MathLinks

INTEGERS 1
STUDENT PACKET

INTRODUCTION TO INTEGERS

Parent (or Guardian) signature _____

MY WORD BANK

Explain the mathematical meaning of each word or phrase, using pictures and examples when possible. (See section 1.5.) Key mathematical vocabulary is underlined throughout the packet.

absolute value	coordinate plane
integers	negative numbers
opposite of a number	positive numbers

HOT AND COLD CHALLENGE

1. What is the hottest temperature you remember experiencing?

   Where was this?

2. What is the coldest temperature you remember experiencing?

   Where was this?

3. What is the difference between these highest and lowest temperatures you experienced in your lifetime?

4. NASA satellite data revealed the coldest recorded temperature on Earth. It happened in August 2010 in East Antarctica, and was -135.8°F.

   The hottest recorded temperature on Earth (confirmed) was 129.2°F. This occurred in Death Valley, CA in June 2013 and also in Mitribah, Kuwait in July 2016.

   What is the difference between these hot and cold record temperatures?

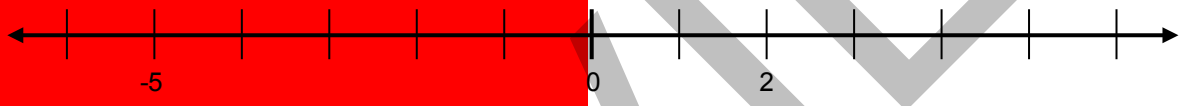
INTEGERS AND THE NUMBER LINE

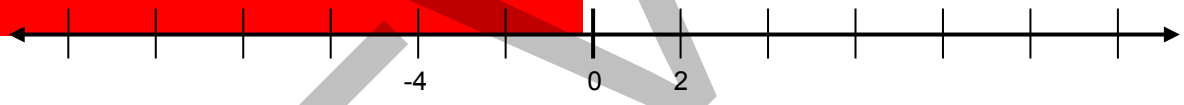
We will extend the positive number line to represent all integers. We will use arrows to represent direction and distance. We will solve problems involving integers and temperature.

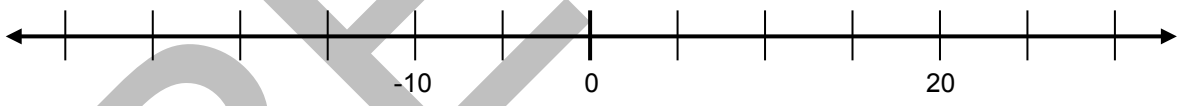
GETTING STARTED

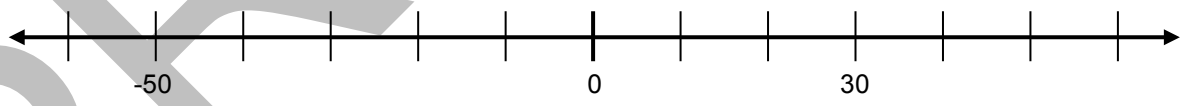
Write the correct integers on each tick mark on these horizontal number lines. Remember that definitions and examples are at the back of this packet.

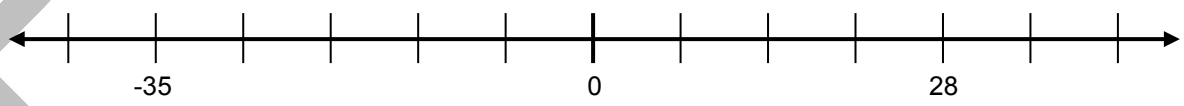
1. Which numbers are greater on the horizontal number line, those going to the right or those going to the left?

2. 

3. 

4. 

5. 

6. 

7. Where are positive numbers located on the number line?

8. Where are negative numbers located on the number line?

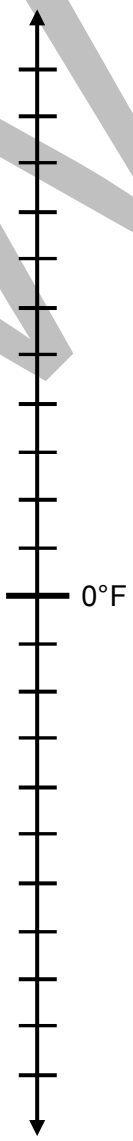
COMPARING TEMPERATURES

1. Which numbers are lesser on the vertical number line, those that are higher or those that are lower?

2. Below are some average temperatures in degrees Fahrenheit for the month of July from various locations around the world. Label the vertical number line to the right, showing temperatures from 100 degrees below zero (-100°F) to 100 degrees above zero (100°F).

3. Graph the temperature for each location with a point on the number line. Label the points on the number line to the right.

   - Point *C*: Cape Town (a region in South Africa) at 0°F
   - Point *M*: Munich (a city in Germany) at 60°F
   - Point *F*: Fairbanks (a city in Alaska) at 40°F
   - Point *S*: The South Pole (a location in Antarctica) at -70°F
   - Point *D*: Death Valley (a region in California) at 100°F
   - Point *E*: Ellsworth Land (a region in Antarctica) at -35°F



4. In the table below, compare the temperatures using your number line.

	Verbal Sentence	Number Sentence
a.	The temperature in Death Valley is greater than the temperature at the South Pole.	_____ > _____
b.	The temperature in Ellsworth Land is less than the temperature in Cape Town.	
c.	The temperature in Ellsworth Land is _____ than the temperature at the South Pole.	
d.	The temperature at the South Pole is _____ than the temperature in Munich.	

