Positive and Negative Numbers
Student Guide

Math 6 Unit 7 Accelerated

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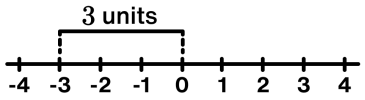
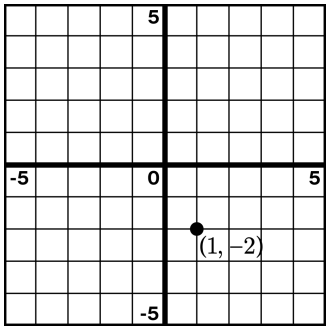
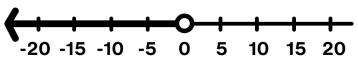
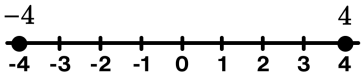
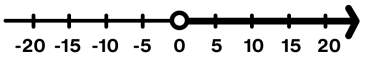
Unit 6.7, Student Goals and Glossary

Glossary

Term	Definition
absolute value	The absolute value of a number is its distance from 0 on the number line. The absolute value of -3 is 3 because -3 is 3 units away from 0. This is written as $\lvert -3 \rvert = 3$. $\lvert 4 \rvert = 4$ and $\lvert -4 \rvert = 4$. They are both 4 units away from 0. 
coordinate plane	The coordinate plane consists of two axes, one vertical and one horizontal, that intersect at 0. Locations are described by coordinate pairs such as $(1, -2)$, where 1 is the location on the horizontal number line and -2 is the location on the vertical number line. 
negative number	A negative number is a number that is **less** than 0. On a horizontal number line, negative numbers are to the left of 0. 
opposite	Two numbers are opposites if they are the same distance from 0 and on different sides of the number line. For example, 4 is the opposite of -4, and -4 is the opposite of 4. 
positive number	A positive number is a number that is **greater** than 0. On a horizontal number line, positive numbers are to the right of 0. 
sign	The sign of a number (other than 0) is either positive or negative. For example, the sign of 4 or $+4$ is positive. The sign of -4 is negative. Zero does not have a sign. It is not positive or negative.
solution to an inequality	A solution to an inequality is any value of a variable that makes the inequality true. For example, 5 is a solution to the inequality $x < 10$ because $5 < 10$. Some other solutions to $x < 10$ are 9.99, 0, and -4.

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Unit 6.7, Family Resource

Unit 7 Summary

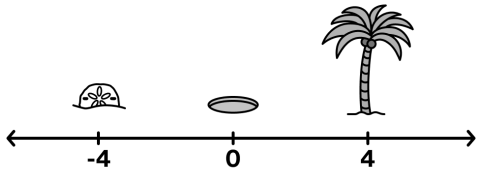
Prior Learning	Math 6, Unit 7	Future Learning
Grades 3–5 • Inequalities with numbers • Comparing fractions and decimals • Graphing points with positive coordinates Math 6 • Intro to polygons (Unit 1) • Equations with variables (Unit 6)	• Negative numbers and absolute value • Inequalities with variables • The coordinate plane (with positive and negative coordinates)	Math 7, Units 5 and 6 • Operations with negative numbers • Solving inequalities Math 8 • Transformations in the plane • Pythagorean theorem and distance

Negative Numbers and Absolute Value

We can use *positive* and *negative* numbers to describe locations on the number line.

The tree is at $+ 4$ because it is 4 units to the right of 0.

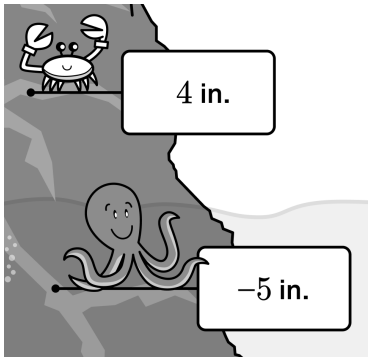
The sand dollar is at -4 because it is 4 units to the left of 0.



4 and -4 are *opposites* because they are the same distance from 0 on different sides of the number line.

$|x|$ is pronounced the *absolute value* of x and describes a number's distance from 0.

$|-4| = 4$ and $|4| = 4$ because both numbers are 4 units away from 0.



We often compare positive and negative numbers when talking about temperatures or elevations.

The crab has a higher elevation than the octopus, so $4 > -5$.

The crab is closer to the surface than the octopus, so $|4| < |-5|$.

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Inequalities

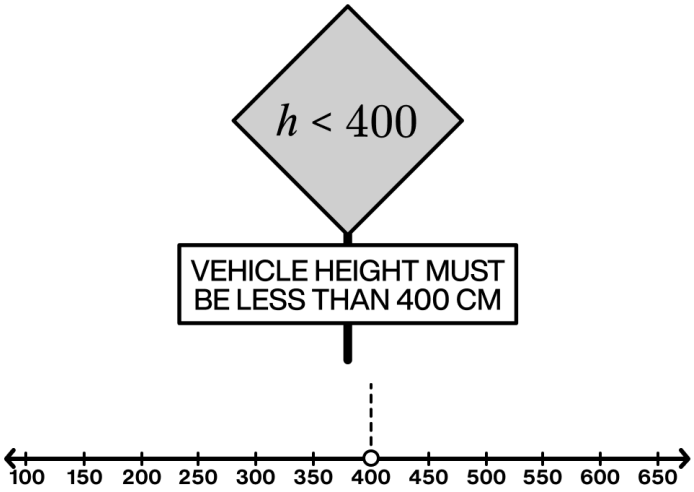
We can compare numbers using the words and symbols *less than* ($<$) and *greater than* ($>$). We can also write inequalities with variables to show any number greater than or less than a value.

The inequality $h < 400$ and the graph represent **all** vehicle heights less than 400 centimeters tall.

There is an open circle on the graph because 400 centimeters is not included.

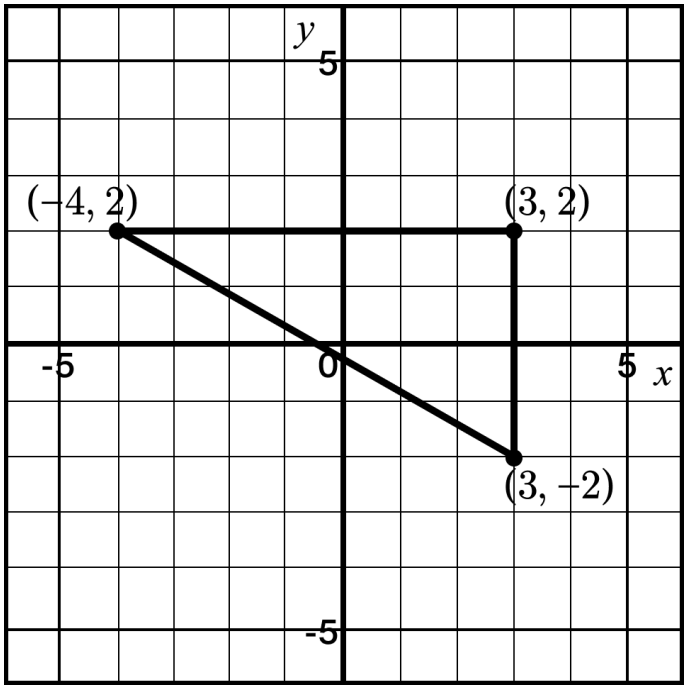
Any value that makes an inequality true is a *solution to the inequality*.

There are infinite solutions to $h < 400$, including $300,\ 1,\ 200.5$, and 399.9.



The Coordinate Plane

In previous grades, students learned to plot points with positive coordinates. In this unit, students learn to plot points that have both positive and negative coordinates.



The leftmost point is located at $(-4,\ 2)$ because it is 4 to the left of the vertical axis and 2 above the horizontal axis.

The side connecting $(-4,\ 2)$ and $(3,\ 2)$ is 7 units long. Because the side is horizontal, we only need to compare the x–coordinates. It takes 4 units to get from -4 to 0 and another 3 units to get from 0 to 3.

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Try This at Home

Negative Numbers and Absolute Value

1.1 Complete each statement below.

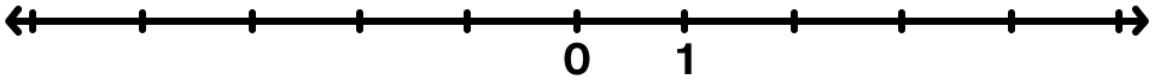
The opposite of 3 is _____.

The opposite of $\frac{4}{5}$ is _____.

The opposite of -2.5 is _____.

The opposite of 0 is _____.

1.2 Plot and label each number from the statements above **and** its opposite on the number line.



2.1 A duck is sitting at the surface of the ocean. What is the duck's elevation?

2.2 The duck dives 15 feet into the water looking for food. What is the duck's elevation now?

2.3 The duck comes back up 5 feet and catches a fish. How far away is the duck from the surface of the ocean? Write this in words and using the symbols $|\ |$.

