Problems

All of the points in the graph are on the same line.



3.1 What is the slope of the line? Explain your thinking.

3.2 What are the values for a and b?

$a =$______ $b =$______

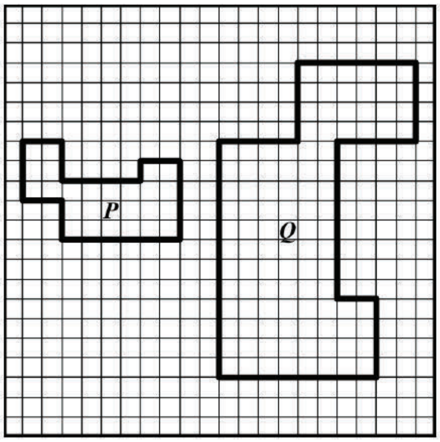
Explain your thinking.

3.3 What is the x-value when $y = 0$?

Explain your thinking.

4. Here are two similar polygons.

Describe a sequence of dilations, translations, rotations, and reflections that takes polygon P to polygon Q.



GRADE 8

Unit 3
Student Lessons

Student lessons from Unit 3 are included here to provide NYC reviewers with access to the specific lessons in Amplify Desmos Math New York that demonstrate coverage of the **Expressions, Equations, and Inequalities** domain.

These lessons are partially designed and will be updated to match the exemplar Student Edition lessons included earlier in this sampler.

Grade 8 Unit 3

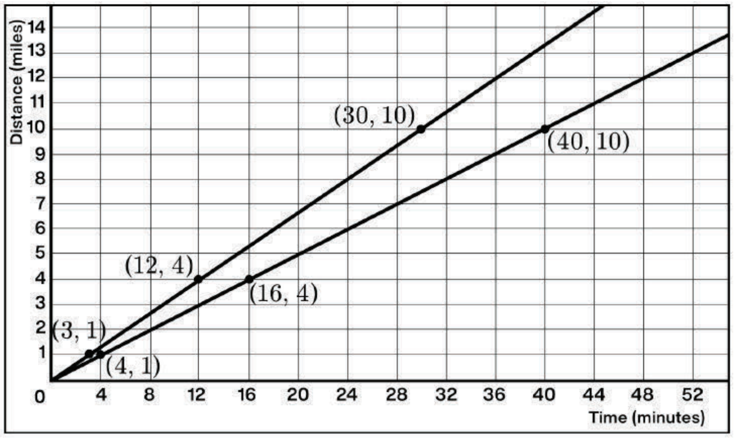
Student Edition Sampler

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.3, Lesson 1: Notes Name ___________________________________

Learning Goal(s):

Here are the graphs showing Jasmine and Sothy's distance on a long bike ride. Jasmine rides 4 miles every 16 minutes, and Sothy rides 4 miles every 12 minutes.



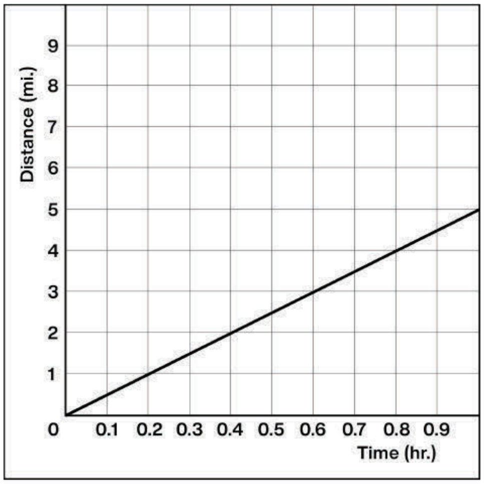
Which graph goes with which rider?	Who rides faster?
Jasmine and Sothy start a bike trip at the same time. How far have they traveled after 24 minutes?	How long will it take each of them to reach the end of the 12-mile bike path?

Summary Question
How can you graph a proportional relationship from a story?

Unit 8.3, Lesson 1: Practice Problems Name ________________________________

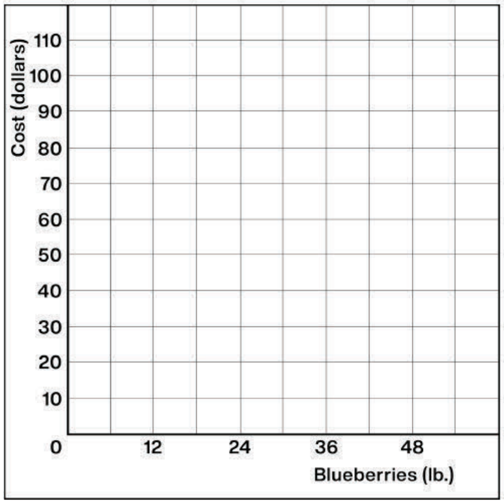
1. Shanice jogs at a constant speed. The relationship between her distance and time is shown on the graph.

   Bao bikes at a constant speed twice as fast as Shanice. On the same axes, sketch a graph showing the relationship between Bao's distance and time.



2. A pick-your-own blueberry farm offers 6 pounds of blueberries for $\$14$.

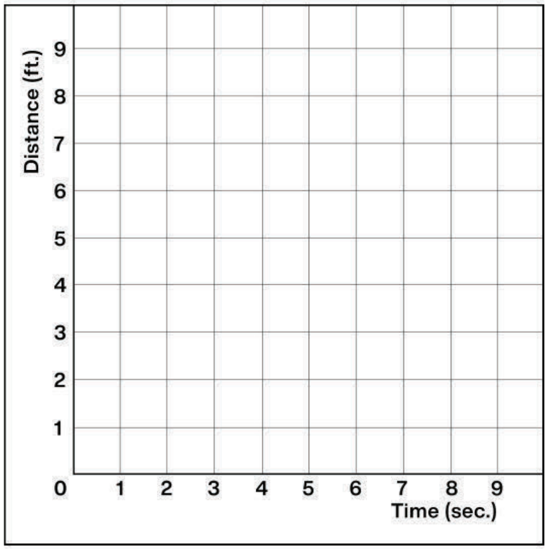
   Sketch a graph of the relationship between cost and pounds of blueberries.



Two people begin walking from the same location. One person walks at a speed of 1 foot per second. The second person walks three times as fast.

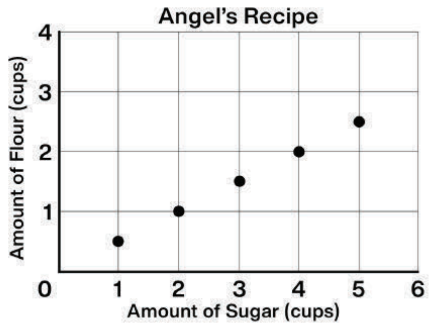
3.1 Sketch the relationship between distance and time for each person.

3.2 Explain how you drew the line to represent the faster walker.



Unit 8.3, Lesson 1: Practice Problems

The graph shows the relationship between the number of cups of flour and the number of cups of sugar in Angel's brownie recipe. The table shows the same relationship for Jaleel's brownie recipe.



Jaleel's Recipe

Amount of Sugar (cups)	Amount of Flour (cups)
$1\frac{1}{2}$	1
3	2
$4\frac{1}{2}$	3

4.1 Jaleel and Angel buy a 12-cup bag of sugar and divide it evenly to make their recipes. If they each use **all** of their sugar, how much **flour** do they each need?

4.2 Jaleel and Angel buy a 20-cup bag of sugar and divide it evenly to make their recipes. If they each use **all** of their sugar, how much **flour** do they each need?

5. Consider the following dialogue:
   - Brianna said, "I found two figures that are congruent, so they can't be similar."
   - Ishaan said, "No, they are similar! The scale factor is 1."

   Who is correct? Explain your thinking.

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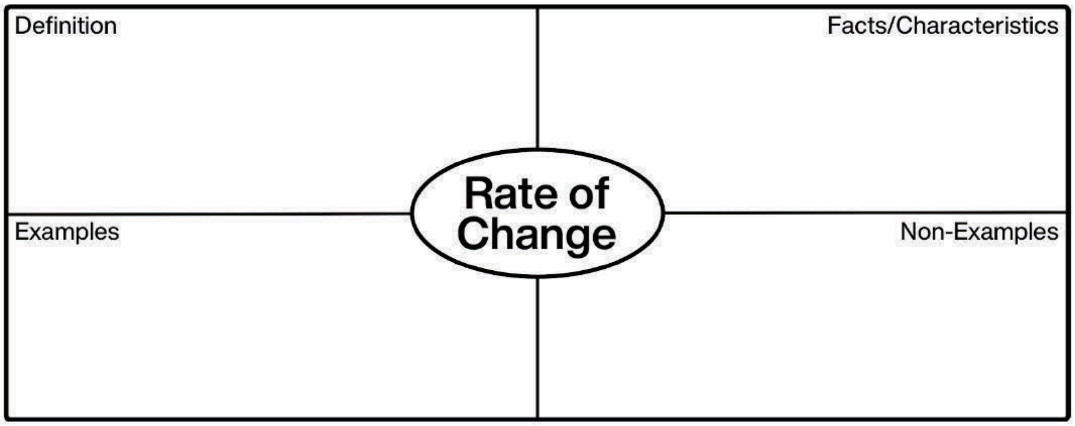
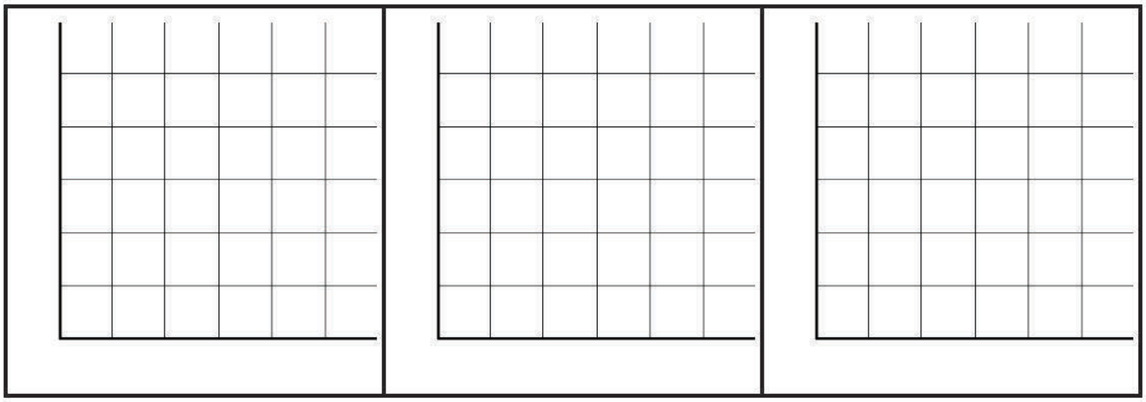
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.3, Lesson 2: Notes Name ___________________________________

Learning Goal(s):



Sketch the graph of the proportional relationship $y = 3x$ by scaling the axes three different ways.



Summary Question

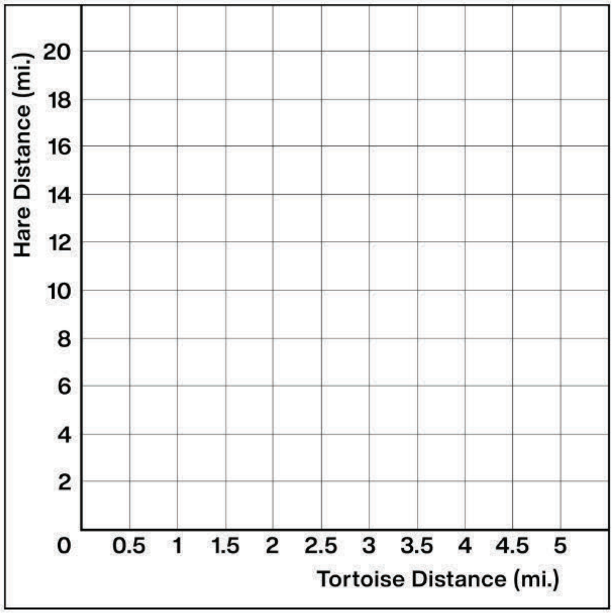
How can you tell when two graphs have the same proportional relationship?

Unit 8.3, Lesson 2: Practice Problems Name ______________________________

1. The tortoise and the hare are having a race.

   The equation $y = 4x$ represents the relationship between the tortoise's distance, x, and the hare's distance, y. Both distances are measured in miles.

   Sketch a graph showing the relationship between the hare's distance and the tortoise's distance.



The table shows a proportional relationship between the distance walked and the calories burned recorded on a fitness tracker.

2.1 Complete the table.

Distance (miles)	Energy (calories)
5	375
12	
	675
1	

2.2 Describe the scales you could use on the x- and y-axes of a coordinate grid that would show all the distances and energies in the table.

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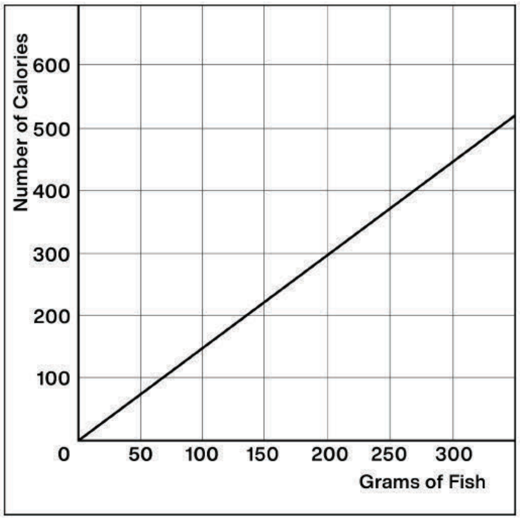
Unit 8.3, Lesson 2: Practice Problems

Here is a graph of the proportional relationship between the amount of fish (in grams) and the number of calories consumed.



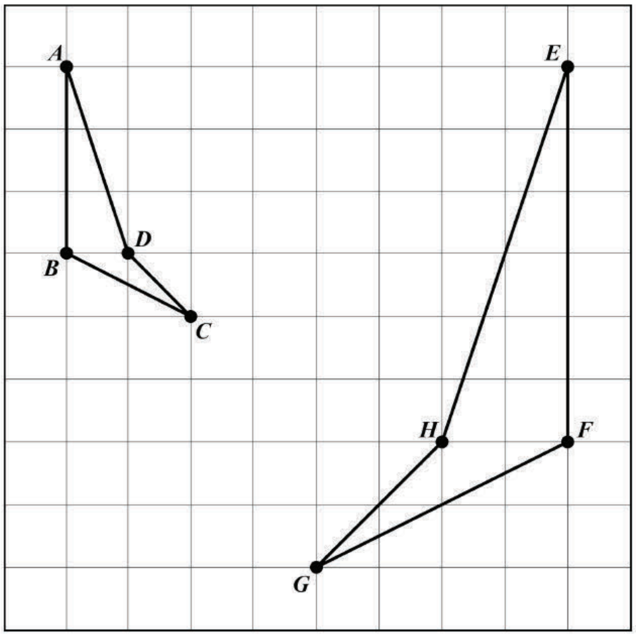
3.1 Create an equation to represent this relationship, where x is the amount of fish in grams and y is the number of calories consumed.

3.2 Use your equation to complete the table.

Grams of Fish	Number of Calories
220	
	1500
1	

4. Describe a sequence of rotations, reflections, translations, and dilations to show that one figure is similar to the other.

Be specific: Give the amount and direction of translation, the line of reflection, the center and angle of rotation, and the center and scale factor of dilation.



This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.3, Lesson 3: Notes Name ______________________________

Learning Goal(s):

When two proportional relationships are represented in different ways, we compare them by finding a common piece of information.

Terrance's earnings are represented by the equation $y = 14.5x$, where y is the amount of money he earns, in dollars, for working x hours.

The table shows some information about Jaylin's pay.

Time Worked (hours)	Earnings (dollars)
7	92.75
4.5	59.63
37	490.25

How much does Terrance get paid per hour?

How much does Jaylin get paid per hour?

After 20 hours, how much more does the person who gets paid a higher rate have?

Summary Question

How can you determine the rate of change of a proportional relationship from . . .

. . . a table? . . . a graph? . . . an equation?

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Unit 8.3, Lesson 3: Practice Problems Name ______________________________

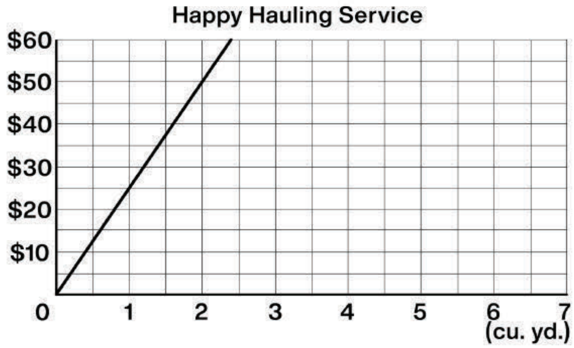
1. Javier and Ebony track the number of steps they walk. Javier records a walk of $6,000$ steps in 50 minutes. Ebony describes her step rate with the equation $y = 118x$, where y is the number of steps and x is the number of minutes she walks.

   This week, Javier and Ebony each walk a total of 5 hours. Who walks more steps?

   How many more steps do they walk?

A contractor must haul a large amount of dirt to a work site. She collected cost information from two companies.

2.1 Calculate the rate of change for Happy Hauling Service.



2.2 Calculate the rate of change for EZ Excavation.

EZ Excavation

Dirt (cu. yd.)	Cost (dollars)
8	196
20	490
26	637

2.3 If the contractor has 40 cubic yards of dirt to haul and only cares about price, which hauling company should she hire? Explain your thinking.

Unit 8.3, Lesson 3: Practice Problems

Students are selling raffle tickets for a school fundraiser. They collect $\$24$ for every 10 raffle tickets they sell. Suppose M is the amount of money the students collect for selling R raffle tickets.

3.1 Complete the table below.

Tickets Sold, R	Money Collected, M (dollars)
10	
20	
300	
...	...
1000	

3.2 Describe the scales you could use on the x- and y-axis of a coordinate grid that would show all the tickets sold and the money collected in the table.

3.3 Write an equation that reflects the relationship between M and R.

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This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

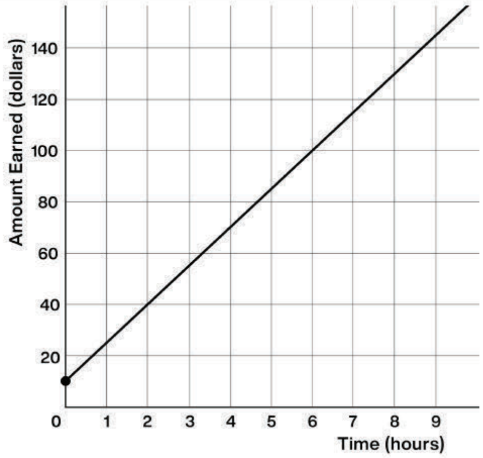
Unit 8.3, Lesson 4: Notes Name ______________________________

Learning Goal(s):

Definition	Facts/Characteristics
Examples	Non-Examples

Linear Relationship

Aniyah starts babysitting. She charges $\$10$ for traveling to and from the job, and $\$15$ per hour. Here is a graph of Aniyah's earnings based on how long she works.



Show how to figure out the rate of change using the graph.

Summary Question

How can you find the rate of change of a linear relationship?

Unit 8.3, Lesson 4: Practice Problems Name ______________________________

1. A restaurant offers delivery for their pizzas and includes the delivery fee in the total price of the pizzas. One customer pays $\$25$ to have 2 pizzas delivered. Another customer pays $\$58$ for 5 pizzas.

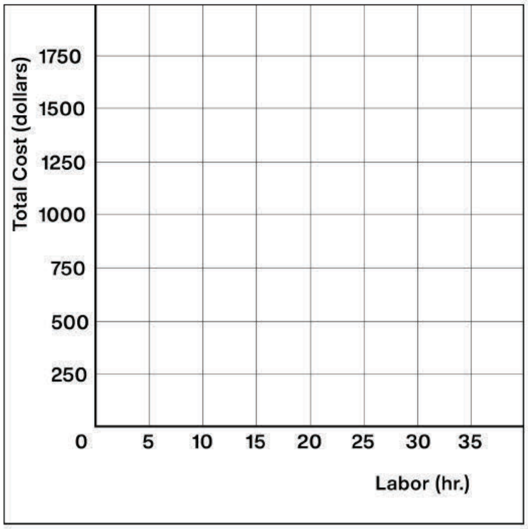
   How many pizzas are delivered to a customer who pays $\$80$?

To paint a house, a painting company charges a flat rate of $\$500$ for supplies plus $\$50$ for each hour of labor.

2.1 How much would the painting company charge to paint a house that needs 20 hours of labor? 50 hours of labor? Write your answers in the table.

Labor (hours)	Cost (dollars)
20	
50	

2.2 Sketch a line representing the relationship between the number of hours of labor needed to paint the house and the total cost of paint.



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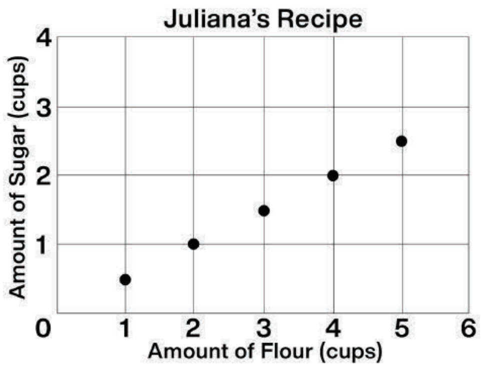
Unit 8.3, Lesson 4: Practice Problems

2.3 Plot a point to show the cost of 20 hours of labor.

2.4 What is the slope of the line?

The graph shows the relationship between the number of cups of flour and the number of cups of sugar in Juliana's brownie recipe. The table shows the same relationship for Emiliano's recipe.



Emiliano's Recipe

Amount of Flour (cups)	Amount of Sugar (cups)
$1\frac{1}{2}$	1
3	2
$4\frac{1}{2}$	3

3.1 If you have 6 cups of flour for each recipe, how much sugar would you need to make Juliana's and Emiliano's brownies?

Write your answers in the table.

Recipe	Amount of Sugar (cups)
Juliana	
Emiliano	

3.2 What are the slopes of the lines representing Juliana's and Emiliano's recipes? Let x represent the number of cups of flour and y represent the number of cups of sugar.

Write your answers in the table.

Recipe	Slope
Juliana	
Emiliano	

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.3, Lesson 5: Notes Name ________________________________

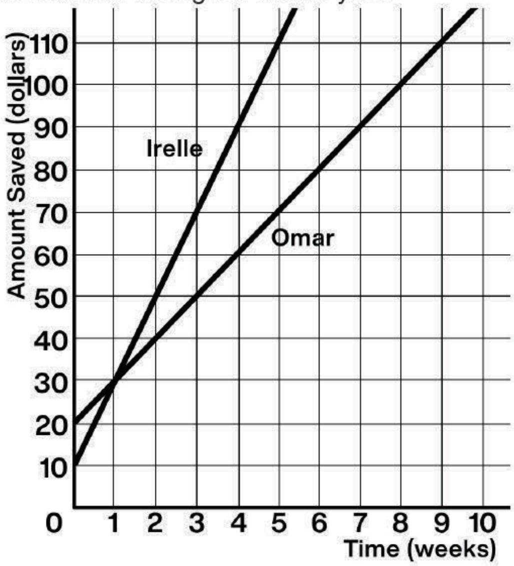
Learning Goal(s):

Definition	Facts/Characteristics
Examples	**Non-Examples**

Vertical Intercept

Omar and Irelle decide to save some of the money they earn to use during the school year.

Here are graphs of how much money they will save after 10 weeks if they each follow their plans.



How much money does Omar have to start?	How much money does Irelle have to start?
How much money does Omar plan to save per week?	How much money does Irelle plan to save per week?

Summary Question
How can you find the vertical intercept and the slope from a graph?

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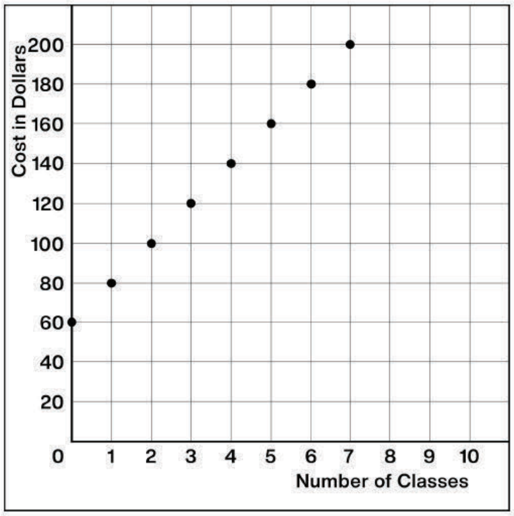
Unit 8.3, Lesson 5: Practice Problems Name ________________________________

Customers at a gym pay a membership fee to join and then a fee for each class they attend. Here is a graph that represents the scenario.

1.1 What is the slope of the line?

1.2 Write the equation of the line that passes through these points.



Explain what the slope and y-intercept mean in each situation.

2.1 Amara is graphing the relationship between the amount of money, y, in a cash box after x tickets are purchased for carnival games. The slope of the line is $\frac{1}{4}$ and the y-intercept is 8.

- The slope means . . .
- The y-intercept means . . .

2.2 Kayleen is graphing the relationship between the cost in dollars of a muffin delivery, y, and the number of muffins ordered, x. The slope of the line is 2 and the y-intercept is 3.

- The slope means . . .
- The y-intercept means . . .

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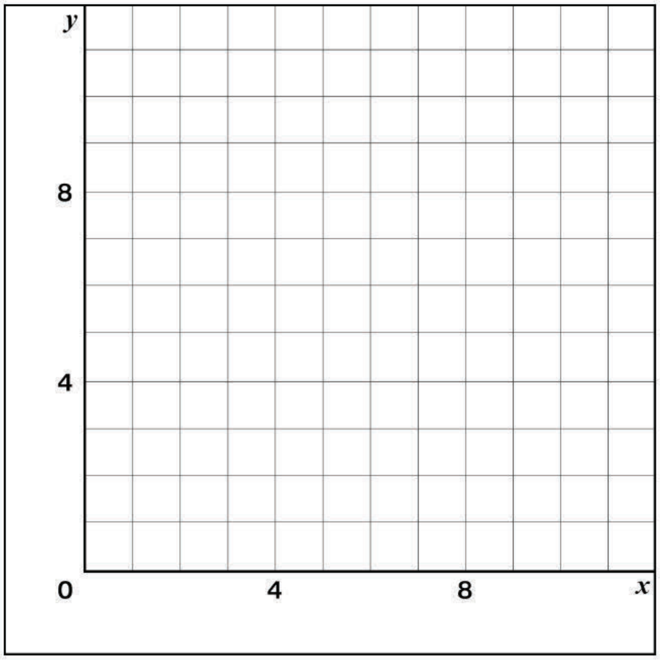
Unit 8.3, Lesson 5: Practice Problems

3. Create a graph that shows three linear relationships with different y-intercepts using the following slopes, and write an equation for each line.

Slope	Equation
$\frac{1}{5}$	
$\frac{3}{5}$	
$\frac{6}{5}$	



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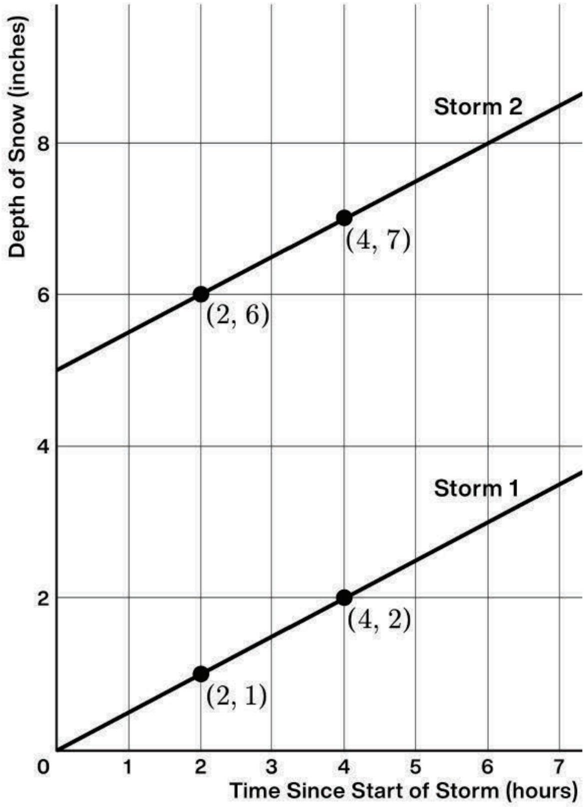
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.3, Lesson 6: Notes Name ___________________________________

Learning Goal(s):

Snow fell at the same rate for two separate snow storms. During the storms, Raven measured the depth of snow on the ground for each hour.



The depth of snow on the ground for Storm 1 is a ____________________ relationship because there were 0 inches of snow on the ground at the start of the storm.

What is the equation representing Storm 1?

The depth of snow on the ground for Storm 2 is a ____________________ relationship because there were 5 inches of snow on the ground at the start of the storm.

What is the equation representing Storm 2?

Summary Question

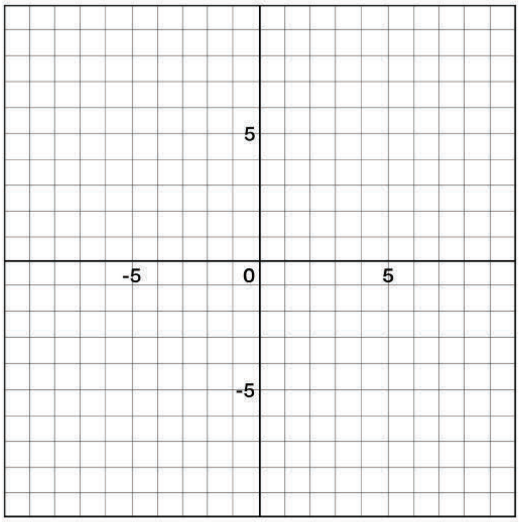
How do you use a graph to write the equation of a line using $y = mx + b$?

Unit 8.3, Lesson 6: Practice Problems Name ______________________________

1. Select **all** of the equations that would produce graphs with the same y-intercept.

   - ☐ $y = 3x - 8$
   - ☐ $y = 3x - 9$
   - ☐ $y = 3x + 8$
   - ☐ $y = 5x - 8$
   - ☐ $y = 2x - 8$
   - ☐ $y = \frac{1}{3}x - 8$

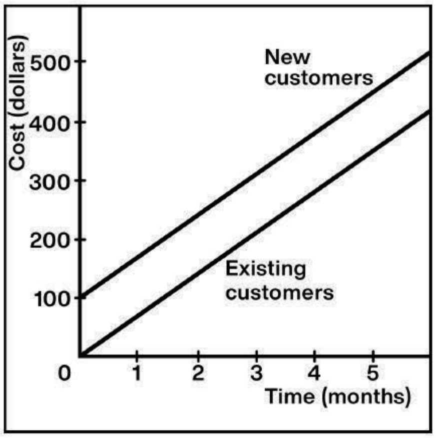
2. Sketch the lines $y = \frac{1}{4}x$ and $y = \frac{1}{4}x - 5$ on the same set of axes.



Is one a translation of the other? Explain your thinking.

Unit 8.3, Lesson 6: Practice Problems

A cable company charges its existing customers $\$70$ per month for cable service.

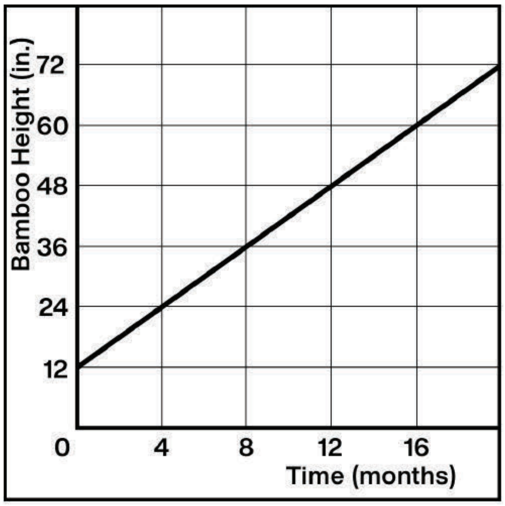


3.1 Write a linear equation representing the relationship between the number of months of service, x, and the total amount paid in dollars by an existing customer, y.

3.2 For new customers, there is an additional one-time service fee of $\$100$. Write a linear equation representing the relationship between the number of months of service, x, and the total amount paid in dollars by a **new** customer, y.

3.3 Describe a transformation that takes the line for the existing customers onto the line for the new customers.

This graph shows the height in inches, h, of a bamboo plant t months after it has been planted.



4.1 Write an equation that describes the relationship between t and h.

4.2 After how many months will the bamboo plant be 66 inches tall?

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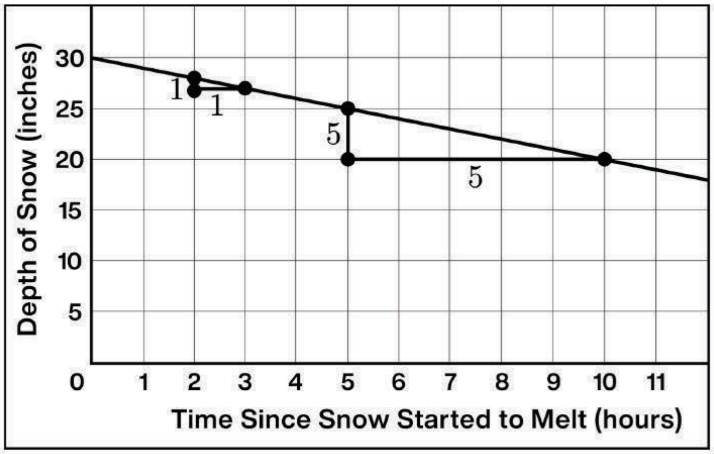
Unit 8.3, Lesson 7: Notes Name ______________________________

Learning Goal(s):

The snow on the ground was 30 inches deep. On a warm day, the snow began to melt. The graph shows the relationship between the time since the snow started to melt and the depth of the snow.



The slope of this graph is ________ since the rate of change is ______ inches of snow per ________ .

This means that the depth of snow __________________________ at a rate of _____ inch per hour.

The vertical intercept is ______________.

This means that the snow was _____ inches deep when the time since snow started to melt was ______ hours.

Summary Task
Give an example of a different situation that would have a negative slope when graphed. Explain how you know the slope would be negative.

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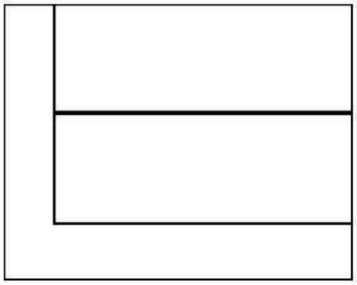
Unit 8.3, Lesson 7: Practice Problems Name ____________________________________

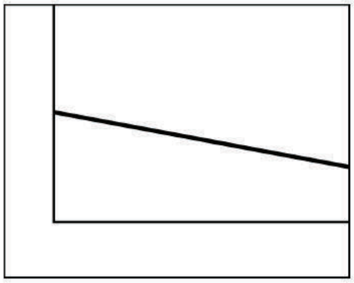
1. Draw a line to match each scenario with its graph. Then say whether the slope is positive, negative, or zero.

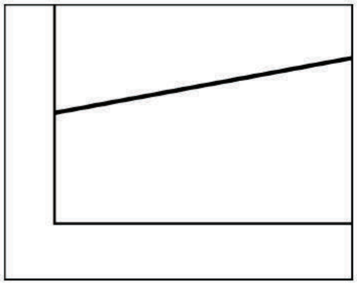
A. The car is speeding up at a rate of 5 miles per minute.

B. The car is maintaining a constant speed of 30 miles per hour.

C. The car is slowing down at a rate of 10 miles per minute.





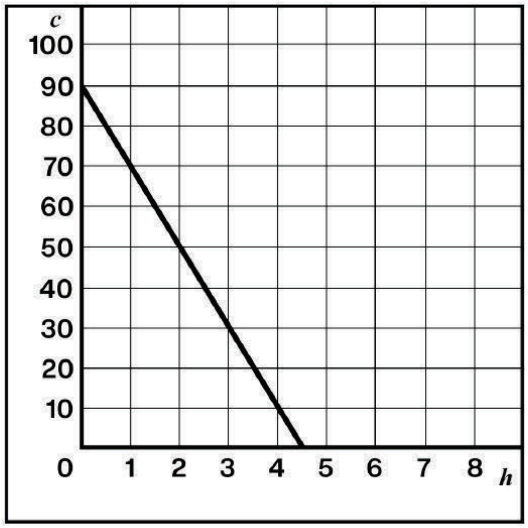


I monitor the amount of battery left on my computer so I can make sure it doesn't die at the wrong time. My battery loses charge at a constant rate. This graph shows the percent of charge left on my computer, c, after I have been awake for h hours.

2.1 What was the percent charge when I woke up?

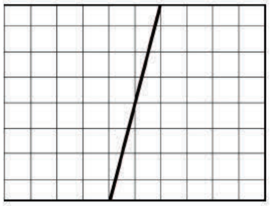
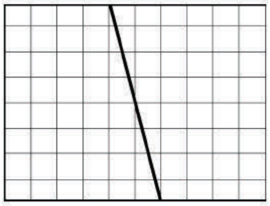
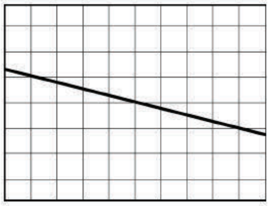
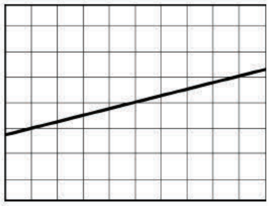
2.2 Write an equation that describes the relationship between c and h.

2.3 How many hours will I have been awake when my computer has no charge left?



Unit 8.3, Lesson 7: Practice Problems

3. Draw a line to match each line with its slope. (A square grid represents 1 unit on each side).

$\frac{1}{4}$ | 4 | $-\frac{1}{4}$ | -4

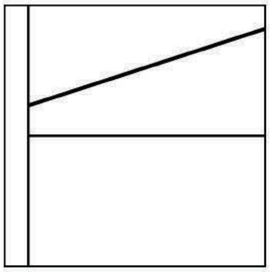
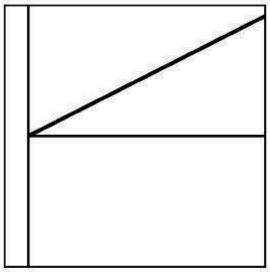
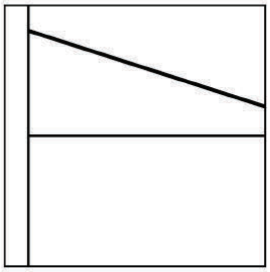
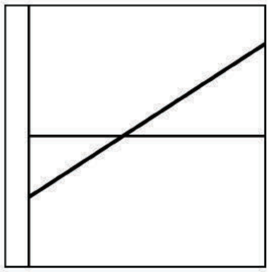
4. Draw a line to match each scenario to its graph.