5. Complete the table with verbal and number statements.

a.	Thirty is greater than zero.	30 ☐ 0
b.	Sixty is …	60 ☐ -45
c.		-60 ☐ -45

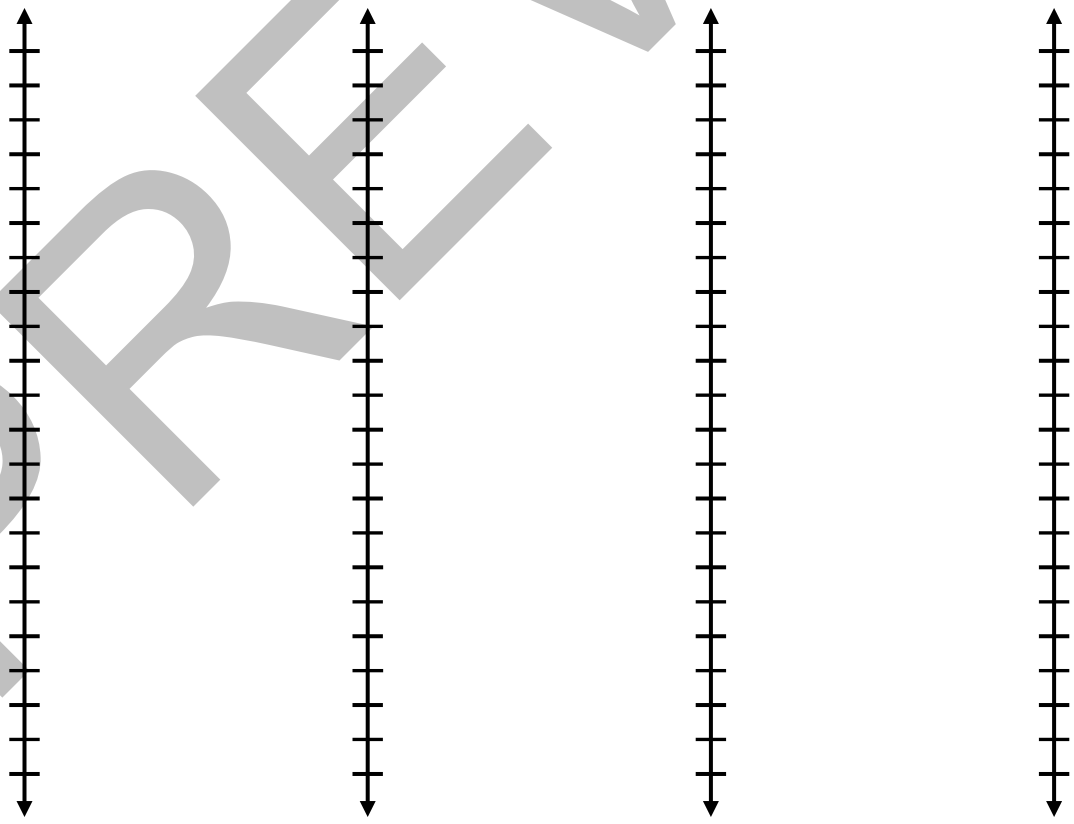
TEMPERATURE CHANGE

Your teacher will give you some starting and ending temperatures.

- Number tick marks on each number line below as needed.
- Place the start and end temperatures.
- Draw an arrow from the start to the end.
- Count to find the temperature change.

Location	Starting temperature	Ending temperature	Temperature change
1. Los Angeles			
2. Bering Strait Coast			
3. Hermosa Beach			
4. Loma			

1. 2. 3. 4.



PRACTICE 1

Scale each number line below and draw arrows to represent each situation. Then answer each question.

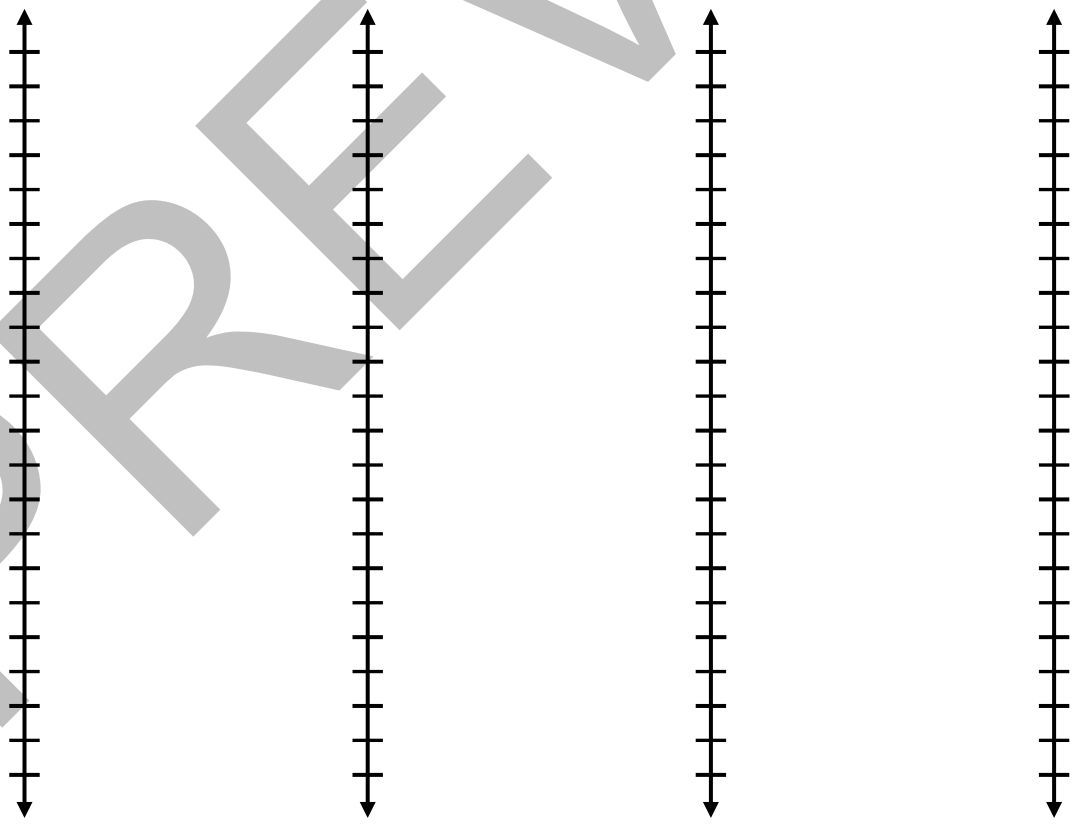
1. A freezer is kept at a temperature of -15°F. The electricity went out one morning, and that evening the temperature inside the freezer climbed to 45°F. Did the temperature increase or decrease and by how much?

2. At the top of a mountain, the morning temperature was -5°F. In the afternoon, it was 20°F higher. What was the afternoon temperature?

3. In Anchorage, Alaska, the temperature rose 15 degrees from the day's low temperature to its high. The high temperature was -10°F. What was the low temperature?