Inequalities

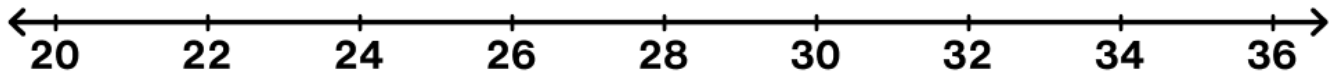
A sign at the fair says, "You must be taller than 32 inches to ride."

3.1 List three possible heights of someone who can ride.

_____ _____ _____

3.2 Write an inequality to show heights, h, for people who can ride the Ferris wheel.

3.3 Make a graph of all the possible heights you could be in order to ride the Ferris wheel.



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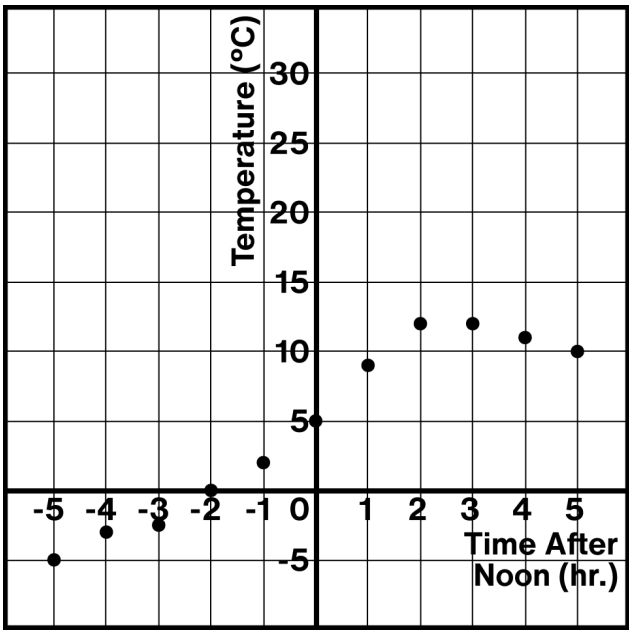
The Coordinate Plane

Did you know that in the southern hemisphere, it is winter in July? Here is a graph of temperatures in the Andes in Peru for one day in July.



4.1 What was the temperature at noon?

4.2 What was the temperature at 10 a.m.?

4.3 When was it colder than freezing (0°C)?

4.4 Tell a story about the temperature that day.

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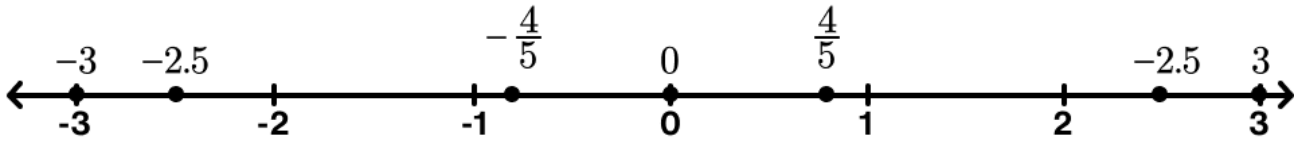
Solutions:

1.1 $3, -\frac{4}{5}, 2.5, 0$

1.2



2.1 0 feet

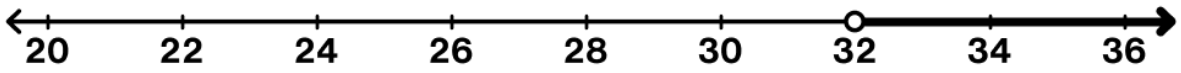
2.2 −15 feet

2.3 The duck's elevation is −10 feet. This means the duck is 10 feet away from the surface, or $|-10| = 10$.

3.1 *Responses vary*. 33 inches, 40 inches, 80 inches.

3.2 $h > 32$

3.3



4.1 5°C

4.2 0°C

4.3 It was colder than freezing at 7, 8, and 9 a.m.

4.4 *Stories vary*. At 7 a.m., it was so cold at −5°C. It got warmer throughout the morning. At 10 a.m., temperatures went from below freezing to above freezing. By the afternoon, the temperature was up to 12°C. After 3 p.m., the temperature started to go slightly down again.

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Unit 7.5, Family Resource

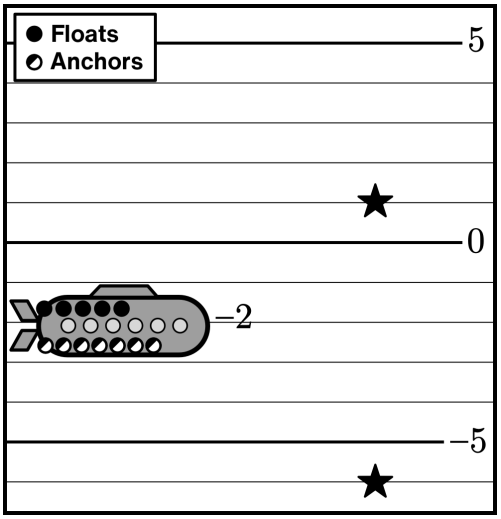
Unit 5 Summary

Prior Learning	Math 7, Unit 5	Future Learning
Grades 3–5 • Fraction and decimal operations Math 6 • Negative numbers • Solving equations	• Operations with positive and negative numbers • Applying operations	Math 7, Unit 6 • Solving equations Math 8, Unit 8 • Rational and irrational numbers

Adding and Subtracting

We can think of adding and subtracting numbers as adding and removing floats and anchors.

For example, to get the submarine from -2 to 1, you can add three floats or remove three anchors. To get from -2 to -6, you can either remove four floats or add four anchors.

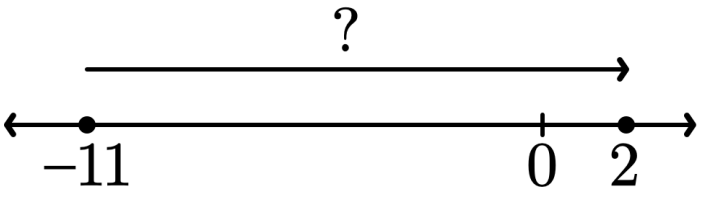


Start	Action	Final Value
-2	Add 3 floats	$-2 + 3 = 1$
-2	Remove 3 anchors	$-2 - (-3) = 1$
-2	Add 4 anchors	$-2 + (-4) = -6$
-2	Remove 4 floats	$-2 - 4 = -6$

We can also think of adding and subtracting numbers as movement on a number line.

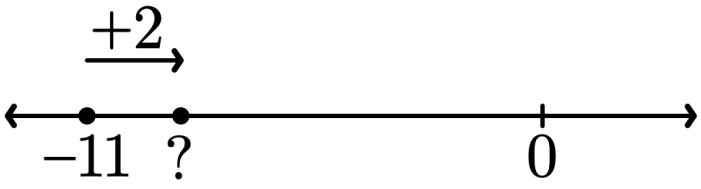
$2 - (-11)$ is another way of asking: *What is the distance from* -11 *to* 2*?*

$2 - (-11) = 13$



$(-11) + 2$ is another way of asking: *What is the point on the number line* that is 2 *to the right of* -11*?*

$(-11) + 2 = -9$



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Unit 7.5, Family Resource

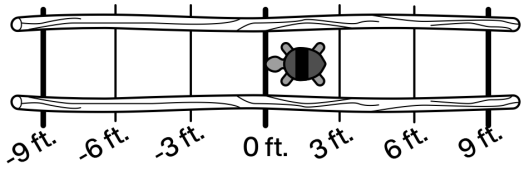
Multiplying and Dividing

One way to imagine multiplying positive and negative numbers is to use distance, rate, and time.

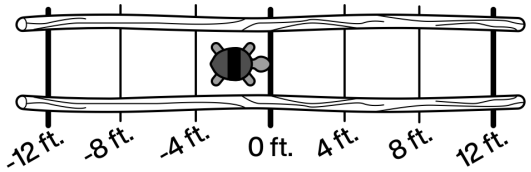
For example, this turtle starts at 0 feet and travels west at a rate of -3 feet per second.

In 2 seconds it will be at $(-3) \cdot 2 = -6$ feet.

2 seconds ago, the turtle was at $(-3) \cdot (-2) = 6$ feet.



A second turtle travels east. 3 seconds ago it was at -12 feet, so its rate is $\frac{-12}{-3} = 4$ feet per second.



Applications With Positive and Negative Numbers

Positive and negative numbers are useful in a variety of real-world situations.

A utility company charges $\$0.19$ per kilowatt-hour of energy that a customer uses.

They also give a credit of $-\$0.17$ for every kilowatt-hour of electricity that a customer with a solar panel generates.

This family used $\frac{180.5}{0.19} = 950$ kWh of electricity.

They also generated $\frac{-136.85}{-0.17} = 805$ kWh.

Bill			
	Kilowatt Hours (kWh)	Charge/ Credit per kWh	Total Charge/ Credit
Electricity Used		$0.19	$180.50
Electricity Generated		−$0.17	−$136.85
Total Due			

The total due for this bill is $180.5 + (-136.85) = 43.65$ dollars.