A. y is the weight of a kitten x days after birth.

B. y is the temperature in °C. x is the temperature in °F.

C. y is the distance left to go in a car ride after x hours of driving at a constant rate towards its destination.

D. y is the amount of calories consumed eating x crackers.

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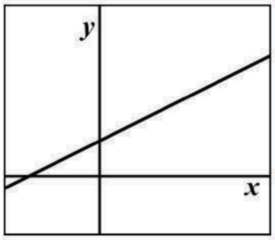
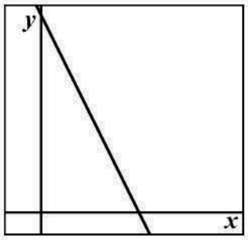
Unit 8.3, Lesson 8: Notes Name ______________________________

Learning Goal(s):

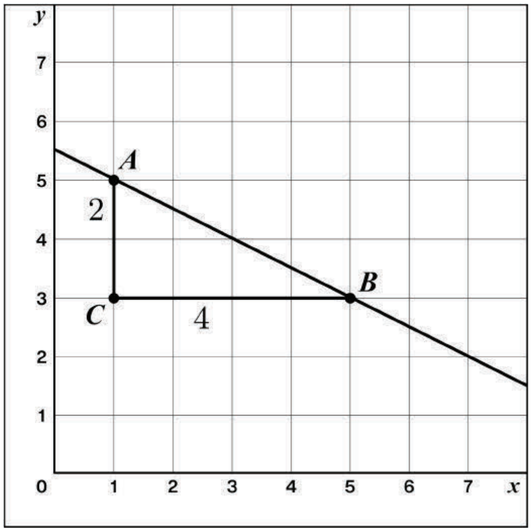
From left to right, if the graph increases, then the slope is _______________ .



From left to right, if the graph decreases, then the slope is _______________ .



Now we know two different ways to find the slope of a line:



1. We learned earlier that one way to find the slope of a line is by drawing a slope triangle.

Using the slope triangle shown here, the slope of the line is:

2. We can also compute the slope of this line using two points.

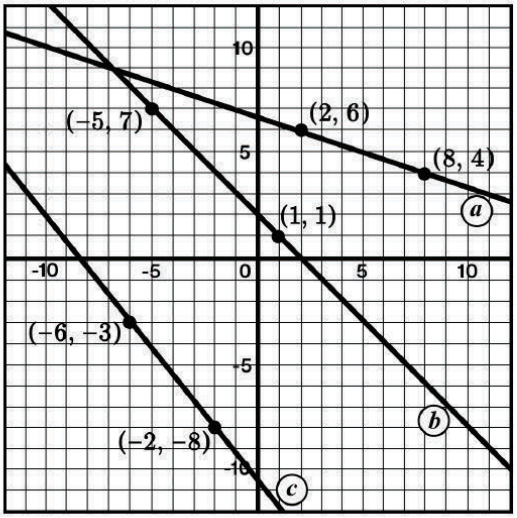
Using the points $A = (1, 5)$ and $B = (5, 3)$, the slope of the line is:

Summary Question

How can you calculate slope using two points on a line?

Unit 8.3, Lesson 8: Practice Problems Name ____________________________________

1. Calculate the slope of each line.



Line	Slope
a	
b	
c	

2. Which pairs of points have lines passing through them with a slope of $\frac{2}{3}$?

- ☐ $(0, 0)$ and $(2, 3)$
- ☐ $(0, 0)$ and $(3, 2)$
- ☐ $(1, 5)$ and $(4, 2)$
- ☐ $(-2, -2)$ and $(4, 2)$
- ☐ $(20, 30)$ and $(-20, -30)$

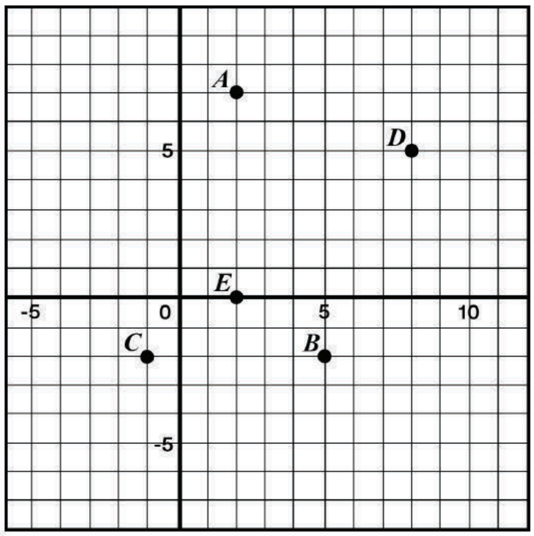
Draw a line with the given slope through the given point.

3.1 Through point A with a slope of -3.

Which other point lies on that line?

3.2 Through point A with slope of $-\frac{1}{3}$.

Which other point lies on that line?



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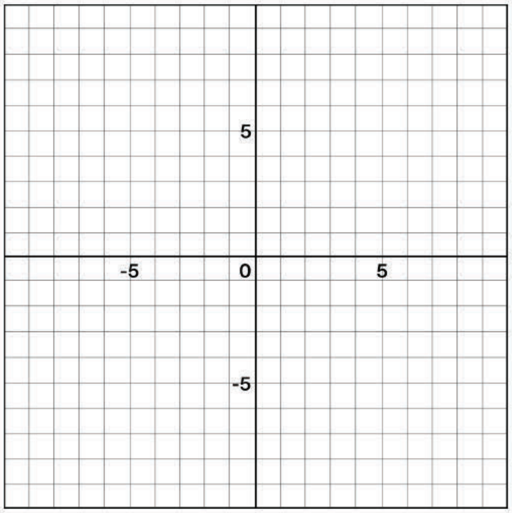
Unit 8.3, Lesson 8: Practice Problems

4. Write a letter in each box to match each pair of points to the slope of the line that joins them.

A. -3		$(5,\ -6)$ and $(2,\ 3)$
B. 4		$(-8,\ -11)$ and $(-1,\ -5)$
C. $\frac{6}{7}$		$(9,\ 10)$ and $(7,\ 2)$
D. $-\frac{5}{2}$		$(6,\ 3)$ and $(5,\ -1)$
		$(4,\ 7)$ and $(6,\ 2)$

5.1 Draw a line with a slope of 4 and a negative y-intercept.



5.2 Show how you know the slope is 4.

5.3 Write an equation for the line.

Digital Lesson

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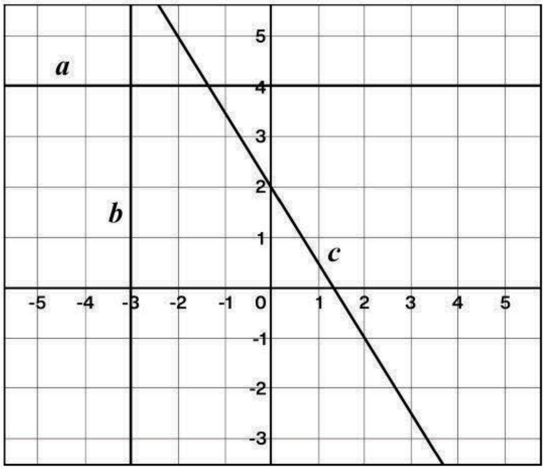
Unit 8.3, Lesson 9: Notes Name ____________________

Learning Goal(s):



Here are three lines on a coordinate grid.

Write an equation for each line.

Line	Equation
a	
b	
c	

	Description	Graph	Slope	Equation
Horizontal Lines				
Vertical Lines				

Summary Question

Write an example of an equation for a . . .

. . . horizontal line.

. . . vertical line.

. . . line with a negative slope.

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Unit 8.3, Lesson 9: Practice Problems Name ___________________________

1.1 Suppose you wanted to graph the equation $y =- 4x - 1$. Describe the steps you would take to draw the graph.

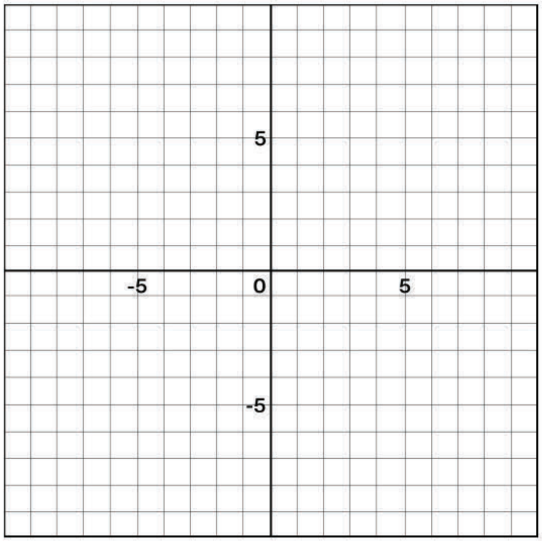
1.2 How would you check that the graph you drew is correct?

Graph the following lines and then write an equation for each:

2.1 A line with a slope of 0 and a y-intercept of 5.

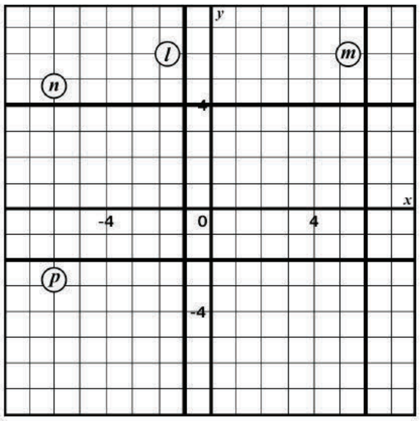
2.2 A line with a slope of 2 and a y-intercept of -1.

2.3 A line with a slope of $-\frac{1}{2}$ and a y-intercept of 1.



3. Write an equation for each line.

Line	Equation
l	
m	
n	
p	



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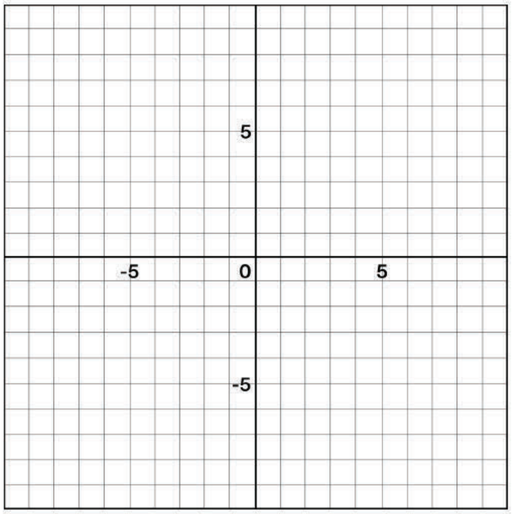
Unit 8.3, Lesson 9: Practice Problems

4. Write an equation for a line that passes through $(2,\ 5)$ and $(6,\ 7)$.



A publisher wants to know the thickness of a new book. The book has a front cover and a back cover, each with a thickness of $\frac{1}{4}$ of an inch. The paper has a thickness of $\frac{1}{4}$ inch per 100 pages.

5.1 Write an equation that represents the total width of the book, y, for every 100 pages of paper, x.

5.2 The publisher chooses to have front and back covers with a thickness of $\frac{1}{3}$ of an inch instead. Write an equation that represents the **new** total width of the book, y, for every 100 pages of paper, x.

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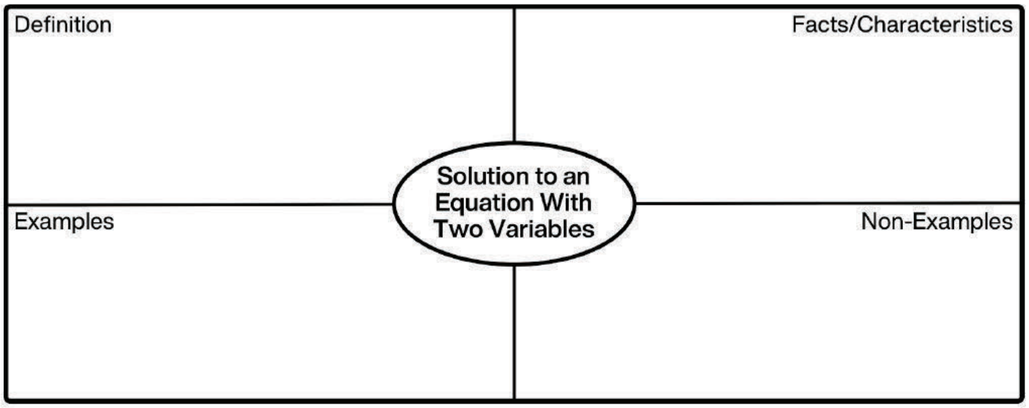
Unit 8.3, Lesson 10: Notes Name ______________________________

Learning Goal(s):



Here are some facts about solutions in two variables:

1. A solution to a linear equation is a pair of values that makes the equation ________ .
2. Solutions can be found by ______________________ a value for one of the variables and solving the equation for the other.
3. The set of all the solutions to a linear equation can be shown in the coordinate plane and is called the _________________ of the equation.
4. The graph of a linear equation is ___________________ .
5. Any points in the coordinate plane that **do not** lie on the graph of the linear equation are _________________________ to the equation.
6. The number of solutions might be limited in a real-world situation even though the equation has ________________________ solutions.

Summary Question
How can you find solutions to linear equations? How do you know when you've found a solution?

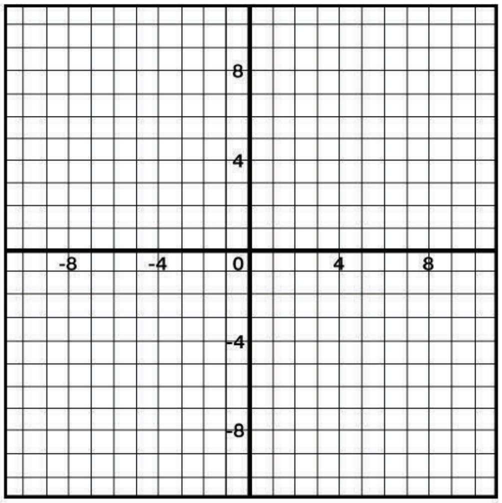
Unit 8.3, Lesson 10: Practice Problems Name ______________________

1. Select all of the ordered pairs (x, y) that are solutions to the linear equation $2x + 3y = 6$.

   - ☐ $(0, 2)$
   - ☐ $(0, 6)$
   - ☐ $(2, 3)$
   - ☐ $(3, -2)$
   - ☐ $(3, 0)$
   - ☐ $(6, -2)$

2. The graph of a linear equation passes through the points $(-4, 1)$ and $(4, 6)$. Which of these points are also solutions to this equation? Use the graph it helps you with your thinking.

   - ☐ $(0, 3.5)$
   - ☐ $(12, 11)$
   - ☐ $(8, 5)$
   - ☐ $(-6, 0)$



3. Here is a linear equation: $y = \frac{1}{4}x + \frac{5}{4}$.

   Are $(1, 1.5)$ and $(12, 4)$ solutions to the equation?

   Explain how you know.

4. Here is a linear equation: $y = \frac{1}{4}x + 2$.

   What is the x-intercept of the graph of the equation? Explain your thinking.

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Unit 8.3, Lesson 10: Practice Problems

5. Write a letter in each box to match the equation with its three solutions.

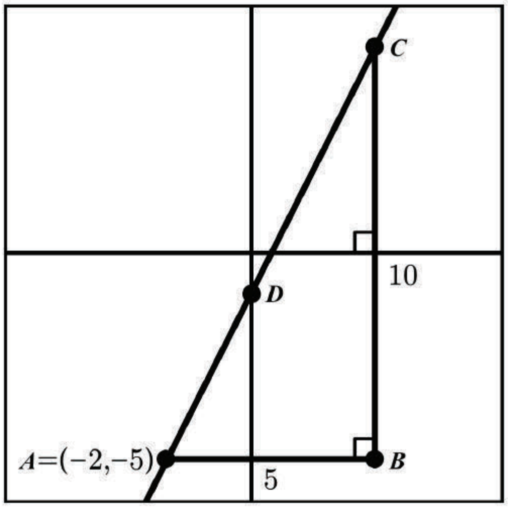
A. $2x + 3y = 7$		$(-3, -7), (0, -4), (-1, -5)$
B. $3x = \frac{y}{2}$		$(3\frac{1}{2}, 0), (-1, 3), (0, 2\frac{1}{3})$
C. $x - y = 4$		$(14, 21), (2, 3), (8, 12)$
D. $y = -x + 1$		$(0.5, 3), (1, 6), (1.2, 7.2)$
E. $y = 1.5x$		$(\frac{1}{2}, \frac{1}{2}), (\frac{1}{4}, \frac{3}{4}), (\frac{1}{8}, \frac{7}{8})$

6. A sandwich store charges a delivery fee to bring lunch to an office building. One office pays $\$33$ for 4 turkey sandwiches. Another office pays $\$61$ for 8 turkey sandwiches.

How much does each turkey sandwich cost (not including the cost of delivery)?

7. We know that $AB = 5$ and $BC = 10$.

Find the coordinate of B, C, and D.



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Unit 8.3, Lesson 11: Notes Name ______________________________

Learning Goal(s):

No matter the form of a linear equation, we can always find solutions to the equation by starting with one value and then solving for the other value.

Let's think about the linear equation $2x - 4y = 12$.

Find the y-intercept by making $x = 0$.	Find the x-intercept by making $y = 0$.
Based on your work above, what are the coordinates of two points on the line $2x - 4y = 12$?	

Summary Question
Once you have identified one solution to your equation, what are some ways you can find others?

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Unit 8.3, Lesson 11: Practice Problems Name ___________________________________

The owner of a restaurant is ordering tables and chairs. She wants to have only tables for 2 and tables for 4.

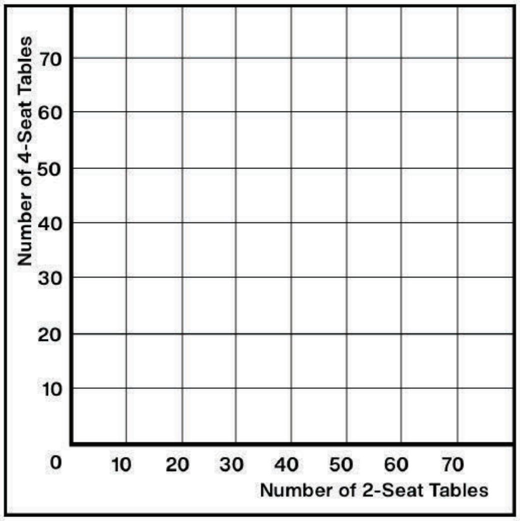
The total number of people that can be seated in the restaurant is 120.

1.1 Complete the table with possible combinations of 2-seat tables and 4-seat tables that will seat 120 customers.

Tables for 2	Tables for 4

1.2 Write an equation that represents the number of 2-seat tables, x, and the number of 4-seat tables, y, she should order.

1.3 Draw a graph of this situation.



1.4 What is the slope of the line on your graph?

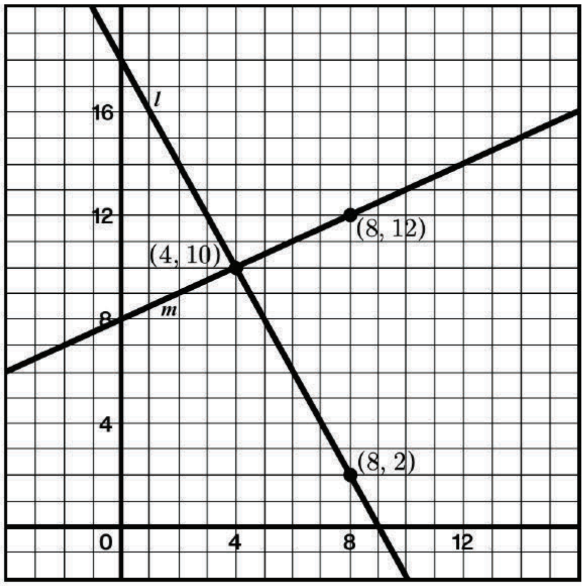
1.5 Circle the x- and y-intercepts on your graph. Interpret the meaning of each intercept.

Unit 8.3, Lesson 11: Practice Problems

2. For which of the following equations is $(-6, -1)$ a solution?

- ☐ $y = 4x + 23$
- ☐ $3x = \frac{1}{2}y$
- ☐ $2x - 13y = 1$
- ☐ $3y = \frac{1}{2}x$
- ☐ $2x + 6y = -6$

Consider the following graphs of linear equations.



3.1 Which of the following statements are true?

- ☐ l has a positive slope.
- ☐ m has a positive slope.
- ☐ l has a positive y - intercept.
- ☐ m has a positive y - intercept.

3.2 Calculate the slope of each line.

Line l slope:

Line m slope:

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Print Lesson

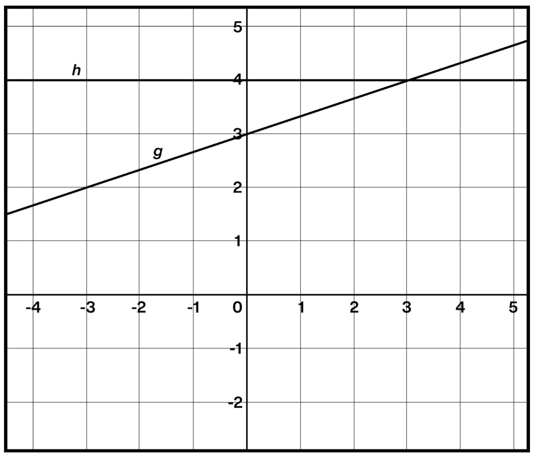
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.3, Practice Day: Cards

1. Select **all** ordered pairs that are solutions to the equation $2x + 3y = 6$.
   - ☐ $(0, 2)$
   - ☐ $(0, 6)$
   - ☐ $(2, 3)$
   - ☐ $(3, 0)$
   - ☐ $(6, -2)$

2. For which equations is $(-4, 2)$ a solution?
   - ☐ $y = -x - 2$
   - ☐ $4y = 2x + 16$
   - ☐ $y = \frac{1}{2}x$

3. Write an equation for each line.



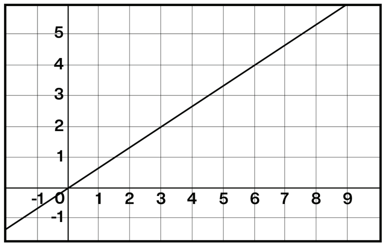
4. A restaurant offers delivery for their sandwiches. Each sandwich costs $\$8$ and there is a $\$5$ delivery fee.

   A. What is the total cost for delivering 2 sandwiches?

   B. Write an equation that relates the total cost, C, to the number of sandwiches delivered, x, representing the total cost for delivering x sandwiches.

Unit 8.3, Practice Day: Cards

5.

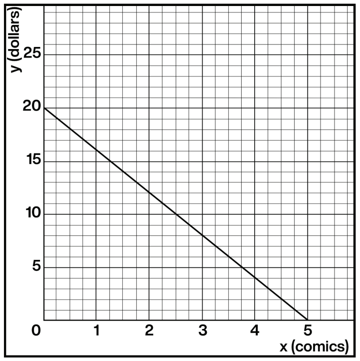


A. Draw a line that is a vertical translation of line m.

B. Write equations for both lines.

C. Which line represents a proportional relationship? Explain your thinking.

6. This graph shows a linear relationship between the number of comic books Pilar buys at the store, x, and the amount of money, in dollars, she has afterwards, y.

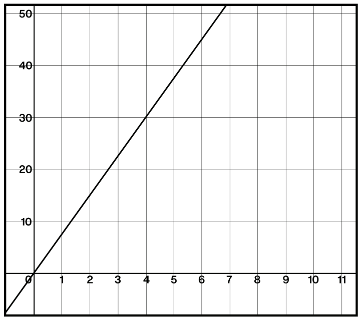


A. Write an equation for this line.

B. If Pilar buys 3 comics, how much money will she have left?

7. Two friends have summer jobs. Let x represent the number of hours worked and y represent their pay in dollars. Which friend makes the most money per hour? Explain your thinking.

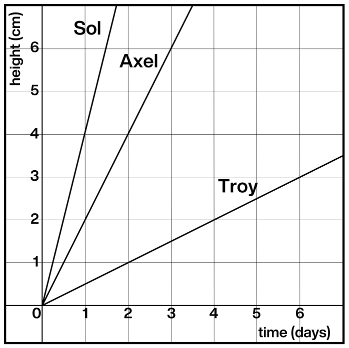
Arjun's Graph:



Kyrie's Table:

x	y
2	16.30
4	32.60
8	65.20

8. Sol, Axel, and Troy have each planted a sunflower seed. The graph below shows the height of each person's plant, in centimeters, over time.

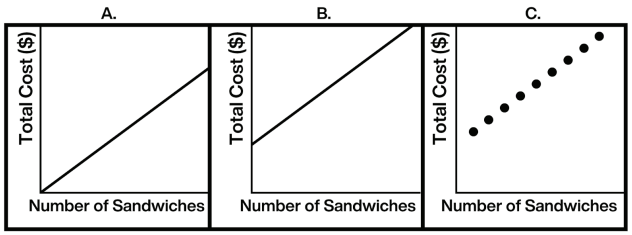


Whose plant is growing the fastest? Explain your thinking.

Unit 8.3, Practice Day: Cards

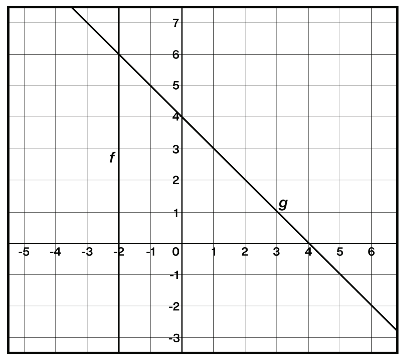
9. A restaurant offers delivery for their sandwiches. Each sandwich costs $\$8$. There is a $\$5$ delivery fee.

A. Which graph best represents the relationship between total cost and number of sandwiches?



B. Is there a proportional relationship between the total cost and the number of sandwiches? Explain your thinking.

10. Write an equation for each line.



11. At a corner store, apples cost $\$1$ and oranges cost $\$2$. Victor has $\$18$ to spend buying fruit.

# of Apples	# of Oranges
8	5
10	4
12	3

Write an equation that relates the number of apples, a, to the number of oranges, o, Victor can buy while spending exactly $\$18$.

12. Chloe wants to buy food for her friends at the concession stand at a soccer game. The stand sells drinks for $\$4$ and burgers for $\$3$. Chloe has $\$32$ to spend and wants to spend it all.

The table shows different possible combinations of drinks and burgers that Chloe could order. Complete the table based on the information above.

# of Drinks	# of Burgers
2	
	4
8	

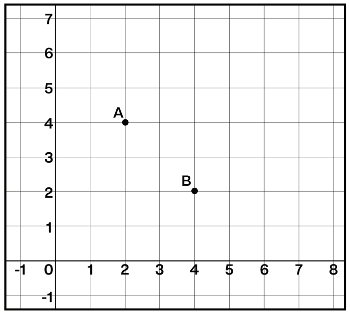
Unit 8.3, Practice Day: Cards

13.

A. Draw a line through point A with a slope of $\frac{1}{2}$.

B. Draw a line through point B that is parallel to the first line.

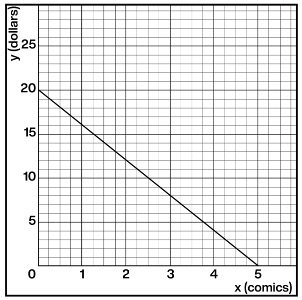
C. Write equations for both lines.



14. This graph shows a linear relationship between the number of comic books Pilar buys at the store, x, and the amount of money, in dollars, she has afterwards, y.

A. What is the slope of this line?

B. Draw a line parallel to the graphed line that goes through the point $(0, 25)$. Suppose that this line represents a different person's comic book purchases. How much money did this person start with?

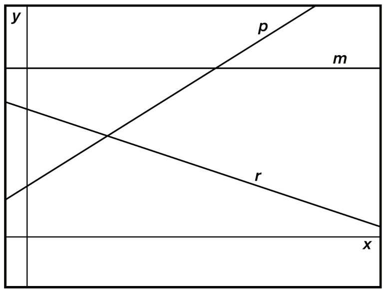


15. A container releases fuel at a rate of 5 gallons per second. If y represents the amount of fuel remaining in the container and x represents the number of seconds that have passed since the fuel started dispensing, then x and y satisfy a linear relationship.

If the tank begins with 103 gallons, how many gallons will remain after 2 seconds?

16. A container releases fuel at a rate of 5 gallons per second. y represents the amount of fuel remaining in the container and x represents the number of seconds that have passed since the fuel started dispensing.

Which line could represent this situation? Explain your thinking.



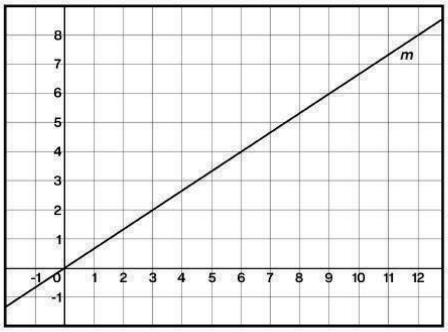
Unit 8.3, Practice Day: Worksheet Name ______________________________

Student Workspace

Workspace for Cards 1–4

Workspace for Cards 5–8

5.

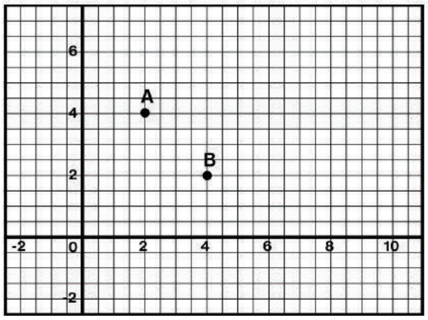


Unit 8.3, Practice Day: Worksheet Name ________________________________

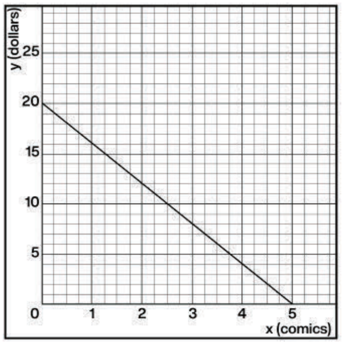
Workspace for Cards 9–12

Workspace for Cards 13–16

13.



14.



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GRADE 8

Unit 4
Student Lessons

Student lessons from Unit 4 are included here to provide NYC reviewers with access to the specific lessons in Amplify Desmos Math New York that demonstrate coverage of the **Expressions, Equations, and Inequalities** domain.

These lessons are partially designed and will be updated to match the exemplar Student Edition lessons included earlier in this sampler.

Grade 8 Unit 4

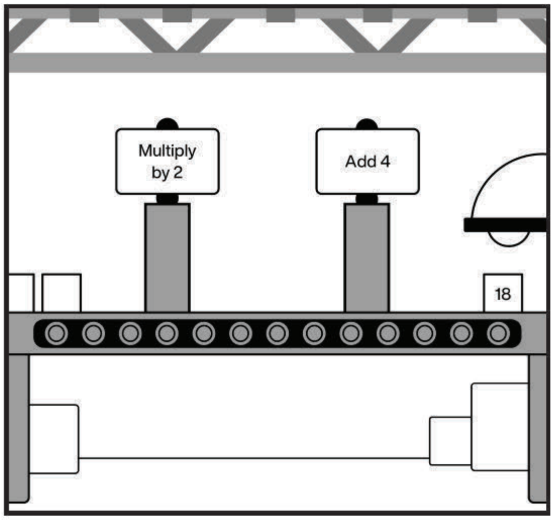
Student Edition Sampler

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 1: Notes Name ________________________________

Learning Goal(s):

Here is a number machine. We put a number into this machine and 18 came out.
There are different ways that we can determine what number went in.



1. We can work backwards one step at a time:

   If we ended with 18, then before we added 4, the number must have been _____ .

   This number was the result of multiplying by 2, so before we multiplied by 2, the number must have been _____ .

2. We can write and solve an equation:

   $$2x + 4 = 18$$

How are working backwards and solving an equation similar?

How are working backwards and solving an equation different?

Summary Question
What are some ways to find the input when you are given the output in number machine problems?

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Unit 8.4, Lesson 1: Practice Problems Name ________________________________

1. Clare asks Andre to play the following number puzzle:
   - Pick a number
   - Add 2
   - Multiply by 3
   - Subtract 7
   - Add your original number

   Andre's final result is 27. What number did he start with?

2. In a basketball game:
   - Aki scores twice as many points as Tyani.
   - Tyani scores four points fewer than Nekeisha.
   - Nekeisha scores three times as many points as Mariana.

   If Mariana scores 5 points, how many points did Aki score?

   Explain your reasoning.

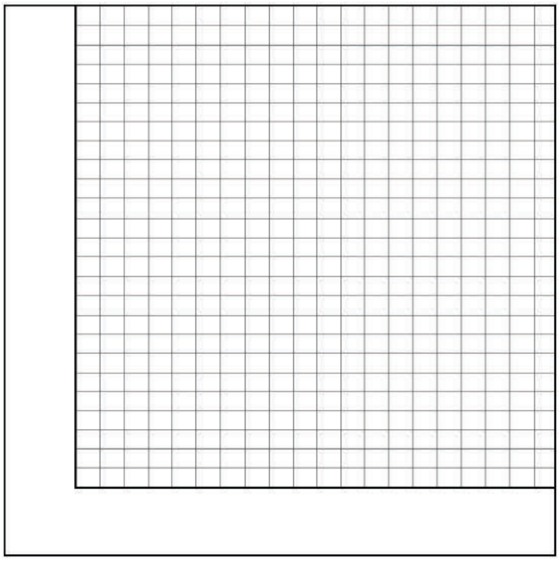
3. Select all of the given points in the coordinate plane that lie on the graph of the linear equation $4x - y = 3$.

   ☐ $(-1, -7)$
   ☐ $(0, 3)$
   ☐ $(\frac{3}{4}, 0)$
   ☐ $(1, 1)$
   ☐ $(2, 5)$
   ☐ $(4, -1)$

Unit 8.4, Lesson 1: Practice Problems

A store is designing the space for rows of nested shopping carts. Each row has a starting cart that is 4 feet long, followed by the nested carts (so 0 nested carts means there's just the starting cart). The store measured a row of 13 nested carts to be 23.5 feet long and a row of 18 nested carts to be 31 feet long.

4.1 Create a graph of the situation. Label your axes and scales.



4.2 How much does each nested cart add to the length of the row? Explain your reasoning.

4.3 If the store design allows for 43 feet for each row, how many total carts fit in a row?

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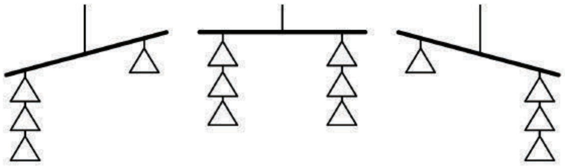
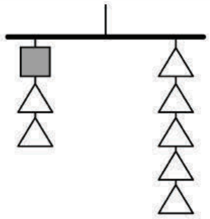
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 2: Notes Name ______________________________

Learning Goal(s):

If we have equal weights on both ends of a hanger, then the hanger will be in balance. If there is more weight on one side than the other, the hanger will tilt to the heavier side.

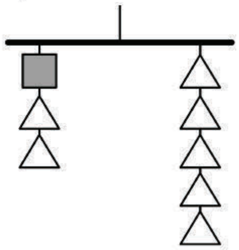




A balanced hanger can be a metaphor for an equation. An equation has expressions of equal value on each side, just like a balanced hanger has equal weights on each side.

We want to figure out how many triangles are equal to one square. We can figure this out by using hangers or equations.

Using Hangers: If we have a balanced hanger and add or remove the same amount of weight from each side, the result will still be in balance.



1 square = ____ triangles

Using Equations: Adding or subtracting the same amount from each side of an equation maintains the equality.

$$s + 2t = 5t$$

$$1s = \_\_\_\_ t$$

Summary Question

What are some moves that keep a hanger balanced?

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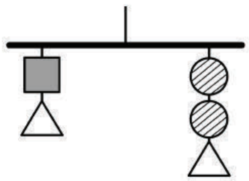
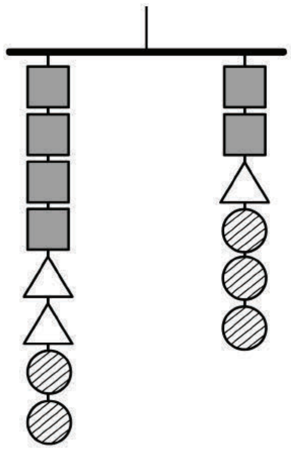
Unit 8.4, Lesson 2: Practice Problems Name ______________________________

1. Which of the changes would keep the hanger in balance? Select **all** that apply.



- ☐ Adding two circles on the left and a square on the right.
- ☐ Adding two triangles to each side.
- ☐ Adding two circles on the right and a square on the left.
- ☐ Adding a circle on the left and a square on the right.
- ☐ Adding a triangle on the left and a square on the right.

2. Here is a balanced hanger diagram.

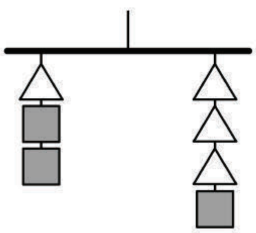


- Each triangle weighs 2.5 pounds.
- Each circle weighs 3 pounds.
- x represents the weight of each square.

Select **all** of the equations that represent the hanger.

- ☐ $x+x+x+x+11=x+11.5$
- ☐ $2x=0.5$
- ☐ $4x+5+6=2x+2.5+6$
- ☐ $2x+2.5=3$
- ☐ $4x+2.5+2.5+3+3=2x+2.5+3+3+3$

3. Here is a balanced hanger diagram.



What is the weight of a square if a triangle weighs 4 grams?

Explain your reasoning.

Unit 8.4, Lesson 2: Practice Problems

Mohamed came up with the following puzzle:

- I am 3 years younger than my brother.
- I am 2 years older than my sister.
- My mom's age is one less than three times my brother's age.
- When you add all of our ages, you get 87.

What are our ages?

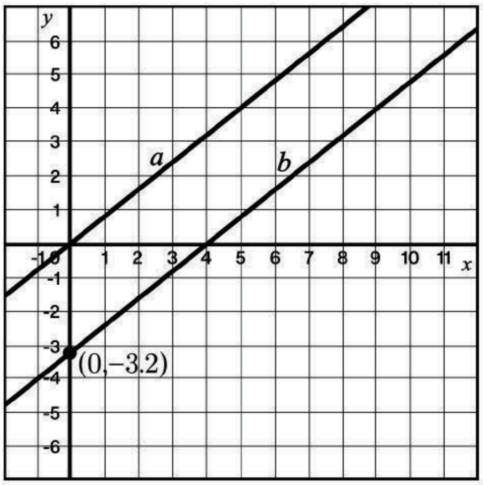
Ariel writes this equation for the sum of the ages: $(x) + (x + 3) + (x - 2) + 3(x + 3) - 1 = 87$

4.1 Explain the meaning of the variable and each term of the equation.

4.2 Write the equation with fewer terms.

4.3 Try to solve the puzzle.

5. These two lines are parallel.
   Write an equation for each.



This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 3: Notes Name ______________________________

Learning Goal(s):

An equation tells us that two expressions have equal value. For example, if $4x + 9$ and $-2x - 3$ have equal value, we can write the equation $4x + 9 = -2x - 3$.