4. In Siberia, Russia, the temperature fell 30 degrees from the afternoon high temperature of 10°F to the nighttime low temperature. What was the nighttime low temperature?

1. 2. 3. 4.



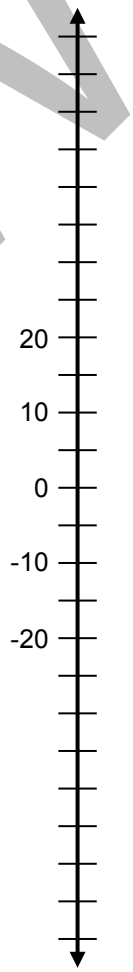
OPPOSITES AND ABSOLUTE VALUE

We will learn to interpret and evaluate the opposite and absolute value of a number.

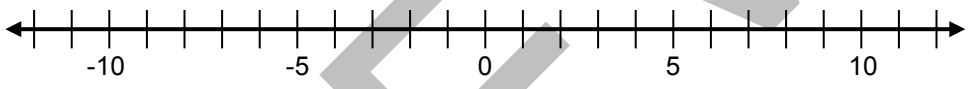
GETTING STARTED

Fill in the table with appropriate words.

The opposite of …	is …
1. up	
2. front	
3. happy	
4. big	
5. negative	



Use the two number lines on this page as needed for problems 6-9. Write more numbers on tick marks as desired.



6. Circle the greater number for each pair below.

-5 or -10 40 or -50 11 or -1

7. Circle the lesser number for each pair below.

-10 or -20 35 or -45 -12 or 7

8. Circle the number for each pair below that is farther from zero on a number line.

-5 or -10 -10 or 20 40 or -50

9. Which number is exactly the same distance from 0 as 5 on a number line?

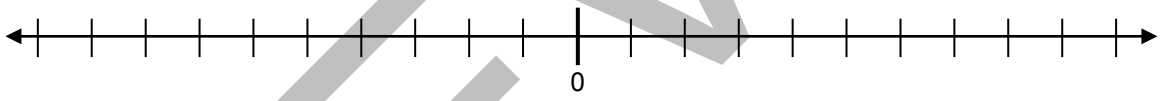
OPPOSITES

Write a number to represent each situation. Then represent the opposite of the given situation using words and the opposite of the number. Be ready to explain your answers.

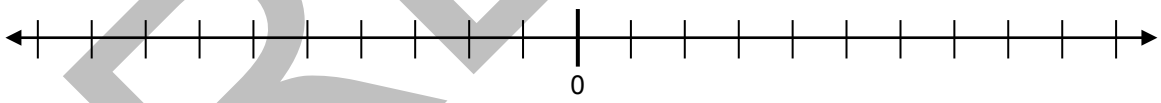
Situation		Opposite of the Situation	
Words	**Number**	**Words**	**Number**
1. Fall 12 feet	-12	Rise 12 feet	
2. Find $5			
3. Gain 4 yards (in football)			
4. Owe $30			
5. Deposit $75			

For problems 6 and 7, draw arrows to illustrate each situation on the number lines below.

6. From 0, a football player gains 10 yards and then loses 10 yards.



7. From 0, you take 8 steps backward and then 8 steps forward.



For problems 8 and 9, describe the end result of each situation in words.

8. A bird falls 20 feet and then rises 20 feet.

9. You find $40 and then lose $40.

ABSOLUTE VALUE

Your teacher will discuss the definition and notation for absolute value of a number. You will find the definitions and some examples in section 1.5. Record its meaning and examples in My Word Bank.

Fact: Distance and absolute value are always greater than or equal to zero.

1. Label the vertical number line to the right to show locations from 100 meters below sea level (-100 m) to 100 meters above sea level (100 m). Then graph and label the following points.

   a. Point *P*:
   A pigeon at 10 m above sea level

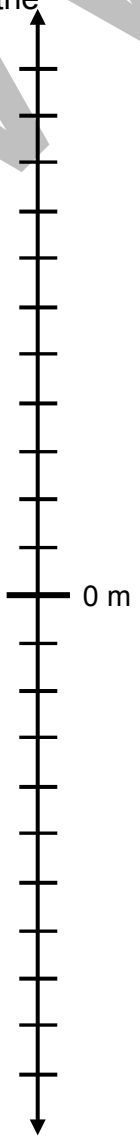
   b. Point *D*:
   A dolphin at 20 m below sea level

   c. Point *W*:
   A whale at 60 m below sea level

   d. Point *C*:
   A crow at 55 m above sea level

   e. Point *S*:
   A swimmer at sea level

   f. Point *G*:
   A gull at 20 m above sea level



Complete the table.

	What	Location relative to sea level	Distance from zero (sea level)	Absolute value equation for the distance from sea level
2.	pigeon	10 m	10 m	$\lvert 10 \rvert$ = _____
3.	dolphin		20 m	$\lvert -20 \rvert$ = _____
4.		-60 m		
5.			55 m	
6.		20 m		
7.	swimmer			$\lvert 0 \rvert$ = _____

8. On the number line, find the crow and the whale.
   a. Which one is at a higher elevation relative to sea level?
   b. Which one is farther from 0 on the number line?
   c. Write >, <, or = in the blank to make the statement true. $\lvert 55 \rvert$ _____ $\lvert -60 \rvert$

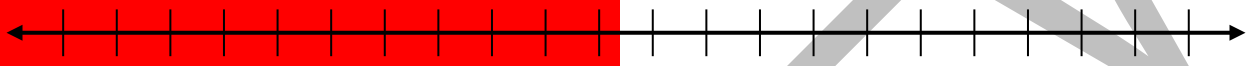
9. On the number line, find the dolphin and the gull.
   a. Which one is at a higher elevation relative to sea level?
   b. Which one is farther from 0 on the number line?
   c. Write >, <, or = in the blank to make the statement true. $\lvert 20 \rvert$ _____ $\lvert -20 \rvert$

PRACTICE 2

Simplify the absolute value expressions.

1. $\lvert 12 \rvert$	2. $\lvert 0 \rvert$	3. $\lvert 19 - 6 \rvert$
4. $\lvert -4 \rvert$	5. $-\lvert -4 \rvert$	6. $-\lvert 16 \rvert$

7. On the number line below, graph each of these numbers and their opposites: 5, -3, 9, -10, 0



8. On a vertical number line, how do you get from a positive number to its opposite?

9. On a horizontal number line, how do you get from a negative number to its opposite?

Simplify each expression. Then write the opposite of the simplified form.