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Unit 7.5, Family Resource

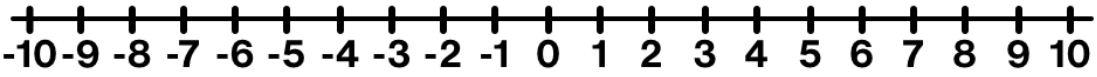
Try This at Home

Adding and Subtracting

1. Select all of the expressions that have the same value as $3 + (-5)$.

   ▢ $-3 + (-5)$ ▢ $5 - 3$ ▢ $-5 + 3$ ▢ $3 - 5$

2. Use the number line to show the value of $3 + (-5) =$ _____.



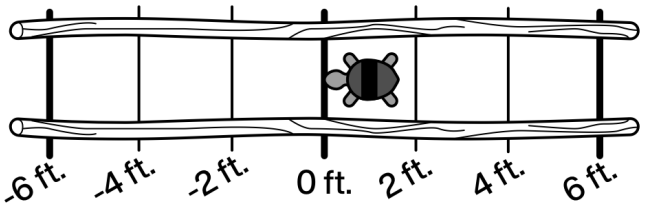
Determine the value of the variable that makes each equation true.

3.1 $-2 + a = 5$ 3.2 $7.5 - b = 12$ 3.3 $\frac{2}{3} + c = -\frac{4}{3}$

Multiplying and Dividing

A turtle is traveling west at a rate of -2 feet per second. Right now the turtle's position is at 0 feet.

4.1 Calculate $(-2) \cdot 5$. What does this tell us about the turtle's journey?



Match each expression to a question for which it could help answer.

4.2 $-2 \cdot 5$

4.3 $-2 \cdot (-5)$

4.4 $\frac{5}{-2}$

Questions

When was the turtle at 5 feet?

Where will the turtle be in 5 seconds?

Where was the turtle 5 seconds ago?

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Unit 7.5, Family Resource

Applications With Positive and Negative Numbers

Each year in September, the Arctic sea ice reaches its annual minimum levels. The table below shows minimums for various years, measured in square kilometers.[1]

Year	Arctic Sea Ice Minimums (square kilometers)
1980	7 670 000
1990	6 140 000
2000	6 250 000
2010	4 870 000
2019 (latest available data)	4 320 000

5. During which decade did the Arctic sea ice minimum change the most?

6. What was the approximate change in square kilometers of ice during this decade? Show whether the change was positive or negative.

7. What was the average rate of change of ice each year during this decade?

[1] "Arctic Sea Ice Minimum," Global Climate Change: Vital Signs of the Planet, https://climate.nasa.gov/vital-signs/arctic-sea-ice/

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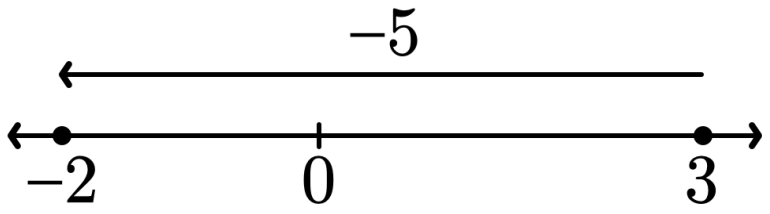
Unit 7.5, Family Resource

Solutions:

1. ✓ $-5 + 3$

   ✓ $3 - 5$

2. 

3.1 $a = 7$

3.2 $b = -4.5$

3.3 $c = -2$

4.1 -10. *Explanations vary*. This number tells us that the turtle's position in 5 seconds will be -10 feet.

4.2 Where will the turtle be in 5 seconds?

4.3 Where was the turtle 5 seconds ago?

4.4 When was the turtle at 5 feet?

5. The Arctic summer sea ice changed the most from 1980 to 1990.

6. $6\,140\,000 - 7\,670\,000 = -1\,530\,000$ square kilometers.

7. On average, Between 1980 and 1990, the ice changed by $\frac{6\,140\,000 - 7\,670\,000}{10}$ $= -153\,000$ square kilometers per year.

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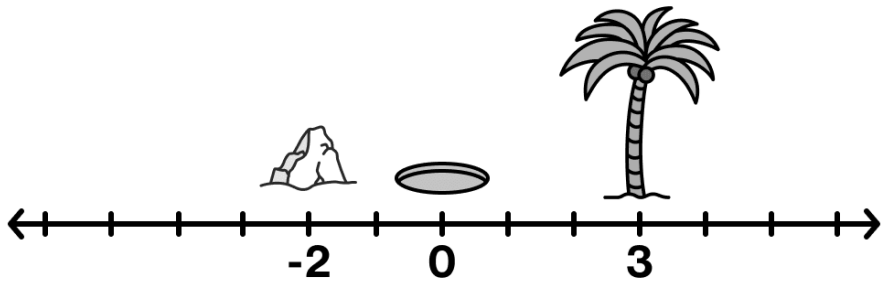
Unit 6.7, Lesson 1: Notes Name _____

My Notes

1. Explain what *negative numbers* are in your own words. Give at least one example.

2.1 Draw a star at -3 on the number line below.
Explain your thinking.



2.2 Label each of the remaining tick marks on the number line.

2.3 A sand dollar is 3 units away from the rock.

Where could it be? Explain your thinking.

Summary

- ☐ I can explain what positive and negative numbers are.
- ☐ I can use the symbol $(-)$ and the word *negative* to describe numbers that are less than 0.

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Unit 6.7, Lesson 1: Notes Name _____

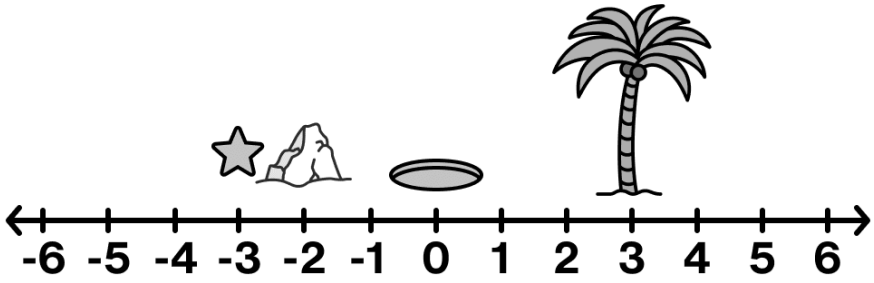
My Notes

1. Explain what *negative numbers* are in your own words. Give at least one example.

   Responses vary. **Negative numbers are numbers less than 0. They are to the left of 0 on the number line.**

2.1 Draw a star at -3 on the number line below.
Explain your thinking. ***Responses vary.***

- **-3 is 1 unit left of the rock, which is at -2.**
- **It is the same distance away from the hole as the tree but to the left of the hole.**



2.2 Label each of the remaining tick marks on the number line.

2.3 A sand dollar is 3 units away from the rock.

Where could it be? Explain your thinking.

-5 or 1. *Explanations vary.* -5 is to the left of the rock and 1 is to the right of the rock. Don't forget to count 0!

Summary

- ☐ I can explain what positive and negative numbers are.
- ☐ I can use the symbol ($-$) and the word *negative* to describe numbers that are less than 0.

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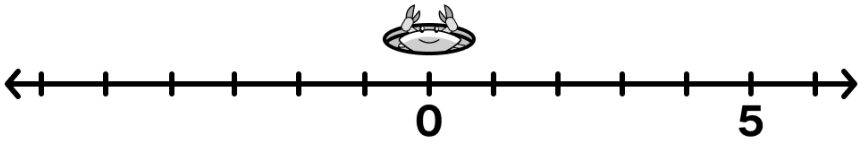
Unit 6.7, Lesson 2: Notes Name _____

My Notes

1. What does it mean for two numbers to be *opposites*? Give at least one example.

2.1 Plot and label each number on the number line.

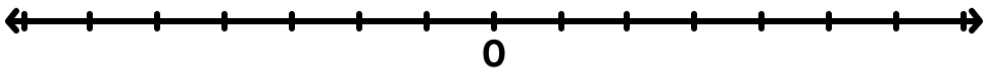
2.5 $-\frac{3}{4}$ $-\frac{7}{3}$



2.2 What is the opposite of 2.5? _____

2.3 What is the opposite of $-\frac{3}{4}$? _____

3. Draw a star at $-(-2)$. Explain your thinking.



Summary

- ☐ I can identify and plot positive and negative numbers on the number line.
- ☐ I know what opposite numbers are and can use the symbol (–) to represent them.
- ☐ I know what the opposite of the opposite of a number is.