In order to figure out what number x is so that $4x + 9$ is equal to $-2x - 3$, we can use moves that keep both sides balanced. Complete each step in the table:

$4x + 9 = -2x - 3$	We can subtract 9 from both sides of this equation and keep the equation balanced.
	We can add $2x$ to each side of the equation and maintain equality.
	If we divide the expressions on each side of the equation by 6, we will also maintain the equality.

We just figured out that when x is ____, $4x + 9$ is equal to $-2x - 3$.

Let's check if it works.

$4x + 9$ $4(\quad) + 9$	$-2x - 3$ $-2(\quad) - 3$

Summary Question
How are balanced moves on a hanger similar to solving an equation?

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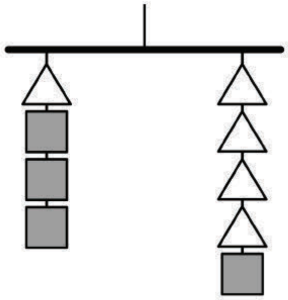
Unit 8.4, Lesson 3: Practice Problems Name ______________________________

1. In this hanger, the weight of the triangle is x and the weight of the square is y. Write an equation using x and y to represent the hanger.



2. Match each set of equations with the move that turned the first equation into the second.

a) Step 1: $6x + 9 = 4x - 3$
Step 2: $2x + 9 = -3$

b) Step 1: $-4(5x - 7) = -18$
Step 2: $5x - 7 = 4.5$

c) Step 1: $8 - 10x = 7 + 5x$
Step 2: $4 - 10x = 3 + 5x$

d) Step 1: $\frac{-5x}{4} = 4$
Step 2: $5x = -16$

e) Step 1: $12x + 4 = 20x + 24$
Step 2: $3x + 1 = 5x + 6$

1. Multiply both sides by $\frac{-1}{4}$.
2. Multiply both sides by -4.
3. Multiply both sides by $\frac{1}{4}$.
4. Add $-4x$ to both sides.
5. Add -4 to both sides.

Felipe and Makayla each tried to solve the equation $2x + 6 = 3x - 8$.

3.1 The result of Felipe's first step was $-x + 6 = -8$. Describe the first step Felipe made.

3.2 The result of Makayla's first step was $6 = x - 8$. Describe the first step Makayla made.

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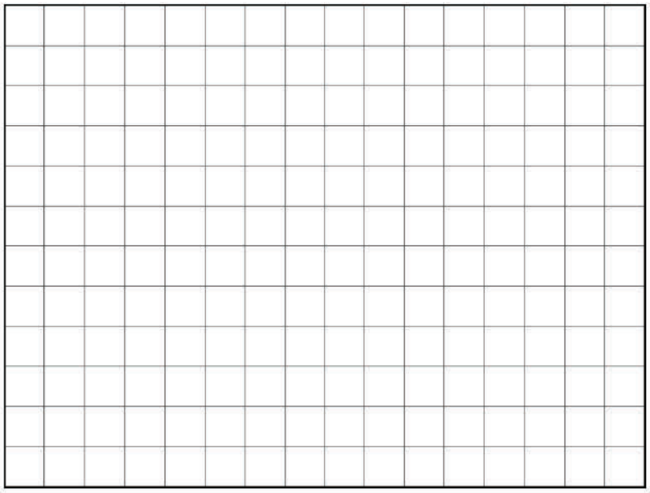
Unit 8.4, Lesson 3: Practice Problems

4.1 Complete the table with values for x and y that make this equation true: $3x + y = 15$.

x	y
2	
	3
6	
0	
3	
	0
	8

4.2 Create a graph and plot the points from the table.



4.3 Find the slope of the line that goes through the points.

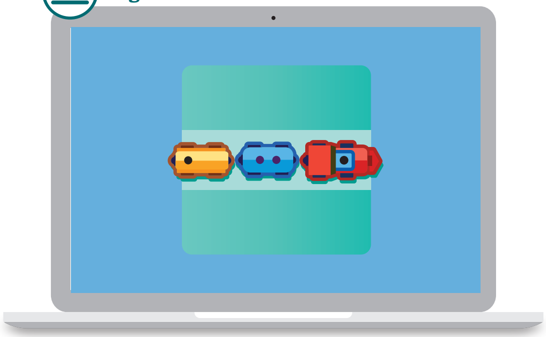
5. Select **all** the situations for which only zero or positive solutions make sense.

- ☐ Measuring temperature in degrees Celsius at an Arctic outpost each day in January.
- ☐ The height of a candle as it burns over an hour.
- ☐ The elevation above sea level of a hiker descending into a canyon.
- ☐ The number of students remaining in school after 6:00 p.m.
- ☐ The temperature in degrees Fahrenheit of an oven used on a hot summer day.

Unit 3 Lesson **4**

Name: ________ Date: ________ Period: ________

Digital Lesson



Model Trains

Let's calculate unit rates and use them to compare speeds.

Warm-Up

1 **Which rate does not belong? Explain your thinking.**

A. 5 miles in 15 minutes

B. 20 miles per 1 hour

C. 3 minutes per mile

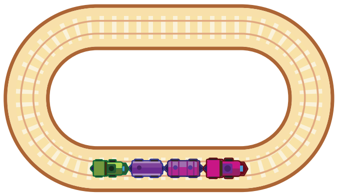
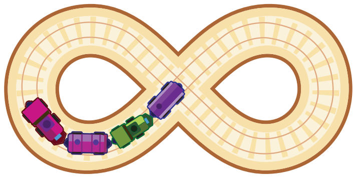
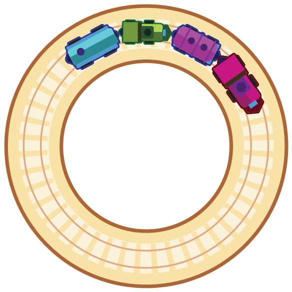
D. 32 kilometers per 1 hour

Activity 1

How Fast?

2 Here are three designs for a model train set for a children's museum. Choose one.

Discuss: What do you notice? What do you wonder?

Track 1	Track 2	Track 3
		

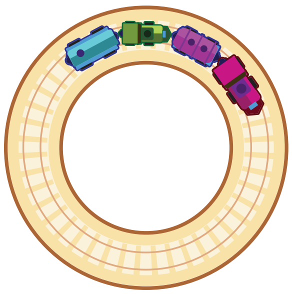
3 Here are Tracks 2 and 3. Which train is faster? Explain your thinking.

A. Train A

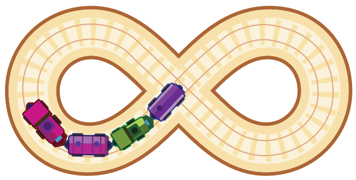
B. Train B

C. Not enough information

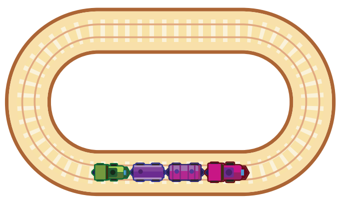
Train A:
15 seconds per lap



Train B:
20 seconds per lap



4 Here is Track 1. One lap is 325 centimeters. This train takes 10 seconds per lap. What is its speed in centimeters per second?



How Fast? (continued)

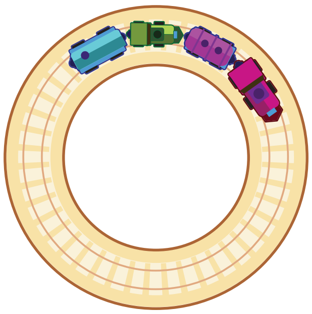
5 Which train is faster?

A. Train A

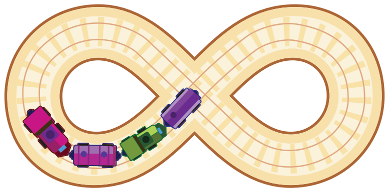
B. Train B

C. They travel at the same speed.

Train A:
270 centimeters in 15 seconds



Train B:
380 centimeters in 20 seconds



6 Amoli and Tiam used different strategies to determine which train was faster given the length of each track.

Amoli's strategy

Train A

270 ÷ 15 = 18, so the speed is 18 centimeters per second.

Train B:

380 ÷ 20 = 19, so the speed is 19 centimeters per second.

Tiam's strategy

Train A

Centimeters	Seconds
270	15
1 080	60

Train B

Centimeters	Seconds
380	20
1 140	60

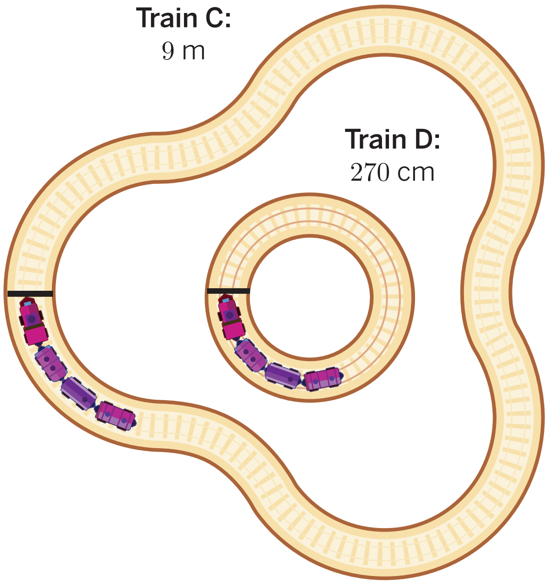
Discuss: How are the strategies alike? How are they different?

Activity 2

Which is Faster?

7 Here are two trains. They each complete 1 lap in 20 seconds. What is each train's speed in centimeters per second?

	Speed
Train C	.... centimeters per second
Train D	.... centimeters per second



8 Here are the distances and times for four model trains.

Train E: 325 centimeters in 30 seconds

Train F: 270 centimeters in 20 seconds

Train G: 3.25 meters in 20 seconds

Train H: 3.25 centimeters in 1 minute

Order the trains by speed from slowest to fastest.

Slowest **Fastest**

You're invited to explore more.

9 **A train's speed is 60 centimeters per second.**

Choose a track length and determine the number of laps the train can complete in 10 seconds.

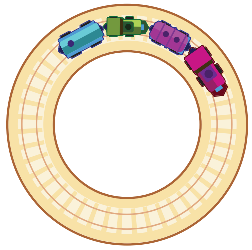
STOP

Synthesis

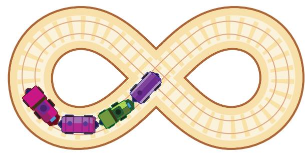
10 Describe two strategies for deciding which of two trains is faster.

Use the examples to help you with your explanation.

Train A:
270 centimeters in 15 seconds



Train B:
380 centimeters in 20 seconds



Summary

Rates expressed in the same units of measurement can be compared by using equivalent ratios or unit rates.

Consider two runners. Runner A runs the 400-meter dash in 50 seconds. Runner B runs the 5K (a 5–kilometer run) in 20 minutes. To compare their rates, they must first be expressed in the same units of measurement. Both runners' rates are converted to meters per second in this table.

Runner A

Seconds	Meters
50	400
1	8

8 meters per second

Runner B

5 kilometers $=$ $5\,000$ meters
20 minutes $=$ $1\,200$ seconds

Seconds	Meters
$1\,200$	$5\,000$
1	$4\frac{1}{6}$

$4\frac{1}{6}$ meters per second

Runner A runs at a faster rate than Runner B because 8 meters is greater than $4\frac{1}{6}$ meters in the same amount of time (1 second).

Practice

Name: .... Date: .... Period: ....

For Problems 1–3, use the following information. Mia and Liam were trying out new remote control cars. Mia's car traveled 135 feet in 3 seconds. Liam's car traveled 228 feet in 6 seconds. Both cars traveled at a constant speed.

1. Determine the speed of each remote control car in feet per second.

Mia's car speed: .... feet per second

Liam's car speed: .... feet per second

2. Whose remote control car traveled faster?

3. Deven says he has a remote control car that can travel 12 yards per second. Is his car faster or slower than the other two? Show your thinking.

4. Emmanuel types 208 words in 4 minutes. Vihaan types 342 words in 6 minutes. Both type at a constant rate. Who types faster? Explain your thinking.

5. During practice, four baseball players recorded the time it takes them to run different distances.

Player A: 3 seconds to run 45 feet

Player B: 48 feet in 2 seconds

Player C: 75 feet in 5 seconds

Player D: 3 seconds to travel 46.5 feet

Which player ran at the fastest speed?

A. Player A

B. Player B

C. Player C

D. Player D

Additional Practice for this lesson is avilable online.

6. Here are the approximate distances and times for four olympic swimmers in different events. Order the swimmers by speed from slowest to fastest.

Swimmer A: 800 meters in 8 minutes	**Swimmer B:** 100 meters in 50 seconds
Swimmer C: 1.5 kilometers in 15.5 minutes	**Swimmer D:** 50 meters in 20 seconds

Slowest **Fastest**

For Problems 7 and 8, use this information. Penguin A walks 10 feet in 5 seconds. Penguin B walks 12 feet in 8 seconds. Each penguin continues walking at a constant speed.

7. How far does each penguin walk in 45 seconds?

8. If the two penguins start at the same place and walk in the same direction, how far apart will the two penguins be after 2 minutes? Show your thinking.

Spiral Review

For Problems 9–12, determine the missing value.

9. 12 ft = ________ yd

10. 300 m = ________ km

11. 500 m = ________ cm

12. 12 cups = ________ gal

Reflection

1. Circle the question that you enjoyed doing the most.
2. Use the space below to ask one question you have or to share something you are proud of.

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 5: Equation Roundtable Name(s)________________________________

Activity 1: Roundtable

Your teacher will give you an equation.

Write **one step** towards solving the equation. When everyone is ready, pass your sheet and get a classmate's sheet. Check the work and write one more step towards solving the equation. Repeat.

1.

2.

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Unit 8.4, Lesson 5: Equation Roundtable Name(s)________________________________

3.

4.

Unit 8.4, Lesson 5: Notes Name ___________________________________

Learning Goal(s):

There are many different ways to solve equations with one variable. In general, we want to make moves that get us closer to an equation like: $variable = number$.

For example, ____ =______ or ____ =______.

If we have an equation like:	Or, if we have an equation like:
$3t + 5 = 7$	$4(a - 5) = 12$
subtracting 5 from each side will leave us with fewer terms. The equation then becomes:	dividing each side by 4 will leave us with fewer factors on the left:
Dividing each side of this equation by 3 will leave us with t by itself on the left:	Adding 5 to each side will leave us with a by itself on the left:

Some people use the following steps to solve a linear equation in one variable:

1. Use the _________________ property so that all the expressions no longer have parentheses.
2. Collect ______________ ____________________ on each side of the equation.
3. Add or subtract an expression so that there is a variable on just __________ side.
4. Add or subtract an expression so that there is just a _________________ on the other side.
5. _______________ or _______________ by a number so that you have an equation that looks like $variable = number$.

Following these steps will always work, but they may not always be the most efficient method. From lots of experience, we learn when to use different approaches.

Summary Question

What are some different first steps towards solving the equation $9 - 2b + 6 = -3(b + 5) + 4b$?

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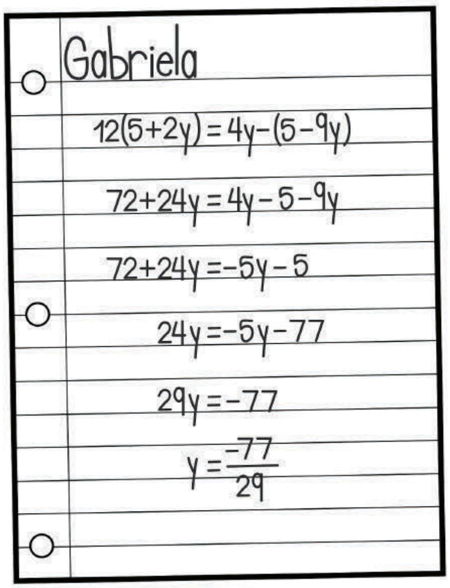
Unit 8.4, Lesson 5: Practice Problems Name ______________________________

Solve each of these equations. Explain or show your reasoning.

1.1 $2(x + 5) = 3x + 1$	1.2 $3y - 4 = 6 - 2y$

2. Gabriela was solving an equation, but when she checked her answer, she saw her solution was incorrect. She knows she made a mistake, but she can't find it.



Circle Gabriela's mistake. Then find the correct solution to the equation.

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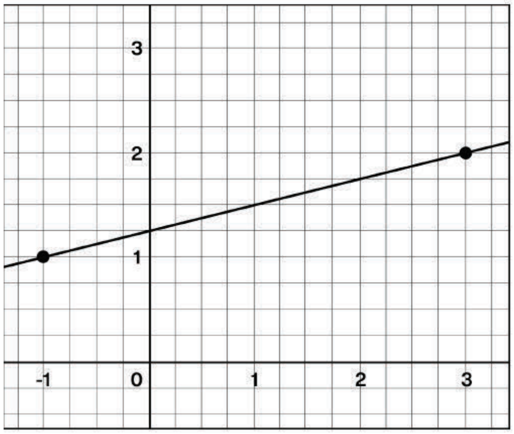
Unit 8.4, Lesson 5: Practice Problems

Solve each of these equations. Then check your solutions.

3.1 $\frac{1}{9}(2m - 16) = \frac{1}{3}(2m + 4)$	3.2 $-4(r + 2) = 4(2 - 2r)$

4. Here is the graph of a linear equation.
Select **all** of the true statements about the line and its equation.



- ☐ One solution of the equation is $(3, 2)$.
- ☐ One solution of the equation is $(-1, 1)$.
- ☐ One solution of the equation is $(1, \frac{3}{2})$.
- ☐ There are 2 solutions.
- ☐ There are infinitely many solutions.
- ☐ The equation of the line is $y = \frac{1}{4}x + \frac{5}{4}$.
- ☐ The equation of the line is $y = \frac{5}{4}x + \frac{1}{4}$.

5. A participant in a 21-mile walkathon walks at a steady rate of 3 miles per hour.

They think, "The relationship between the number of miles left to walk and the number of hours I've already walked can be represented by a line with a slope of -3."

Do you agree with this claim?

Explain your reasoning.

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Unit 8.4, Lesson 6: Strategic Solving Name(s) ______________________________

Activity 1: Predicting Solutions

Without solving, identify whether each equation has a solution that is positive, negative, or zero.

A. $7x = 3.25$	B. $7x = 32.5$	C. $\frac{x}{6} = \frac{3x}{4}$	D. $-8 + 5x = -20$

E. $9 - 4x = 4$	F. $3x + 11 = 11$	G. $-\frac{1}{2}(-8 + 5x) = -20$

Select one problem and explain how you decided if the solution was positive, negative, or zero.

Activity 2: Least and Most Difficult

Your teacher will give you a set of equations. Look through the equations, and without solving, find three equations that you think would be the least difficult to solve and three equations that you think would be the most difficult to solve. Write the letter of each of the equations below.

Least Difficult Cards	Most Difficult Cards

Explain how you decided which equations would be the least difficult to solve.

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Unit 8.4, Lesson 6: Strategic Solving Name(s) ______________________________

Activity 3: Solve 'em

Look through the equations and choose three to solve. At least one should be from your "least difficult" list and one should be from your "most difficult" list.

Unit 8.4, Lesson 6: Notes Name ___________________________________

Learning Goal(s):

Sometimes we are asked to solve equations with a lot of things going on. For example:	$x - 2(x+5) = \frac{3(2x-20)}{6}$
Before we start distributing, let's take a closer look at the fraction on the right side. The expression $2x - 20$ is being multiplied by ____ and divided by ____, which is the same as dividing by ____, so we can rewrite the equation as:	$x - 2(x+5) = \frac{2x-20}{2}$
Now it's easier to see that all the terms in the numerator on the right side are divisible by ___, which means we can rewrite the right side again:	$x - 2(x+5) =$ ___ - ___
At this point, we could _____________ and then collect like terms on each side of the equation. Another choice would be to **use the structure of the equation**. Both the left and the right side have something being subtracted from x. But, if the two sides are equal, that means the "something" being subtracted on each side must also be equal. The equation can be rewritten with less terms, like:	$2(x+5) = 10$
When we finish the steps, we have:	$2(x+5) = 10$

Summary Question
How does pausing and thinking about the structure of an equation help when solving the equation?

Unit 8.4, Lesson 6: Practice Problems Name ______________________________

Solve each of these equations. Explain or show your reasoning.

1.1 $2b + 8 - 5b + 3 = 13 + 8b - 5$	1.2 $2x + 7 - 5x + 8 = 3(5 + 6x) - 12x$

Solve each of these equations. Then check your solutions.

2.1 $3(3 - 3x) = 2(x + 3) - 30$	2.2 $\frac{1}{3}(z + 4) - 6 = \frac{2}{3}(5 - z)$

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Unit 8.4, Lesson 6: Practice Problems

3. Irene says the equation $9x + 15 = 3x + 15$ has no solutions because $9x$ is greater than $3x$. Do you agree with Irene? Explain your reasoning.

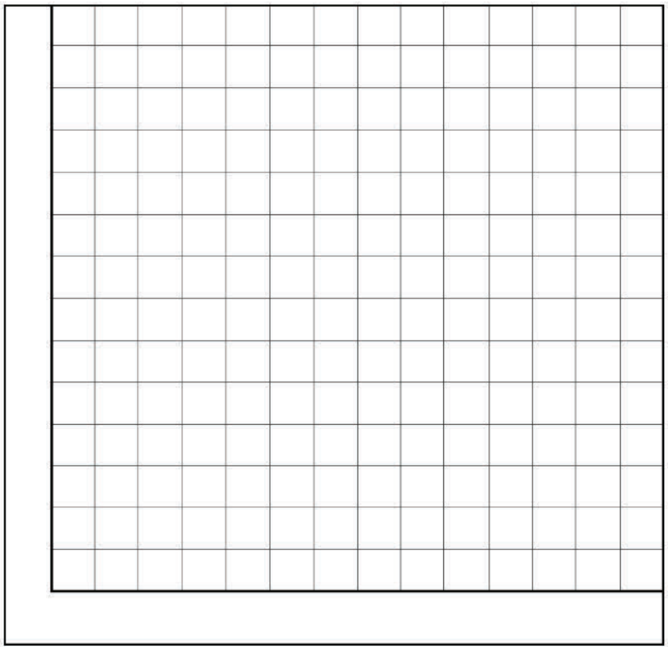
The table gives some sample data for two quantities, x and y, that are in a proportional relationship.

4.1 Complete the table.

x	y
14	21
64	
	39
1	

4.2 Write an equation that represents the relationship between x and y shown in the table.

4.3 Graph the relationship. Use a scale for the axes that shows all the points in the table.



This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 7: Notes Name ___________________________________

Learning Goal(s):

An equation is a statement that two expressions have an equal value. The equation $2x = 6$ . . .

. . . is a true statement if x is _____. . . . is a false statement if x is _____.

The equation $2x = 6$ has one and only one solution because there is only one number, 3, that you can double to get 6.

Some equations are *true no matter what* the value of the variable is. For example:	Some equations have *no solutions*. For example:
$2x = x + x$	$x = x + 1$
is always true because doubling a number will always be the same as adding the number to itself.	has no solutions because no matter what the value of x is, it can't equal one more than itself.
Equations like $2x = x + x$ have an _____________ number of solutions. We say it is true for _______ values of x.	Equations like $x = x + 1$ have ________ solutions. We say it is __________ true for any value of x.
Sometimes we make allowable moves and get an equation like this: $8 = 8$	Sometimes we make allowable moves and get an equation like this: $8 = 9$
This statement is true, so the original equation must be true no matter what value x has.	This statement is false, so the original equation must have no solutions at all.

Summary Question
What does it mean for an equation to have no solutions, one solution, or infinitely many solutions?

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Unit 8.4, Lesson 7: Practice Problems Name ______________________________

For each equation, decide if it is always true or never true.

1.1 $x - 13 = x + 1$	1.2 $x + \frac{1}{2} = x - \frac{1}{2}$	1.3 $2(x + 3) = 5x + 6 - 3x$
1.4 $x - 3 = 2x - 3 - x$	1.5 $3(x - 5) = 2(x - 5) + x$	

2. Ivory says that the equation $2x + 2 = x + 1$ has no solution because the left-hand side is double the right-hand side.

   Is Ivory correct? Explain your reasoning.

Write the other side of the equation so that it's true for . . .

3.1 . . . all values of x. $\frac{1}{2}(6x - 10) - x =$	3.2 . . . no values of x. $\frac{1}{2}(6x - 10) - x =$

Unit 8.4, Lesson 7: Practice Problems

4.

Here is an equation that is true for all values of x: $$5(x+2)=5x+10$$	Anya saw the following equation and said she can tell this is also true for any value of x: $$20(x+2)+31=4(5x+10)+31$$
How can she tell? Explain your reasoning.	

5. Daniela is trying to solve an equation for x.

Original equation: $$\frac{1}{2}x+3=\frac{7}{2}x+5$$	The result of Daniela's first step was: $$3=\frac{7}{2}x-\frac{1}{2}x+5$$
Describe the first step Daniela made for the equation.	

6. Solve this equation. Then check your solution.

$$3x-6=4(2-3x)-8x$$

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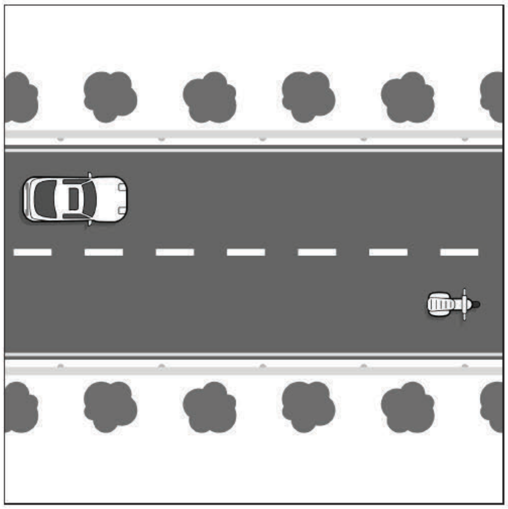
Unit 8.4, Lesson 8: Notes Name ______________________________

Learning Goal(s):

Imagine a car traveling on a road at a constant speed of 16 meters per second. We can represent the distance the car travels with the expression ______________, where t represents the number of seconds the car has been traveling.

Now imagine, at the same time, there is a scooter traveling at 9 meters per second and is 42 meters ahead of the car. We can represent the distance the scooter travels with the expression ____________, where t represents the number of seconds the scooter has been traveling.



Since the car is behind the scooter and is traveling at a faster rate, at some point, the vehicles will meet . . . but when? Asking when the two vehicles will meet is the same as asking when ______________ is equal to ______________.

$$16t = 9t + 42$$

Solving for t gives us _________, which means ________________________________.

Summary Question
If two quantities are changing, how can you determine when they will be the same?

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Unit 8.4, Lesson 8: Practice Problems Name ______________________

1. For what value of x do the expressions $\frac{2}{3}x + 2$ and $\frac{4}{3}x - 6$ have the same value?

2. Circle the story that matches the equation $-6 + 3x = 2 + 4x$.

Story A

At 5 p.m., the temperatures recorded at two weather stations in Antarctica are -6 degrees and 2 degrees.

The temperature changes at the same constant rate, x degrees per hour, throughout the night at both locations.

The temperature at the first station 3 hours after this recording is the same as the temperature at the second station 4 hours after this recording.

Story B

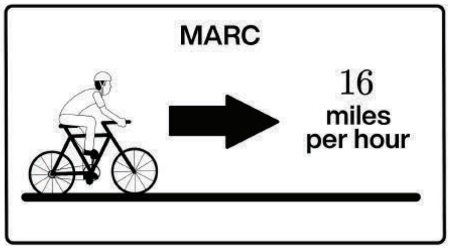
Elena and Kiran play a card game.

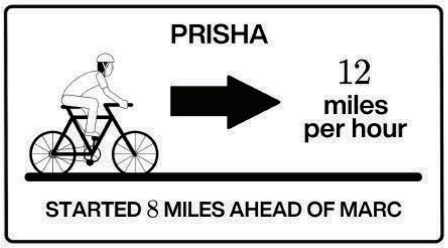
Every time they collect a pair of matching cards, they earn x points.

At one point in the game, Kiran has -6 points and Elena has 2 points.

After Elena collects 3 pairs and Kiran collects 4 pairs, they have the same number of points.

Prisha and Marc are biking in the same direction on the same path.





3.1 Write an expression for the number of miles Marc has gone after t hours.	3.3 Use your expression to find when Marc and Prisha will meet.
3.2 Prisha started riding 8 miles ahead of Marc. Write an expression for the number of miles Prisha has biked.	

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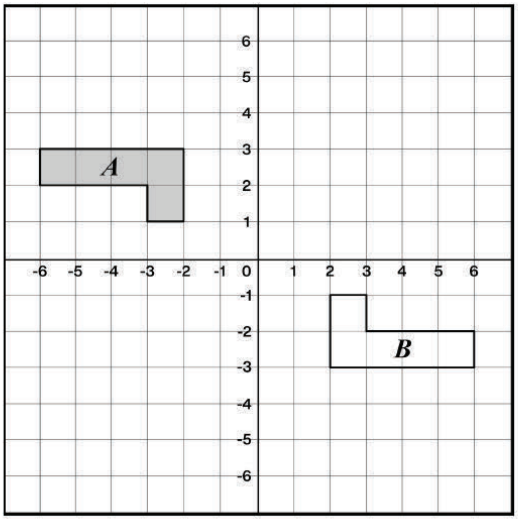
Unit 8.4, Lesson 8: Practice Problems

4. Decide whether each equation is true for all, one, or no values of x .

Equation	True for ___________ values of x.
4.1 $2x + 8 = -3.5x + 19$	
4.2 $9(x - 2) = 7x + 5$	
4.3 $3(3x + 2) - 2x = 7x + 6$	

5. Solve this equation: $2k - 3(4 - k) = 3k + 4$.

6. Describe a rigid transformation that takes polygon A to polygon B . Explain your reasoning.



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$x = 3$

Solve the equation.

$$5(x - 7) = 3x + 15$$

$$x = 25$$

Cell phone plan A is $\$30$ per month, and you have to buy a new phone for $\$800$.

Cell phone plan B is $\$80$ per month, and you get a free phone.

After how many months, x, will both plans cost the same?

Unit 8.4, Practice Day 1: Scavenger Hunt Sheets

$$x = 16$$

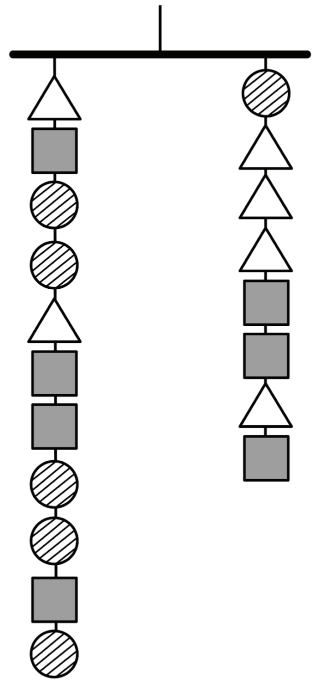
Solve the equation.

$$-5(x+9) = -3(x-8) - 2x$$

True for no values of x.

In this balanced hanger diagram, a circle weighs 3 grams and a square weighs 2 grams.

What is the weight of a triangle?



Unit 8.4, Practice Day 1: Scavenger Hunt Sheets

$$x = 7$$

Solve the equation.

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

Unit 8.4, Practice Day 1: Scavenger Hunt Sheets

$$x = -3$$

What was the first step in solving this equation?

Original equation: $9(2p + 1) = 6p + 15$

Result of the first step: $3(2p + 1) = 2p + 5$

Divide each term by 3.

Solve the equation.

$$\frac{2}{3}x - 13 = 2\left(\frac{1}{3}x - 5\right) - 3$$

Unit 8.4, Practice Day 1: Scavenger Hunt Sheets

True for all values of x.

In Denver, there was 5 inches of snow on the ground, and $\frac{1}{2}$ inch was melting each hour.

In Baltimore, there was 1 inch of snow on the ground, and 1.5 inches was falling per hour.

In how many hours will both cities have the same amount of snow on the ground?

$$x = 2$$

What was the first step in solving this equation?

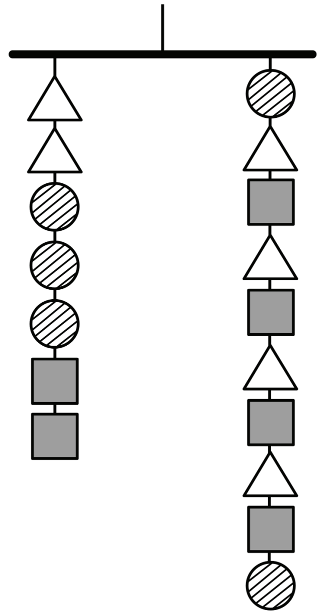
Original equation: $-5x + 1 = 3 + 4x - 15$

The result of the first step: $-9x + 1 = 3 - 15$

Unit 8.4, Practice Day 1: Scavenger Hunt Sheets

Subtract $4x$ from each side.

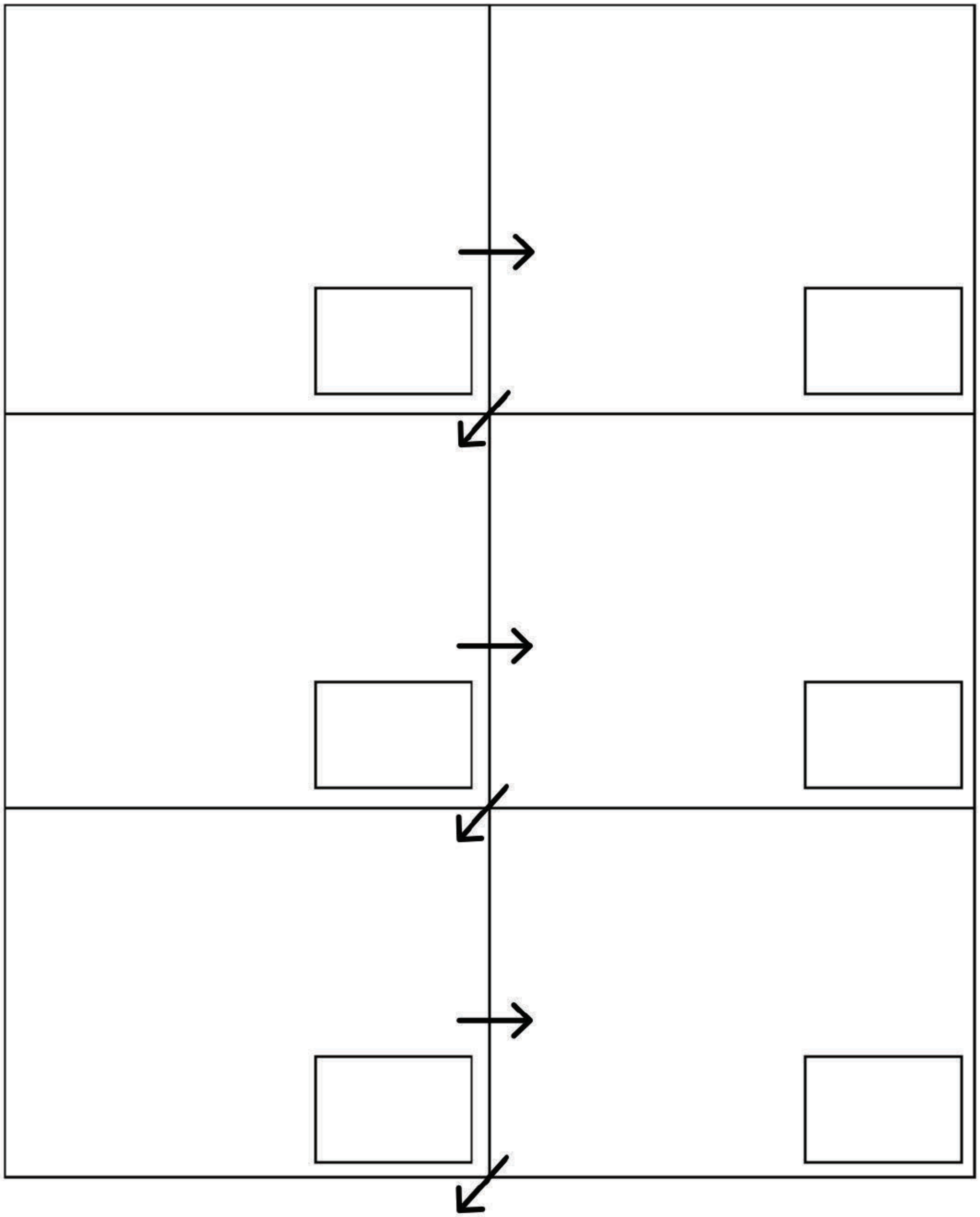
In this balanced hanger diagram, a circle weighs 10 grams and a square weighs 2 grams.



What is the weight of a triangle?

Unit 8.4, Practice Day 1: Worksheet Name ___________________________________

Start at any of the scavenger hunt sheets. Use this worksheet to solve the problem. Then, look for your answer at the top of another scavenger hunt sheet and solve the problem on that sheet next.