Example: $10 - 4 = 6$ opposite: -6	10. $-(11 + 1)$ opposite:	11. $\lvert 5 - 5 \rvert$ opposite:
12. $19 - 7$ opposite:	13. $6 - 4$ opposite:	14. $-\lvert 6 - 4 \rvert$ opposite:

Write >, <, or = in the blanks to make each statement true.

15. $\lvert -8 \rvert$ _____ 8	16. $\lvert -8 \rvert$ _____ -8	17. $-\lvert -8 \rvert$ _____ -8

18. Magdalena thinks that the opposite of a number and the absolute value of a number are the same thing. Is Magdalena correct? Use examples or counterexamples to support your answer.

GRAPHING IN THE COORDINATE PLANE

We will graph ordered pairs of integers in the coordinate plane in one quadrant and in four quadrants. We will solve graphing challenges and scale graphs appropriately.

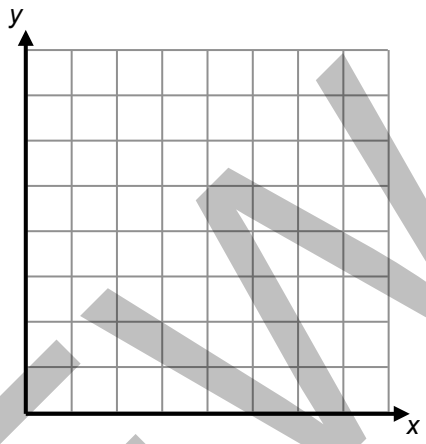
GETTING STARTED

Follow your teacher's directions to complete this page about finding dots.

1.
2.
3.
4.

GRAPHING REVIEW

Each small square on the grid represents 1 square unit.



1. Graph the ordered pairs below and label them with the given capital letters.

   A (0, 0) *B* (4, 4) *C* (1, 5) *D* (5, 1)

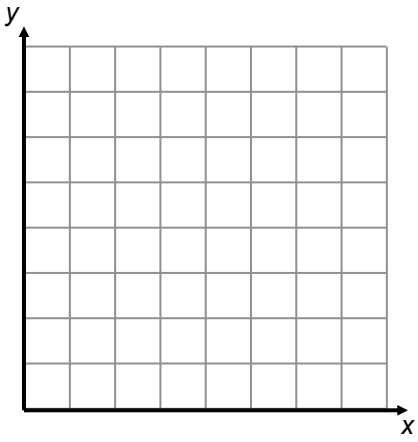
   E (3, 0) *F* (0, 3) *G* (8, 6) *H* (6, 8)

2. How can you remember that we count on the horizontal axis (*x*-axis) first and the vertical axis (*y*-axis) second when graphing ordered pairs?

Use the word list below to fill in the blanks. Some words are used more than once. Definitions can be found in section 1.5. Use the coordinate plane below for reference or notes.

coordinate plane	horizontal	ordered pairs	origin	vertical

3. A _____ _____ is a plane with a horizontal axis and a vertical axis meeting at the point (0, 0), called the _____.



4. The _____ axis is frequently referred to as the *x*-axis.

5. The _____ axis is frequently referred to as the *y*-axis.

6. Points in the coordinate plane are named by pairs of numbers, called _____ _____. They are written in the form (*x*, *y*).

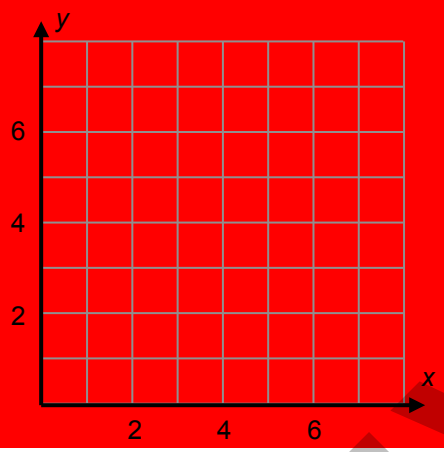
7. From the origin to the point located at (3, 5), move 3 units in the _____ direction and 5 units in the _____ direction.

GRAPHING CHALLENGE 1

Follow your teacher's directions to complete this page.

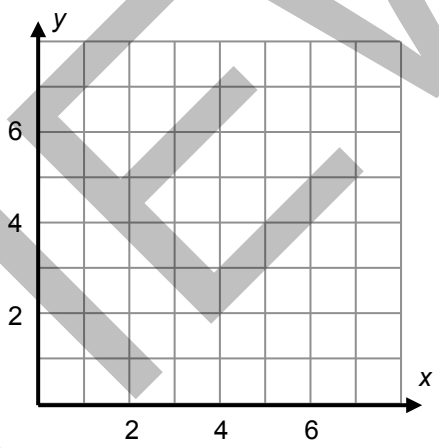
1. Briefly summarize the rules.
   -
   -
   -

2.



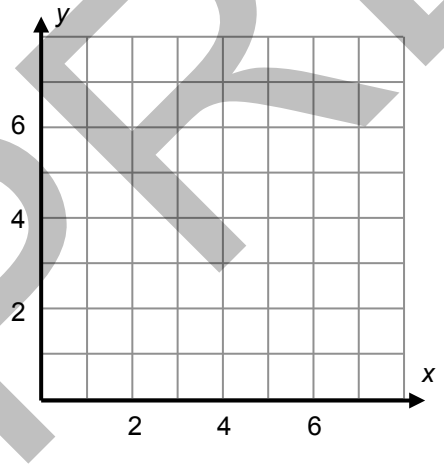
Ordered pairs:

3.



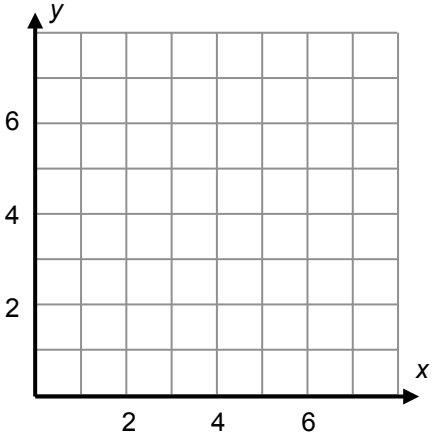
Ordered pairs:

4.