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Unit 6.7, Lesson 2: Notes Name _____

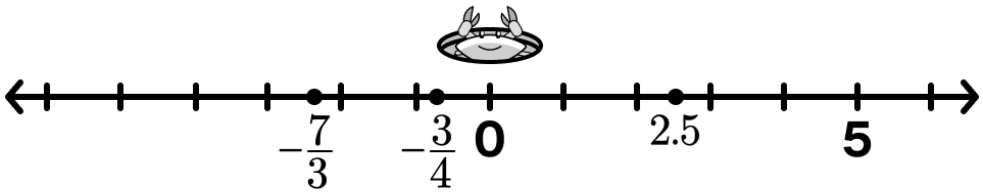
My Notes

1. What does it mean for two numbers to be *opposites*? Give at least one example.

   Responses vary. **Two numbers are opposites if they are the same distance from 0 and on different sides of the number line. For example, -4 is the opposite of 4, and 3 is the opposite of -3.**

2.1 Plot and label each number on the number line.

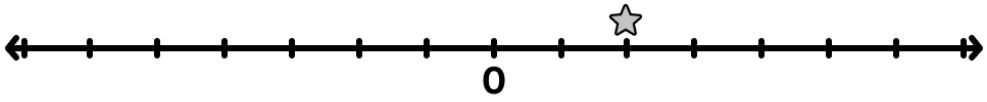
2.5 $-\frac{3}{4}$ $-\frac{7}{3}$



2.2 What is the opposite of 2.5? -2.5

2.3 What is the opposite of $-\frac{3}{4}$? $\frac{3}{4}$

3. Draw a star at $-(-2)$. Explain your thinking.



Explanations vary. **Another way of saying $-(-2)$ is "the opposite of -2." The opposite of a negative number is a positive number, so $-(-2) = 2$.**

Summary

- ☐ I can identify and plot positive and negative numbers on the number line.
- ☐ I know what opposite numbers are and can use the symbol (–) to represent them.
- ☐ I know what the opposite of the opposite of a number is.

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Unit 6.7, Lesson 3: Notes Name _____

My Notes

Here are some numbers from the lesson.

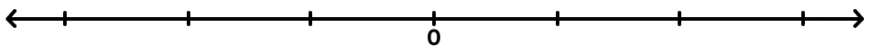
-0.4 $-\frac{5}{4}$ $-2\frac{2}{3}$ 2.5

1.1 Use these numbers to create true sentences. You can use numbers more than once.

_____ is greater than _____. _____ is less than _____.

_____ > _____ _____ < _____ _____ > _____

1.2 Plot and label these numbers on the number line.



1.3 Order these numbers from least to greatest.

Least _____ _____ _____ _____ **Greatest**

2. What advice would you give another student about ordering positive and negative numbers?

Summary

- ☐ I can compare positive and negative numbers using words and symbols.
- ☐ I can use a number line to order positive and negative numbers.

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Unit 6.7, Lesson 3: Notes Name _____

My Notes

Here are some numbers from the lesson.

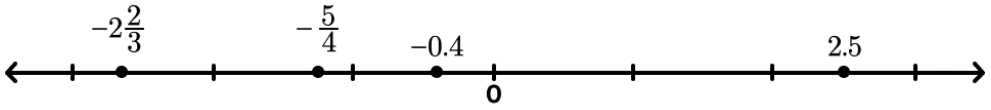
-0.4 $-\frac{5}{4}$ $-2\frac{2}{3}$ 2.5

1.1 Use these numbers to create true sentences. You can use numbers more than once. ***Responses vary.***

-0.4 is greater than $-\frac{5}{4}$. $-2\frac{2}{3}$ is less than $-\frac{5}{4}$.

$2.5 > -2\frac{2}{3}$ $-\frac{5}{4} < -0.4$ $2.5 > -0.4$

1.2 Plot and label these numbers on the number line.



1.3 Order these numbers from least to greatest.

Least $-2\frac{2}{3}$ $-\frac{5}{4}$ -0.4 2.5 **Greatest**

2. What advice would you give another student about ordering positive and negative numbers? ***Responses vary.***

- **Positive numbers are greater than negative numbers.**
- **Numbers farther to the left on the number line are less than numbers farther to the right.**

Summary

- ☐ I can compare positive and negative numbers using words and symbols.
- ☐ I can use a number line to order positive and negative numbers.

desmos

Unit 6.7, Lesson 4: Notes Name _____

My Notes

The record low temperature in Damascus, Syria, is -11.1 °C.

1.1 Write two temperatures that are warmer than -11.1 °C.

1.2 Write two temperatures that are colder than -11.1 °C.

1.3 Imagine the temperature is -11 °C.

Is that a new record low? Explain your thinking.

2. Order these cities in California from lowest to highest elevation.

City	Coachella	El Centro	Imperial	Niland
Elevation (ft.)	-72	-39	-59	-141

Lowest _____ _____ _____ _____ **Highest**

3. What concepts besides temperature and elevation include both positive and negative numbers?

Summary

- ☐ I can explain what positive numbers, negative numbers, and 0 mean in a context.
- ☐ I can compare negative numbers in context using words and symbols.

desmos

Unit 6.7, Lesson 4: Notes Name _____

My Notes

The record low temperature in Damascus, Syria, is -11.1 °C.

1.1 Write two temperatures that are warmer than -11.1 °C.

Responses vary. **-10 °C and 20 °C.**

1.2 Write two temperatures that are colder than -11.1 °C.

Responses vary. **-12 °C and -20 °C.**

1.3 Imagine the temperature is -11 °C.

Is that a new record low? **No.** Explain your thinking.

Explanations vary. **-11 °C is to the right of -11.1 °C on a number line, so -11 °C is warmer than -11.1 °C.**

2. Order these cities in California from lowest to highest elevation.

City	Coachella	El Centro	Imperial	Niland
Elevation (ft.)	–72	–39	–59	–141

Lowest Niland Coachella Imperial El Centro **Highest**

Lowest -141 -72 -59 -39 **Highest**

3. What concepts besides temperature and elevation include both positive and negative numbers? ***Responses vary.***

- **Spending money and debt**
- **Negative scores in games (like golf)**

Summary

- ☐ I can explain what positive numbers, negative numbers, and 0 mean in a context.
- ☐ I can compare negative numbers in context using words and symbols.

desmos

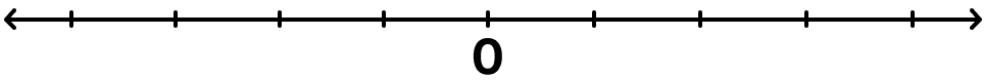
Unit 6.7, Lesson 5: Notes Name _____

My Notes

1. What does *absolute value* mean? Give at least one example of a number and its absolute value.

2. Determine the value of each expression. Use the number line if it helps you with your thinking.

Expression	Value
$\lvert -4 \rvert$	
$\lvert 2.5 \rvert$	
$\left\lvert -\frac{7}{20} \right\rvert$	



Decide if each statement is true or false.

3.1 $\lvert -3 \rvert < \lvert -2.5 \rvert$ True False

3.2 $-3 < -2.5$ True False

3.3 $\lvert 5 \rvert = -5$ True False

3.4 Choose one of the statements above. Explain your thinking.

Summary

- ☐ I understand what absolute value is and how to write it in symbols.
- ☐ I can compare numbers and absolute values.

desmos

Unit 6.7, Lesson 5: Notes Name _____

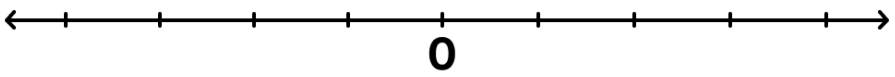
My Notes

1. What does *absolute value* mean? Give at least one example.

   Responses vary. **The absolute value of a number is its distance from 0 on the number line.** $|-3| = 3$ **because** -3 **is** 3 **units away from** 0**.** $|4| = 4$ **and** $|-4| = 4$**.**

2. Determine the value of each expression. Use the number line if it helps you with your thinking.

Expression	Value
$\|-4\|$	4
$\|2.5\|$	2.5
$\left\|-\frac{7}{20}\right\|$	$\frac{7}{20}$



Decide if each statement is true or false.

3.1 $|-3| < |-2.5|$ True **False**

3.2 $-3 < -2.5$ **True** False

3.3 $|5| = -5$ True **False**

3.4 Choose one of the statements above. Explain your thinking.

- $|-3| < |-2.5|$ **is false.** -3 **is farther from** 0 **than** -2.5**.**
- $-3 < -2.5$ **is true.** -3 **is to the left of** -2.5 **on the number line.**
- $|5| = -5$ **is false.** 5 **is** 5 **units from** 0**, not** -5 **units.**

Summary

- [ ] I understand what absolute value is and how to write it in symbols.
- [ ] I can compare numbers and absolute values.

desmos

Unit 7.5, Lesson 1: Notes Name _____

My Notes

This submarine's position is controlled by floats and anchors.

1. Enter the missing information in the table.

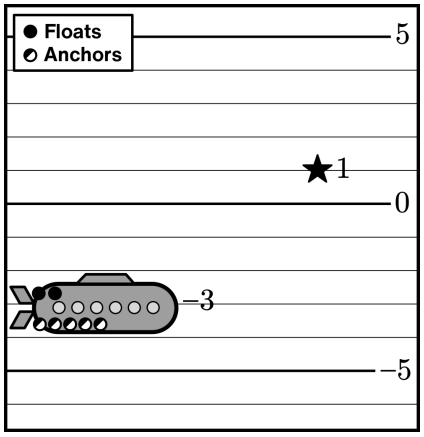
Start	Action	Final
-3	Add 2 floats	-1
-3	Remove 2 anchors	
-3	Add 11 floats	
-3		-7

2. The submarine starts at -3 units. List three different actions that would move it to 1 unit.

Action 1:

Action 2:

Action 3:



Summary

- ☐ I can use floats and anchors to solve problems.
- ☐ I can identify different ways to represent the same change.

desmos

Unit 7.5, Lesson 1: Notes Name _____

My Notes

This submarine's position is controlled by floats and anchors.