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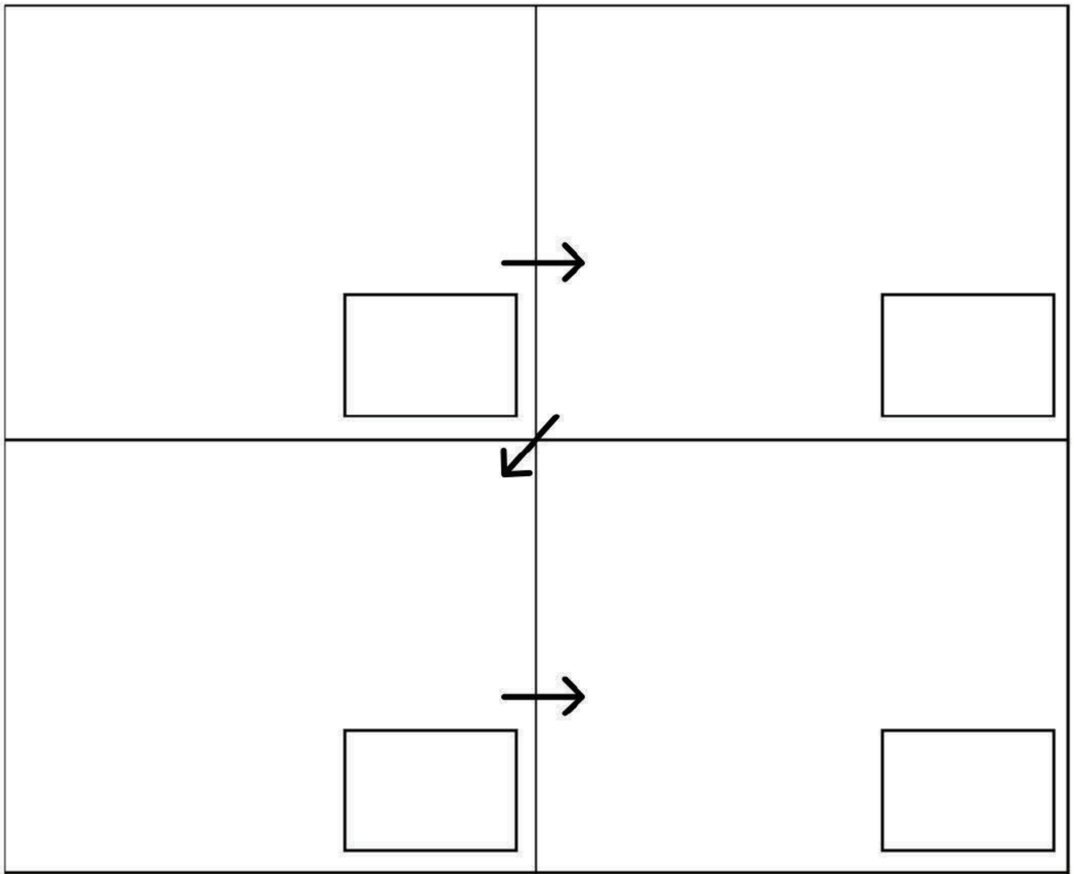
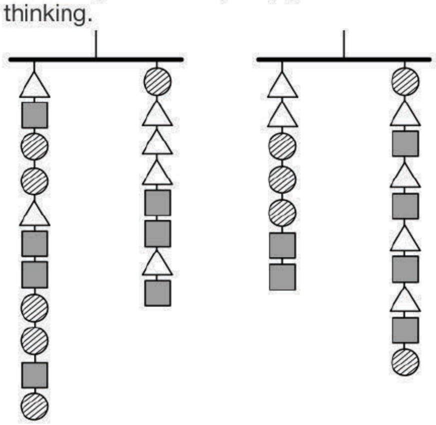
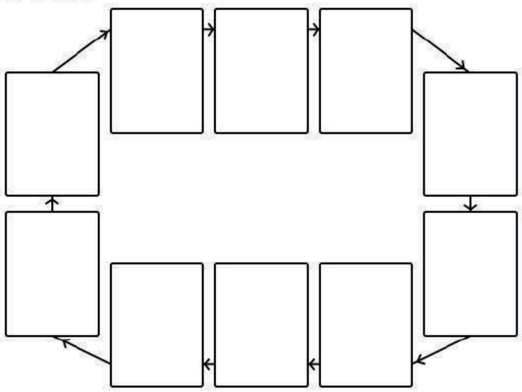
Unit 8.4, Practice Day 1: Worksheet Name ______________________________



Use these diagrams if they help you with your thinking.



Start with any box and write the answers in order.



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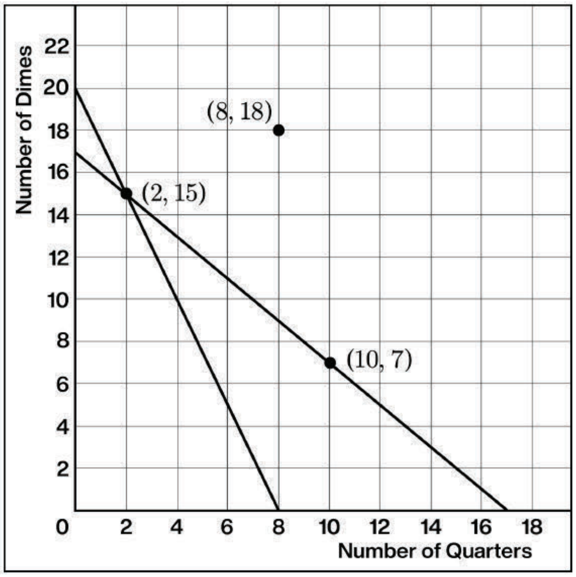
Unit 8.4, Lesson 9: Notes Name ______________________________

Learning Goal(s):

Values of x and y that make an equation ________ correspond to points (x, y) on the graph. For example, if we have x number of quarters and y number of dimes and the total cost is $\$2.00$, then we can write an equation like this to represent the relationship between x and y: $0.25x + 0.10y = 2$.



Since 2 quarters is $ _______ and 15 dimes is $ _______, we know that $x = 2$, $y = 15$ is a _______________ to the equation, and the point (___, ___) is a point on the graph. The line shown is the graph of the equation.

We also know that the quarters and dimes together total 17 coins. That means that : $x + y = 17$

1. Label the graph of each equation on the coordinate plane.
2. Pick another point on the coordinate plane and explain what it means in context:

In general, if we have two lines in the coordinate plane:

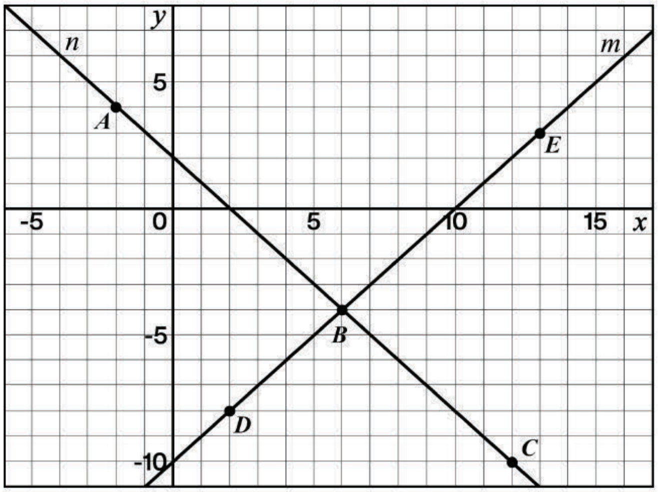
- The coordinates of a point that is on both lines make _______________ equations true.
- The coordinates of a point on only one line make _______________ equation true.
- The coordinates of a point on neither line make _______________ equation true.

Summary Question

If you are given two linear relationships, how can you determine x- and y-values that will make both relationships true?

Unit 8.4, Lesson 9: Practice Problems Name ___________________________

Use this graph to answer the questions.



1.1 Which line, m or n, goes with each statement? a. A set of points where the coordinates of each point have a sum of 2. b. A set of points where the y-coordinate of each point is 10 less than its x-coordinate.	1.2 List all of the labeled points on the graph that go with each statement about their coordinates: a. Two numbers with a sum of 2. b. Two numbers where the y-coordinate is 10 less than the x-coordinate. c. Two numbers with a sum of 2 and where the y-coordinate of each point is 10 less than its x-coordinate.

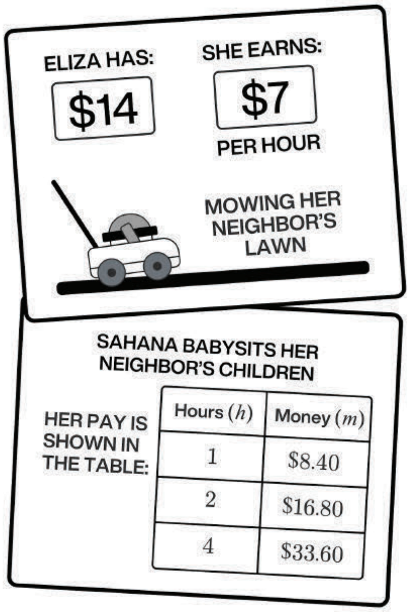
Here is an equation: $4x - 4 = 4x + \_\_\_\_$.

Fill in the blanks to make the following statements true.

2.1 True for no values of x. $4x - 4 = 4x + \_\_\_\_$	2.2 True for all values of x. $4x - 4 = 4x + \_\_\_\_$	2.3 True for one value of x. $4x - 4 = 4x + \_\_\_\_$

Unit 8.4, Lesson 9: Practice Problems

Eliza has a job mowing her neighbor's lawn, and Sahana babysits her neighbor's children. Their pay is given in the image.



Eliza and Sahana have agreed to go to the movies the weekend after they have earned the same amount of money for the same number of work hours.

3.1 How many hours do they have to work before they go to the movies?

3.2 How much will they have earned?

3.3 Explain where the solution can be seen in tables of values, in graphs, and in the equations that represent Eliza's and Sahana's hourly earnings.

4. Explain what you would do first to each side of the equation so that there would be no fractions. You do not have to solve the equations (unless you want more practice).

$$\frac{4p+3}{8} = \frac{p+2}{4}$$

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Unit 8.4, Lesson 10: Notes Name ________________________________

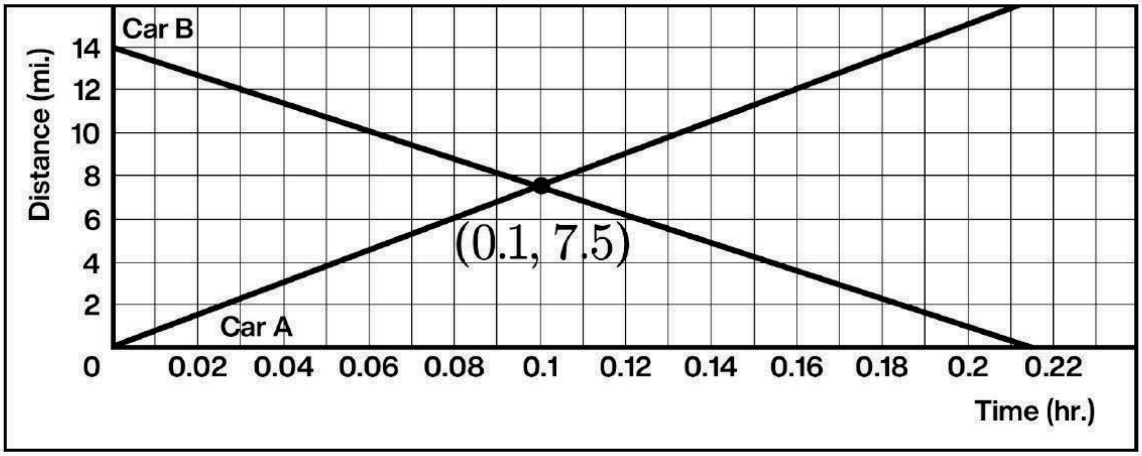
Learning Goal(s):

The solutions to an equation correspond to __________ on its graph. For example, if Car A is traveling 75 miles per hour and passes a rest area when $t = 0$, then the distance in miles it has traveled from the rest area after t hours can be represented by the equation ______________.

1. What is one point that will be on this graph? How do you know?

If you have **two** equations, you can ask whether there is an ordered pair that is a solution to both equations simultaneously.

For example, if Car B is traveling toward the rest area and its distance from the rest area is $d = 14 - 65t$, we can ask if there is ever a time when the distance of Car A from the rest area is the same as the distance of Car B from the rest area. If the answer is yes, then the solution will correspond to a point ____________________________.



Looking at the coordinates of the intersection point, we see that Car A and Car B will both be ________ miles from the rest area after ________ hours.

Summary Question
How can you tell by looking at a graph when two linear relationships will be the same?

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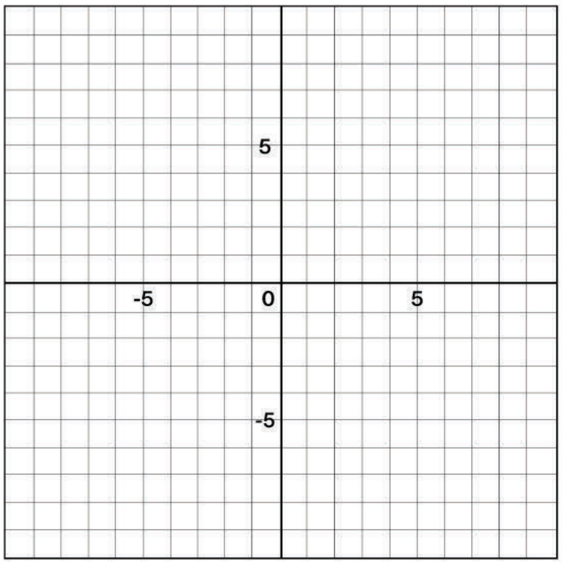
Unit 8.4, Lesson 10: Practice Problems Name ______________________________

1. Jayden has $\$11$ and begins saving $\$5$ each week towards buying a new phone. At the same time that Jayden begins saving, Aditi has $\$60$ and begins spending $\$2$ per week on supplies for her art class.

   Is there a week when they have the same amount of money? How much do they have at that time?

2. Find x- and y-values that make both $y = -\frac{2}{3}x + 3$ and $y = 2x - 5$ true.

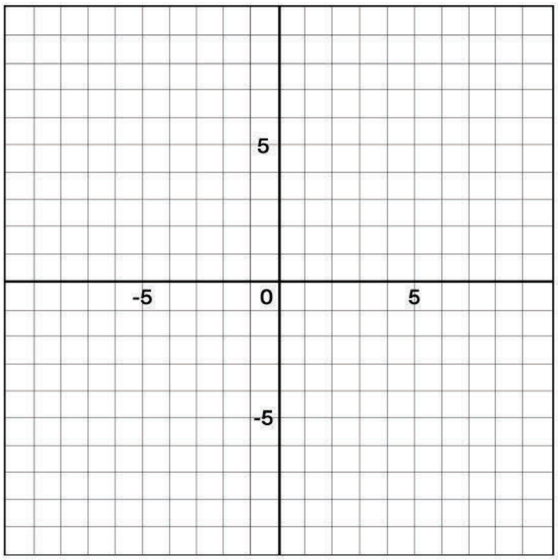
Use the graph if it helps you with your thinking.



3. The point where the graphs of two equations intersect has y-coordinate 2. One equation is $y = -3x + 5$.

Find the other equation if its graph has a slope of 1.

Use the graph if it helps you with your thinking.



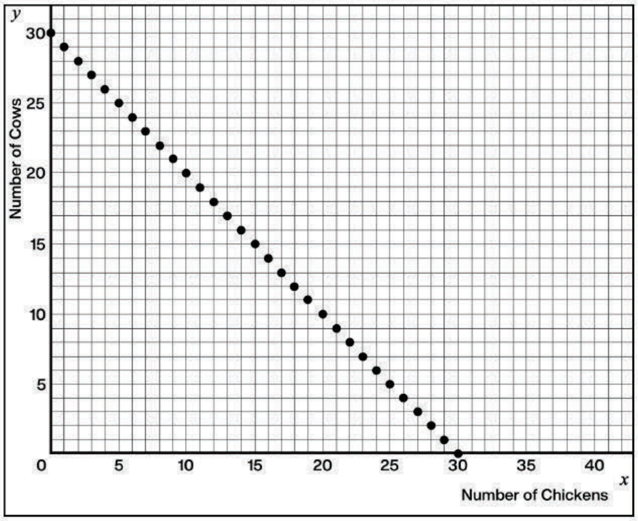
Unit 8.4, Lesson 10: Practice Problems

A farm has chickens and cows. All the cows have 4 legs and all the chickens have 2 legs. Altogether, there are 82 cow and chicken legs on the farm.

4.1 Complete the table to show some possible combinations of chickens and cows to get 82 total legs.

Number of Chickens (x)	Number of Cows (y)
35	
7	
	10
19	
	5

Here is a graph that shows possible combinations of chickens and cows that add up to 30 animals:



4.2 If the farm has 30 chickens and cows, and there are 82 cow and chicken legs altogether, then how many chickens and how many cows could the farm have?

5. Explain what you would do first to each side of the equation so that there would be no fractions. You do not have to solve the equations (unless you want more practice).

$$\frac{2(a-7)}{15} = \frac{a+4}{6}$$

6. Solve this equation:

$$3d + 16 = -2(5 - 3d)$$

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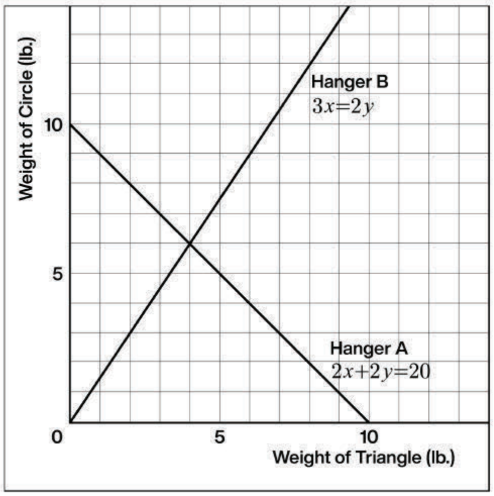
Unit 8.4, Lesson 11: Notes Name ______________________________

Learning Goal(s):

Definition	Facts/Characteristics
Examples	**Non-Examples**

System of Equations

The system of equations below represents the weights of two balanced hangers.



What is the solution to the system of equations?

What does the solution tell us about the hangers?

Summary Question
What does it mean to solve a system of equations?

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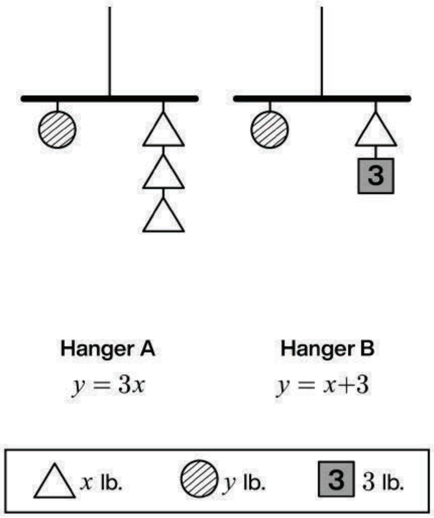
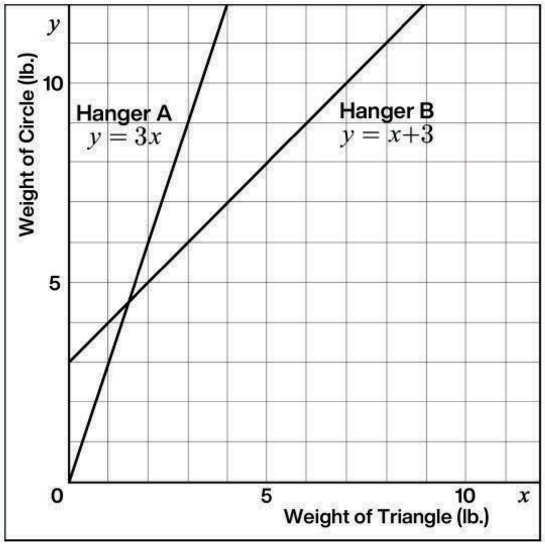
Unit 8.4, Lesson 11: Practice Problems Name ___________________________

The hangers and the graph represent the same system of equations.



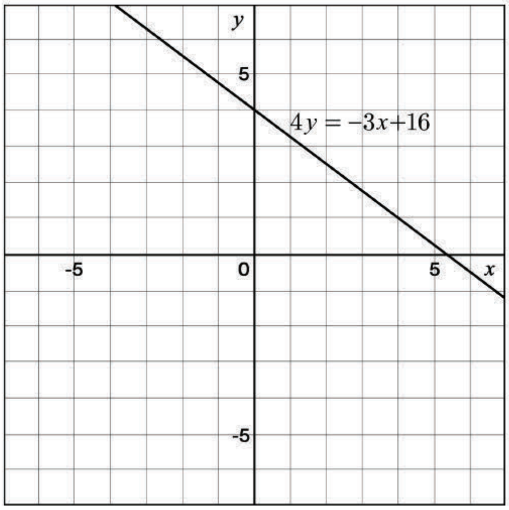


1.1 Find the solution to the system of equations.

1.2 What does the solution tell you about the weight of a triangle and the weight of a circle to balance the hanger?

Unit 8.4, Lesson 11: Practice Problems

Here is the equation and graph for one equation in a system of equations.

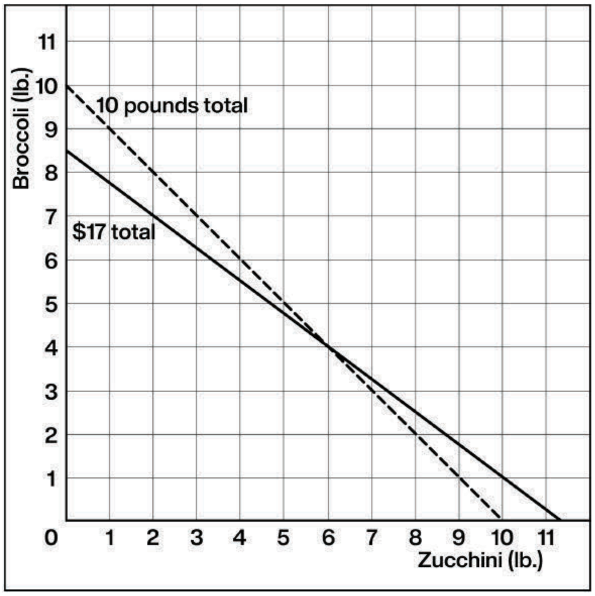


2.1 Write a second equation for the system so that it has infinitely many solutions.

2.2 Write a second equation whose graph goes through $(0, 1)$ so that the system has no solutions.

2.3 Write a second equation whose graph goes through $(0, 2)$ and $(4, 1)$ so that the system has one solution.

Vincente is in charge of cooking broccoli and zucchini for a large group. He has to spend all $\$17$ he has and can carry 10 pounds of veggies. Zucchini costs $\$1.50$ per pound and broccoli costs $\$2$ per pound.



3.1 Name one combination of veggies that weighs 10 pounds but does not cost $\$17$.

3.2 Name one combination of veggies that costs $\$17$ but does not weigh 10 pounds.

3.3 How many pounds each of zucchini and broccoli can Vincente get so that he spends all $\$17$ and gets 10 pounds of veggies?

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 12: Notes Name ____________________________________

Learning Goal(s):

Sometimes it is easier to solve a system of equations without having to graph the equations and look for an _______________ ________.

In general, whenever we are solving a system of equations we know that we are looking for a pair of (x, y) values that makes both equations _________. In particular, we know that the value for y will be the _________ in both equations.

If we have a system like this:

$$y = 2x + 6$$
$$y = -3x - 4$$

we know the ____________ of the solution is the same in both equations, so we can write the following:

$$2x + 6 = -3x - 4$$

and we can solve this equation for x:

$$2x + 6 = -3x - 4$$

Solving for x is only half of what we are looking for; we know the value for x, but we need the corresponding value for y.

Since both equations have the same y-value, we can use either equation to find the y-value:

$$y = 2(-2) + 6$$
$$y = -3(-2) - 4$$

In both cases, we find that $y = 2$. So the solution to the system is ________.

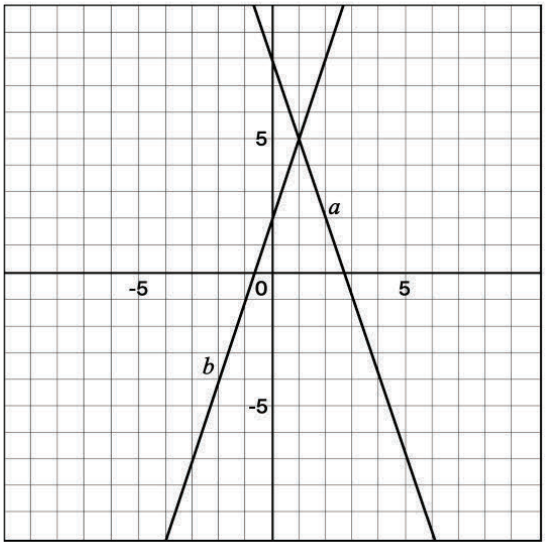
We can verify this by graphing both equations in the coordinate plane.

Summary Question
What are the first steps you can take when solving the following system of equations?

$$y = 2x$$
$$y = -3x + 10$$

Unit 8.4, Lesson 12: Practice Problems Name ______________________________

Here is a graph of a system of equations.



1.1 Describe how to find the solution to the corresponding system of equations for the two lines by looking at the graph.

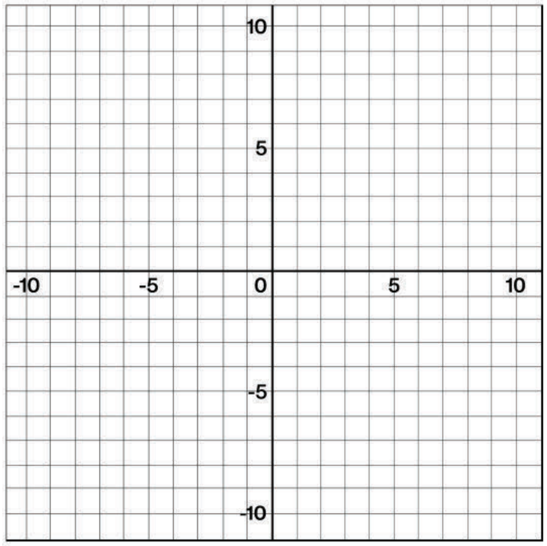
1.2 Write an equation for each line.

1.3 Describe how to find the solution to the corresponding system by using the equations.

Unit 8.4, Lesson 12: Practice Problems

2. The solution to a system of equations is $(1, 5)$. Choose two equations that might make up the system. Use the graph if it helps you with your thinking.

- ☐ $y = -3x - 6$
- ☐ $y = 2x + 3$
- ☐ $y = -7x + 1$
- ☐ $y = x + 4$
- ☐ $y = -2x - 9$



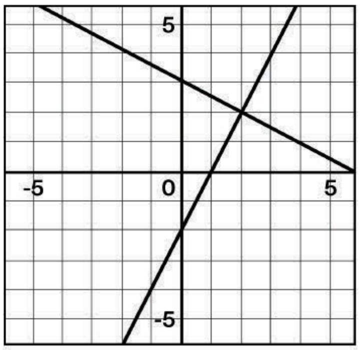
3. Solve this system of equations: $y = 4x - 3$, $y = -2x + 9$	4. Solve this system of equations: $y = \frac{5}{4}x - 2$, $y = -\frac{1}{4}x + 19$	5. Solve this equation: $\frac{15(x-3)}{5} = 3(2x - 3)$

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 13: Notes Name ______________________________

Learning Goal(s):

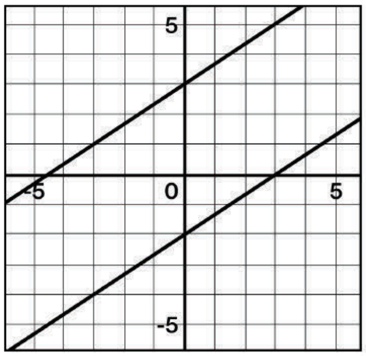
The x- and y- values that make both equations true are known as the ________________ to a system of equations. Depending on the equations, a system can have ________________, ________________, or ________________ solutions.



$$y = 2x - 2$$
$$y = -\frac{1}{2}x + 3$$

If the two lines of a system intersect at a point, there is ______________ solution.

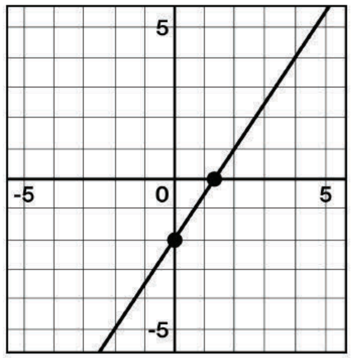
If the two lines have ________________ slopes, there is one solution.



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

If the two lines of a system **do not** intersect at a point, there are ____________ solutions.

If the two lines have ___________ slope and different y-intercepts, there are no solutions.



$$y = 1.5x - 2$$
$$y = \frac{3}{2}x - 2$$

If the two equations have the **same** slope and the **same** y-intercept, the system has ________________ solutions.

Summary Question

How can you tell from the structure of the equations if a system has no solutions, one solution, or infinite solutions?

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Unit 8.4, Lesson 13: Practice Problems Name ______________________________

1. Solve this system of equations: $\begin{cases} y=6x \\ 4x+y=7 \end{cases}$	2. Solve this system of equations: $\begin{cases} y=3x \\ x=-2y+70 \end{cases}$

3. Which equation, together with $y=-1.5x+3$, makes a system with one solution?

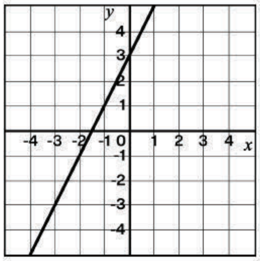
- ☐ $y=-1.5x+6$
- ☐ $y=-1.5x$
- ☐ $2y=-3x+6$
- ☐ $y=-2x+3$

This system of equations has no solution: $\begin{cases} x-6y=4 \\ 3x-18y=4 \end{cases}$	4.1 Change one number to make a new system with one solution.
	4.2 Change one number to make a new system with an infinite number of solutions.

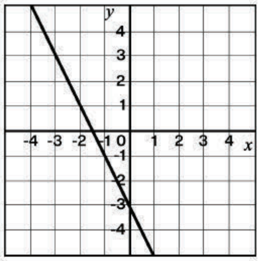
Unit 8.4, Lesson 13: Practice Problems

5. Draw a line to match each graph to its equation.

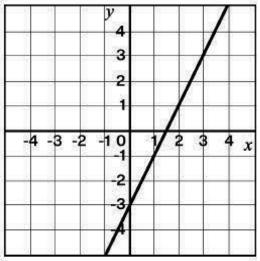
A.



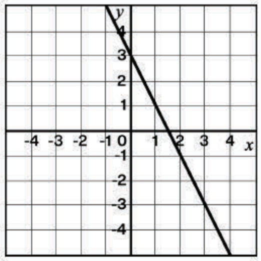
B.



C.



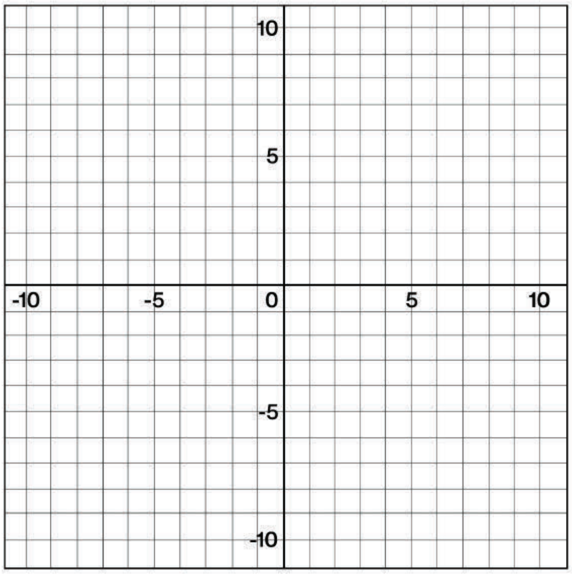
D.



$y =- 2x + 3$ $y = 2x + 3$ $y = 2x - 3$ $y =- 2x - 3$

6. Here are two points: $(-\ 3,\ 4)$ and $(1,\ 7)$. What is the slope of the line between the two points?

- ☐ $\frac{4}{3}$
- ☐ $\frac{3}{4}$
- ☐ $\frac{1}{6}$
- ☐ $\frac{2}{3}$



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This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Lesson 14: Strategic Solving, Part 2 Name(s) ______________________________

Activity 1: Least and Most Difficult

Your teacher will give you a set of systems of equations. Look through the equations, and without solving, find three equations that you think would be the **least difficult** to solve and three equations that you think would be the **most difficult** to solve. Write the letter of each of the equations below.

Least Difficult Cards	Most Difficult Cards

Explain how you decided which equations would be the least difficult to solve.

Activity 2: Solve 'em

Look through the equations and choose three to solve. At least one should be from your "least difficult" list and one should be from your "most difficult" list.

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Unit 8.4, Lesson 14: Strategic Solving, Part 2 Name(s) ______________________________

Activity 3: Thinking About Solutions

Martina looked at this system of equations and determined there was no solution. Do you agree? Explain your thinking.

$$\begin{cases} x+y=5 \\ x+y=7 \end{cases}$$

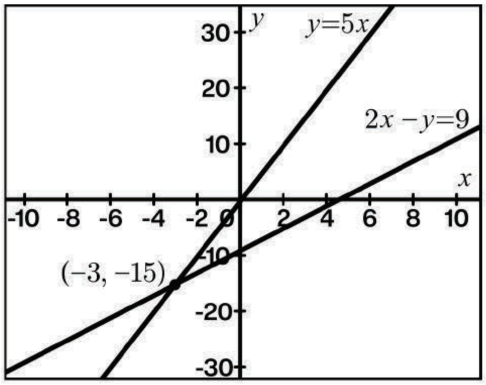
Unit 8.4, Lesson 14: Notes Name ___________________________________

Learning Goal(s):

When we have a system of linear equations where one of the equations is of the form $y = [stuff]$ or $x = [stuff]$, we can solve it algebraically by using ______________. The basic idea is to replace a variable with an equivalent ____________.	$\begin{cases} y=5x \\ 2x-y=9 \end{cases}$
Since $y = 5x$, we can substitute ______ for y in $2x - y = 9$.	$2x - (\quad) = 9$
And then solve the equation for x.	$x =$
We can calculate y using either equation. Let's use the first one:	$y = 5x$ $y = 5 \cdot$ ____ $y =$ _____
The x- and y-values that make both equations true are known as the ________________ to the system.	Solution $(-3,$ _____ $)$

We can check this by looking at the graphs of the equations in the system:

They intersect at $(-3, -15)$.



Summary Question

Describe one strategy you can use for solving a system of equations algebraically.

Unit 8.4, Lesson 14: Practice Problems Name ______________________________

1. Circle the story that can be represented by the system of equations below? Explain your reasoning.

$$\begin{cases} y = x + 6 \\ x + y = 100 \end{cases}$$

Story A

Evan and his younger cousin measure their heights.

They notice that Evan is 6 inches taller, and their heights add up to exactly 100 inches.

Story B

Angel's teacher writes a test worth 100 points.

There are 6 more multiple choice questions than short answer questions.

Yolanda and Neel play a game in which they earn the same number of points for each goal and lose the same number of points for each penalty.

- Yolanda makes 6 goals and 3 penalties, ending the game with 6 points.
- Neel earns 8 goals and 9 penaltis, and ends the game with -22 points.

2.1 Write a system of equations that describes Yolanda's and Neel's outcomes. Use x to represent the number of points for a goal and y to represent the number of points for a penalty.

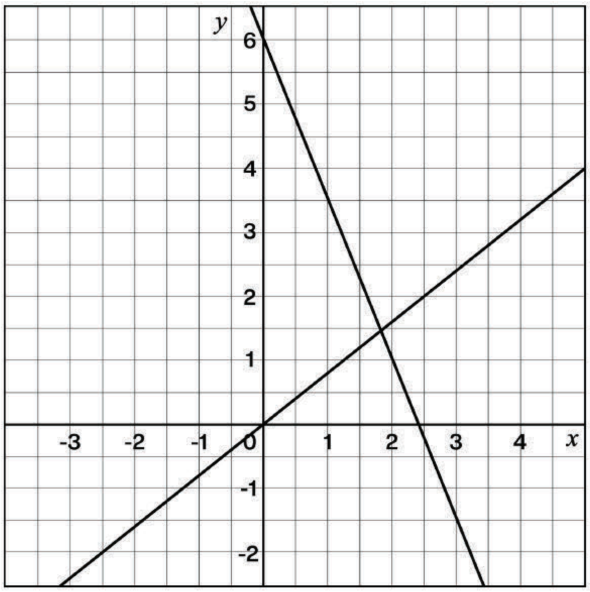
2.2 Solve the system to determine the number of points each goal and each penalty are worth.

Unit 8.4, Lesson 14: Practice Problems

3. Solve this system of equations:

$$\begin{cases} y = 6x - 8 \\ y = -3x + 10 \end{cases}$$

4.1 Estimate the coordinates of the point where the two lines meet.



4.2 Choose two equations that make up the system represented by the graph.

- ☐ $y = \frac{5}{4}x$
- ☐ $y = 6 - 2.5x$
- ☐ $y = 2.5x + 6$
- ☐ $y = 6 - 3x$
- ☐ $y = 0.8x$

4.3 Solve the system of equations and confirm the accuracy of your estimate.

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.4, Practice Day 2: Task Cards

Task 1: Second Draft

Look at Ava's work for each problem and then:

1. Write one thing Ava did well and one error you found in her work.
2. Create a second draft where you determine the correct solution.

Problem A

$$-2(4x-5)-1=x$$
$$2x-7-1=x$$
$$2x-8=x$$
$$2x=x+8$$
$$x=8$$

Problem B

$$5x-4=-2(3x+1)-7$$
$$+4 \qquad +4$$
$$5x=2(3x+1)-7$$
$$5x=6x+2-7$$
$$5x=6x-5$$
$$5x+5=6x$$
$$5=x$$

Task 2: How Many Solutions?

Here are three different systems of equations.

Decide if each system has one solution, infinite solutions, or no solutions. Explain or show how you know.

1.1

$$y=-4x$$
$$y=-4x+5$$

1.2

$$y=-4x$$
$$4x+y=0$$

1.3

$$y=-4x$$
$$y=x-5$$

2. What does it mean for a system of equations to have **infinite solutions**?

3. Write an equation that has **no solutions** in common with the equation $y=2x$.

Unit 8.4, Practice Day 2: Task Cards

Task 3: More Than One Way

A system of equations and its solution is shown below.

System	Solution
$y = \frac{1}{2}x - 4$ $2x + y = 6$	$(4, -2)$

1. Use at least **two** different ways to check or show that the solution is correct.

2. Put a star next to your preferred way to check a solution, then explain your thinking.

Task 4: Solve It!

1. Choose **one** of these systems of equations to solve. Use any method.

A. $y = 4x + 5$ $y = x + 5$	B. $2y = x$ $x + y = 15$	C. $y = -2x + 5$ $y = -2x - 2$

2. Choose **one** of these systems of equations to solve. Use any method.

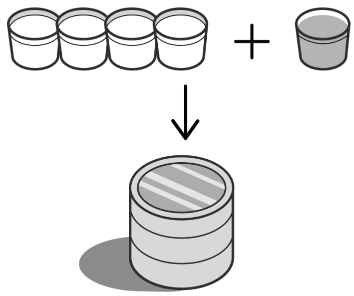
D. $3x + 6y = 9$ $y = -\frac{1}{3}x + 2$	E. $\frac{1}{2}x + 3y = -7$ $x = -2$	F. $x = \frac{1}{2}y$ $6x + 2y = -35$

Unit 8.4, Practice Day 2: Task Cards

Task 5: Paint It!

Zahra is painting her room. The color she chose uses 1 cup of blue paint for every 4 cups of white.