Ordered pairs:

5.



Ordered pairs:

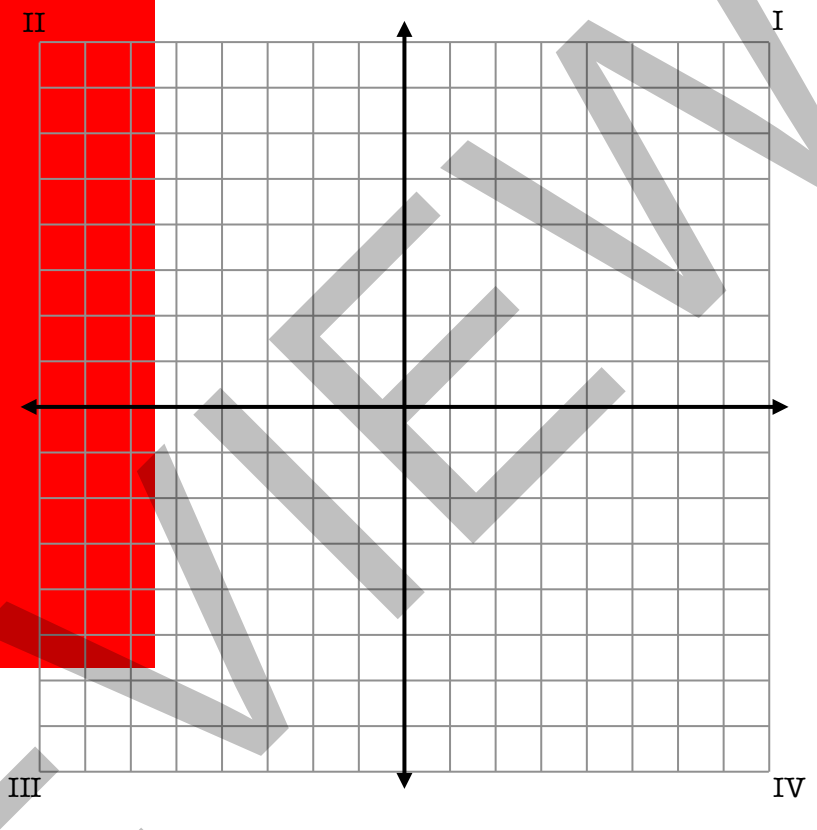
GRAPHING IN FOUR QUADRANTS

Your teacher will discuss the coordinate plane with you, including the *x*-axis, the *y*-axis, the origin, and the four quadrants. Record in My Word Bank as needed.

1. Label the *x*-axis and the *y*-axis.

2. Locate the origin at the point (0, 0) and label it *O*.

3. Graph the ordered pairs below and label them with the given capital letters.



A (3, 3) *B* (-3, -3)

C (1, 6) *D* (-1, -6)

E (6, 1) *F* (6, -1)

G (4, 0) *H* (-4, 0)

I (0, 4) *J* (0, -4)

K (7, 8) *L* (-7, 8)

M (8, 7) *N* (8, -7)

4. In the table below, name the location of each ordered pair by the quadrant it is in or the axis it is on.

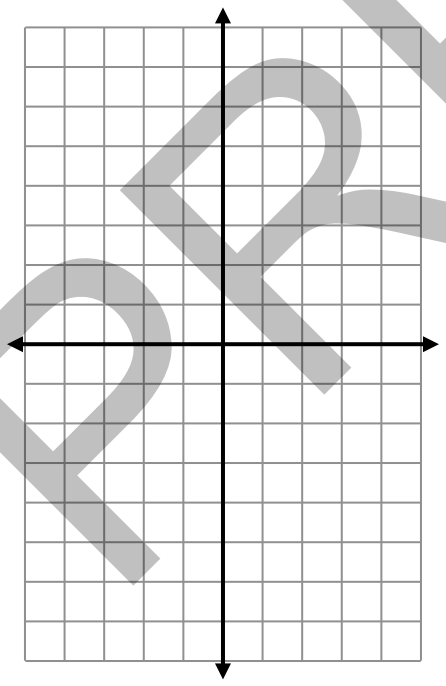
Point	Location	Point	Location
A		*H*	
B		*I*	
C		*J*	
D		*K*	
E		*L*	
F		*M*	
G		*N*	

PRACTICE 3

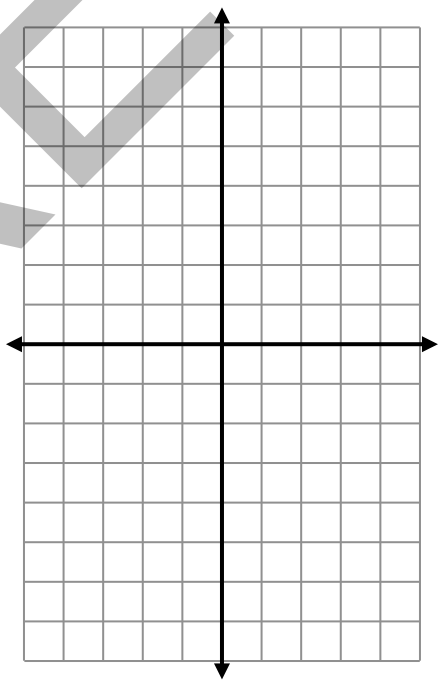
For this graphing challenge, list all ordered pairs (integer coordinates only) that fit on the grid and whose coordinates satisfy the conditions. Graph all the points on the grids below. Each square on the grid is one square unit.

Conditions on (*x*, *y*)	**List of ordered pairs (integers coordinates only)**	**Explain why this ordered pair should not appear on your list.**
1. $x \neq 0$ $y < -7$		(1, -7)
2. *x* is even *y* is the opposite of 5		(12, -5)
3. the absolute value of $x = 2$ $y < -5$		(-2, -4)

1.



2.