1. Enter the missing information in the table.

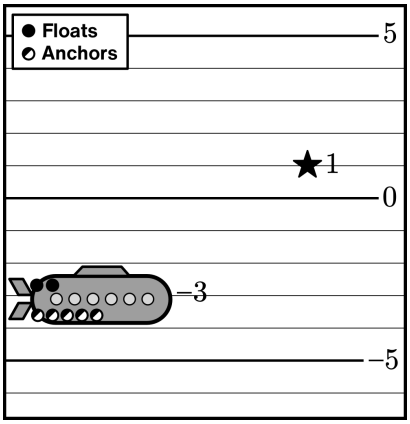
Start	Action	Final
-3	Add 2 floats	-1
-3	Remove 2 anchors	-1
-3	Add 11 floats	8
-3	Add 4 anchors or Remove 4 floats	-7

2. The submarine starts at -3 units. List three different actions that would move it to 1 unit.

Action 1: **Add 4 floats**

Action 2: **Remove 4 anchors**

Action 3: **Add 2 floats and remove 2 anchors**



Summary

- ☐ I can use floats and anchors to solve problems.
- ☐ I can identify different ways to represent the same change.

desmos

Unit 7.5, Lesson 2: Notes Name _____

My Notes

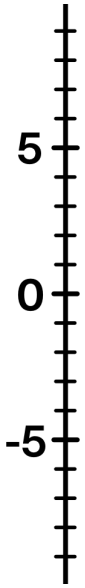
1. Complete the table for these four submarine scenarios.

Start	Action	Final Expression	Final Value
-2	Add 6 floats	$-2+6$	4
	Remove 5 anchors	$1-(-5)$	
3		$3-7$	
		$-1+(-4)$	

Describe your strategy for calculating the value of each expression. Use the number line if it helps you with your thinking.

2.1 $-4-(-2)$

2.2 $-4+(-2)$



Summary

- ☐ I can connect adding and removing floats and anchors to adding and subtracting integers.
- ☐ I can identify different expressions that have the same value.

desmos

Unit 7.5, Lesson 2: Notes Name _____

My Notes

1. Complete the table for these four submarine scenarios.

Start	Action	Final Expression	Final Value
-2	Add 6 floats	$-2+6$	4
1	Remove 5 anchors	$1-(-5)$	6
3	Remove 7 floats	$3-7$	-4
-1	Add 4 anchors	$-1+(-4)$	-5

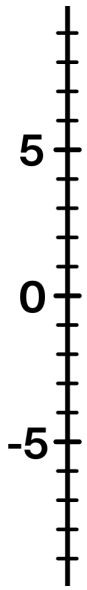
Describe your strategy for calculating the value of each expression. Use the number line if it helps you with your thinking.

2.1 $-4-(-2)$

***Responses vary*. Start at -4 and remove 2 anchors. This is like going up by 2, so the value is -2.**

2.2 $-4+(-2)$

***Responses vary*. Start at -4 and add 2 anchors. This is like going down by 2, so the value is -6.**



Summary

- ☐ I can connect adding and removing floats and anchors to adding and subtracting integers.
- ☐ I can identify different expressions that have the same value.

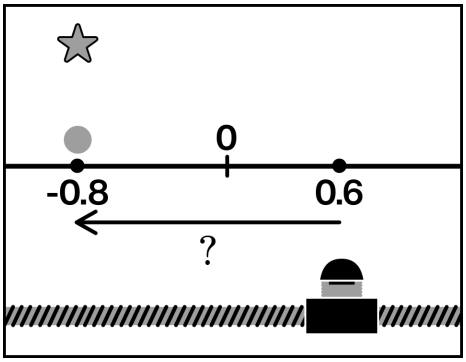
desmos

Unit 7.5, Lesson 3: Notes Name _____

My Notes

1.1 Select all the equations that represent this challenge.

- ☐ $0.6 + x = -0.8$
- ☐ $-0.8 + x = 0.6$
- ☐ $x = -0.8 - 0.6$
- ☐ $x - 0.6 = -0.8$



1.2 What is the value of x that makes this equation true? Explain your strategy.

Determine the value of the variable that makes each equation true.

2.1 $-1.3 + x = 7.2$

2.2 $\frac{3}{4} - \left(-\frac{5}{4}\right) = x$

Summary

- ☐ I can add and subtract integers, decimals, and fractions on a number line.
- ☐ I can determine the value of a variable that makes an equation true.

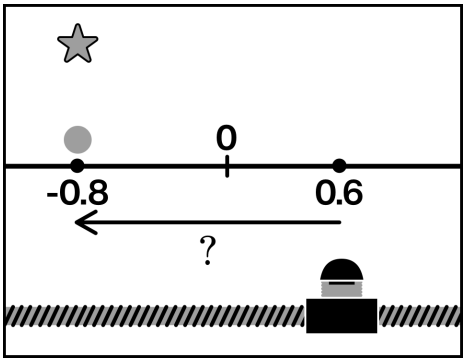
desmos

Unit 7.5, Lesson 3: Notes Name _____

My Notes

1.1 Select all the equations that represent this challenge.

- ✓ $0.6 + x = -0.8$
- ☐ $-0.8 + x = 0.6$
- ✓ $x = -0.8 - 0.6$
- ☐ $x - 0.6 = -0.8$



1.2 What is the value of x that makes this equation true?

-1.4

Explanations vary. **I know it is -0.6 to change from 0.6 to 0 and then another -0.8 to change from 0 to -0.8.**

Determine the value of the variable that makes each equation true.

2.1 $-1.3 + x = 7.2$

8.5

2.2 $\frac{3}{4} - \left(-\frac{5}{4}\right) = x$

$\frac{8}{4}$ **(or equivalent)**

Summary

- ☐ I can add and subtract integers, decimals, and fractions on a number line.
- ☐ I can determine the value of a variable that makes an equation true.

desmos

Unit 7.5, Lesson 4: Notes Name _____

My Notes

For each expression, draw a number line diagram and determine its value.

1.1 $(-5)-(2)=$ _____

1.2 $(2)-(-5)=$ _____

1.3 What is similar and different about your diagrams?

2. The statement below is (always / sometimes / never) true.

$x-1$ is greater than $x-4$.

My reasoning:

Summary

- ☐ I can draw a number line to add and subtract positive and negative numbers.
- ☐ I can compare and contrast similar expressions (e.g., $2.5-3.5$ and $3.5-2.5$).
- ☐ I can make arguments about addition and subtraction with variables.

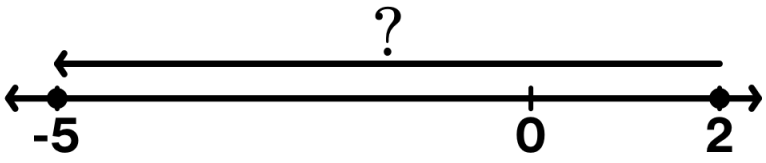
desmos

Unit 7.5, Lesson 4: Notes Name _____

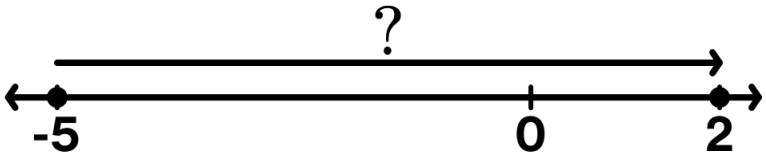
My Notes

For each expression, draw a number line diagram and determine its value.

1.1 $(-5)-(2)=$ -7



1.2 $(2)-(-5)=$ 7



1.3 What is similar and different about your diagrams?

Responses vary.

Similar: The diagrams have the same values, so the arrows are the same length.

Different: The start and the end are switched, so the change arrow is going in the opposite direction.

2. The statement below is (**always** / sometimes / never) true.

$x-1$ is greater than $x-4$.

My reasoning: $x-1$ **is one to the left of** x **and** $x-4$ **is** 4 **to the left of** x**.** $x-4$ **will always be further to the left, so it will always be less than** $x-1$.

Summary

- ☐ I can draw a number line to add and subtract positive and negative numbers.
- ☐ I can compare and contrast similar expressions (e.g., $2.5-3.5$ and $3.5-2.5$).
- ☐ I can make arguments about addition and subtraction with variables.