1. Complete the table on your worksheet with combinations that will make Zahra's paint color.



Zahra needs 35 more cups of paint to finish painting her room.

She uses these two equations to help her determine how much of each color to mix:

$$x + y = 35$$
$$y = 4x$$

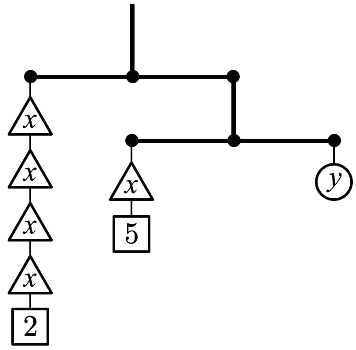
2. What do x and y represent?

3. How much of each color should she mix? Explain or show your thinking.

Unit 8.4, Practice Day 2: Task Cards

Are You Ready for More?

Determine values of x and y so that both hangers balance.



Are You Ready for Even More?

The graphs of the equations $Ax + By = 7$ and $Ax - By = 3$ intersect at $(1, -2)$.

Determine the value of A and B.

Unit 8.4, Practice Day 2: Worksheet

Name ______________________________

Task 1: Second Draft

Problem A

1. Did well:

   Error:

2.

Problem B

1. Did well:

   Error:

2.

Task 2: How Many Solutions?

1.1

1.2

1.3

2.

3.

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Unit 8.4, Practice Day 2: Worksheet

Name ___________________________________

Task 3: More Than One Way

1.

Check #1	Check #2

2.

Task 4: Solve It!

1. I chose system _____.

2. I chose system _____.

Unit 8.4, Practice Day 2: Worksheet

Name ______________________________

Task 5: Paint It!

1.

Blue Paint (cups)	White Paint (cups)
1	4
5	
	12
18	

2.

x represents:

y represents:

3.

Are You Ready for More?

Are You Ready for Even More?

GRADE 8

Unit 5
Student Lessons

Student lessons from Unit 5 are included here to provide NYC reviewers with access to the specific lessons in Amplify Desmos Math New York that demonstrate coverage of the **Functions** domain.

These lessons are partially designed and will be updated to match the exemplar Student Edition lessons included earlier in this sampler.

NOTE: *We have included only those lessons from Unit 5 that cover the standards in the Functions domain.*

Grade 8 Unit5

Student Edition Sampler

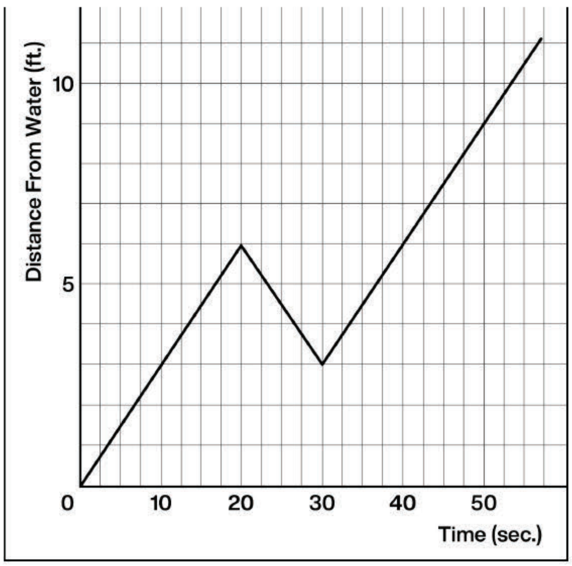
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 1: Notes Name ________________________________

Making Sense of Graphs

Learning Goal(s):

Here is the graph of a turtle's journey.



What story does the graph tell about the turtle's journey?

What is the turtle's distance from the water after 40 seconds?

When is the turtle's distance from the water 3 feet?

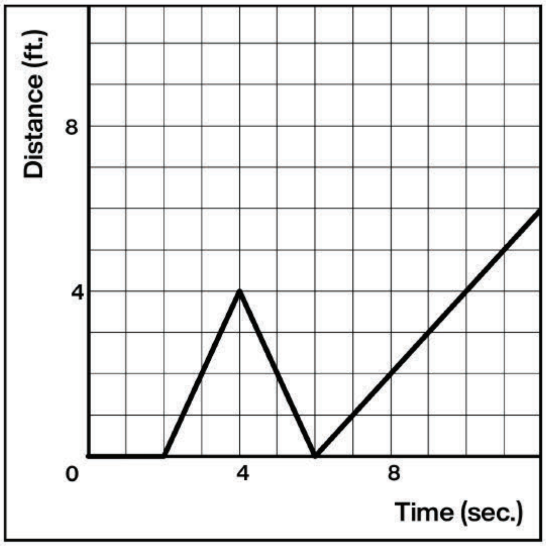
Summary Question

How does a point on a graph represent part of a story? Give at least one example.

4

Unit 8.5, Lesson 1: Practice Problems Name ______________________________

This graph represents a turtle walking across the sand.



1.1 What story does the graph tell about the turtle's journey?

1.2 How far was the turtle from the water after 8 seconds?

1.3 After how many seconds is the turtle's distance 2 feet from the water?

2. For what value of x do the expressions $2x + 3$ and $3x - 6$ have the same value?

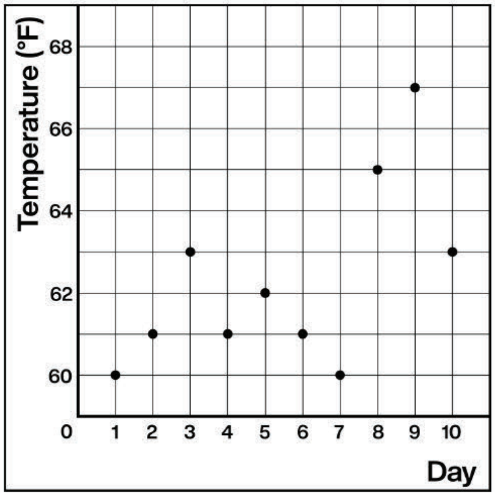
3. Solve this system of equations:

$$\begin{cases} y = x - 4 \\ y = 6x - 10 \end{cases}$$

Unit 8.5, Lesson 1: Practice Problems

This graph represents the high temperatures in a city over a 10-day period.

4.1 What was the high temperature on day 7?



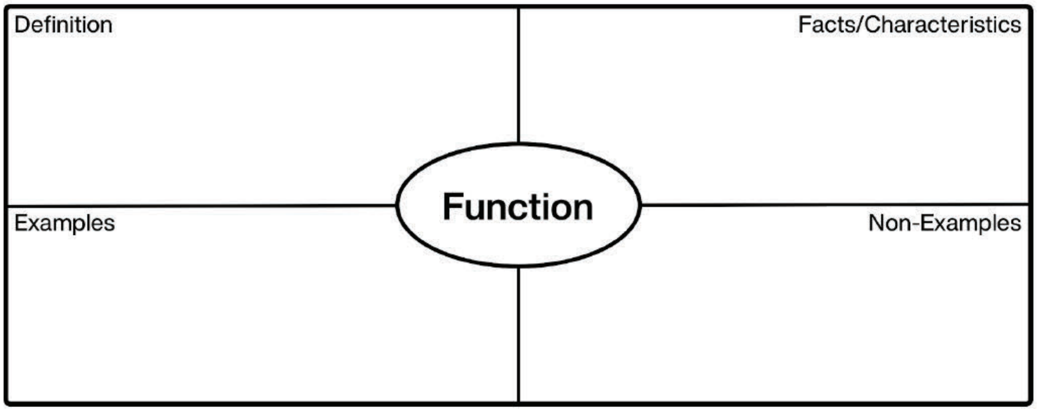
4.2 On which days was the high temperature 61 °F?

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 2: Notes Name ______________________________

Introduction to Functions

Learning Goal(s):



For each rule, decide if the rule represents a function or not. Explain your thinking.

Possible Inputs: Any person Rule: Output the month the person was born in. Function? Yes No	Possible Inputs: Any month Rule: Output a person born in that month. Function? Yes No

Summary Question
Why might it be useful to know whether a rule is a function?

Unit 8.5, Lesson 2: Practice Problems

Name ______________________________

1. Complete the table based on the following rule:
   Divide by 4. Add 2.

Input	Output
0	
2	
4	
6	
8	
10	

2. Complete the table based on the following rule:
   If odd, write 1. If even, write 0.

Input	Output
1	
2	
3	
7	
12	
73	

3. Use -6 as the input for each of the rules below.

Rule	Input	Output
Square the input	-6	
Divide by 3	-6	
Write π	-6	

4. Recall this image from today's lesson.

   What makes a rule a function or not?

Rule #1: Function	
Input	Output
35	25
723	713
-4	-14
53	43
723	713

Rule #2: Function	
Input	Output
15	7
18	7
262	7
-3	7
82.3	7

Rule #3: Function	
Input	Output
hi	J
my	Z
name	F
is	T
Arturo	P

Rule #4: Not a Function	
Input	Output
H	Hailey
J	Jada
M	Mai
H	Hamza
M	Madison

8

Unit 8.5, Lesson 2: Practice Problems

5.1 Could this table represent a function?

Input	Output
–2	4
–1	1
0	0
1	1
2	4

Explain your thinking.

5.2 Could this table represent a function?

Input	Output
4	–2
1	–1
0	0
1	1
4	2

Explain your thinking.

5.3 Could this table represent a function?

Input	Output
0	6
5	6
8	6
17	6
43	5

Explain your thinking.

6. Ada's history teacher wrote a test for the class.

The test is 26 questions long and is worth 123 points.

Ada wrote two equations, where m represents the number of multiple choice questions on the test, and s represents the number of essay questions on the test.

$$m + s = 26$$
$$3m + 8s = 123$$

How many essay questions are on the test?

Show or explain your thinking.

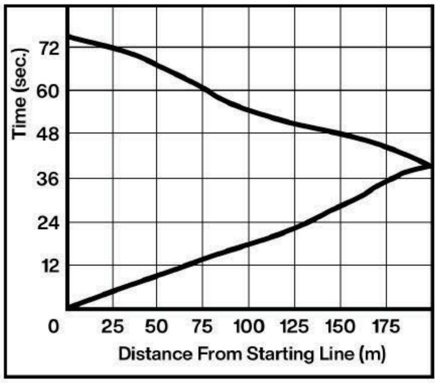
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

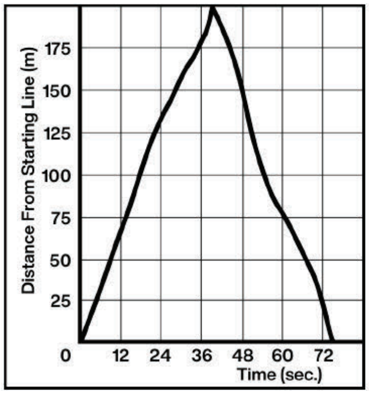
Unit 8.5, Lesson 3: Notes Name ___________________________

Graphs of Functions and Non-Functions

Learning Goal(s):

Ariana is running once around the track. The graphs below show the relationship between her time and her distance from the starting point.





Estimate when Ariana was 100 meters from her starting point.	Estimate how far Ariana was from the starting line after 60 seconds.
Is time a function of Ariana's distance from the starting point? Explain how you know.	Is Ariana's distance from the starting point a function of time? Explain how you know.

Summary Question
What is something you won't see on the graph of a function?

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Unit 8.5, Lesson 3: Practice Problems Name ________________________________

A group of students are timed while sprinting 100 meters.

1.1 Consider the table.

Time (sec.)	Speed (m/s)
13.8	7.246
15.9	6.289
16.3	6.135
17.1	5.848
18.2	5.495
18.3	5.464

Is speed a function of time?

1.2 Consider the table.

Time (sec.)	Distance (m)
13.8	100
15.9	100
16.3	100
17.1	100
18.2	100
18.3	100

Is distance a function of time?

1.3 Consider the table.

Distance (m)	Time (sec.)
100	13.8
100	15.9
100	16.3
100	17.1
100	18.2
100	18.3

Is time a function of distance?

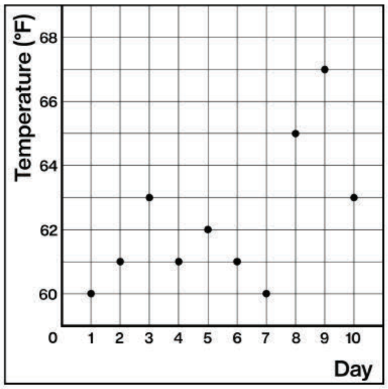
1.4 How did you decide which relationships were functions?

2. This graph represents the high temperatures in a city over a 10-day period.

Consider the graph on the right.

Is temperature a function of day?

Explain your thinking.

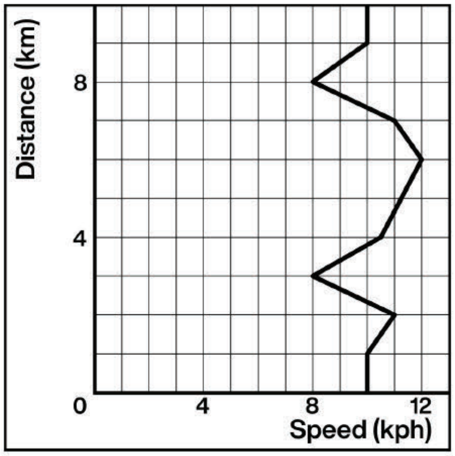


11

Unit 8.5, Lesson 3: Practice Problems

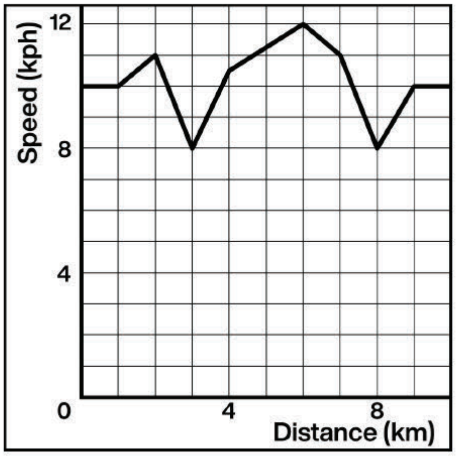
Diego runs a 10-kilometer race and keeps track of his speed.

3.1 Consider the graph.



Is distance a function of speed?

3.2 Consider the graph.



Is speed a function of distance?

3.3 How did you decide which relationships were functions?

4.1 Solve this equation. Check your answer.

$$4z + 5 = -3z - 8$$

4.2 Solve this equation. Check your answer.

$$2x + 4(3 - 2x) = \frac{3(2x+2)}{6} + 4$$

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This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 4: Notes Name ___________________________

Functions and Equations

Learning Goal(s):

In each situation, complete the table with a possible *independent variable* or *dependent variable.*

Question or Equation	Independent Variable	Dependent Variable
How many pickles can I make?	The number of cucumbers	The number of pickles
How much does my ice cream cost if I get different amounts of toppings?		Cost of my ice cream cone
How does sleep affect performance on tests?		
$y = 3x + 5$		

What is the *independent variable*? How is it represented on a graph?

What is the *dependent variable*? How is it represented on a graph?

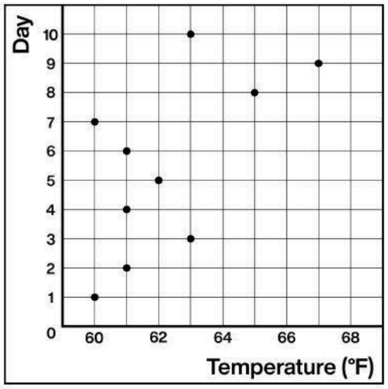
Brown rice costs $\$2$ per pound and beans cost $\$1.60$ per pound. Rudra has $\$10$ to spend on these items. The amount of brown rice, r, is related to the amount of beans, b, Rudra can buy.

Rudra wrote the equation $r = \frac{10-1.60b}{2}$. What is the dependent variable? How do you know?

Summary Question
How does the choice of independent and dependent variables affect the equation of a function?

Unit 8.5, Lesson 4: Practice Problems Name ______________________________

1. The graph and the table show the high temperatures in a city over a 10-day period.



Temperature (°F)	60	60	61	61	61	62	63	63	65	67
Day	1	7	2	4	6	5	3	10	8	9

Is the day a function of the high temperature?

Explain your thinking.

Rafael earns $\$10.50$ per hour helping his neighbor with their chores.

2.1 Is the amount he earns a function of the number of hours he works? Explain your thinking.

2.2 Is the number of hours he works a function of the amount he earns? Explain your thinking.

2.3 Write an equation that describes the situation. Use x to represent the independent variable and y to represent the dependent variable.

2.4 How much will Rafael earn if he works 3 hours each weekday next week?

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Unit 8.5, Lesson 4: Practice Problems

3. The solution to a system of equations is $(6, -3)$.

   Select two equations that might make up the system.

   - ☐ $y = -3x + 6$
   - ☐ $y = 2x - 9$
   - ☐ $y = -5x + 27$
   - ☐ $y = 2x - 15$
   - ☐ $y = -4x + 27$

4. Here is an equation that represents a function:

   $72x + 12y = 60$

   Select the equation that most closely represents x as the independent variable.

   - ☐ $120y + 720x = 600$
   - ☐ $y = 5 - 6x$
   - ☐ $2y + 12x = 10$
   - ☐ $x = \frac{60-12y}{6}$

   Explain your thinking.

5. Solve this system of equations:

$$\begin{cases} y = 7x + 10 \\ y = -4x - 23 \end{cases}$$

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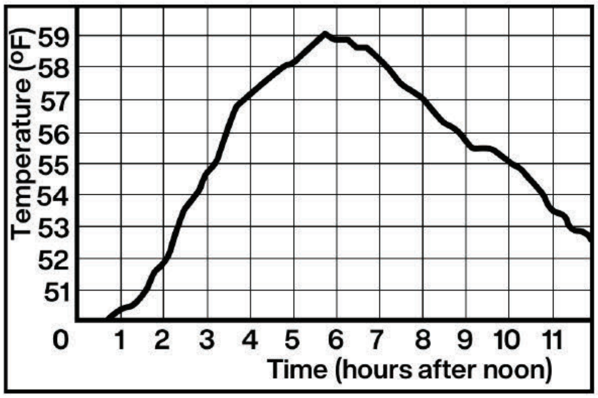
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 5: Notes Name ___________________________

Interpreting Graphs of Functions

Learning Goal(s):

This graph shows the temperature between noon and midnight on one day.

	Tell the story of the temperature on this day.
Did the temperature change more between 1 p.m. and 3 p.m. or between 7 p.m. and 9 p.m.? Explain your thinking.	Was it warmer at 3 p.m. or 9 p.m.?

Summary Question

How can you tell from a graph whether a function is increasing or decreasing?

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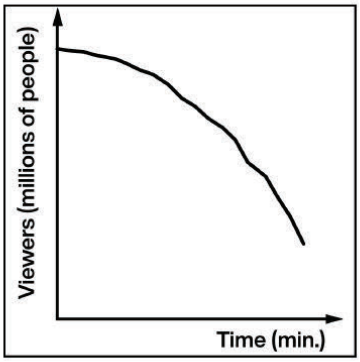
Unit 8.5, Lesson 5: Practice Problems Name ____________________________

1.1 This graph represents the height of a plant over a period of one month.

Tell a story of the plant's height.

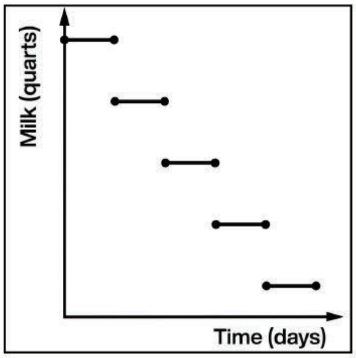
1.2 This graph represents the number of viewers of a short video vs. time.

Tell a story of the video's viewership.



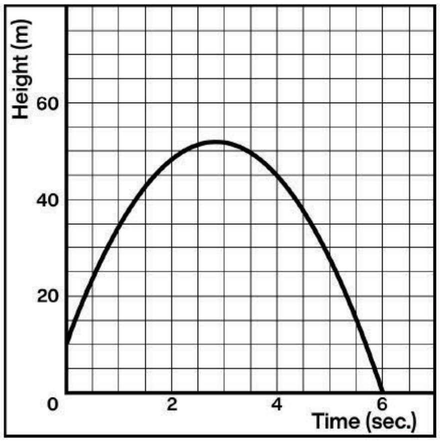
1.3 This graph represents the amount of milk in a bottle in the fridge.

Tell a story of the amount of milk in the bottle.



Unit 8.5, Lesson 5: Practice Problems

This graph represents the height of an object that was shot upwards from a tower and then fell to the ground.



2.1 What is the independent variable? (Circle one)

Height Time

What is the dependent variable? (Circle one)

Height Time

Explain your thinking.

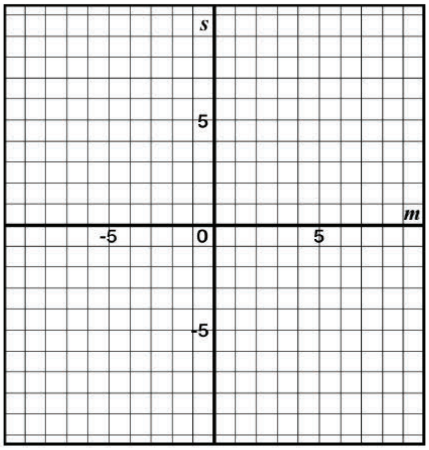
2.2 About how tall is the tower from which the object was shot?

2.3 When did the object hit the ground?

3.1 Complete the table below using the equation $2m + 4s = 16$.

m	s
0	
	3
-2	
	0

3.2 Draw the line $2m + 4s = 16$. Use m as the independent variable and s as the dependent variable.



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Unit 5
Lesson
6

Name: .... Date: .... Period: ....

Digital Lesson

Graphing Stories

Let's make connections between scenarios and the graphs that represent them.

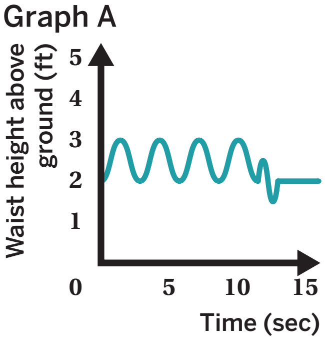
Warm-Up

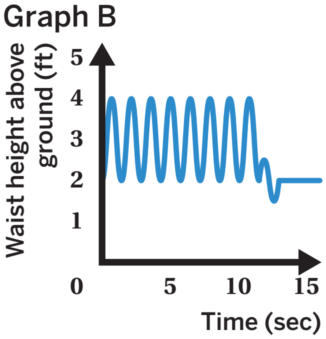
1 Clem loves to play on the playground. Let's watch a short video of him on the swings.

What different quantities are changing in this video?

2 Here are two graphs of Clem's waist height vs. time.

Discuss: How are these graphs alike? How are they different?





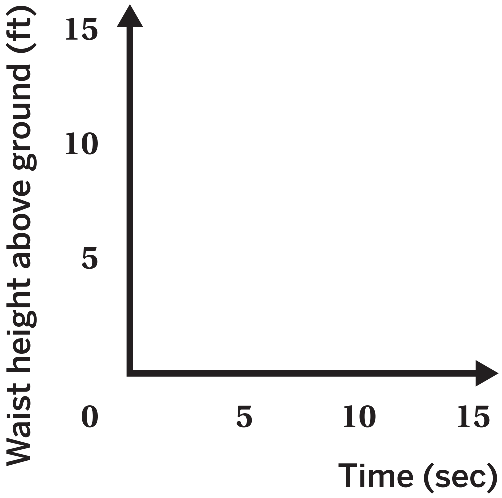
Amplify Desmos Math NEW YORK
Lesson Sample

Activity 1

Tyler and the Slide

3 Let's watch a video.

Sketch a graph representing Tyler's waist height vs. time.



4 Let's look at an answer sketch of the graph that represents Tyler's waist height vs. time.

Discuss: What feature(s) of this answer do you like?

Discuss: What feature(s) of this answer do you want to revise?

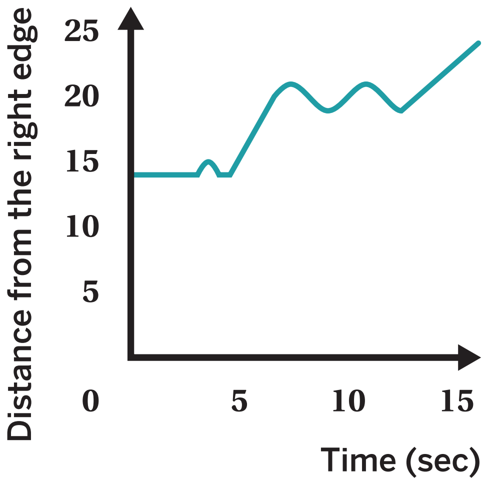
Name: .... Date: .... Period: ....

Tyler and the Slide (continued)

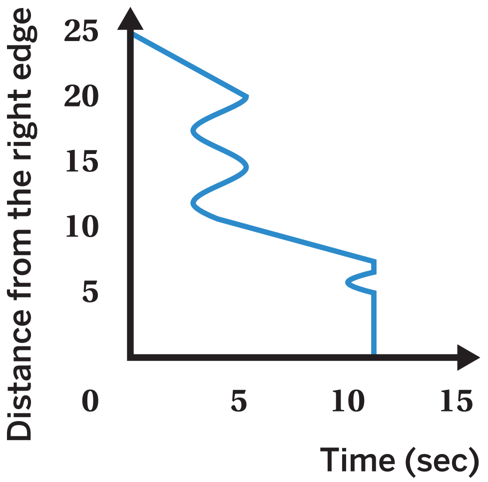
5 Let's watch the video of Tyler again.

Which graph could represent the relationship between Tyler's distance from the right edge of the screen and time? Explain your thinking.

Graph A



Graph B

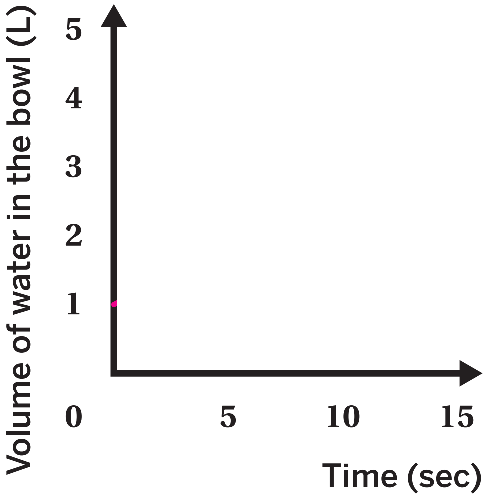


Activity 2

Water in the Bowl

6 Let's watch a video of a bowl being filled with water.

Sketch a graph representing the volume of water in the 5-liter bowl vs. time.



7 Let's look at the answer sketch of the graph that represents the volume of water in the bowl vs. time.

Discuss: What feature(s) of this answer do you like?

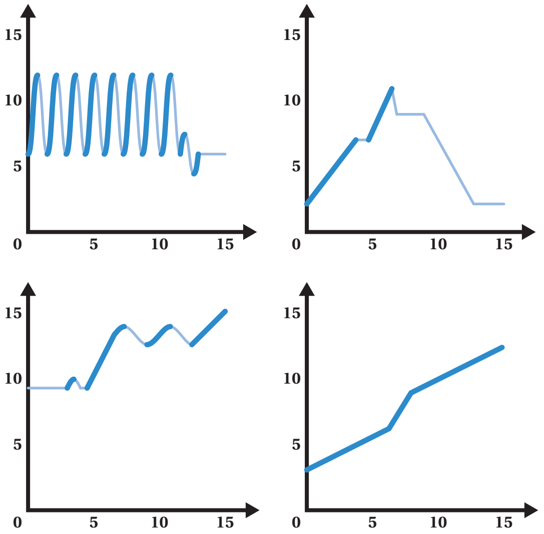
Discuss: What feature(s) of this answer do you want to revise?

Name: .... Date: .... Period: ....

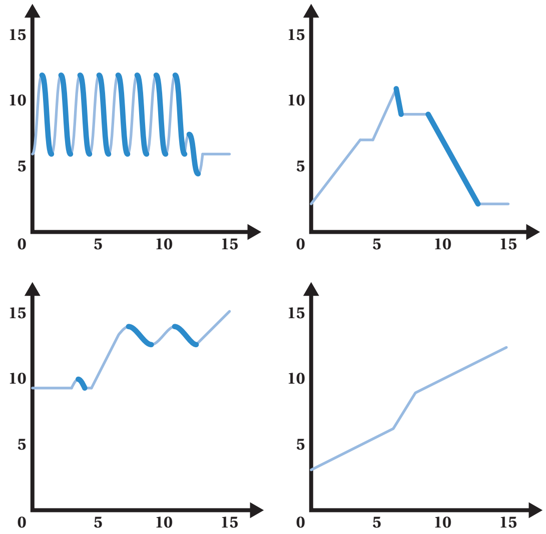
Describing Graphs

8 Here are some graphs from this lesson. Parts of the graph are bolded to show where they are either increasing, decreasing, linear, or non-linear.

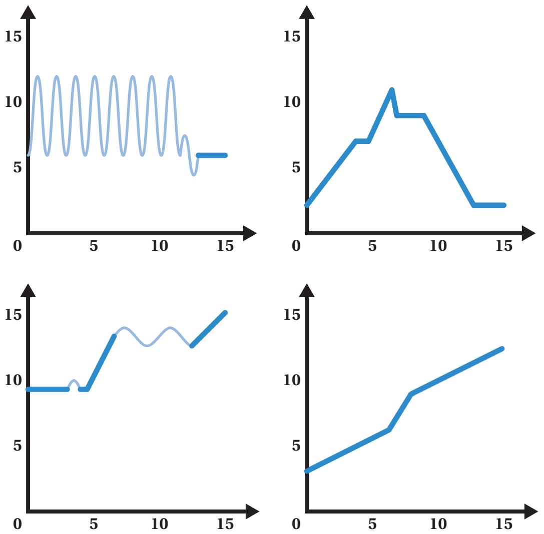
Increasing



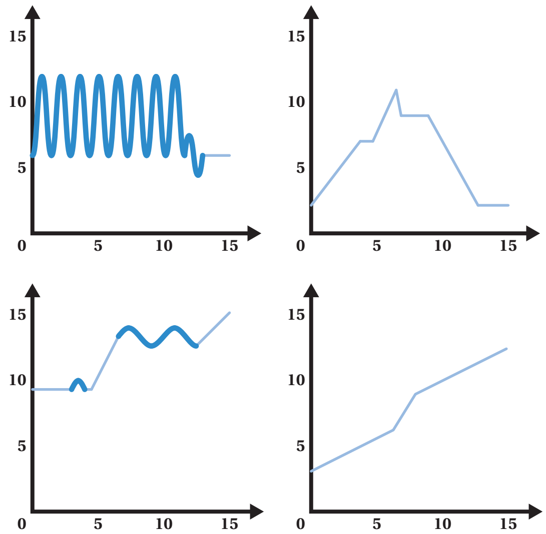
Decreasing



Linear



Non-linear



Discuss: What do you think each of these terms mean?

- Increasing?
- Decreasing?
- Linear?
- Non-linear?

STOP

Synthesis

9 What are some important things to consider when graphing a function that represents a real-world situation?

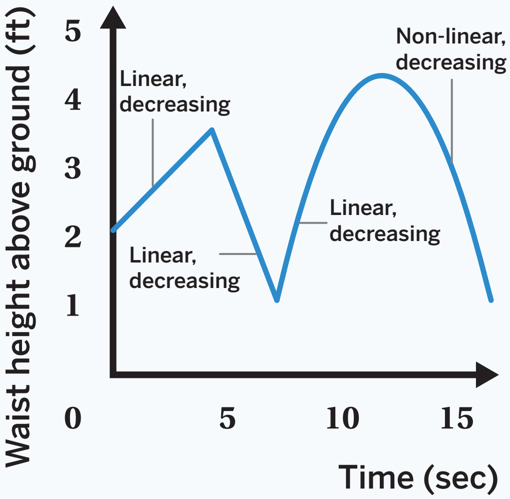
Summary

Graphs can be used to represent a context. When drawing a graph, carefully choose and label variables for the axes. Depending on the independent and dependent variables, distinct graphs can describe different aspects of the same story.

The intervals and the overall shape of a graph can be used to interpret the function.

For example, when part of the graph is:

- Going up from left to right, the values of the function are *increasing*.
- Going down from left to right, the values of the function are *decreasing*.
- A straight, non-vertical line, this part of the function is *linear*.
- Not a straight line, this part of the function is *non-linear*.



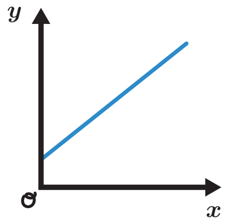
Name: .... Date: .... Period: ....

Practice

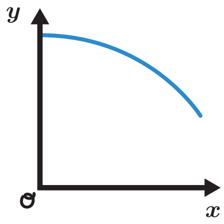
1. Determine which graph best represents the description.

Description	Graph
a Linear and decreasing	....
b Non-linear and increasing	....
c Linear and increasing	....
d Non-linear and decreasing	....

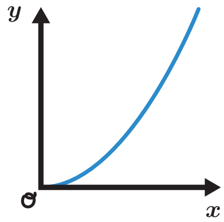
Graph A



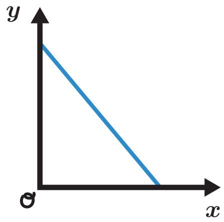
Graph B



Graph C

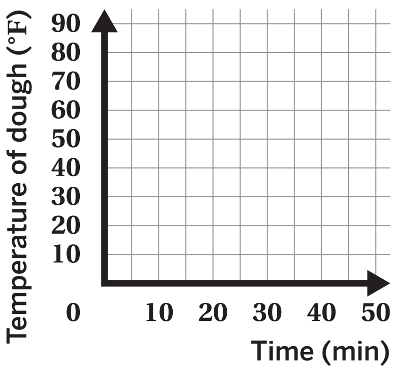


Graph D

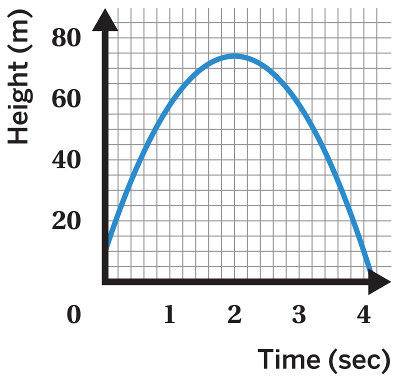


2. David places a batch of homemade pretzel dough in the refrigerator. The pretzel dough takes 15 minutes to cool from $70°F$ to $40°F$. Once it is cool, the pretzel dough stays in the refrigerator for another 30 minutes. David then places the pretzel dough into the oven to bake. After 5 minutes in the oven, the temperature of the pretzel dough is $80°F$.

Sketch a graph that represents this situation.



For Problems 3–6, use this information. The graph represents the height of an object that is launched upwards from a tower and then falls to the ground.



3. How tall is the tower from which the object was launched?

4. Plot the point that represents the greatest height of the object and the time it took the object to reach that height.

5. Determine one time interval when the height of the object was increasing.

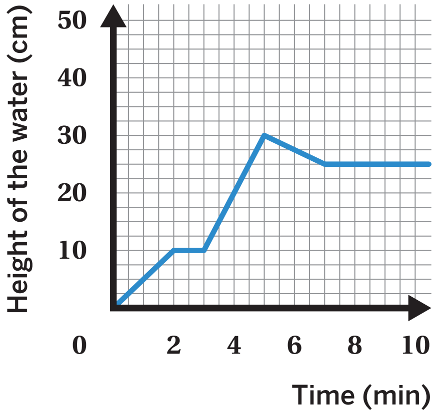
6. Determine one time interval when the height of the object was decreasing.

Additional Practice for this lesson is avilable online.

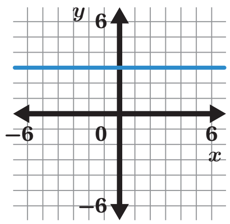
Practice

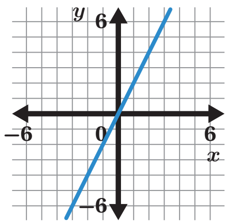
Name: ______________ Date: __________ Period: __________

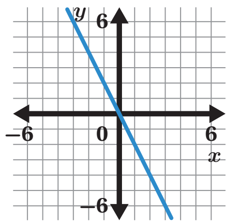
7. Kimaya fills her aquarium with water. Here is a graph that shows the height of the water in the aquarium vs. time. Tell a story about how Kimaya fills the aquarium based on what you see. Include specific heights and times.

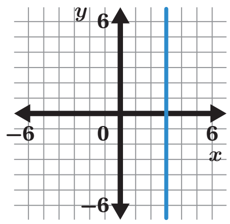


8. Which graph represents a function that is increasing?

A.


B.


C.


D.


Spiral Review

For Problems 9–11, solve each equation. Show your thinking.

9. $-(-2x + 1) = 9 - 14x$

10. $2x + 4(3 - 2x) = \frac{3(2x + 2)}{6} + 4$

11. $3x + \frac{3}{5} = \frac{1}{3}(5x + 5)$

Reflection

1. Circle the question you feel most confident about.

2. Use the space below to ask one question you have or to share something you are proud of.

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 7: Feel the Burn Name(s) ______________________________

Warm-Up: Making Sense of Representations

Select a context card and answer the question that appears on it. Then share your answer (and explain your thinking) to the members of your group.

Activity 1: Awards

Work with the members of your group to answer the following questions:

1. Who gets the award for most calories burned overall?
2. Who gets the award for most calories burned in the first 10 minutes?
3. Who gets the award for burning the most calories per minute over any period of time?

Work with the members of your group to create a poster displaying your work. Here is what your poster should include:

- The three task cards (graph, table, and equation). Do not re-create the representations. Instead, use tape or glue to affix the task cards to your poster.
- Your answers to the three "awards" questions.
- Explanations that clearly illustrate the reasoning for your answer. Include complete sentences on your poster as well as annotations on the task cards.

Unit 8.5, Lesson 7: Notes Name ________________________________

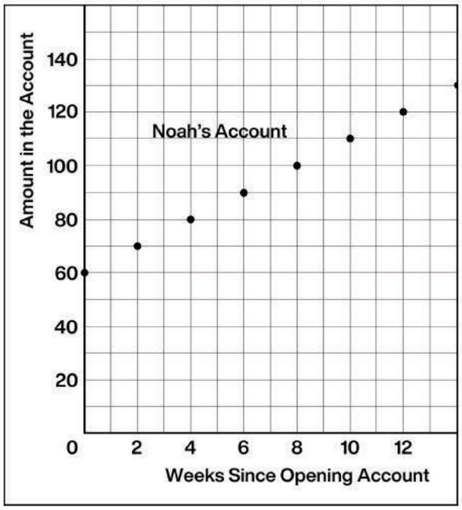
Comparing Representations of Functions

Learning Goal(s):

Elena opened an account on the same day as Noah. The amount of money, E, in Elena's account is given by the function $E = 8w + 70$, where w is the number of weeks since the account was opened. The graph below shows some data about the amount of money in Noah's account.