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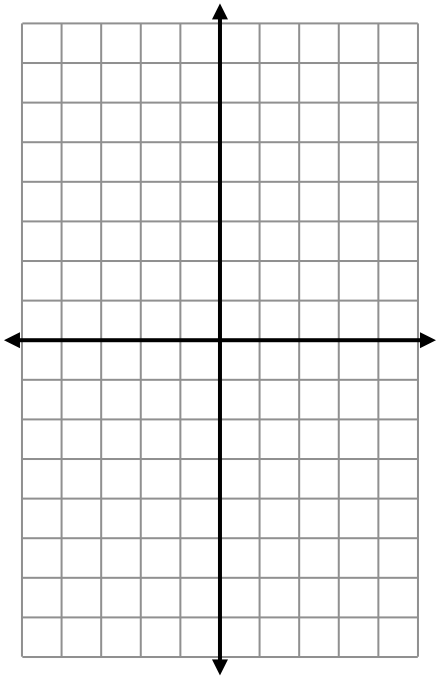
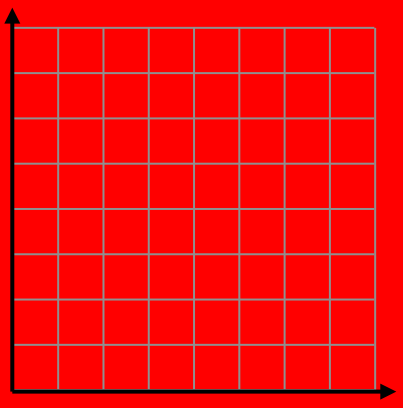


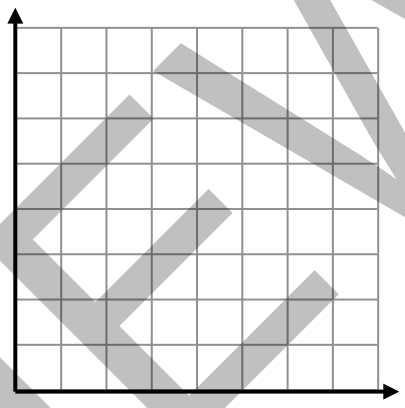
SCALING GRAPHS

For problems 1-3, label and scale the axes appropriately, then graph the given ordered pairs. ALL of these points must be graphed.

1. *A* (6, 8) B (10, 14) *C* (2, 16)
   D (0, 4) *E* (4, 12) *F* (1, 11)



2. *G* (0, 10) *H* (10, 30) *I* (22, 60)
   J (80, 40) *K* (25, 25) *L* (55, 0)



3.

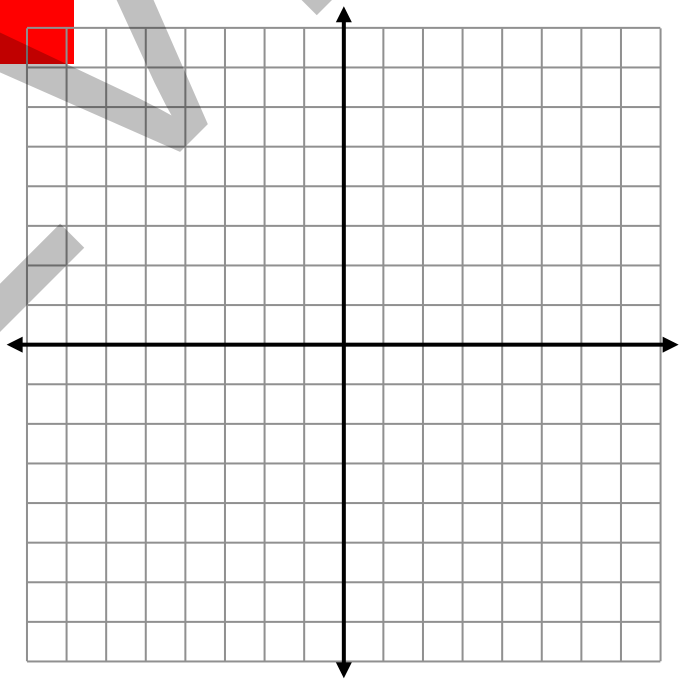
M (4, -4) *N* (0, 16)

P (20, 32) *Q* (-20, 0)

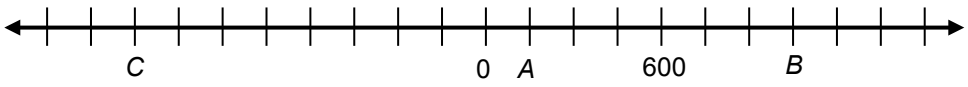
R (0, -20) *S* (-12, -16)

T (28, -4) *U* (-24, -4)

V (2, -2) *W* (-10, 16)

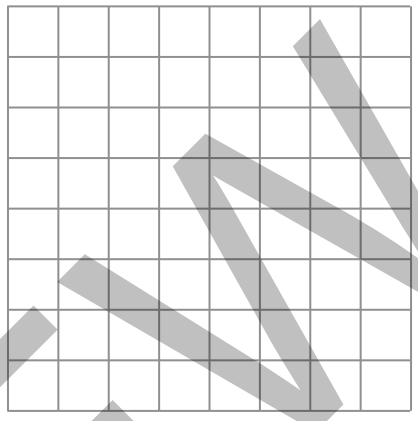


4. Find the values for *A*, *B*, and *C* on the number line below. All tick marks are equally spaced.



PRACTICE 4

Do the following for the 1st quadrant grid to the right.