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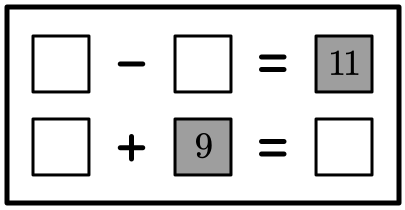
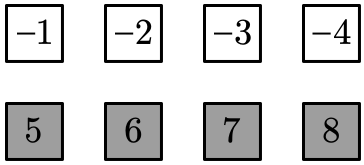
Unit 7.5, Lesson 5: Notes Name _____

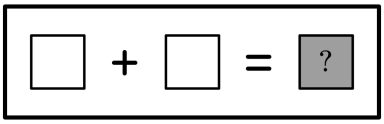
My Notes

1. Fill in the blanks using these numbers to make the equations true.





2. Imagine adding a pair of numbers. Describe how you can tell whether its value will be positive, negative, or zero.



Summary

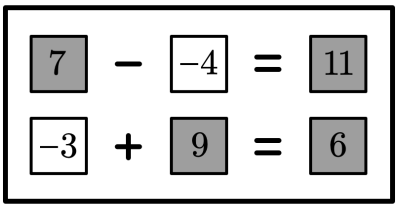
☐ I can add and subtract positive and negative numbers in complicated expressions.

desmos

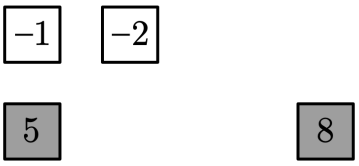
Unit 7.5, Lesson 5: Notes Name _____

My Notes

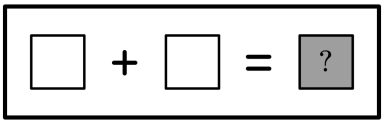
1. Fill in the blanks using these numbers to make the equations true.



Responses vary.



2. Imagine adding a pair of numbers. Describe how you can tell whether its value will be positive, negative, or zero.



Responses vary. **The value will be zero if the numbers are opposites, like -5 and 5. It will be negative if both numbers are negative, or if the negative number is farther from zero than the positive number, like -5 and 2. The value will be positive if both numbers are positive, or if the positive number is farther from zero than the negative number, like -2 and 5.**

Summary

☐ I can add and subtract positive and negative numbers in complicated expressions.

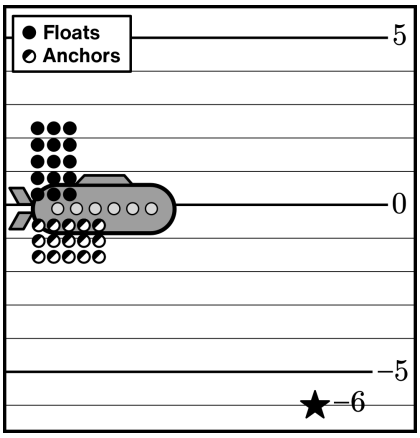
desmos

Unit 7.5, Lesson 6: Notes Name _____

My Notes

This submarine is controlled by groups of 5 floats and groups of 3 anchors. The submarine starts at 0 units.

1.1 Explain why adding 2 groups of 3 anchors moves the submarine to -6 units.



1.2 Where will the submarine end up after . . .

. . . removing 3 groups of 5 floats? _____

. . . removing 3 groups of 3 anchors? _____

3. Calculate the value of $(-2)(-7)$. Explain your strategy.

Summary

- ☐ I can use floats and anchors to represent multiplying positive and negative numbers.
- ☐ I can explain why the product of two numbers will be positive or negative.

desmos

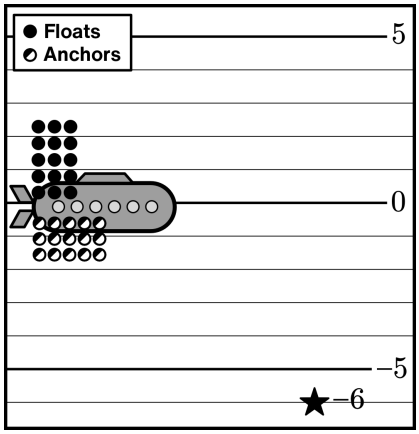
Unit 7.5, Lesson 6: Notes Name _____

My Notes

This submarine is controlled by groups of 5 floats and groups of 3 anchors. The submarine starts at 0 units.

1.1 Explain why adding 2 groups of 3 anchors moves the submarine to -6 units.

***Responses vary*. Adding 2 groups of 3 anchors moves the submarine down 6 units. Since it starts at 0, it will go down to -6.**



1.2 Where will the submarine end up after . . .

. . . removing 3 groups of 5 floats? -15 **units**

. . . removing 3 groups of 3 anchors? 9 **units**

3. Calculate the value of $(-2)(-7)$. Explain your strategy.

14. *Explanations vary*. The -2 is like removing 2 groups, and the -7 is like 7 anchors). If you remove anchors, the sub goes up, so if you remove 2 groups of 7 anchors, the sub goes up by 14.

Summary

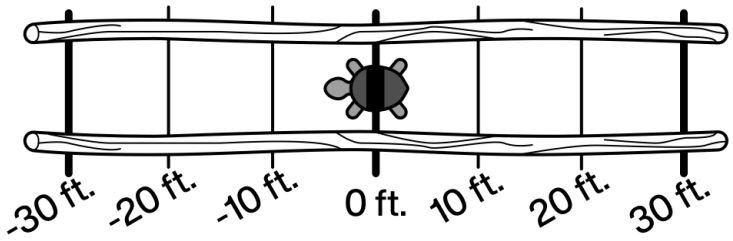
- ☐ I can use floats and anchors to represent multiplying positive and negative numbers.
- ☐ I can explain why the product of two numbers will be positive or negative.

desmos

Unit 7.5, Lesson 7: Notes Name _____

My Notes

This is Mat, Tam's twin turtle. Assume Mat walks at a constant rate.



1.1 Complete the table.

Time (min.)	Position (ft.)
0	0
1	-4
5	
	-28

1.2 What is Mat's rate of change?

1.3 Where was Mat 5 minutes ago?

2. Use the turtle scenario to explain why it makes sense that $(-5)(-4)$ is positive.

Summary

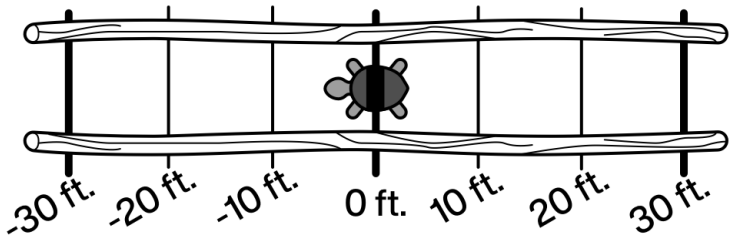
- ☐ I can use position, rate, and time to represent multiplying positive and negative numbers.
- ☐ I can explain why multiplying two negative numbers has a positive value.

desmos

Unit 7.5, Lesson 7: Notes Name _____

My Notes

This is Mat, Tam's twin turtle. Assume Mat walks at a constant rate.



1.1 Complete the table.

Time (min.)	Position (ft.)
0	0
1	-4
5	-20
7	-28

1.2 What is Mat's rate of change?

-4 **ft./min.**

1.3 Where was Mat 5 minutes ago?

20 **feet**

2. Use the turtle scenario to explain why it makes sense that $(-5)(-4)$ is positive.

Responses vary. -4 **is like moving to the left and** -5 **is like** 5 **minutes ago. So we are asking about where the turtle was** 5 **minutes ago, which was to the right. The right is toward the positive numbers.**

Summary

- ☐ I can use position, rate, and time to represent multiplying positive and negative numbers.
- ☐ I can explain why multiplying two negative numbers has a positive value.

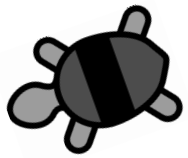
desmos

Unit 7.5, Lesson 8: Notes Name _____

My Notes

The table shows three different turtle scenarios.

Each turtle is traveling at a constant rate.



1.1 Complete the table.

Turtle	Rate (ft./min.)	Time (min.)	Position (ft.)
A	–3	2.5	
B	–2		–23
C		–2	11

1.2 Describe your strategy for calculating Turtle B's time.

2. Do $-\frac{8}{2}$ and $\frac{-8}{-2}$ have the same value? Why or why not?

Summary

- ☐ I can multiply and divide positive and negative numbers.
- ☐ I can identify different expressions that have the same value.

My Notes

The table shows three different turtle scenarios.

Each turtle is traveling at a constant rate.

1.1 Complete the table.

Turtle	Rate (ft./min.)	Time (min.)	Position (ft.)
A	–3	2.5	–7.5
B	–2	11.5	–23
C	–5.5	–2	11

1.2 Describe your strategy for calculating Turtle B's time.

***Responses vary*. I know that $rate \cdot time = position$, so this is like asking: what number times -2 equals -23? To figure out that number you have to divide. I know the time is positive because the rate and position are both negative.**

2. Do $-\frac{8}{2}$ and $\frac{-8}{-2}$ have the same value? Why or why not?

No. *Explanations vary*. The first one is like the opposite of 4, which is -4. The second one is like walking at a rate of -2 and ending up at -8, which would mean the time was positive 4.

Summary

- ☐ I can multiply and divide positive and negative numbers.
- ☐ I can identify different expressions that have the same value.