Who started out with more money in their account? Explain how you know.

Who is saving money at a faster rate? Explain how you know.



Write one question that might be easier to answer using the equation than using the graph.

Write one question that might be easier to answer using the graph than using the equation.

Summary Question: What are the strengths of using . . .

. . . a table? . . . a graph? . . . an equation?

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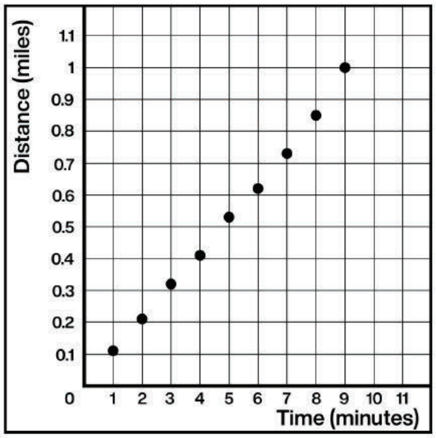
Unit 8.5, Lesson 7: Practice Problems Name ___________________________________

1.1 Yosef is training for a 1-mile race. Yosef's progress is shown by the graph.

Is Yosef's distance a function of time? Explain your thinking.



1.2 Demetrius is training for the same 1-mile race. He ran at a constant speed of 7.5 miles per hour.

Who finished the mile first?

1.3 Draw a line on the graph to represent Demetrius's mile.

The table and equation below represent two different functions with independent variable a.

Equation: $b = 4a - 5$

a	c
-3	-20
0	7
2	3
5	21
10	19
12	45

2.1 When $a = 10$, what are the values of b and c?

$b =$________ $c =$________

2.2 Which is larger when $a = -3$: b or c?

Explain your answer or why there is not enough information.

2.3 Which is larger when $a = 6$: b or c?

Explain your answer or why there is not enough information.

Unit 8.5, Lesson 7: Practice Problems

Recall the relationship between the radius of a circle, r, and its area, A.

3.1 Which of the following equations is true?

- ☐ $A = \pi r$
- ☐ $A = \pi r^2$
- ☐ $A = 2\pi r$
- ☐ $A = 2\pi r^2$

3.2 Is the area of a circle a function of its radius?

Is the radius of a circle a function of its area?

3.3 Use the relationship $A = \pi r^2$ to fill in the missing parts of the table below.

r	A
3	
	16π
$\frac{1}{2}$	
	100π

25

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 8: Charge! Name(s) ______________________________

Warm-Up

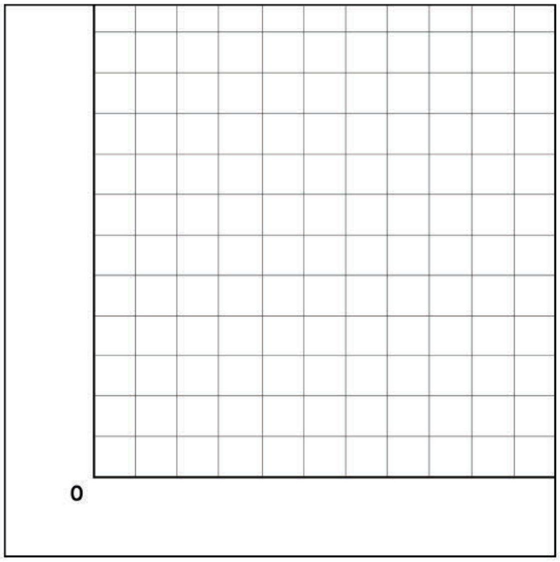
Tell a story about the image you see on the screen.

Activity 1: Charge!

What question are you trying to answer?	What is your estimate?

What relevant information do you know?	What additional information would be helpful?

Do your scratch work here.



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This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 8: Charge! Name(s) ________________________________

Write your answer to the question. Explain your thinking.

Reflection: What is something new you learned during the lesson?

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Unit 8.5, Lesson 8: Notes Name ___________________________________

Modeling With Linear Functions

Learning Goal(s):

In each scenario, decide if a single linear model is appropriate. If so, write a linear equation of the form $y = mx + b$. If not, explain your reasoning.

You begin with 12 gallons of gas in your tank. For every 50 miles you drive, the amount of gas in the tank decreases by 1 gallon. The amount of gas in the tank is a function of the miles driven.	The area of a circle, A, is a function of its radius, r.

Write an example of a situation that may seem linear but actually is not.

Summary Question

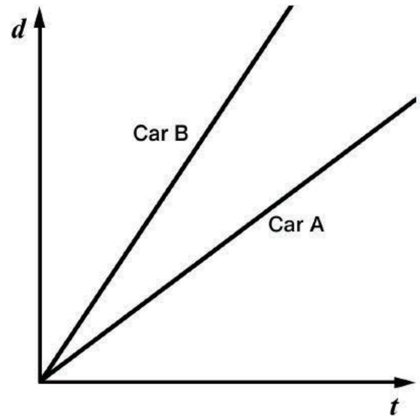
Why might it be important to know if a single linear model is appropriate for a situation?

Unit 8.5, Lesson 8: Practice Problems Name ______________________

1. Two cars drive on the same highway in the same direction. The graph shows the distance, d, of each car as a function of time, t.

   Which car drives faster?

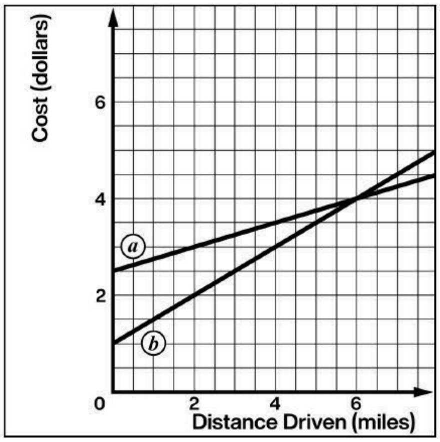
   Explain your thinking.



A car service charges $\$2.50$ to pick you up and charges c cents for each mile of your trip.

2.1 Which line represents the cost of the car service?

Explain your thinking.



2.2 Is the additional charge per mile greater or less than 50 cents per mile of the trip?

Explain your thinking.

2.3 Write an equation in the form $y = mx + b$ that could represent the cost of a car trip based on the number of miles driven.

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Unit 8.5, Lesson 8: Practice Problems

3. Write an equation for each line.

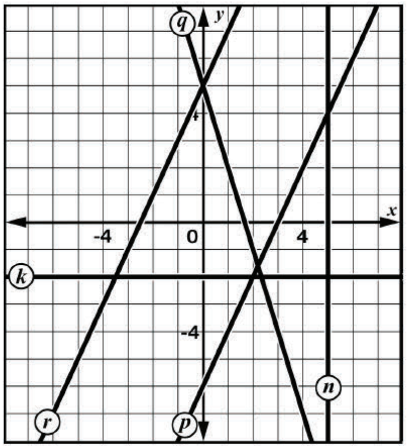
   Line k: ________________

   Line n: ________________

   Line p: ________________

   Line q: ________________

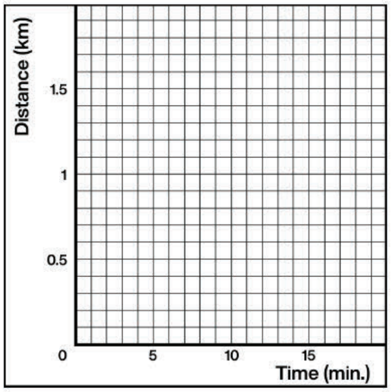
   Line r: ________________



4. Kiran and Clare like to race each other from their houses to school.

   They run at the same speed, but Kiran's house is closer to school than Clare's house.

   Create possible sketches of Kiran's and Clare's distances from Clare's house vs. time.



5. A school is designing their vegetable garden. The school gardener wrote these two equations to represent the situation, where w represents the width and l represents the length (in feet):

$$2l + 2w = 28$$
$$l = 2 + 2w$$

   Solve the system of equations to find the dimensions of the garden.

   Width: ________________ Length: ________________

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 9: Notes Name ______________________________

Modeling With Piecewise Linear Functions

Learning Goal(s):

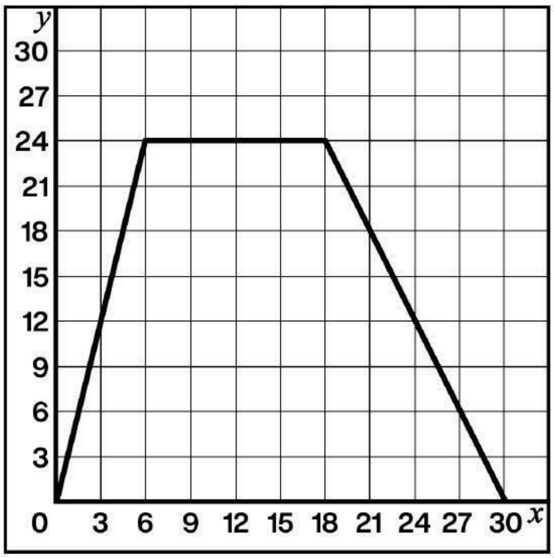
Deiondre gave their dog a bath in a bathtub. This graph shows the volume of water in the tub, in gallons, as a function of time, in minutes.

Why do you think this function is called a piecewise linear function?

At what rate did the water in the tub fill up? Explain how you know.

At what rate did the water in the tub drain? Explain how you know.

Select one linear piece of this function. Then write an equation for that piece in the form $y = mx + b$.



x **represents the time (min.).**
y **represents the water in the bath (gal.).**

Summary Question
How would you describe a piecewise linear function to someone who has never seen one?

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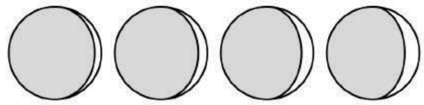
Unit 8.5, Lesson 9: Practice Problems Name ______________________________

On the first day after the new moon, 2% of the moon's surface is illuminated. On the second day, 6% of the moon's surface is illuminated.



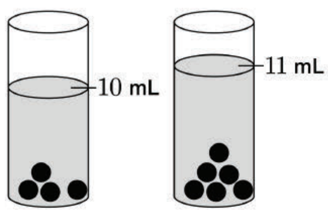
1.1 Use a linear model to fill out the table below.

Day Number	Illumination
1	2%
2	6%
...	...
	50%
	100%

1.2 The moon's surface is actually 100% illuminated on day 14. How appropriate is it to use a linear model for this data?

In science class, Farah uses a graduated cylinder with water in it to measure the volume of some marbles.

After dropping in 4 marbles, the height is 10 mL.
After dropping in 6 marbles, the height is 11 mL.



2.1 How much does the height increase for each marble? ____________

How much water was in the cylinder before any marbles were dropped in? __________

2.2 What should be the height of the water after 13 marbles are dropped in? __________

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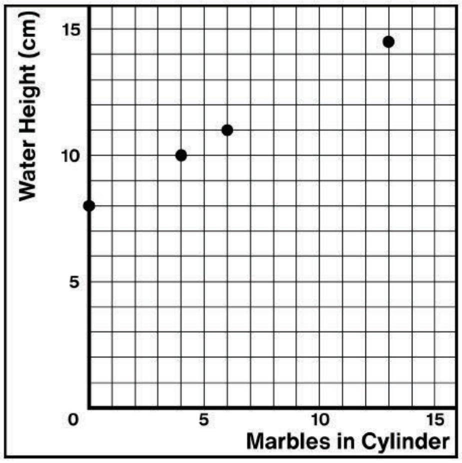
Unit 8.5, Lesson 9: Practice Problems

2.3 Is the relationship between the volume of water and number of marbles a linear relationship?



What does the slope of the line mean?

Solve each equation below.

3.1 $2(3x + 2) = 2x + 28$

3.2 $5y + 13 = -43 - 3y$

3.3 $4(2a + 2) = 8(2 - 3a)$

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Practice Day 1: Task Cards

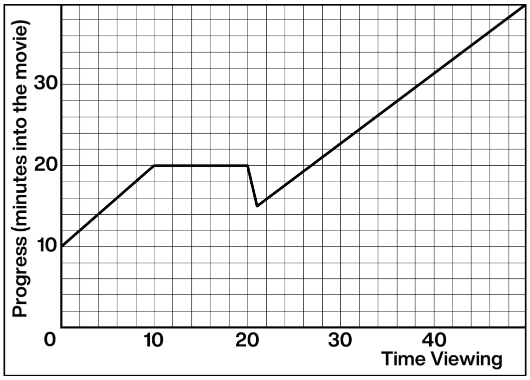
Two Truths and a Lie

1. Takeshi and Mateo sit down to watch a movie at home.

   A. After 30 minutes, Takeshi and Mateo were more than 20 minutes into the movie.

   B. Takeshi and Mateo began watching the movie at the beginning.

   C. Takeshi and Mateo watched part of the movie twice.

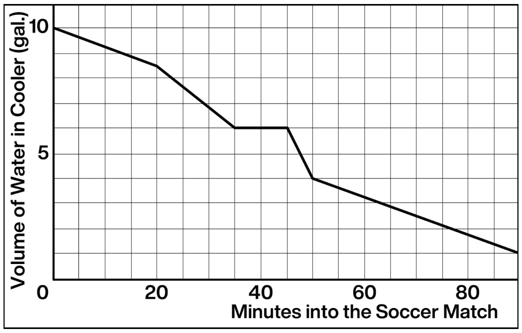


2. A student measures the volume of water in a cooler at a soccer match.

   A. The fastest volume decrease occurs between 45 and 50 minutes.

   B. The volume of water is decreasing at all times.

   C. A total of 9 gallons of water was used throughout the game.



3. A local utility company charges based on how much gas you use in your home. If you use 30 therms of gas a month, the cost is $\$60$. If you use 40 therms of gas, the cost is $\$75$. If you use 60 therms, the cost is $\$200$.

   A. Cost is a function of the amount of gas used.

   B. The amount of gas used is a function of cost.

   C. A single linear model is a reasonable option for this data.

Ready for More?

For each situation, write a new false statement that someone may believe is true.

Unit 8.5, Practice Day 1: Task Cards

Three Restaurants

Three burger restaurants use different representations to show the total cost, c, of ordering a certain number of burgers, b.

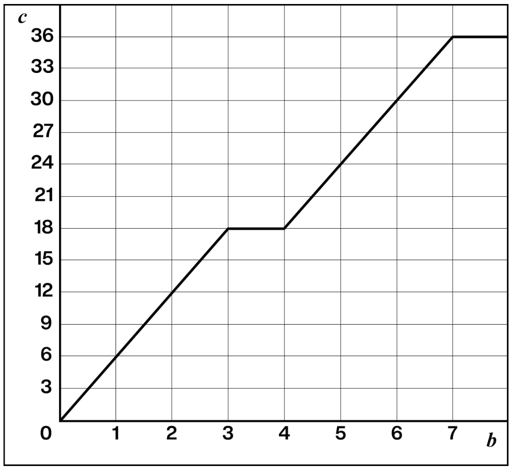
1. McDougal's

$$c = 4.75b$$

2. Sandy's

b	c
1	5
3	15
4	20
5	20

3. Burger Royalty



1. Is cost a function of number of burgers at Burger Royalty? Explain your thinking.
2. At which company is it cheapest to order 5 burgers? Explain how you know.
3. How much does each burger cost at each location? (Ignore "buy some, get one free" deals.)
4. What is one advantage of the equation over the graph of this situation?

Ready for More?

Write an equation in the form $y = mx + b$ for each segment of the graph.

Unit 8.5, Practice Day 1: Task Cards

Graphing Stories

Scenario: You are playing catch with your dog. She starts at the edge of the park, about 50 feet away from you. She starts to run towards you, but after 5 seconds, stops about 10 feet away from you to stare at the ball in your hand. She waits for 4 seconds, and then runs back to the edge of the park, chasing the ball. She grabs the ball at 12 seconds and runs back all the way to you. The scenario ends after 15 seconds.

1. Sketch two graphs that represent this situation.
   - 1.1 Sketch the relationship between the dog's distance from you and time.
   - 1.2 Sketch the relationship between the dog's distance from the edge of the park and time.

Ready for More?

Imagine that you have an object and you are recording its temperature over time. On your worksheet, create a sketch so that **all** of these statements are true.

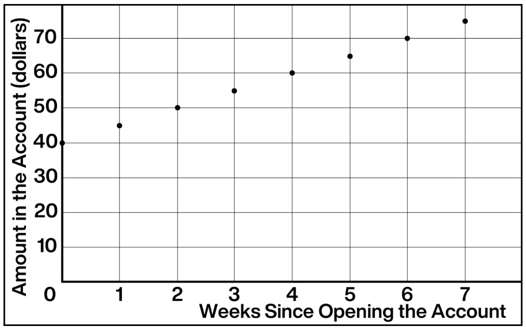
1. The temperature is 75 degrees Fahrenheit after 10 minutes.
2. The temperature is decreasing for at least 5 minutes.
3. The temperature is increasing for at least 7 minutes.

Unit 8.5, Practice Day 1: Task Cards

Linear or Not?

1. The Maya Civilization used shadows to track the passage of time. Alexis decides to examine shadows in their backyard using a stick. When the sun was directly overhead, there was no shadow. After 20 minutes, the shadow was 10.5 centimeters long. After 60 minutes, it was 26 centimeters long.

2. Peter starts helping out his neighbor with chores. He tracks how much money is in his bank account after each payment.



3. Have you ever noticed that the amount of daylight is different depending on the day of the year? A certain city in France gains about 2 minutes of daylight each day between March (the vernal equinox) and September (the autumnal equinox). After September, it loses about 2 minutes of daylight each day.

4. Tyrone is reading for an Independent Reading Project at school. The book he chooses is 355 pages long. His assignment is to read 15 pages each night. He completes his assignment every night and tracks the number of pages left in his book.

Ready for More?

For each scenario where a single linear model is not appropriate, find an interval where a linear model is appropriate. Write an equation of the form $y = mx + b$ for that interval.

Unit 8.5, Practice Day 1: Worksheet Name ______________________________

Student Workspace

Two Truths and a Lie: One of the statements for each situation is a lie. Which is it? Explain how you know it is a lie. 1. 2. 3. **Ready for More?**
Three Restaurants: Answer each question. 1. 2. 3. 4. **Ready for More?**

Unit 8.5, Practice Day 1: Worksheet Name ______________________________

Graphing Stories: Draw a graph to represent each scenario.

1.1

1.2

Ready for More

Linear or Not?: Decide if a single linear model is reasonable for this data. If so, write a linear equation of the form $y = mx + b$. If not, explain your reasoning.

1.

2.

3.

4.

Ready for More?

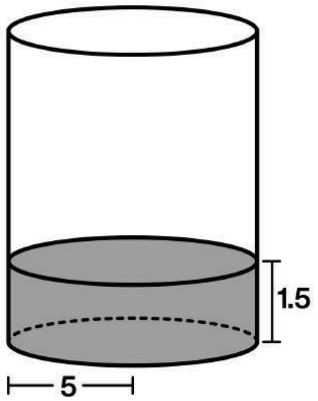
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.5, Lesson 12: Notes Name ________________________________

Scaling Cylinders Using Functions

Learning Goal(s):

Imagine a water tank that is shaped like a cylinder.

	If you triple the height of the water, will you triple the volume inside the container? Yes No Explain your thinking.
	If you triple the radius of the water tank, will you triple the volume inside the container? Yes No Explain your thinking.
What are all of the ways you could change the water or the tank so that its volume is 4 times its current amount?	

Summary Question

Why is the relationship between radius and volume non-linear?

Unit 8.5, Lesson 12: Practice Problems Name ______________________________

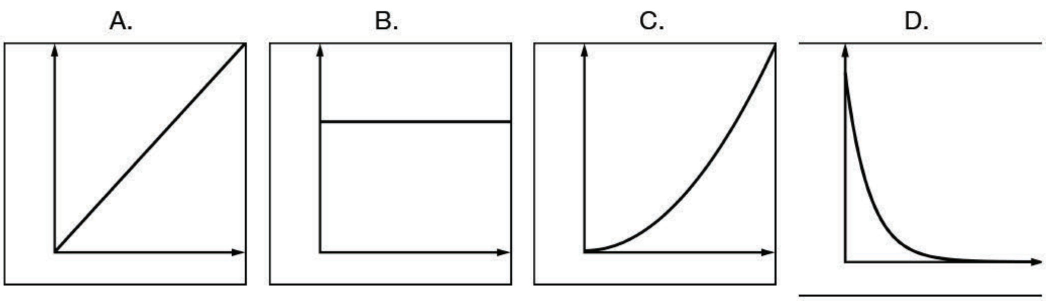
1.1 A cylinder has a radius of 3 centimeters and a height of 5 centimeters.

What is the volume of the cylinder? Express your answer in terms of π.

1.2 What is the volume of the cylinder from problem 1.1 with three times the height? Express your answer in terms of π.

1.3 What is the volume of the cylinder from problem 1.1 with three times the radius? Express your answer in terms of π.

2. Which graph could represent the volume of water in a cylinder as a function of its height?



Explain your choice.

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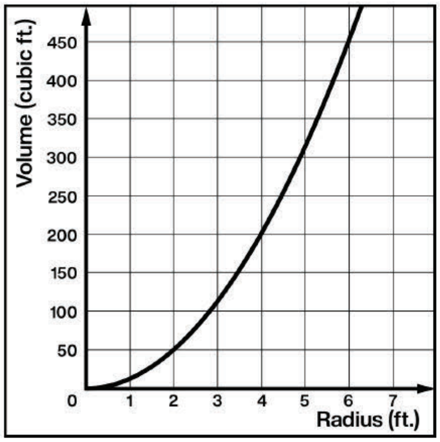
Unit 8.5, Lesson 12: Practice Problems

This function represents the relationship between the radius and volume of cylinders with a height of 4 feet.



3.1 Based on the graph, what is the volume of a cylinder with a radius of 2 feet?

3.2 Why is this relationship between radius and volume nonlinear?

4. A cylinder has a volume of 48π cm³ and height h.

Complete this table for volume of cylinders with the same radius but different heights.

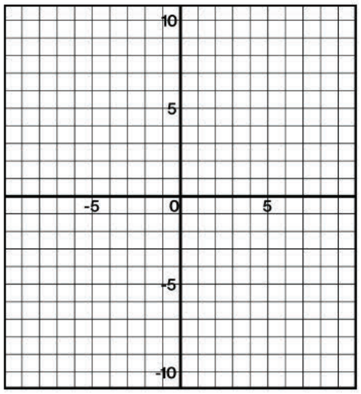
Express your answer in terms of π.

Height (cm)	Volume (cubic cm)
h	48π
$2h$	
$5h$	
$\frac{h}{2}$	
$\frac{h}{5}$	

5. Select **all** the points that are on a line with a slope of 2 that also contains the point $(2, -1)$.

Use the graph if it helps you with your thinking.

- ☐ $(3, 1)$
- ☐ $(1, 1)$
- ☐ $(1, -3)$
- ☐ $(4, 0)$
- ☐ $(6, 7)$



GRADE 8

Unit 7
Student Lessons

Student lessons from Unit 7 are included here to provide NYC reviewers with access to the specific lessons in Amplify Desmos Math New York that demonstrate coverage of the **Expressions, Equations, and Inequalities** domain.

These lessons are partially designed and will be updated to match the exemplar Student Edition lessons included earlier in this sampler.

Grade 8 Unit 7

Student Edition Sampler

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 1: Notes Name ___________________________

Learning Goal(s):

Exponents make it easy to show repeated multiplication. It is easier to write 2^6 than to write $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$. Imagine writing 2^{100} using multiplication!

For each expression below, write an equivalent expression that uses exponents:

A. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$	B. $5 \cdot 8 \cdot 5 \cdot 8 \cdot 5 \cdot 8 \cdot 5$	C. $10 \cdot 10 \cdot 10 + 10 \cdot 10$

Consider this situation: Each day, the number of grains of rice you have triples. On day one, you have 3 grains of rice. On day two, you have 9 grains of rice.

- On what day will you have 243 grains of rice?
- On what day will you have 3^{13} grains of rice?
- How many grains of rice will you have *two days after* you have 3^{13} grains of rice?

Summary Question
When is it useful to express a number or expression with exponents?

Unit 8.7, Lesson 1: Practice Problems Name ____________________

1. Write each expression using an exponent.

Expression	Expression With Exponent
$3 \cdot 3 \cdot 3 \cdot 3$	3^4
$7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$	
$\left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right)$	
$9.3 \cdot 9.3 \cdot 9.3 \cdot 9.3 \cdot 9.3 \cdot 9.3 \cdot 9.3 \cdot 9.3$	

2. Evaluate each expression.

Expression	Value
2^5	
3^3	
4^3	
6^2	
$\left(\frac{1}{2}\right)^4$	
$\left(\frac{1}{3}\right)^2$	

3. Write an expression using an exponent to represent the following:

Adnan starts with two coins on Day 1. The number of coins doubles every day.

How many coins will he have on Day 8?

Unit 8.7, Lesson 1: Practice Problems

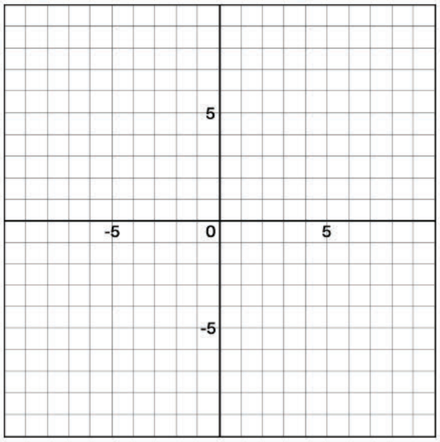
4. The equation $y = 5280x$ gives the number of feet, y, in x miles.

   What does the number 5280 represent in this relationship?

5. The points $(2, 4)$ and $(6, 7)$ lie on a line.

   What is the slope of the line?

   Use the coordinate plane if it helps you with your thinking.



   A. 2

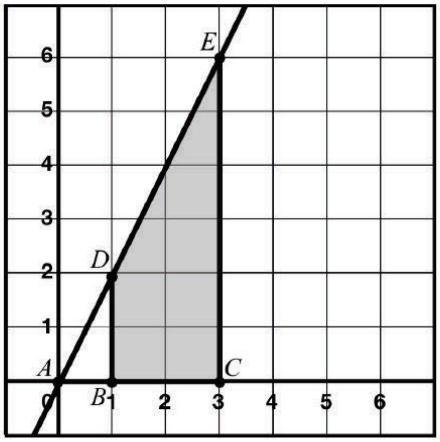
   B. 1

   C. $\frac{4}{3}$

   D. $\frac{3}{4}$

6. The diagram shows a pair of similar figures.

   What do the center and the scale factor need to be in order to transform triangle ACE to triangle ABD?



Center	Scale Factor

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This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 2: Notes Name ___________________________________

Learning Goal(s):

Sometimes writing an expression in an equivalent way can help us compare it to other expressions. The fact that exponents represent repeated multiplication can help us write equivalent expressions.

Decide if Expression 1 is equivalent to Expression 2 for each pair. Consider “expanding” each expression, as shown in Pair A.

	Expression 1	Expression 2	Equivalent?
Pair A	$\left(12^2\right)^3$ $(12 \cdot 12)(12 \cdot 12)(12 \cdot 12)$	$12^4 \cdot 12^2$ $(12 \cdot 12 \cdot 12 \cdot 12)(12 \cdot 12)$	YES NO
Pair B	$7^3 \cdot 2^3$	$(7 \cdot 2)^3$	YES NO
Pair C	$16^3 + 16^2 + 16$	16^6	YES NO
Pair D	15^6	$(5 \cdot 3 \cdot 3 \cdot 5)^4$	YES NO

Summary Question

Show or explain why $6^5 \cdot 6^3$ is equivalent to $\left(6^4\right)^2$. Then write another expression that is equivalent to both of them.

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Unit 8.7, Lesson 2: Practice Problems Name ______________________________

1. Rewrite each expression as a single power.

Expression	Single Power
$6^3 \cdot 6^9$	
$2 \cdot 2^4$	
$3^{10} \cdot 3^7$	
$5^3 \cdot 5^3$	
$12^5 \cdot 12^{12}$	
$7^6 \cdot 7^6 \cdot 7^6$	

2. Write each expression as a single power.

Expression	Single Power
$(3^7)^2$	
$(2^9)^3$	
$(7^6)^3$	
$(11^2)^3$	
$(5^3)^2$	
$(6^5)^7$	

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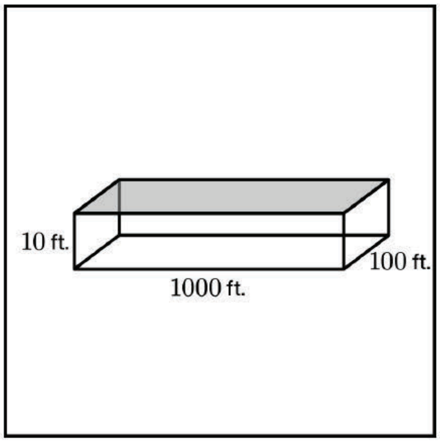
Unit 8.7, Lesson 2: Practice Problems

3. A large rectangular swimming pool is $1\,000$ feet long, 100 feet wide, and 10 feet deep.

   The pool is filled to the top with water.

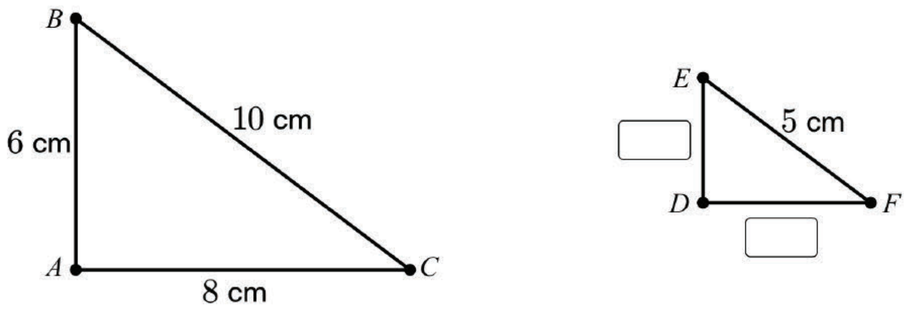


   3.1 What is the area of the surface of the water in the pool?

   3.2 How much water does the pool hold?

   3.3 Express your answers to the previous two questions as a single power.

4. Triangle DEF is similar to triangle ABC. Label the side lengths DE and DF.



This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 3: Power Pairs Name ___________________________

Power Pairs Score Sheet

Complete this sheet as you play the card game.

Player's Name	Card 1	Card 2	Equivalent?

Workspace:

Unit 8.7, Lesson 3: Power Pairs

Name ________________________________

Power Pairs Score Sheet

Complete this sheet as you play the card game.

Player's Name	Card 1	Card 2	Equivalent?

Workspace:

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 3: Notes Name ________________________________

Learning Goal(s):

Sometimes, we want to investigate whether two expressions are equivalent. In those instances, it can be helpful to convert between exponents and repeated multiplication.

For each pair, decide if Expression 1 is equivalent to Expression 2.

	Expression 1	Expression 2	Equivalent?
Pair A	$(5^5)^2$	$5^4 \cdot 5^3$	YES NO
Pair B	$4^3 \cdot 2^5$	8^8	YES NO
Pair C	$15^3 \cdot 2^3$	$(5 \cdot 2)^3 \cdot 3^3$	YES NO

Decide whether each expression below is equivalent to 10^6. For any that are not, change the expression so that it *is* equivalent to 10^6.

A. $10 \cdot 10^3 \cdot 10^2$	B. 100^5	C. $10^3 + 10^3$	D. $(10^2)^3$

Summary Question
What are some important things to remember when determining whether expressions with exponents are equivalent?

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Unit 8.7, Lesson 3: Practice Problems Name ______________________________

1. Rewrite each expression as a single power.

Expression	Single Power
$3^7 \cdot 3^2$	
$(3^7)^2$	
$5^3 \cdot 5^2$	
$(5^3)^2$	
$(5^2)^3$	

2. There is an amoeba (a single-celled animal) on a dish. After one hour, the amoeba divides to form two amoebas. One hour later, each amoeba divides to form two more. Every hour, each amoeba divides to form two more.

2.1 How many amoebas are there after 2 hours?

2.2 Write an expression for the number of amoebas after 6 hours.

2.3 Write an expression for the number of amoebas after 24 hours.

2.4 Why might exponential notation, like 2^6, be useful for answering these questions?

Unit 8.7, Lesson 3: Practice Problems

3. Nine years ago, Katie was twice as old as Elena was then.

   Elena realizes, "In four years, I'll be as old as Katie is now!"

   Elena writes these equations to help her make sense of the situation:

$$k - 9 = 2(e - 9)$$
$$e + 4 = k$$

   If Elena is currently e years old and Katie is k years old, how old is Katie now?

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 4: Notes Name ______________________________

Learning Goal(s):

Expressions that have a single base and a single exponent (like 7^3) are sometimes preferable to expressions with more parts because they can help us easily compare numbers to each other.

For each expression below, fill in the blanks. The first row has been done for you.

Expression	Expanded Expression	Single Power
$\left(12^2\right)^3$	$(12 \cdot 12)(12 \cdot 12)(12 \cdot 12)$	12^6
A. $\frac{6^5 \cdot 6^2}{6^4}$		
B. $7^3 \cdot 2^3$		
C. $\frac{\left(3^3\right)^2}{3^4}$		
D. $\frac{9^2 \cdot 3^5}{3^3}$		

Which of the four above expressions (A, B, C, or D) is greatest? Explain your reasoning.

Summary Question

Describe a strategy for rewriting an expression like $\frac{\left(6^{30}\right)^3}{6^{40}}$ as a single power.

Unit 8.7, Lesson 4: Practice Problems Name ______________________________

1. Rewrite each expression as a single power.

Expression	Single Power
$\frac{5^6}{5^3}$	
$\left(14^3\right)^6$	
$8^3 \cdot 8^6$	
$\frac{16^6}{2^6}$	
$\frac{21^3 \cdot 21^5}{21^2}$	

2. Rewrite each expression as a single power.

Expression	Single Power
$4^4 \cdot 5^4$	
$6 \cdot 6^8$	
$\left(12^2\right)^7 \cdot 12$	
$\frac{3^{10}}{3}$	
$(0.173)^9 \cdot (0.173)^2$	
$\frac{0.87^5}{0.87^3}$	

Unit 8.7, Lesson 4: Practice Problems

3. Find x, y, and z if the following is true:

   $(3 \cdot 5)^4 \cdot (2 \cdot 3)^5 \cdot (2 \cdot 5)^7 = 2^x \cdot 3^y \cdot 5^z$

   Record your answers in the table.

Variable	Value
x	
y	
z	

4. Bananas cost $\$1.50$ per pound, and guavas cost $\$3.00$ per pound.
   Kiran spends $\$12$ on fruit for a breakfast his family is hosting.
   He buys b pounds of bananas and g pounds of guavas.

   4.1 Write an equation relating the two variables.

   4.2 If he buys 4 pounds of bananas, how many pounds of guavas can he buy?

   4.3 If Kiran buys b pounds of bananas and is interested in how many pounds of guavas he can buy, what is the independent variable?

   A. Number of pounds of bananas

   B. Number of pounds of guavas

   C. Total cost of fruit

   Explain your thinking.

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 5: Notes Name ___________________________________

Learning Goal(s):

Our concept of "exponents as repeated multiplication" is less helpful when the exponent is zero or a negative number. Patterns can help us discover what zero or negative numbers mean as exponents.

Powers of 8		
8^3	$1 \cdot 8 \cdot 8 \cdot 8$	512
8^2	$1 \cdot 8 \cdot 8$	64
8^1	$1 \cdot 8$	8
8^0	1	1
8^{-1}	$1 \div 8$	$\frac{1}{8}$
8^{-2}	$1 \div 8 \div 8$	$\frac{1}{8^2}$ or $\frac{1}{64}$
8^{-3}	$1 \div 8 \div 8 \div 8$	$\frac{1}{8^3}$ or $\frac{1}{512}$

Examine the **Powers of 8** table. How do the numbers change as you look *down* the table from 8^3 to 8^2 to 8^1?

Based on the patterns in the table, what is another way to represent 8^{-5}?

Why does it make sense that $8^0 = 1$?

Write each expression as a single power:

A. $\dfrac{7^4 \cdot 7^{-2}}{7^{12}}$

B. $\dfrac{1}{5} \cdot \dfrac{1}{5} \cdot \dfrac{1}{5}$

C. $\dfrac{2^{-4}}{\left(2^{-5}\right)^2}$

Summary Questions

What is the relationship between 10^5 and 10^{-5}?

What is the value of $10^5 \cdot 10^{-5}$?

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Unit 8.7, Lesson 5: Practice Problems Name ____________________________________

1. Priya says, "I can figure out 5^0 by looking at other powers of 5. If 5^3 is 125 and 5^2 is 25, then 5^1 is 5."

   1.1 What pattern do you notice?

   1.2 If this pattern continues, what should be the value of 5^0? Explain your thinking.

2. Select all the expressions that are equivalent to 4^{-3}.

   - ☐ -12
   - ☐ 2^{-6}
   - ☐ $\frac{1}{4^3}$
   - ☐ $\left(\frac{1}{4}\right) \cdot \left(\frac{1}{4}\right) \cdot \left(\frac{1}{4}\right)$
   - ☐ 12
   - ☐ $\frac{8^{-1}}{2^2}$

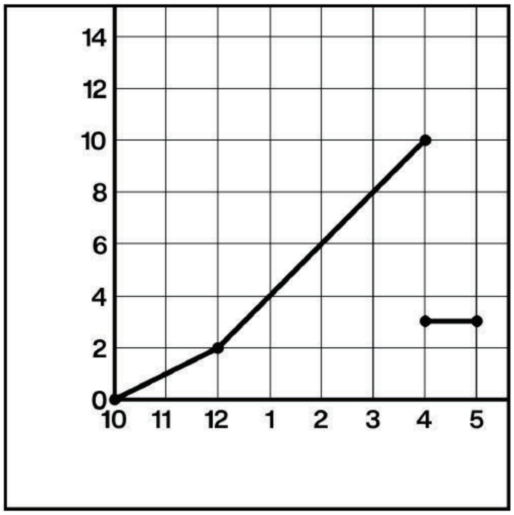
Unit 8.7, Lesson 5: Practice Problems

3. Andre sets up a rain gauge to measure rainfall in his backyard. It rains off and on all day Tuesday.

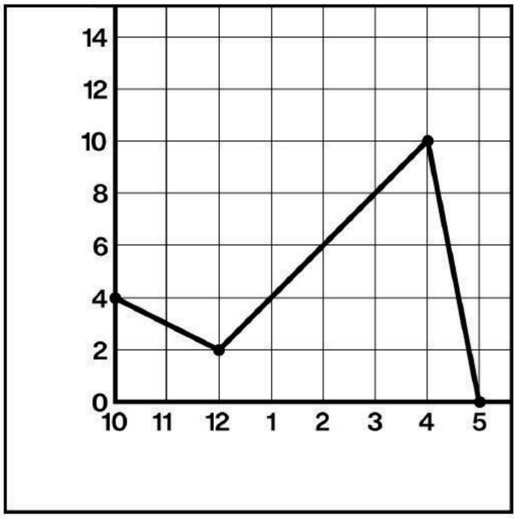
- At 10 a.m., the gauge is empty.
- Two hours later, the gauge has 2 centimeters of water in it.
- At 4 p.m., he finds the gauge has 10 centimeters of water in it.
- He accidentally knocks the gauge over and spills most of the water, leaving only 3 centimeters of water.
- At 5 p.m., there is no change in the water level.