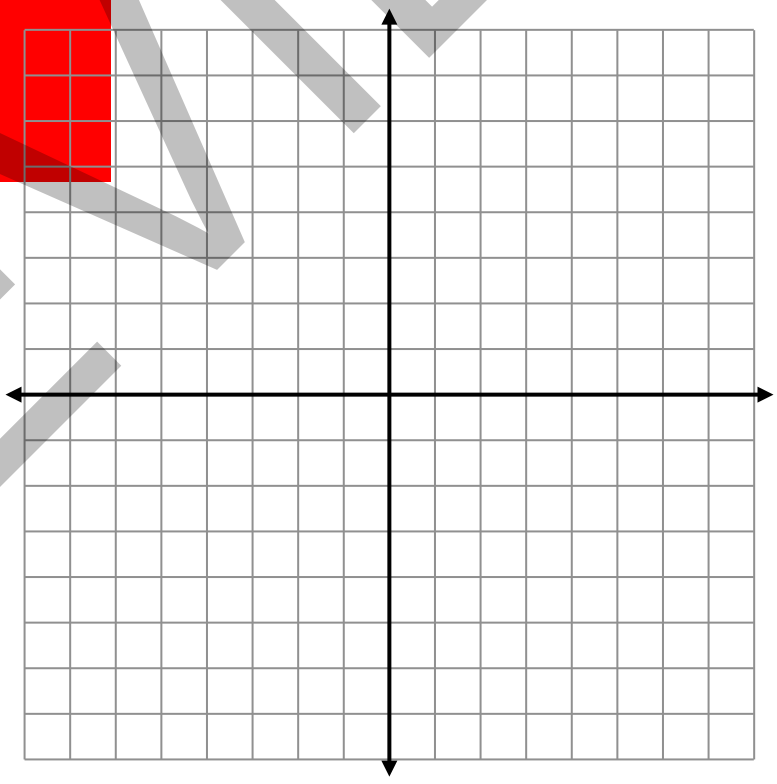


1. Label the *x*-axis and the *y*-axis.
2. Scale the axes appropriately.
3. Graph and label the ordered pairs below.

   A (0, 0) *B* (2, 10) *C* (10, 2) *D* (0, 8)

   E (8, 0) *F* (6, 16) *G* (3, 2) *H* (7, 5)

Do the following for the 4-quadrant grid to the right.



4. Label the *x*-axis and the *y*-axis.
5. Scale the axes appropriately.
6. Label the four quadrants with Roman numerals.
7. Graph and label the ordered pairs below.

   A (0, 12) *B* (12, 0)

   C (-2, 10) *D* (-2, -10)

   E (6, 16) *F* (-6, -16)

   G (4, 9) *H* (9, 4)

   J (1, -7) *K* (-1, -7)

REVIEW

ORDER IT!

You will need:

- 2 or more players
- Integer Cards

The object of this game is to get five numbers in a row, in order, from least value to greatest value. Once a card is placed on the table face up, it may not be moved to another location. However, a new card may be placed on top of it.

- Shuffle all the cards and place the cards face down in a pile.
- To begin, put 5 cards face-up, in the order they are drawn, from left to right.
- The first player draws a card from the pile and places it **on top of** one of the existing face-up cards. If all of the cards are now in order from least to greatest, then the player wins. If not, then play passes to the next player.
- The next player draws a card from the pile and places it **on top of** one of the existing face-up cards. If all the cards are now in order from least to greatest, then the player wins. If not, then play continues until eventually one player wins by getting all five cards in order from least to greatest.

In order to win, the player must convince his or her opponent with a reasonable argument that the cards are in order.

1. Play two rounds of Order It! Record the final ordered card sequences here.

_____ _____ _____ _____ _____

_____ _____ _____ _____ _____

2. Choose one of the sequences above and explain how you know that the numbers are in order.

BATTLING SHIPS

The Setup:

Each player uses two coordinate grids. Label all axes from -5 to 5. One grid should be labeled “Self” and the other “Opponent.” (One game setup is provided below.)

Each player then decides where to place three rectangular ships: a **B**attleship (5 units x 1 unit), a **C**ruiser (3 units x 1 unit), and a **D**estroyer (2 units x 1 unit) so that edges and corners are on the grid lines. All ships must be placed in straight lines either horizontally or vertically. Two ships may be adjacent to each other, but they cannot overlap. Label the ships B, C, and D.

The Game:

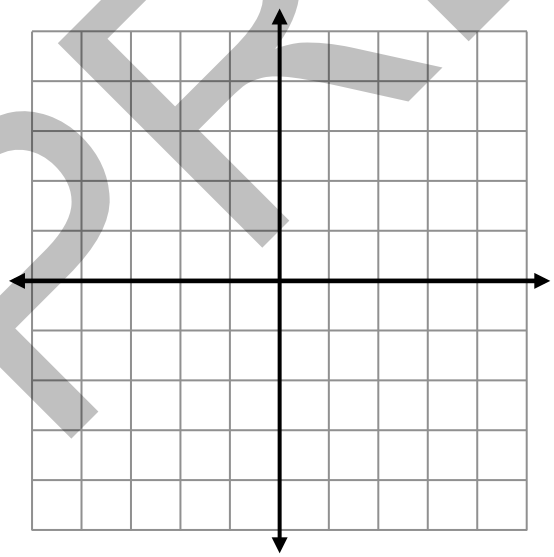
Players take turns calling out one ordered pair of integers at a time. If a player calls an ordered pair where an edge or corner of a ship is located, the opponent says "hit" and the player gets another turn. If no ship is located at the ordered pair, the opponent says "miss," and players change roles.

Players should take care to record their hits and misses on their "Opponent" grid so that they do not call an ordered pair more than once. Players should also mark the "Self" grid with shots taken by their opponent.

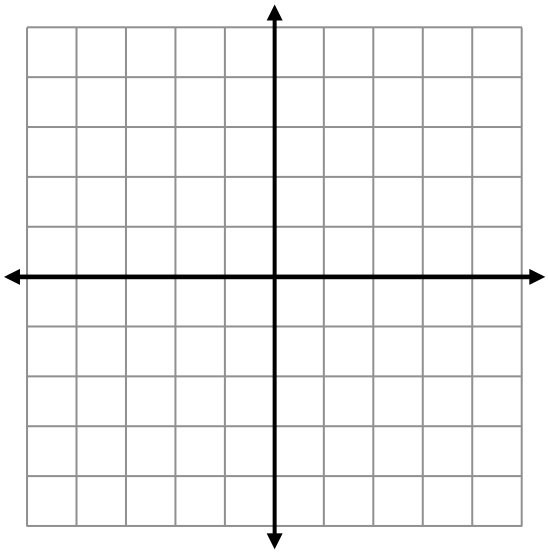
A ship is sunk when all of its coordinates have been hit. When this happens, the player whose ship was sunk says, "You sank my (B, C, or D) ship."

You win by either sinking all of your opponent’s ships, or by scoring the most hits before time is called. Make sure to exchange grids afterwards to check that both players marked coordinates correctly.

Self



Opponent



TRUE-FALSE-EXPLAIN

Your teacher will give pairs or small groups of students either one or two sets of cards.