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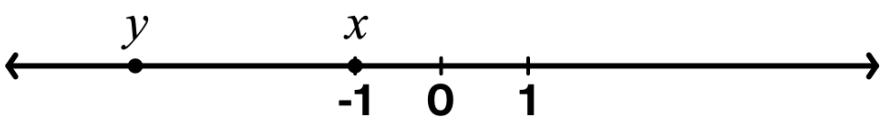
Unit 7.5, Lesson 9: Notes Name _____

My Notes

1. x and y are plotted on the number line below.



Order these expressions from least to greatest.

$x - y$ $x \cdot y$ $2x$

Least _____ _____ _____ **Greatest**

2. The statement below is (always / sometimes / never) true.

$-x \cdot y$ is less than $x \cdot y$.

My reasoning:

Summary

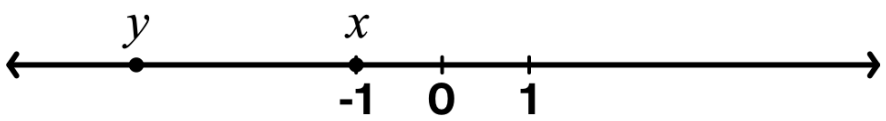
☐ I can reason about expressions that involve variables.

desmos

Unit 7.5, Lesson 9: Notes Name _____

My Notes

1. x and y are plotted on the number line below.



Order these expressions from least to greatest.

$x - y$ $x \cdot y$ $2x$

Least $2x$ $x - y$ $x \cdot y$ **Greatest**

2. The statement below is (always / **sometimes** / never) true.

$-x \cdot y$ is less than $x \cdot y$.

My reasoning: **If x and y are both positive or both negative, then this would be a true statement. $x \cdot y$ would be positive and $-x \cdot y$ would be negative. But if only one of the numbers is negative, like $x = 2$ and $y = -5$, then it wouldn't be true. $(2) \cdot (-5) = -10$ and $-(2) \cdot (-5) = 10$, so $x \cdot y$ would be less than $-x \cdot y$.**

Summary

☐ I can reason about expressions that involve variables.

desmos

Unit 7.5, Lesson 10: Notes Name _____

My Notes

1. What is the value of this expression? Show all of your thinking.

$$\frac{3 + -5 \times -3}{4 - -2} = ?$$

2.1 Fill in the blanks to make an expression with a negative value.

$$\square \times \square + \square = ?$$

2.2 What is the value of your expression?

1	−2	−3	4
5	−6	−7	8

3. Use the numbers from Problem 2 to make a new expression. Write the value of your expression.

Summary

☐ I can add, subtract, multiply, and divide integers in complicated expressions.

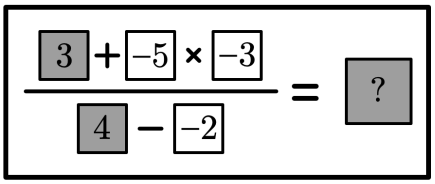
desmos

Unit 7.5, Lesson 10: Notes Name _____

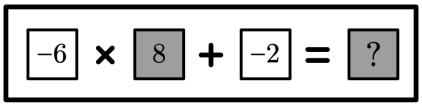
My Notes

1. What is the value of this expression? Show all of your thinking.

$$\frac{3+(-5)\times(-3)}{4-(-2)}$$
$$= \frac{3+15}{6}$$
$$= \frac{18}{6}$$ **or equivalent**

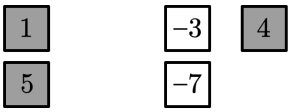


2.1 Fill in the blanks to make an expression with a negative value.



2.2 What is the value of your expression?

–50



3. Use the numbers from Problem 2 to make a new expression. Write the value of your expression.

Expression: $(-6) \times (-3) - (-2)(-7)$

Value: 4

Summary

☐ I can add, subtract, multiply, and divide integers in complicated expressions.

desmos

Unit 7.5, Lesson 11: Notes Name _____

My Notes

1.1 This table shows how the average temperature in different places around the world have changed from 1900 to 2014.

Enter the missing values.

Location	Average Temperature in 1900 (°C)	Average Temperature in 2014 (°C)	Change From 1900 to 2014 (°C)
Ulaanbaatar, Mongolia	–3.16	–1.71	
Khabarovsk, Russia		1.35	1.57
Punta Arenas, Chile	6.03		0.96
Greenland	–21.64	–19.26	

1.2 Describe a strategy you used for deciding whether a missing value was positive or negative.

1.3 Which location had the largest change in temperature from 1900 to 2014? What might the impact of this change be?

Summary

☐ I can apply what I've learned to solve problems about changing temperatures.

My Notes

1.1 This table shows how the average temperature in different places around the world have changed from 1900 to 2014.

Enter the missing values.

Location	Average Temperature in 1900 (°C)	Average Temperature in 2014 (°C)	Change From 1900 to 2014 (°C)
Ulaanbaatar, Mongolia	–3.16	–1.71	1.45
Khabarovsk, Russia	–0.22	1.35	1.57
Punta Arenas, Chile	6.03	6.99	0.96
Greenland	–21.64	–19.26	2.38

1.2 Describe a strategy you used for deciding whether a missing value was positive or negative.

***Responses vary*. I estimated where each number or change would be on a number line.**

1.3 Which location had the largest change in temperature from 1900 to 2014? What might the impact of this change be?

Greenland. *Responses vary*. Hotter temperatures may lead to ice melting more quickly and sea levels rising, which could impact plants and animals.

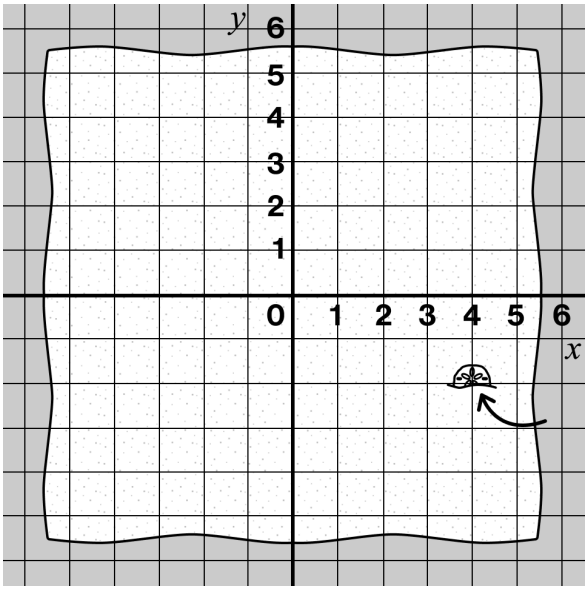
Summary

☐ I can apply what I've learned to solve problems about changing temperatures.

desmos

Unit 6.7, Lesson 9: Notes Name _____

My Notes



1. What are the coordinates of the sand dollar? _____

   Explain how you know.

2. A new sand dollar is also buried in the bottom-right quarter of the graph. What do we know about its coordinates?

3. Plot and label each point in the coordinate plane above.

   $(-4, 1)$ $(-1, -2)$ $(0, -3)$ $(-5, 0)$

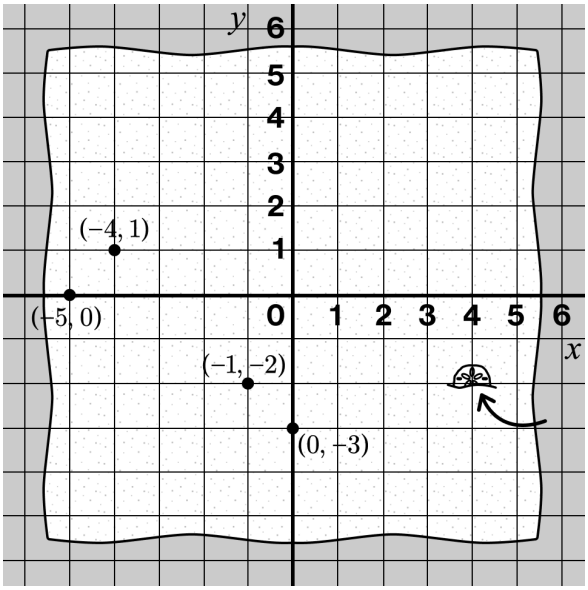
Summary

- ☐ I can explain what the coordinate plane looks like with positive and negative numbers.
- ☐ I can write coordinates for points in the coordinate plane.
- ☐ I can estimate the location of a point in the coordinate plane using the signs of its coordinates.

desmos

Unit 6.7, Lesson 9: Notes Name _____

My Notes



1. What are the coordinates of the sand dollar? $(4, -2)$

   Explain how you know. ***Explanations vary.***
   - **It is 4 units to the right of the y–axis and 2 units below the x–axis .**
   - **If this were two number lines, then it would be at 4 on the horizontal one and -2 on the vertical one.**

2. A new sand dollar is also buried in the bottom-right quarter of the graph. What do we know about its coordinates?

   Responses vary. **The x–coordinate is positive because it is to the right of the vertical axis. The y–coordinate is negative because it is below the horizontal axis.**