3.1 Which of the two graphs could represent Andre's story?

A.



B.



Explain your thinking.

3.2 Label the axes on the graph you selected in 3.1. Include appropriate units in parentheses.

3.3 Use the graph to determine how much rain fell on Tuesday.

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Unit 8.7, Lesson 6: Write a Rule Name(s) ______________________________

Activity 1: Write a Rule

Grouping 1:

Three Examples	Rule (first draft)
Rule (second draft)	**Show how you know this rule works.**

Grouping 2:

Three Examples	Rule (first draft)
Rule (second draft)	**Show how you know this rule works.**

Unit 8.7, Lesson 6: Write a Rule Name(s) ______________________________

Grouping 3:

Three Examples	Rule (first draft)
Rule (second draft)	Show how you know this rule works.

Grouping 4:

Three Examples	Rule (first draft)
Rule (second draft)	Show how you know this rule works.

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Unit 8.7, Lesson 6: Write a Rule Name(s) ______________________________

Grouping 5:

Three Examples	Rule (first draft)
Rule (second draft)	**Show how you know this rule works.**

Grouping 6:

Three Examples	Rule (first draft)
Rule (second draft)	**Show how you know this rule works.**

Unit 8.7, Lesson 6: Notes Name ___________________________________

Learning Goal(s):

Patterns emerge when we rewrite expressions with exponents. We can generalize these patterns into exponent rules.

Fill in the blanks. Then write why the rule makes sense.

Symbolic Rule	Example	Why It Makes Sense
$x^m \cdot x^n = x^{m+n}$	$8^5 \cdot 8^2 = 8^7$	Both sides of the equal sign have seven factors of 8.
$(x^m)^n = (x^n)^m = x^{m \cdot n}$	$(11^2)^3 = (11^3)^2 = 11^6$	
	$6^3 \cdot 5^3 = 30^3$	
$\frac{x^m}{x^n} = x^{m-n}$		
$x^{-n} = \frac{1}{x^n}$		
	$188^0 = 1$	

Summary Question

Explain why $15^{10} \cdot 2^{13}$ is equivalent to $30^{10} \cdot 2^3$.

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Unit 8.7, Lesson 6: Practice Problems Name ______________________

1. Evaluate each expression.

Expression	Value
5^0	
$\frac{6^3}{6^3}$	
$2^2 + 2^1 + 2^0$	

2. Rewrite each expression as a single power.

Expression	Single Power
$\frac{5^3 \cdot 5^4}{5^5}$	
$\left(\frac{3^5}{3^3}\right)^4$	
$\frac{2^4 \cdot 2^5 \cdot 2^6}{2^3 \cdot 2^7}$	

Expression	Single Power
$(7^4) \cdot \frac{7^{12}}{7^7}$	
$\frac{(10^5)^2}{(10^2)^3}$	

3. Write each expression as a single power with a negative exponent. One is already written as an example.

Expression	Single Power With Negative Exponent
$\frac{1}{6} \cdot \frac{1}{6}$	6^{-2}
$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$	
$\frac{1}{5^7}$	

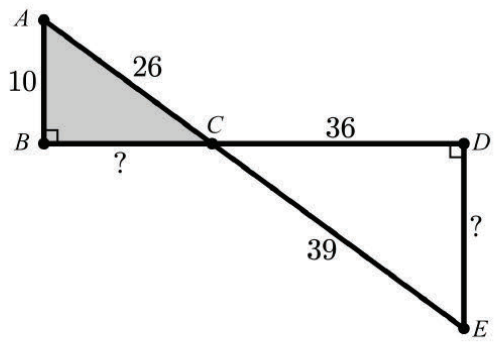
Expression	Single Power With Negative Exponent
$(\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3})^2$	
$\left(\frac{1}{10^3}\right)^3$	

Unit 8.7, Lesson 6: Practice Problems

4. Fill in the blank next to each scenario with the letter of its equation.

A dump truck is hauling loads of dirt to a construction site. After 20 loads, there are 70 cubic feet: _______	A. $\frac{1}{2}x = y$
I am making a water-and-salt mixture that has 2 cups of salt for every 6 cups of water: _______	B. $y = \frac{5}{2}x$
For every 48 cookies I bake, my students get 24: _______	C. $y = 3x$
A store has a "4 for $10" sale on hats: _______	D. $y = 3.5x$

Here are two right triangles.



5.1 Explain why triangle ABC is similar to EDC.

5.2 Find the missing side lengths.

BC	DE

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Unit 8.7, Practice Day 1: Worksheet Name ______________________________

Part 1

1. Choose **six** of the following problems to write using a single exponent.

A. $10^{-3} \cdot 10^{8}$	B. $\frac{3^5}{3^{28}}$	C. $(7^2)^3$
D. $\frac{2^{-5}}{2^4}$	E. $3^5 \cdot 3^6$	F. $(5^3)^{-3}$
G. $2^{-4} \cdot 2^{-3}$	H. $(10^{-8})^{-4}$	I. $\frac{6^5}{6^{-8}}$
J. $(12^{-3})^5$	K. $\frac{10^{-12}}{10^{-20}}$	L. $\left(\frac{5}{6}\right)^4 \cdot \left(\frac{5}{6}\right)^5$

2. Select one problem that you skipped and explain why you skipped it.

Part 2

1. Choose **three** of the following problems to write using a single positive exponent.

A. 10^{-7}	B. $\frac{5^3}{5^7}$	C. $\frac{9^6}{9^{11}}$
D. $\left(\frac{1}{2}\right)^{-32}$	E. 7^{-8}	F. $\left(\frac{8}{5}\right)^{-5}$

2. Which problem would you assign to one of your best friends? Why?

Unit 8.7, Practice Day 1: Worksheet Name ___________________________

Part 3

1. Choose **three** of the following problems to evaluate (write without any exponents).

A. $\frac{10^5}{10^5}$	B. $\left(\frac{5}{4}\right)^2$	C. $\left(\frac{2}{3}\right)^3$
D. $(3^4)^0$	E. $2^8 \cdot 2^{-8}$	F. $\left(\frac{7}{2}\right)^2$

2. Find an expression above that evaluates to 1, and explain how you know it does so.

Part 4

1. Choose **three** of the following problems to write using a single exponent. (Note: Not all problems can be written using a single exponent.)

A. $10^3 \cdot 10^3$	B. $3^2 \cdot 2^3$	C. $5^6 \cdot 9^6$
D. $2^3 \cdot 4^3 \cdot 6^3$	E. $7^5 \cdot 8^5$	F. $\left(\frac{2}{3}\right)^4 \cdot \left(\frac{2}{3}\right)^4$

2. Circle one problem above that cannot be written using a single exponent. Explain how you know.

Are You Ready for More?

Solve this equation: $3^{x+4} = 9^{12}$. Explain your thinking.

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Unit 8.7, Lesson 7: Notes Name ___________________________

Learning Goal(s):

The United States Mint has made over $500,000,000,000$ pennies. Exactly how many pennies is that? One way to make sense of that number is by considering how many thousands, millions, or billions of pennies that is. Another way of making sense is to rewrite it using powers of 10.

Number	In Billions	In Millions	In Thousands	Rewrite as a Multiple of a Power of 10
$500,000,000,000$	________ billion (10^9)			
$500,000,000,000$		________ million (10^6)		
$500,000,000,000$			________ thousand (10^3)	

Write two different expressions that represent the weight of the object using a power of ten.

Object and Weight	Expression #1	Expression #2
Bus: $7,810$ **kg**	$781 \cdot 10^1$	
Ship: $4,850,000$**kg**		
Cell Phone: 0.13 **kg**		

Summary Question

What does it mean to write a number using a single multiple of a power of 10?

Unit 8.7, Lesson 7: Practice Problems Name ______________________

1. Fill in the blank next to each number with the letter of its name.

0.000001 : ______	A. One billion
0.001 : ______	B. One thousandth
0.01 : ______	C. One million
1 000 000 : ______	D. One hundredth
1 000 000 000 : ______	E. One millionth

2. Write each expression as a multiple of a power of 10.

Expression	As a Multiple of a Power of 10
42 300	
2 000	
9 200 000	
Four thousand	
80 million	
32 billion	

3. Find three different ways to write the number $437{,}000$ as a multiple of a power of 10.

Value	As a Multiple of a Power of 10
437 000	
437 000	
437 000	

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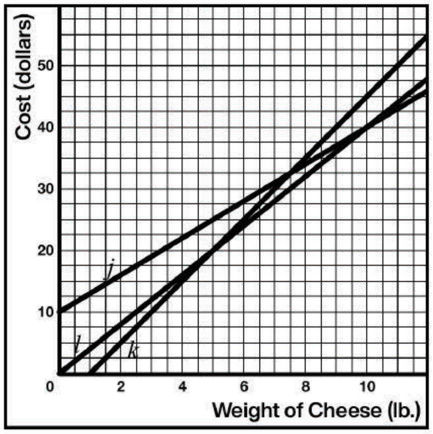
Unit 8.7, Lesson 7: Practice Problems

4. A fancy cheese is not prepackaged, so a customer can buy any amount of it. The cost of this cheese at three stores is a function of the weight of the cheese.

   - Store A sells the cheese for a dollars per pound.
   - Store B sells the same cheese for b dollars per pound, with a coupon for $\$5$ off their total purchase at the store.
   - Store C is an online store. They sell the same cheese for c dollars per pound, with a $\$10$ delivery fee.

   This graph shows the price functions for each store.



4.1 Fill in the blank next to each store with the letter of the line that represents it.

Store A: _______		J.	Line j
Store B: _______		K.	Line k
Store C: _______		L.	Line l

4.2 Which store has the lowest price for half a pound of cheese?

A. Store A
B. Store B
C. Store C

4.3 If a customer wants to buy 6 pounds of cheese for a party, which store has the lowest price?

A. Store A
B. Store B
C. Store C

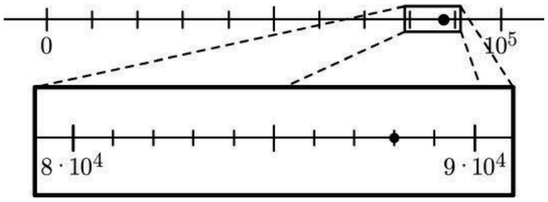
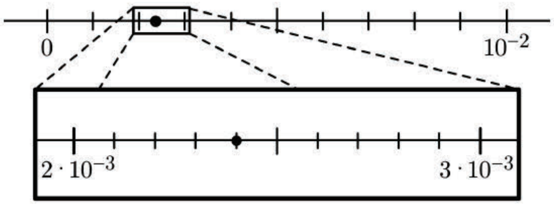
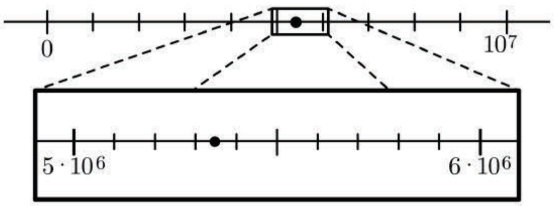
4.4 How many pounds would a customer need to order to make Store C a good option? Explain your thinking.

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 8: Notes Name ____________________________________

Learning Goal(s):

For each example below, write the number shown on the number line diagram.

	Write the number shown on the number line diagram.
	What is another way to write this number?
	Write the number shown on the number line diagram.
	What is another way to write this number?
	Write the number shown on the number line diagram.
	What is another way to write this number?

Summary Question

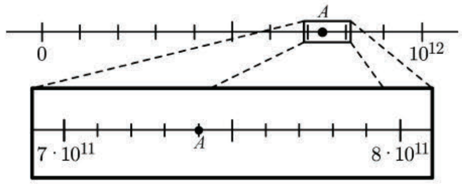
When a number is given as a multiple of a power of 10, what is a strategy for writing an equivalent number?

Unit 8.7, Lesson 8: Practice Problems Name ______________________________

1. Find three different ways to write the number 5 230 000 as a multiple of a power of 10.

Value	As a Multiple of a Power of 10
5 230 000	
5 230 000	
5 230 000	

2. What number is represented by point A? Explain your thinking.



3. Rewrite each expression as a single power of 10.

Expression	Single Power of 10
$10^{-3} \cdot 10^{-2}$	
$10^{4} \cdot 10^{-1}$	
$\frac{10^{5}}{10^{7}}$	
$\left(10^{-4}\right)^{5}$	
$10^{-3} \cdot 10^{2}$	
$\frac{10^{-9}}{10^{5}}$	

Unit 8.7, Lesson 8: Practice Problems

4. Select each expression that is equivalent to $\frac{1}{10\,000}$.

   - ☐ $(10\,000)^{-1}$
   - ☐ $(-10\,000)$
   - ☐ $(100)^{-2}$
   - ☐ $(10)^{-4}$
   - ☐ $(-10)^{4}$

5. A fully inflated basketball has a radius of 12 centimeters.
   How many cubic centimeters of air does your ball need to fully inflate?

   Express your answer in terms of π.
   Then estimate your answer using 3.14 to approximate π.

In Terms of π	Using 3.14 as an Estimate

6. Solve each of these equations. Explain or show all of your reasoning.

   6.1 $2(3 - 2c) = 30$

   6.2 $3x - 2 = 7 - 6x$

   6.3 $31 = 5(b - 2)$

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Lesson 9: Notes Name ______________________________

Learning Goal(s):

Powers of 10 and exponent rules can be helpful for making calculations with large or small numbers. The table below shows the number of people in the United States in 2014 and how much total oil they used for energy.

	Estimated Amount	**Write Using a Power of 10**
Population of United States in 2014	$300,000,000$ people	
Total Oil Used	$2,000,000,000,000$ kilograms	

Approximately how many kilograms of oil did the average person in the United States use in 2014?

The table shows the total number of creatures as well as the approximate masses of each creature.

Creature	**Total**	**Mass of One Individual (kg)**
Humans	$7.5 \cdot 10^9$	$6 \cdot 10^1$
Ants	$5 \cdot 10^{16}$	$3 \cdot 10^{-6}$

Which is more massive: the total mass of all humans or the total mass of all the ants? About how many times more massive is it?

Summary Question

If you have two very large numbers, how can you tell which is larger?

Unit 8.7, Lesson 9: Practice Problems Name ______________________________

1. The Sun is roughly 10^2 times as wide as Earth.

   The star KW Sagittarii is roughly 10^5 times as wide as Earth.

   About how many times as wide is KW Sagittarii as the Sun? Explain your thinking.

You have $1\ 000\ 000$ small cubes. Each cube measures 1 inch on a side.

2.1 If you stacked all of the cubes on top of one another to make an enormous tower, how high would they reach?

Express your answer in terms of inches, feet and miles.

Note: There are 12 inches in a foot and $5\ 280$ feet in a mile.

Value	Unit
	inches
	feet
	miles

2.2 If you arranged all of the cubes on the floor to make a square, what would be the length of each side?

2.3 If you arranged all of the cubes on the floor to make a square, would the square fit in your classroom? Explain your thinking.

2.4 If you used all of the cubes to make one big cube, what would be the side length of the big cube? Explain your thinking.

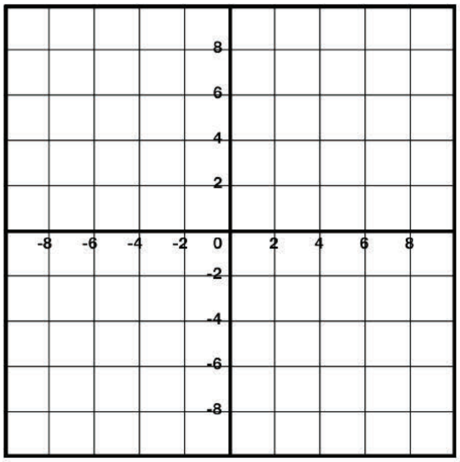
Unit 8.7, Lesson 9: Practice Problems

3. Select all the expressions that are equivalent to 6^{-3}.

- ☐ -18
- ☐ $\frac{6}{6^4}$
- ☐ $\frac{1}{6^3}$
- ☐ $(-6) \cdot (-6) \cdot (-6)$
- ☐ $\left(\frac{1}{6}\right) \cdot \left(\frac{1}{6}\right) \cdot \left(\frac{1}{6}\right)$
- ☐ $2^{-3} \cdot 3^{-3}$
- ☐ $\frac{12^6}{2^9}$

4. Draw a line going through $(-6, 1)$ with a slope of $-\frac{2}{3}$.

Then write the equation of the line.



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Unit 8.7, Lesson 10: Notes Name ______________________________

Learning Goal(s):

Definition	Facts/Characteristics
Scientific Notation	
Examples	Non-Examples

Write each number using scientific notation, or say if it is already written using scientific notation.

Number	Scientific Notation
$540,000$	
0.003	
$6.8 \cdot 10^9$	
$12 \cdot 10^{-2}$	
$97 \cdot 10^5$	

Summary Question
What is important to pay attention to when writing a number in scientific notation?

Unit 8.7, Lesson 10: Practice Problems Name ____________________________________

1. Which expressions are equivalent to $4 \cdot 10^{-3}$?

- ☐ $4 \cdot \left(\frac{1}{10}\right) \cdot \left(\frac{1}{10}\right) \cdot \left(\frac{1}{10}\right)$
- ☐ $4 \cdot (-10) \cdot (-10) \cdot (-10)$
- ☐ $4 \cdot 0.001$
- ☐ $4 \cdot 0.0001$
- ☐ 0.004
- ☐ 0.0004

2.1 Write each expression as a multiple of a power of 10.

Expression	As a Multiple of a Power of 10
0.04	
0.072	
0.0000325	
Three thousandths	
23 hundredths	
729 thousandths	
41 millionths	

2.2 Write each expression in scientific notation.

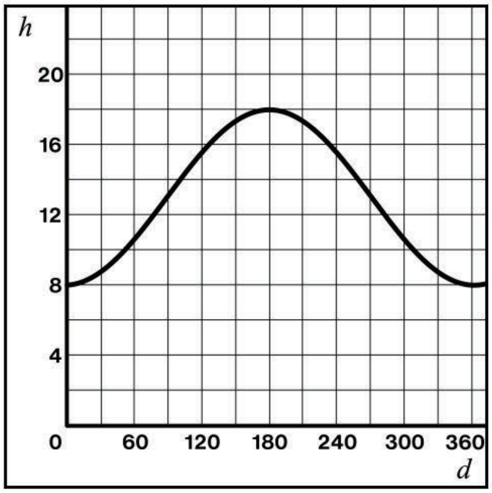
Expression	Scientific Notation
0.04	
0.072	
0.0000325	
Three thousandths	
23 hundredths	
729 thousandths	
41 millionths	

Unit 8.7, Lesson 10: Practice Problems

3. Write each expression in scientific notation.

Standard Notation	Scientific Notation
$14,700$	
0.00083	
$760,000,000$	
0.038	
0.38	
3.8	
$3,800,000,000,000$	

Here is the graph of days and the predicted number of hours of sunlight, h, on the d-th day of the year.



4.1 Is hours of sunlight a function of days of the year? Explain your thinking

4.2 For what days of the year do the hours of sunlight increase?

4.3 For what days of the year do the hours of sunlight decrease?

4.4 Which day of the year has the most hours of sunlight?

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Unit 8.7, Lesson 11: Notes Name ______________________________

Learning Goal(s):

Comparing the relative sizes of very large or very small numbers is easier with scientific notation. The table shows the total numbers of humans and ants.

	Approximate Number	Scientific Notation
Humans	$7,500,000,000$	
Ants	$50,000,000,000,000,00($	

About how many ants are there for every human?

Ants weigh about $3 \cdot 10^{-6}$ kilograms each. Humans weigh about $6.2 \cdot 10^{1}$ kilograms each. About how many ants weigh the same as one human?

There are about $3.9 \cdot 10^{7}$ residents in California. The average Californian uses about 180 gallons of water per day. About how many gallons of water total do Californians use in a day?

Summary Question
Describe a strategy you used to divide two numbers given in scientific notation.

Unit 8.7, Lesson 11: Practice Problems Name ______________________________

1. Evaluate each expression. Express your answer in scientific notation.

Expression	Answer (in scientific notation)
$(1.5 \cdot 10^{2})(5 \cdot 10^{10})$	
$\frac{4.8 \cdot 10^{-8}}{3 \cdot 10^{-3}}$	
$(5 \cdot 10^{8})(4 \cdot 10^{3})$	
$(7.2 \cdot 10^{3}) \div (1.2 \cdot 10^{5})$	

2.1 Which number is greater?

$17 \cdot 10^{8}$ or $4 \cdot 10^{8}$

About how many times greater is one than the other?

2.2 Which number is greater?

$2 \cdot 10^{6}$ or $7.839 \cdot 10^{6}$

About how many times greater is one than the other?

2.3 Which number is greater?

$42 \cdot 10^{7}$ or $8.5 \cdot 10^{8}$

About how many times greater is one than the other?

Unit 8.7, Lesson 11: Practice Problems

3. Jada is making a scale model of the solar system.

   The distance from Earth to the Moon is about 2.389×10^5 miles.

   The distance from Earth to the Sun is about 9.296×10^7 miles.

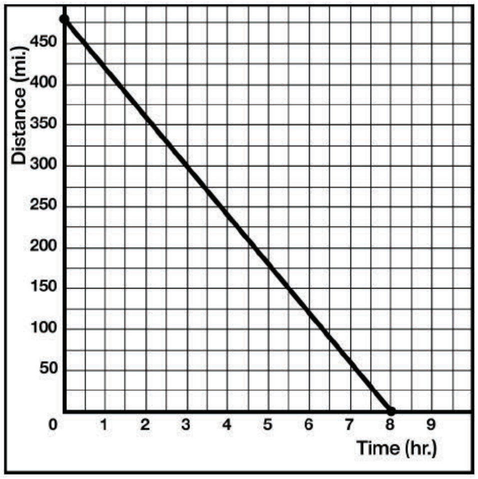
   She decides to put Earth on one corner of her dresser and the Moon in another corner about a foot away.

   Where should she put the Sun?

   A. On a windowsill in the same room
   B. In her kitchen, which is down the hallway
   C. A city block away

   Explain your thinking.

4. A family sets out on a road trip to visit their cousins. They travel at a steady rate. The graph shows the remaining distance to their cousins' house for each hour of the trip.



   4.1 How fast are they traveling?

   4.2 Is the slope positive or negative? Explain how you know and why that fits the situation.

   4.3 How far is the trip? Explain your thinking.

   4.4 How long did the trip take? Explain your thinking.

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Unit 8.7, Lesson 12: Notes Name ______________________________

Learning Goal(s):

The table below shows the diameters for objects in our solar system.

Object	Diameter (km)
Sun	$1.392 \cdot 10^6$
Mars	$6.785 \cdot 10^3$
Jupiter	$1.428 \cdot 10^5$
Neptune	$4.95 \cdot 10^4$
Saturn	$1.2 \cdot 10^5$

If we place Mars and Neptune next to each other, are they wider than Saturn?

First, add the diameters of Mars and Neptune:

$$6.785 \cdot 10^3 + 4.95 \cdot 10^4$$

To add these numbers, we can either rewrite them as multiples of 10^3 or as multiples of 10^4.

Method 1: Rewrite each number as a multiple of 10^3.

Method 2: Rewrite each number as a multiple of 10^4.

If we place Jupiter and Neptune next to each other, are they wider than the Sun?

About how much wider is Jupiter than Neptune?

Summary Question

What are some important things to remember when adding numbers written in scientific notation?

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Unit 8.7, Lesson 12: Practice Problems Name ______________________________

1. Evaluate each expression. Express your answer in scientific notation.

Expression	Answer (in scientific notation)
$(2 \cdot 10^5) + (6 \cdot 10^5)$	
$(4.1 \cdot 10^7) \cdot 2$	
$3 \cdot (1.5 \cdot 10^{11})$	
$(3 \cdot 10^3)^2$	
$(9 \cdot 10^6) \cdot (3 \cdot 10^6)$	

2. Evaluate each expression. Express your answer in scientific notation.

Expression	Answer (in scientific notation)
$5.3 \cdot 10^4 + 4.7 \cdot 10^4$	
$3.7 \cdot 10^6 - 3.3 \cdot 10^6$	
$4.8 \cdot 10^{-3} + 6.3 \cdot 10^{-3}$	
$6.6 \cdot 10^{-5} - 6.1 \cdot 10^{-5}$	

3. Han found a way to compute complicated expressions more easily. Since $2 \cdot 5 = 10$, he looks for pairings of 2s and 5s that he knows equal 10. Apply Han's technique to compute the expressions in the table.

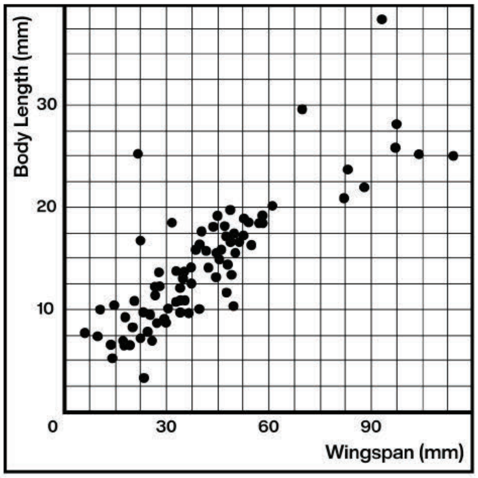
For example:

$$3 \cdot 2^4 \cdot 5^5 = 3 \cdot 2^4 \cdot 5^4 \cdot 5$$
$$= (3 \cdot 5) \cdot (2 \cdot 5)^4$$
$$= 15 \cdot 10^4$$
$$= 150\,000$$

Expression	Value
$2^4 \cdot 5 \cdot (3 \cdot 5)^3$	
$\dfrac{2^3 \cdot 5^2 \cdot (2 \cdot 3)^2 \cdot (3 \cdot 5)^2}{3^2}$	

Unit 8.7, Lesson 12: Practice Problems

4. Ecologists measured the body length and the wingspan of 127 butterfly specimens caught in a single field.



   4.1 Draw a straight line that is a good fit for the data.

   4.2 Write an equation for your line.

   4.3 What does the slope of the line tell you about the wingspans and lengths of these butterflies?

5. Diego was solving an equation, but when he checked his answer, he saw his solution was incorrect. He knew he made a mistake, but he couldn't find it.

Diego's work:

$$-4(7 - 2x) = 3(x + 4)$$

$$-28 - 8x = 3x + 12$$

$$-28 = 11x + 12$$

$$-40 = 11x$$

$$-\frac{40}{11} = x$$

   5.1 What is the correct solution to the equation?

   5.2 Where did Diego go wrong? Write on Diego's work above if it helps you show your thinking.

Digital Lesson

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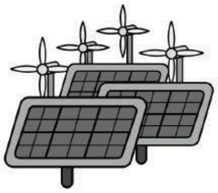
Unit 8.7, Lesson 13: Supplement Name(s) ______________________________

Spend Jeff's Money

Spend as much of Jeff Bezos's money as you can (**without going over**) by purchasing any combination of these items.

Pay one medical crowdfunded goal
$\$5 \cdot 10^4$

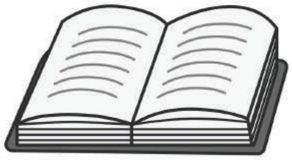


Make green energy in the U.S.
$\$1.5 \cdot 10^{10}$

Lamborghini
$\$2.2 \cdot 10^5$

End homelessness in the U.S.
$\$2 \cdot 10^{10}$

Gaming console
$\$6 \cdot 10^2$



Book
$\$2 \cdot 10^1$

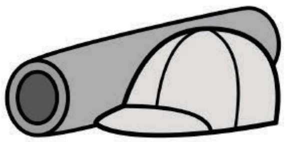
Pay one student's college loan debt
$\$3 \cdot 10^4$

Private island
$\$5 \cdot 10^6$

Pay for healthcare for one American for one year
$\$1 \cdot 10^4$

Professional football team
$\$3 \cdot 10^9$

Luxurious yacht
$\$1 \cdot 10^8$



Replace Flint's old water pipes
$\$6 \cdot 10^7$

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Unit 8.7, Lesson 13: Supplement Name(s) ______________________________

Pick **at least four** different items to purchase from the options listed. Enter your selections in the table below. Then calculate how much of Jeff Bezos's money you spent.

Note: Jeff Bezos's net worth is $1.2 \cdot 10^{11}$ dollars.

Item	Price Each	Quantity	Total Cost
		Total Spent	

How close did you get to spending all of Jeff Bezos's money?

Explain how you figured it out.

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Unit 8.7, Lesson 13: Notes Name ___________________________________

Learning Goal(s):

Use the table to answer questions about different life forms on our planet.

Creature	Number	Mass of One Individual (kg)
Humans	$7.5 \cdot 10^9$	$6.2 \cdot 10^1$
Sheep	$1.75 \cdot 10^9$	$6 \cdot 10^1$
Chickens	$2.4 \cdot 10^{10}$	$2 \cdot 10^0$
Antarctic Krill	$7.8 \cdot 10^{14}$	$4.86 \cdot 10^{-4}$
Bacteria	$5 \cdot 10^{30}$	$1 \cdot 10^{-12}$

Which is larger: the total mass of all humans or of all the Antarctic krill?

How can you tell which creature has the greatest total mass?

About how many more chickens are there than sheep?

Summary Question
What are some important things to remember about adding, subtracting, multiplying, and dividing numbers written in scientific notation?

Unit 8.7, Lesson 13: Practice Problems Name ______________________________

1. How many bucketloads would it take to bucket out the world's oceans?

   Some useful information:

   - The world's oceans hold roughly 1.4×10^9 cubic kilometers of water.
   - A typical bucket holds roughly $20\ 000$ cubic centimeters of water.
   - There are 10^{15} cubic centimeters in a cubic kilometer.

   Write your answer in scientific notation.

2. Which is larger: the number of meters across the Milky Way or the total number of cells in all humans?

   Some useful information:

   - The Milky Way is about $100\ 000$ light years across.
   - There are about 37 trillion cells in a human body.
   - One light year is about 10^{16} meters.
   - The world population is about 7 billion.

   ☐ Meters across the milky way

   ☐ Total number of cells in all humans

   Explain your thinking.

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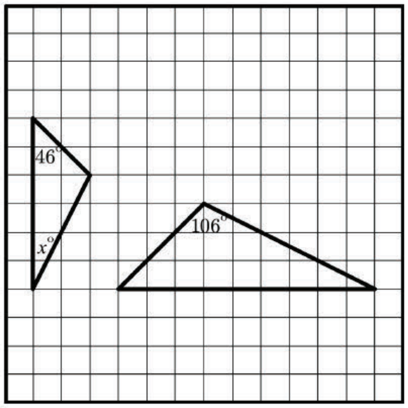
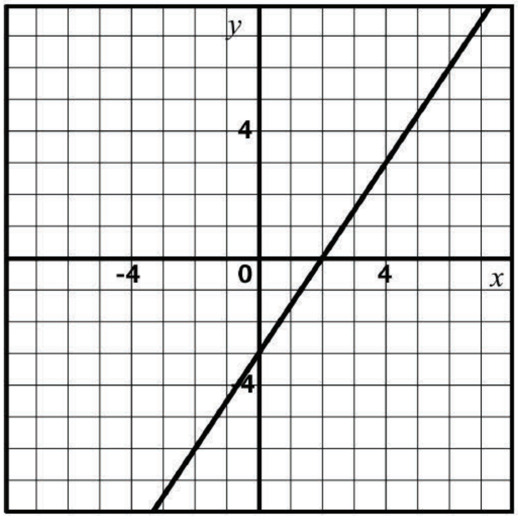
Unit 8.7, Lesson 13: Practice Problems

3. The two triangles are similar.

   Find the value of x.



Here is the graph for one equation in a system of equations.



4.1 Write a second equation for the system so it has infinitely many solutions.

4.2 Write a second equation with a graph that goes through $(0, 2)$ so that the system has no solutions.

4.3 Write a second equation with a graph that goes through $(2, 2)$ so that the system has one solution at $(4, 3)$.

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.7, Practice Day 2 Name(s) ____________________

1. Write $6.2 \cdot 10^4 + 3.9 \cdot 10^4$ using scientific notation.	2. Write $2.8 \cdot 10^6 + 1.5 \cdot 10^5$ using scientific notation.
3. Each day, City A uses $2.5 \cdot 10^9$ watts of energy and City B uses $7.3 \cdot 10^8$ watts. How much power must a power plant produce per day to serve both cities?	4. Write $3.6 \cdot 10^5 + 4.8 \cdot 10^4$ using scientific notation.
5. Write $5.2 \cdot 10^7 - 3 \cdot 10^6$ using scientific notation.	6. Write $7.5 \cdot 10^6 - 2.3 \cdot 10^5$ using scientific notation.
7. The area of Australia is $6.79 \cdot 10^6$ square kilometers and the area of India is $3.29 \cdot 10^6$ square kilometers. How many more square kilometers of land are in Australia than are in India?	8. The area of Russia is $1.71 \cdot 10^7$ square kilometers and the area of China is $9.6 \cdot 10^6$ square kilometers. How many more square kilometers of land are in Russia than are in China?

Unit 8.7, Practice Day 2 Name(s) ______________________________

2. **Solution:** $2.95 \cdot 10^6$	1. **Solution:** $1.01 \cdot 10^5$
4. **Solution:** $4.08 \cdot 10^5$	3. **Solution:** $3.23 \cdot 10^9$
6. **Solution:** $7.27 \cdot 10^6$	5. **Solution:** $4.9 \cdot 10^7$
8. **Solution:** $7.5 \cdot 10^6$ square kilometers	7. **Solution:** $3.5 \cdot 10^6$ square kilometers

Unit 8.7, Practice Day 2 Name(s) ____________________

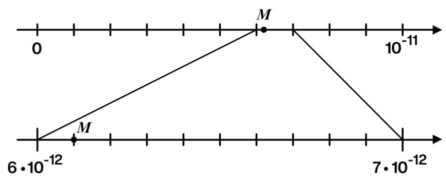
9. Write $(1.3 \cdot 10^2)(3.6 \cdot 10^8)$ using scientific notation.	10. Write $(5 \cdot 10^4)(6 \cdot 10^7)$ using scientific notation.
11. Write $\frac{4.1 \cdot 10^2}{2 \cdot 10^{-3}}$ using scientific notation.	12. Write $(4.8 \cdot 10^8) \div (1.2 \cdot 10^2)$ using scientific notation.
13. In 2019, the United States defense budget was about $7.5 \cdot 10^{11}$ dollars. The population of the United States is about $3 \cdot 10^8$ people. About how much does the United States spend on defense per capita (per person)?	14. In 2019, the United States education budget was about $6 \cdot 10^{10}$ dollars. The population of the United States is about $3 \cdot 10^8$ people. About how much does the United States spend on education per capita (per person)?
15. Which number is larger? About how many times as large? $20 \cdot 10^6$ or $8 \cdot 10^7$	16. Which number is larger? About how many times as large? $6{,}000{,}000$ or $2.9 \cdot 10^9$

Unit 8.7, Practice Day 2 Name(s) ______________________________

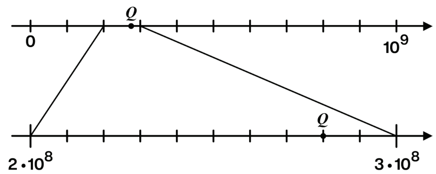
10. **Solution:** $3 \cdot 10^{12}$	9. **Solution:** $4.68 \cdot 10^{10}$
12. **Solution:** $4 \cdot 10^{6}$	11. **Solution:** $2.05 \cdot 10^{5}$
14. **Solution:** $2 \cdot 10^{2}$ per person (or equivalent)	13. **Solution:** $2.5 \cdot 10^{3}$ per person (or equivalent)
16. **Solution:** $2.9 \cdot 10^{9}$ is about $5 \cdot 10^{2}$ times as large.	15. **Solution:** $8 \cdot 10^{7}$ is about 4 times as large.

Unit 8.7, Practice Day 2 Name(s) ______________________________

17. What number is represented by point M?



18. What number is represented by point Q?



19. In one year, the United States emitted about $3.3 \cdot 10^4$ pounds of CO_2 per capita and Brazil emitted about $4.4 \cdot 10^3$ pounds of CO_2 per capita.

    Which country emitted more CO_2 per capita? How many times as much?

20. About $3 \cdot 10^8$ people live in the United States and about $2 \cdot 10^8$ people live in Brazil.

    How many times as many people live in the United States as live in Brazil?

21. On your paper, place a number in each box so that the equation is true.

$$3^8 \cdot \square^8 = 12^{\square}$$

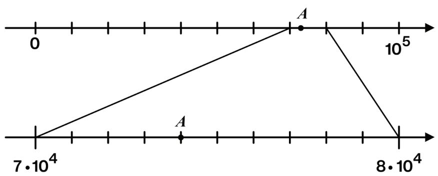
22. On your paper, place a number in each box so that the equation is true.

$$(7^{\square})^{\square} = \frac{1}{7^{24}}$$

23. On your paper, place a number in each box so that the equation is true.

$$\frac{8^{\square}}{8^9} = 8^{\square}$$

24. What number is represented by point A?



Unit 8.7, Practice Day 2 Name(s) ______________________________

18. **Solution:** $Q = 2.8 \cdot 10^{8}$	17. **Solution:** $M = 6.1 \cdot 10^{-12}$
20. **Solution:** About 1.5 times as many people live in the United States than live in Brazil.	19. **Solution:** The United States emitted about 7.5 times as much CO_2 per capita as Brazil emitted.
22. ***Solutions vary.*** Any values of a and b, where $a \cdot b = -24$ is correct.	21. **Solution:** $3^8 \cdot \boxed{4}^8 = 12^{\boxed{8}}$ **or** $3^8 \cdot \boxed{48}^8 = 12^{\boxed{16}}$
24. **Solution:** $A = 7.4 \cdot 10^{4}$	23. ***Solutions vary.*** For $\frac{8^a}{8^9} = 8^b$, any values of a and b where $a - 9 = b$ is correct.

Unit 8.7, Practice Day 2: Worksheet Name ______________________________

Student Workspace

1.	2.	3.
4.	5.	6.
7.	8.	9.
10.	11.	12.