3. Plot and label each point in the coordinate plane above.
   See graph above.

   $(-4, 1)$ $(-1, -2)$ $(0, -3)$ $(-5, 0)$

Summary

- ☐ I can explain what the coordinate plane looks like with positive and negative numbers.
- ☐ I can write coordinates for points in the coordinate plane.
- ☐ I can estimate the location of a point in the coordinate plane using the signs of its coordinates.

desmos

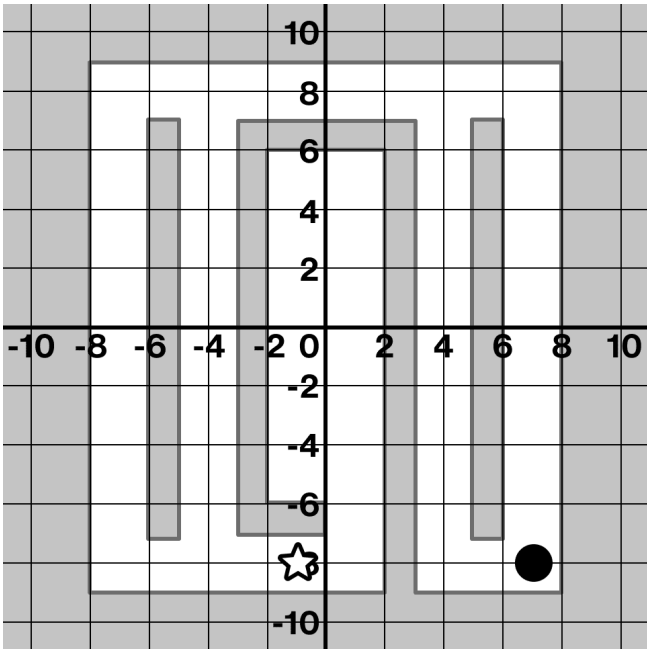
Unit 6.7, Lesson 10: Notes Name _____

My Notes

1. What are the coordinates of the star? _____

2. Sketch a path to get from the ball to the star.

3. Write coordinates for each stop the ball makes on the path.



Your Path

$(7, -8)$

_____

_____

_____

_____

_____

_____

4. Abdel included the point $(-3, 4)$ on his path.

   Will that hit a barrier? _____ Explain how you know.

5. Diamond included both $(7, 8)$ and $(-7, 8)$ on her path. How are the positions of these points related?

Summary

- ☐ I can plot points in coordinate planes with different scales.
- ☐ I can explain how the locations of points that differ only by one sign are related.

desmos

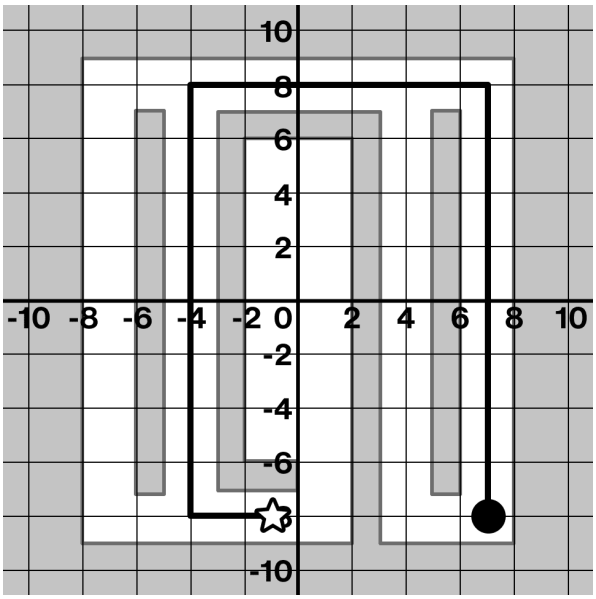
Unit 6.7, Lesson 10: Notes Name _____

My Notes

1. What are the coordinates of the star? $(-1, -8)$

2. Sketch a path to get from the ball to the star. ***Paths vary.***

3. Write coordinates for each stop the ball makes on the path.



Your Path

$(7, -8)$

$(7, 8)$

$(-4, 8)$

$(-4, -8)$

$(-1, -8)$

4. Abdel included the point $(-3, 4)$ on his path.

   Will that hit a barrier? **Yes. *Explanations vary.* Abdel may have counted the number of boxes to figure out his point but the scale is by 2 s. $(-3, 4)$ would hit the edge of the barrier.**

5. Diamond included both $(7, 8)$ and $(-7, 8)$ on her path. How are the positions of these points related? ***Responses vary.*** **These points are a mirror image across the y –axis. $(7, -8)$ is on the right side of the graph. $(-7, -8)$ is a reflection on the left side.**

Summary

- ☐ I can plot points in coordinate planes with different scales.
- ☐ I can explain how the locations of points that differ only by one sign are related.

desmos

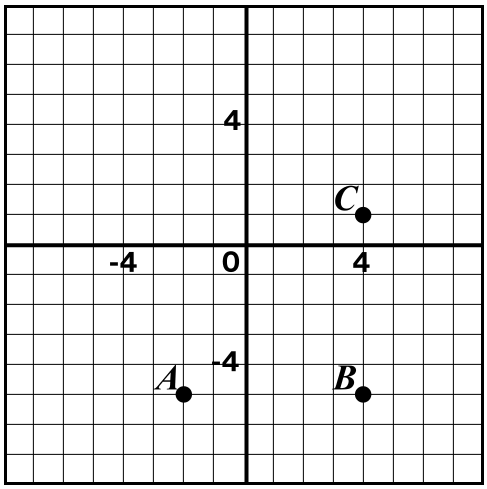
Unit 6.7, Lesson 11: Notes Name _____

My Notes

Here are three of the four coordinates that make a square.

1.1 Write the coordinates of point D.

Point	Coordinates
A	$(-2, -5)$
B	$(4, -5)$
C	$(4, 1)$
D	

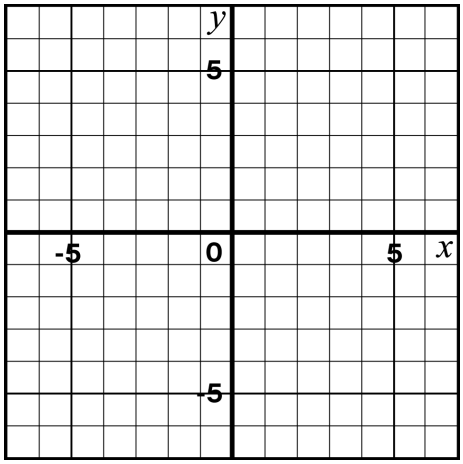


1.2 What is the side length of the square? _____

Explain how you know.

2.1 Plot and label the coordinates of a polygon that looks like a house.

2.2 How long is the longest horizontal or vertical segment in your polygon?



Summary

- ☐ I can draw a polygon in the coordinate plane.
- ☐ I can determine horizontal and vertical side lengths of a polygon in a coordinate plane.

desmos

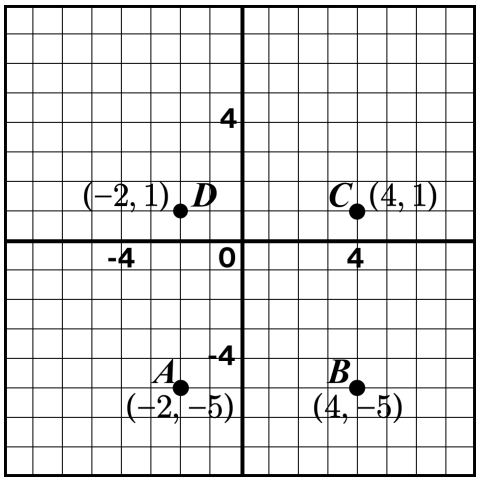
Unit 6.7, Lesson 11: Notes Name _____

My Notes

Here are three of the four coordinates that make a square.

1.1 Write the coordinates of point D.

Point	Coordinates
A	$(-2, -5)$
B	$(4, -5)$
C	$(4, 1)$
D	$(-2, 1)$

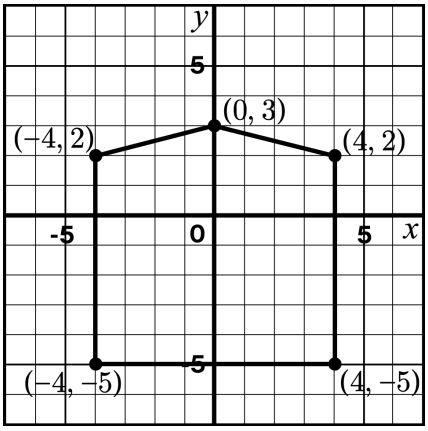


1.2 What is the side length of the square? 6 **units.**

Explanations vary. **For the top side of the square, it is 2 units from -2 to 0 and another 4 units from 0 to 4.**

2.1 Plot and label the coordinates of a polygon that looks like a house. ***Points vary.***

2.2 How long is the longest horizontal or vertical segment in your polygon? ***Responses vary.*** 10 **units.**



Summary

- ☐ I can draw a polygon in the coordinate plane.
- ☐ I can determine horizontal and vertical side lengths of a polygon in a coordinate plane.