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Unit 8.7, Practice Day 2: Worksheet Name ___________________________

13.	14.	15.
16.	17.	18.
19.	20.	21.
22.	23.	24.

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GRADE 8

Unit 8
Student Lessons

Student lessons from Unit 8 are included here to provide NYC reviewers with access to the specific lessons in Amplify Desmos Math New York that demonstrate coverage of the **Expressions, Equations, and Inequalities** domain.

These lessons are partially designed and will be updated to match the exemplar Student Edition lessons included earlier in this sampler.

NOTE: *We have included only those lessons from Unit 8 that cover the standards in the Expressions, Equations, and Inequalities domain.*

Grade 8 Unit 8

Student Edition Sampler

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.8, Lesson 2: Notes Name ___________________________________

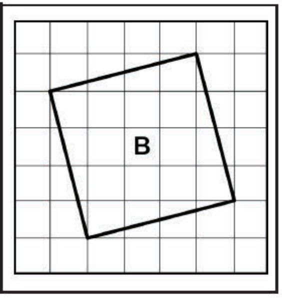
Learning Goal(s):

Sometimes we want to know the side length of a square whose length is not countable using a grid. When this is true, we can take the square root of the area in order to find the side length.

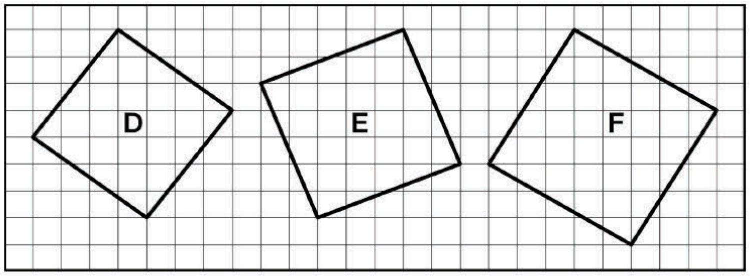
Square B has an area of 17.

We say the side length of a square with an area of 17 units is $\sqrt{17}$ units.

This means that $(\quad)^2 =$ ______.



Find each missing value.



Square	Side Length of Square (units)	Area of Square (square units)
D		25
E	$\sqrt{29}$	
F		

Summary Question

Explain the meaning of $(\sqrt{9})^2 = 9$ using squares and side lengths.

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Unit 8.8, Lesson 2: Practice Problems Name ______________________________

1. Square A has an area of 81 square feet.

   Select all the expressions that are equal to the side length of this square (in feet).

   - ☐ 3
   - ☐ $\frac{81}{2}$
   - ☐ $\sqrt{81}$
   - ☐ $\sqrt{9}$
   - ☐ 9

2. The areas of six squares are given in the table. Find the side length of each square.

Area (square units)	Side Length (units)
36	
37	
$\frac{100}{9}$	
$\frac{2}{5}$	
0.0001	
0.11	

3. Here is some information about three squares.

   - Square A is smaller than Square B.
   - Square B is smaller than Square C.
   - The three squares' side lengths are $\sqrt{26}$, 4.2, and $\sqrt{11}$.

   Write each side length next to the appropriate square in the table.

Square	Side Length
A	
B	
C	

Unit 8.8, Lesson 2: Practice Problems

4. The side lengths of five squares are given in the table. Find the area of each square.

Side Length	Area
$\frac{1}{5}$ cm	
$\frac{3}{7}$ units	
0.1 meters	

5. Here is a table showing the seven largest countries by area.

Country	Area (square km)
Russia	1.71×10^7
Canada	9.98×10^6
China	9.60×10^6
United States	9.53×10^6
Brazil	8.52×10^6
Australia	6.79×10^6
India	3.29×10^6

5.1 How much greater is the area of Russia than the area of Canada?

5.2 The Asian countries on this list are Russia, China, and India. The American countries are Canada, the United States, and Brazil.

Which has the greater total area?

A. The three Asian countries
B. The three American countries

Explain your thinking.

6. Select all the expressions that are equivalent to 10^{-6}.

- ☐ $\frac{1}{1,000,000}$
- ☐ $\left(\frac{1}{10}\right)^6$
- ☐ $\frac{-1}{1,000,000}$
- ☐ $\frac{1}{10^6}$
- ☐ $10^8 \cdot 10^{-2}$
- ☐ $\frac{1}{10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10}$

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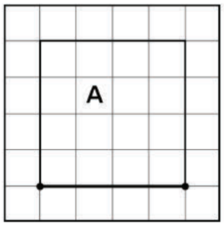
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.8, Lesson 3: Notes Name ___________________________________

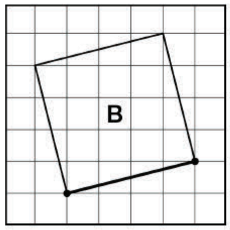
Learning Goal(s):

Determine the side length of each square. Use a square root if the value is not exact.



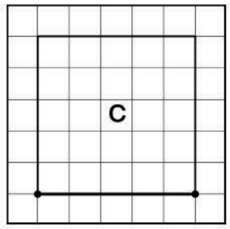
Area: 16 square units

Side length:________



Area: 17 square units

Side length:________



Area: 25 square units

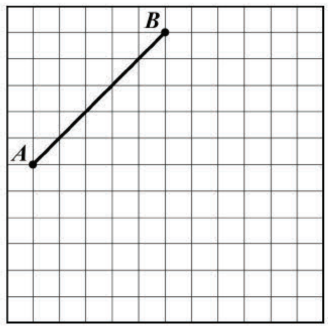
Side length:_________

Square B has a side length of ______ units. In order to approximate numbers like ______, we can find two integer values that the number lies between. Square B has an area between ______ and ______ square units, so its side length must be between ______ and ______ units.

Draw a square so that segment AB is along one side of the square.

Exact length of AB (as a square root):_____________

Approximate length of AB :_____________



Summary Question

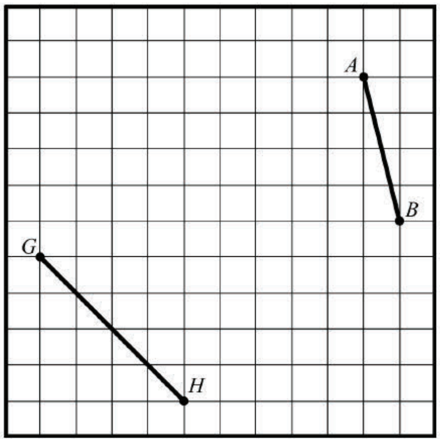
What two integers does $\sqrt{60}$ lie between? Explain how you know. Then use a calculating device to approximate $\sqrt{60}$ as closely as possible.

Unit 8.8, Lesson 3: Practice Problems Name ____________________________

1. Find the exact length of each line segment.

   Then estimate the length of each line segment to the nearest tenth of a unit.

   Each grid square represents 1 square unit.

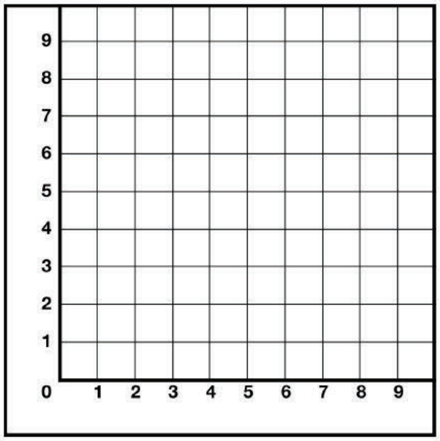


Segment	Exact Length	Estimate (nearest tenth)
AB		
GH		

2. Plot the following numbers on the x-axis.

   - $\sqrt{16}$
   - $\sqrt{35}$
   - $\sqrt{66}$

   Consider using the grid to help.



3. $\sqrt{7}$ is a solution to the equation $x^2 = 7$.

   Find a decimal approximation of $\sqrt{7}$ whose square is between 6.9 and 7.1.

Unit 8.8, Lesson 3: Practice Problems

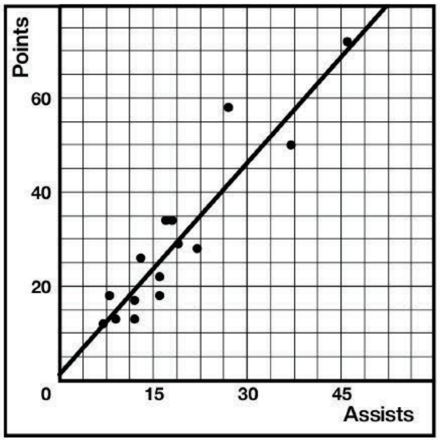
4. Graphite is made up of layers of graphene. Each layer of graphene is about 200 picometers, or 200×10^{-12} meters, thick.

   How many layers of graphene are there in a 1.6-millimeter-thick piece of graphite?

   Express your answer in scientific notation.

5. Here is a scatter plot that shows the number of assists and points for a group of hockey players.

   A model is graphed with the scatter plot. The model is represented by $y = 1.5x + 1.2$.



   5.1 What does the slope of the line mean in this situation?

   5.2 Based on the model, how many points will a player have if he has 30 assists?

6. The points $(12, 23)$ and $(14, 45)$ lie on a line. What is the slope of the line?

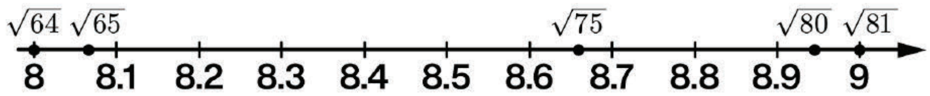
This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.8, Lesson 4: Notes Name ______________________________

Learning Goal(s):

We can approximate the values of square roots by looking for whole numbers nearby.

- $\sqrt{65}$ is a little more than _____ , because $\sqrt{65}$ is a little more than $\sqrt{64}$ = ______.
- $\sqrt{80}$ is a little less than ______ , because $\sqrt{80}$ is a little less than $\sqrt{81}$ = ______.
- $\sqrt{75}$ is between ______ and ______ , because 75 is between 64 and 81 .
- $\sqrt{75}$ is approximately ______. We can check this by calculating ______________.

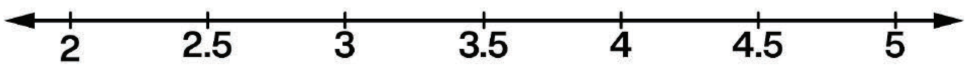


Under each description, write the square root(s) that lie between the integers described.

- $\sqrt{6}$
- $\sqrt{12}$
- $\sqrt{24}$
- x when $x^2 = 8$

Between 2 and 3	**Between 4 and 5**

Add each number above to the number line below.



Summary Question

Where would $\sqrt{17}$ belong on the number line above? Explain how you know.

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Unit 8.8, Lesson 4: Practice Problems Name ______________________________

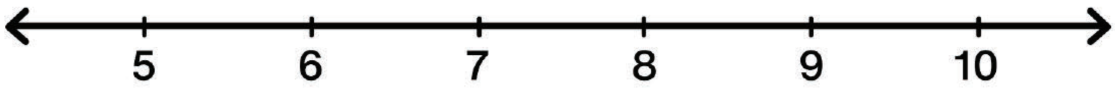
1.1 Explain how you know that $\sqrt{37}$ is a little more than 6.

1.2 Explain how you know that $\sqrt{95}$ is a little less than 10.

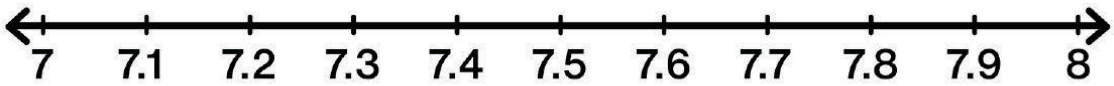
1.3 Explain how you know that $\sqrt{30}$ is between 5 and 6.

2. Plot and label each number on the number line:

- 6
- $\sqrt{83}$
- $\sqrt{40}$
- $\sqrt{64}$
- 7.5



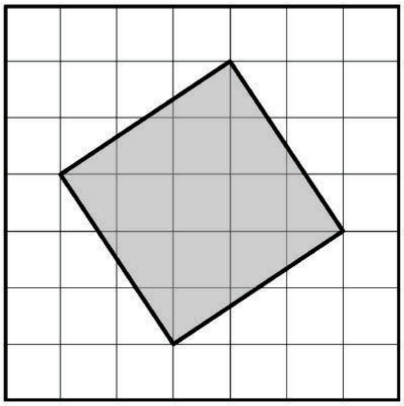
3. Plot and label two square root values between 7 and 8 on the number line.



Unit 8.8, Lesson 4: Practice Problems

4. Each grid square represents 1 square unit.

   What is the exact side length of the shaded square?



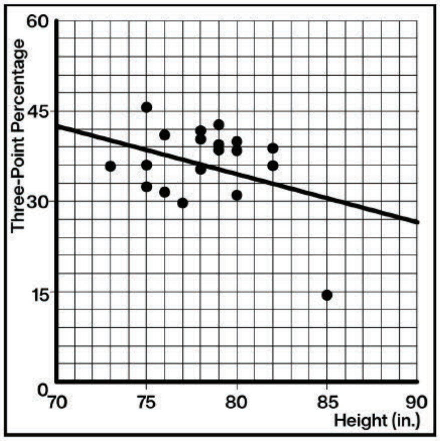
5. For each pair of numbers, circle the larger number. Estimate how many times as large.

5.1 $700 \cdot 10^4$ or $0.37 \cdot 10^6$	5.2 $4.87 \cdot 10^4$ or $15 \cdot 10^5$	5.3 $500{,}000$ or $2.3 \cdot 10^8$

6. This scatter plot shows the heights (in inches) and the three-point percentages for different basketball players last season.

   6.1 Circle any data points that appear to be outliers.

   6.2 Describe how the outlier(s) compare to the value(s) predicted by the model.



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This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.8, Lesson 5: Notes Name ______________________________

Learning Goal(s):

Sometimes we are interested in the edge length of a cube instead of the side length of a square.

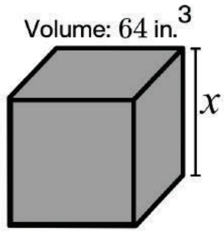
The number $\sqrt[3]{17}$, read as "cube root of 17," is the edge length of a cube that has a volume of 17.

We can approximate the value of a cube root in a similar way to approximating a square root:

$\sqrt[3]{17}$ is more than ______ , because $\sqrt[3]{17}$ is more than $\sqrt[3]{8}$ = ______ .

$\sqrt[3]{17}$ is less than ______ , because $\sqrt[3]{17}$ is less than $\sqrt[3]{27}$ = ______ .

$\sqrt[3]{17}$ is approximately ______ , because $(2.57)^3 = 16.9746$.



Find each missing value without using a calculator.

Exact Edge Length of Cube (units)	Approximate Edge Length of Cube (units)	Volume of Cube (cubic units)
	Between _____ and _____	60
$\sqrt[3]{4}$	Between _____ and _____	
	Between _____ and _____	25

Summary Question

Approximate the value of x when $x^3 = 81$. Explain your thinking.

Unit 8.8, Lesson 5: Practice Problems Name ______________________________

1.1 Given these side lengths, what is the volume of each cube?

Side Length	Volume
4 cm	
$\sqrt[3]{11}$ ft.	
s units	

1.2 Given these volumes, what is the side length of each cube?

Side Length	Volume
	$1\,000$ cubic cm
	23 cubic ft.
	v cubic units

2. For each expression, write an equivalent expression that doesn't use a cube root symbol.

Expression	Equivalent Expression
$\sqrt[3]{1}$	
$\sqrt[3]{216}$	
$\sqrt[3]{8\,000}$	
$\sqrt[3]{\frac{1}{64}}$	
$\sqrt[3]{\frac{27}{125}}$	
$\sqrt[3]{0.027}$	
$\sqrt[3]{0.000125}$	

Unit 8.8, Lesson 5: Practice Problems

3. For each equation, write the positive solution as a whole number or using square root or cube root notation.

Equation	Positive Solution
$t^3 = 216$	$t =$
$a^2 = 15$	$a =$
$m^3 = 8$	$m =$
$c^3 = 343$	$c =$
$f^3 = 181$	$f =$

4. For each cube root, write which two consecutive integers the value is between. Consecutive integers are whole numbers that are next to each other. One is done as an example.

Number	Between
$\sqrt[3]{5}$	1 and 2
$\sqrt[3]{11}$	
$\sqrt[3]{80}$	
$\sqrt[3]{120}$	
$\sqrt[3]{250}$	

5. Order the values in the table from least to greatest (1 = least, 6 = greatest).

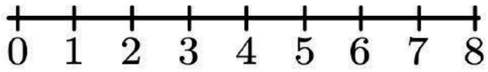
Number	Order
$\sqrt[3]{27}$	
$\sqrt[3]{530}$	
$\sqrt{48}$	
$\sqrt{121}$	
π	
$\frac{19}{2}$	

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.8, Practice Day 1: Worksheet Name ______________________

Set A

1. If $x^2 = 10$ and is a positive number, plot the approximate location of x.



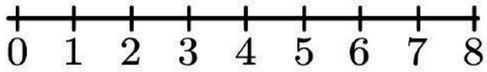
2. What is the side length of a square that has an area of 64 square inches?

3. What is the exact side length of a cube that has a volume of 10 cubic units?

4. If x is positive and $x^2 = 8$, what is the exact value of x.

5. Evaluate: $\sqrt[3]{64}$

6. Plot a point at the approximate location of $\sqrt[3]{15}$.

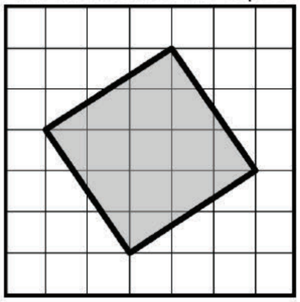


7. The side length of a square is $\sqrt{27}$ inches. What is the area of the square?

8. $\sqrt{18}$ is between which two consecutive integers?

Unit 8.8, Practice Day 1: Worksheet Name ______________________________

9. Find the area of the square.

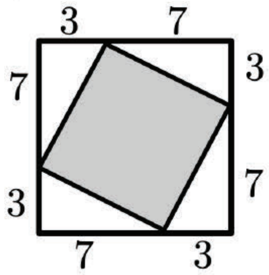


10. $\sqrt[3]{50}$ is between which two consecutive integers?

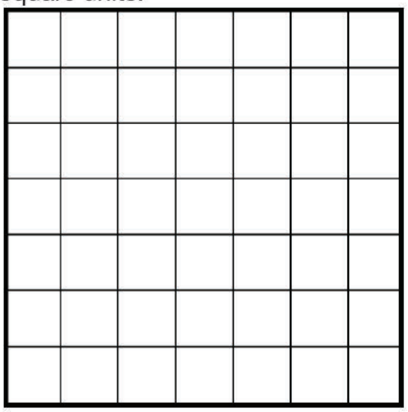
11. Solve for x: $x^2 = \frac{1}{4}$

12. The volume of a cube is 125 cubic inches. What is the side length of the cube?

13. Find the side length of the shaded square.



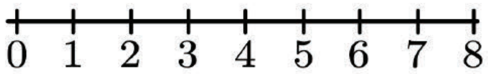
14. Draw a square that has an area of 8 square units.



Unit 8.8, Practice Day 1: Worksheet Name ______________________________

Set B

1. Plot a point at the approximate location of $\sqrt{10}$.



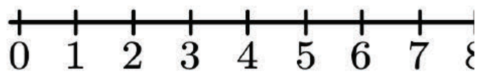
2. Evaluate: $\sqrt{64}$

3. Solve this equation exactly: $x^3 = 10$

4. What is the exact side length of a square that has an area of 8 square inches?

5. Evaluate: $\sqrt{16}$

6. If $x^3 = 15$, plot the approximate location of x.

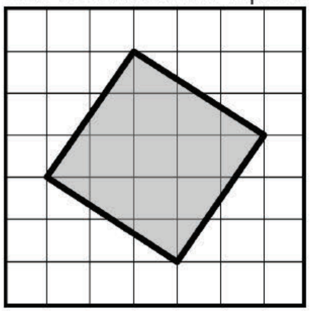


7. The side length of a cube is 3 inches. What is the volume of the cube?

8. $\sqrt{24}$ is between which two consecutive integers?

Unit 8.8, Practice Day 1: Worksheet Name ________________________________

9. Find the area of the square.

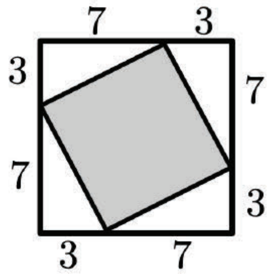


10. $\sqrt[3]{60}$ is between which two consecutive integers?

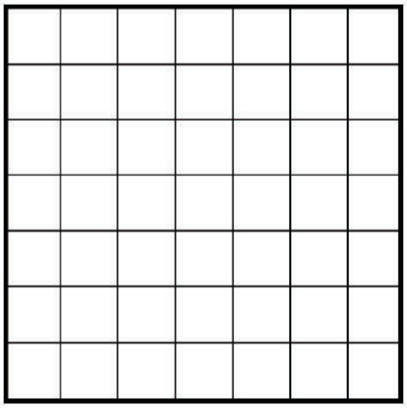
11. If x is positive and $x^3 = \frac{1}{8}$, what is the value of x.

12. The side length of a cube is $\sqrt[3]{5}$ inches. What is the volume of the cube?

13. Find the side length of the shaded square.



14. Draw a square that has a side length of $\sqrt{8}$ units.



Digital Lesson

This lesson is still being upgraded to the Amplify Desmos Math design style for the 2024–25 school year.

Unit 8.8, Lesson 10: Notes Name ______________________________

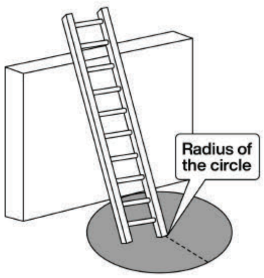
Learning Goal(s):

Name some situations in your world that might involve right triangles.

A 17 -foot ladder is leaning against a wall. The ladder can reach a window 15 feet up the wall. How far from the wall should the base of the ladder be so that it reaches the window?

Draw a picture of the situation.	Write your answer to the question. Show all of your thinking.

To avoid accidents, the fire department wants to create a circular no-walk zone under the ladder with a radius that is the distance between the ladder and the wall. What is the area of the no-walk zone?



Summary Question
What are some things that are important to remember when using the Pythagorean theorem?

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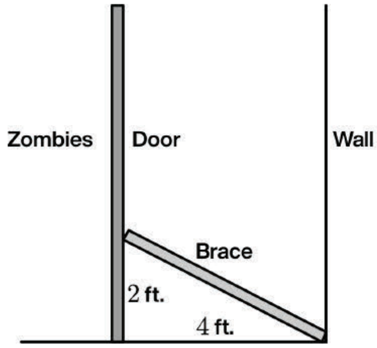
Unit 8.8, Lesson 10: Practice Problems Name ______________________________

1. A man is trying to zombie proof his house. He wants to cut a length of wood that will brace the door against the wall. The wall is 4 feet away from the door, and he wants the brace to rest 2 feet up the door.

   About how long should he cut the brace?



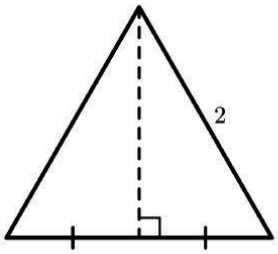
2. At a restaurant, a trash can's opening is rectangular and measures 7 inches by 9 inches. The serving trays measure 12 inches by 16 inches. Jada says it is impossible for a tray to accidentally fall through the trash can opening because the shortest side of a tray is longer than either side of the opening.

   Do you agree or disagree with Jada's explanation? Explain your thinking.

3. Here is an equilateral triangle. The length of each side is 2 units. A height is drawn. In an equilateral triangle, a line drawn from one corner to the center of the opposite side represents the height.

   3.1 Find the exact height.

   3.2 Find the area of the equilateral triangle.



   3.3 **Challenge:** Using x for the length of each side in the equilateral triangle, express its area in terms of x.

Unit 8.8, Lesson 10: Practice Problems

4. A standard city block in Manhattan is a rectangle measuring 80 meters by 270 meters. A resident wants to get from one corner of a block containing a park to the opposite corner of the block. She wonders about the difference between cutting diagonally through the park and going around the park along the streets.

   How much shorter would her walk be if she cuts through the park? Round your answer to the nearest meter.

5. Select **all** the sets of side lengths that form a right triangle.

   - ☐ 8, 7, 15
   - ☐ 4, 10, $\sqrt{84}$
   - ☐ $\sqrt{8}$, 11, $\sqrt{129}$
   - ☐ $\sqrt{1}$, 2, $\sqrt{3}$

6. For each pair of numbers, circle the larger number. Estimate how many times as large.

   6.1 $12 \cdot 10^9$ or $4 \cdot 10^9$

   6.2 $1.5 \cdot 10^{12}$ or $3 \cdot 10^{12}$

   6.3 $20 \cdot 10^4$ or $6 \cdot 10^5$

7. A line contains the point $(3, 5)$.
   If the line has a negative slope, which of these points could also be on the line?

   A. $(4, 7)$

   B. $(2, 0)$

   C. $(6, 5)$

   D. $(5, 4)$

8. Noah and Han are preparing for a jump rope contest. Noah can jump 40 times in 0.5 minutes. Han can jump y times in x minutes, where $y = 78x$.

   If they both jump for 2 minutes, who jumps more times?

   How many more?

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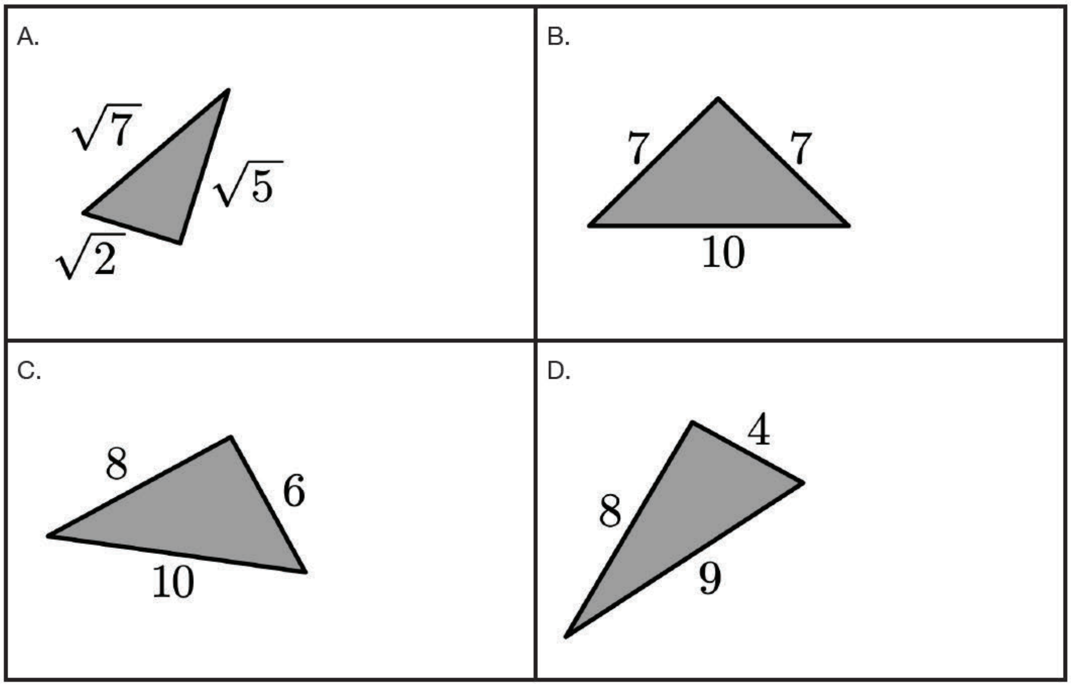
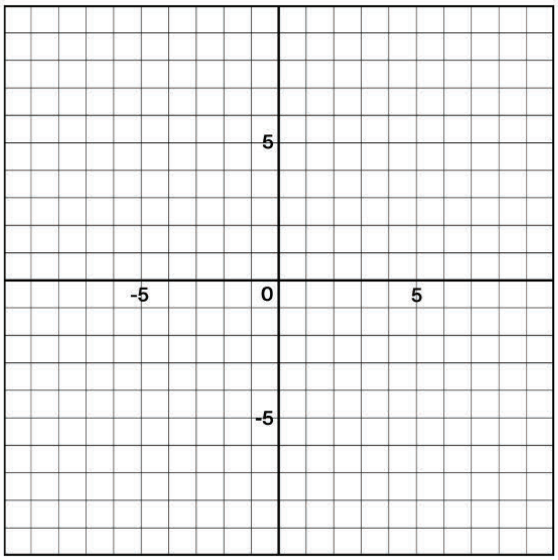
Unit 8.8, Practice Day 2: Worksheet Name ___________________________

1. Which of the following triangles are right triangles? Explain or show your reasoning

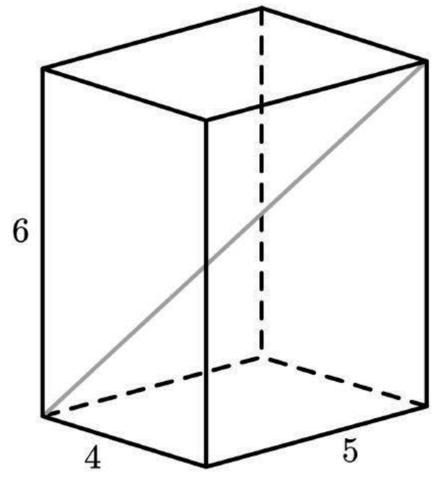


2. Find the length of the segment that joins the points $(-4, 5)$ and $(6, -1)$.

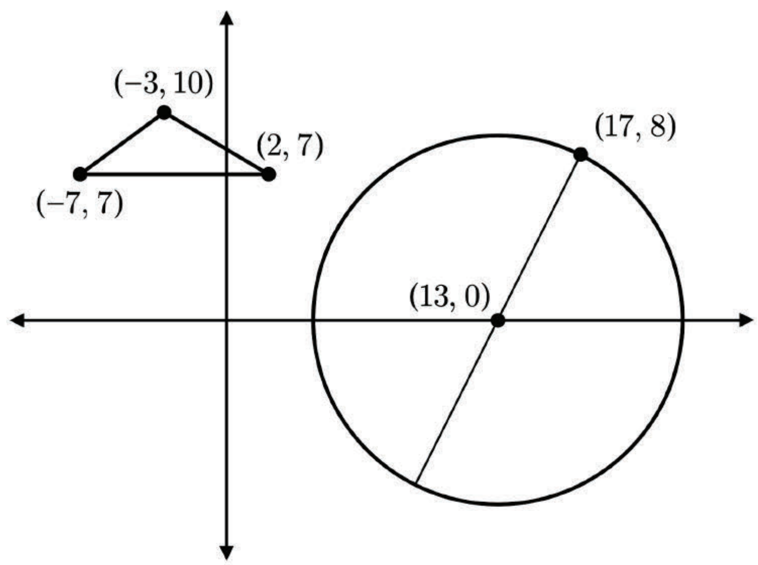


Unit 8.8, Practice Day 2: Worksheet Name ________________________________

3. Calculate the length of the grey line in the rectangular prism below.



4. Which is greater: the perimeter of the triangle or the diameter of the circle? The circle's center is $(13, 0)$. Explain or show your reasoning.



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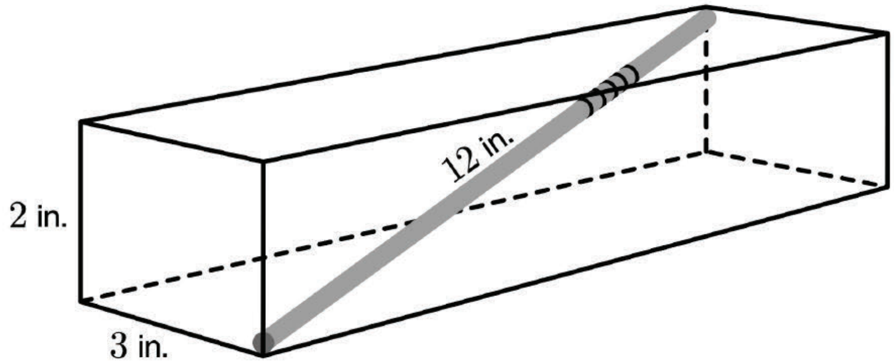
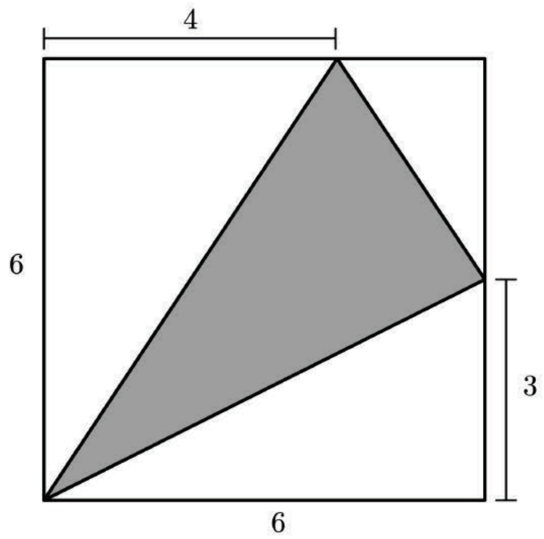
Unit 8.8, Practice Day 2: Worksheet Name ___________________________________

5. Pablo wanted to see if a 12-inch straw would fit inside a small rectangular box. He noticed that it only fits diagonally. The box has a height of 2 inches and width of 3 inches. What is the length of the box?

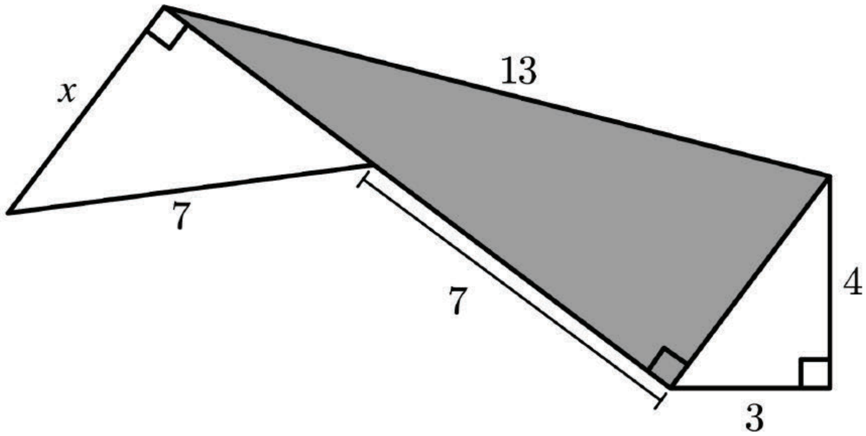


6. The shaded triangle is contained within a 6-by-6 square. Show that the shaded triangle is not a right triangle.



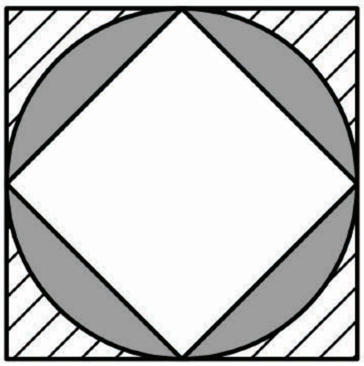
Unit 8.8, Practice Day 2: Worksheet Name ___________________________________

7. Determine the length of the segment that is labeled with x. Explain or show your reasoning.



8. Which has a greater area: the grey regions or the striped regions? Explain or show your reasoning.

   Recall that the area of a circle can be found by the formula $A = \pi \cdot r^2$. It may help to assume the outer square has a side length of 2 units.



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Unit 8.8, Lesson 14: Notes Name ______________________________

Learning Goal(s):

Rational numbers are numbers that can be written as a fraction of two integers. What if a number cannot be written as a fraction of two integers? We call this type of number an irrational number.

Definition	Facts/Characteristics
Irrational Number	
Examples	Non-Examples

Write each number as a rational number. If it is impossible, write "irrational."

0.16	$\frac{\sqrt{16}}{\sqrt{100}}$	$\sqrt{8}$	x when $x^3 = 64$	$\sqrt[3]{16}$

Summary Question

What does it mean when someone says that $\sqrt{3}$ is irrational?

Unit 8.8, Lesson 14: Practice Problems Name ______________________________

1. State whether each number is rational or irrational.

Number	Rational or Irrational
$\frac{-13}{3}$	
$\sqrt{37}$	
-77	
$-\sqrt{100}$	
$-\sqrt{12}$	
0.1234	

2. Select the best explanation for why $-\sqrt{10}$ is irrational.

A. $-\sqrt{10}$ is irrational because it is not rational.

B. $-\sqrt{10}$ is irrational because it is less than zero.

C. $-\sqrt{10}$ is irrational because it is not a whole number.

D. $-\sqrt{10}$ is irrational because if I put $-\sqrt{10}$ into a calculator, I get -3.16227766, which does not make a repeating pattern.

3.1 Give an example of a rational number and explain how you know it is rational.

3.2 Give three examples of irrational numbers.

4. Select all the irrational numbers.

☐ $\frac{-123}{45}$ ☐ $\frac{2}{3}$ ☐ $\sqrt{14}$

☐ $\sqrt{99}$ ☐ $\sqrt{100}$ ☐ $\sqrt{64}$

Unit 8.8, Lesson 14: Practice Problems

5. Which value is an exact solution of the equation $m^2 = 14$? Circle your answer.

A. 7 B. $\sqrt{14}$ C. 3.74 D. $\sqrt{3.74}$

6. A square has vertices $(0, 0)$, $(5, 2)$, $(3, 7)$, and $(-2, 5)$. Which statement is true?

A. The square's side length is between 6 and 7.

B. The square's side length is between 5 and 6.

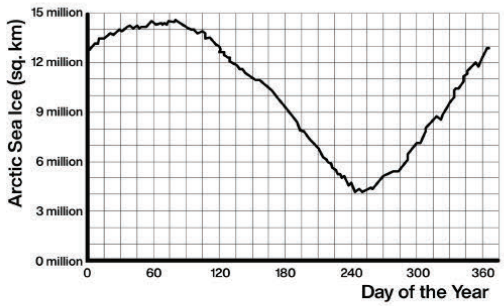
C. The square's side length is 5.

D. The square's side length is 7.

7. Rewrite each expression using a single exponent.

7.1 $(10^2)^{-3}$	7.2 $(3^{-3})^2$	7.3 $3^{-5} \cdot 4^{-5}$	7.4 $2^5 \cdot 3^{-5}$

8. The graph represents the area of arctic sea ice in square kilometers as a function of the day of the year in 2016.



8.1 Give an approximate interval of days when the area of arctic sea ice was decreasing.

8.2 On which days was the area of arctic sea ice 12 million square kilometers?

9. A high school is hosting an event for seniors but will also allow some juniors to attend.

The principal approved the event for 200 students and decided the number of juniors should be 25% of the number of seniors.

How many juniors will be allowed to attend? If you get stuck, try writing two equations that each represent the number of juniors and seniors at the event.