Set 1

1. Sort these cards into a "true" group and a "false" group. Put cards you are unsure about into a third group for now.
2. The true cards are: _____
3. The false cards are: _____
4. For now, I am unsure about these cards: _____
5. Discuss cards you are unsure about before going on. Then choose one card from Set 1 that is false and explain how you know. Use words and examples as needed.

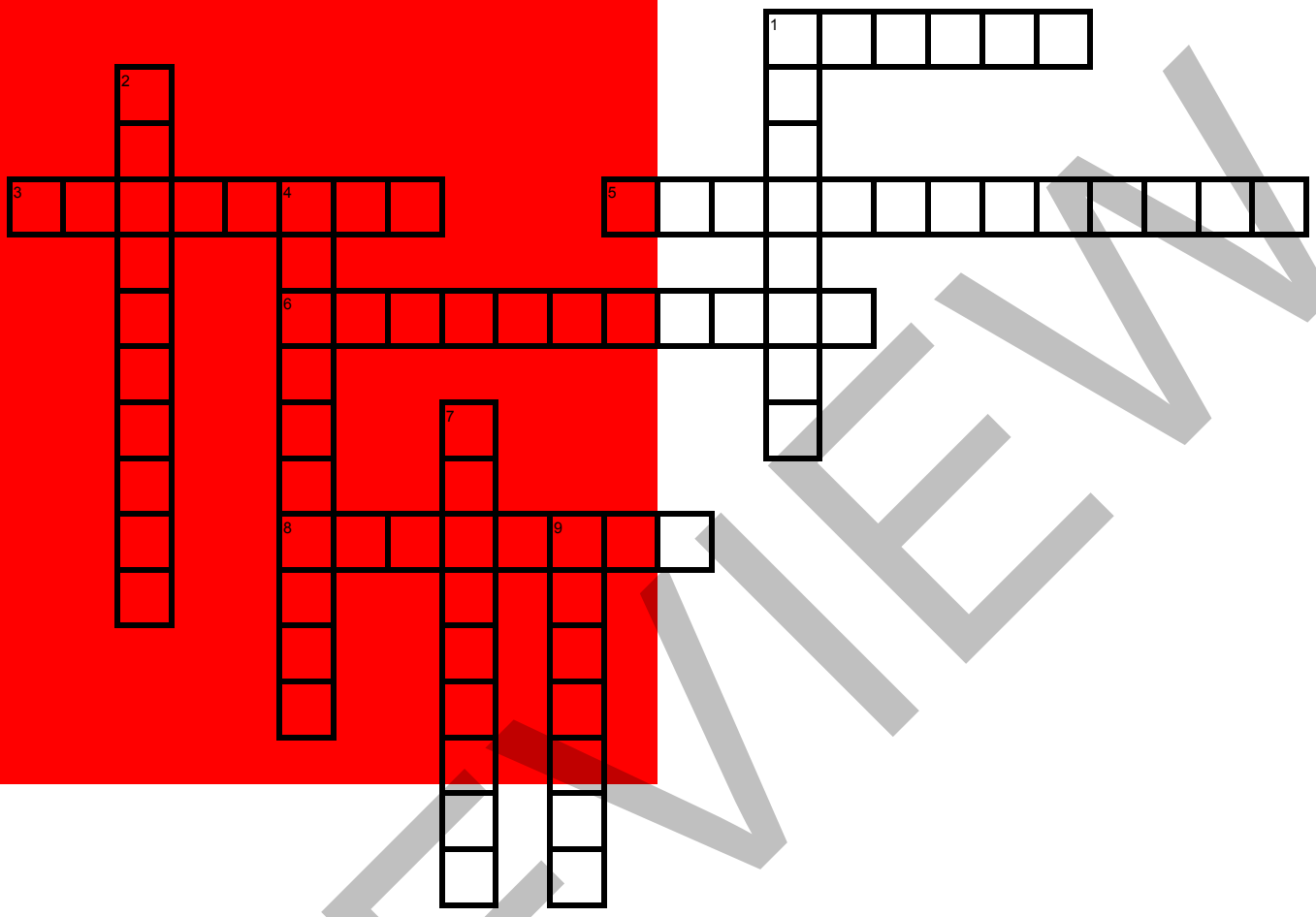
6. The letters for the false cards form a word. The word is _____.

Set 2

7. Sort these cards into a "true" group and a "false" group. Put cards you are unsure about into a third group for now.
8. The true cards are: _____
9. The false cards are: _____
10. For now I am unsure about these cards: _____
11. Discuss cards you are unsure about before going on. Then choose one card from Set 2 that is false and explain how you know. Use words and examples as needed.

12. The letters for the false cards form a word. The word is _____.

VOCABULARY REVIEW



Across

1 The point at (0, 0) is called the _____.

3 The direction of the *y*-axis.

5 The _____ _____ of a number is never negative (2 words).

6 (4, 6) is an example of a(n) _____ _____ (2 words).

8 The opposite of a positive number is a _____ number.

Down

1 4 and -4 are the _____ of one another.

2 The direction of the *x*-axis.

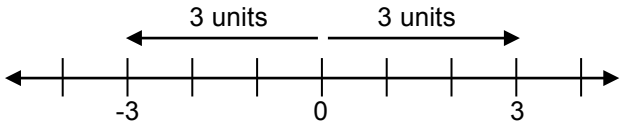
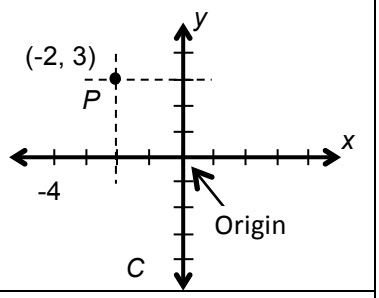
4 The *x*-axis and *y*-axis intersect to form the _____ plane.

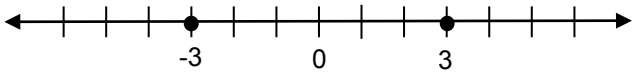
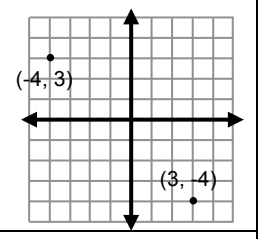
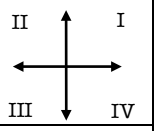
7 The four regions of a coordinate plane are called _____.

9 A whole number or its opposite, like 4, -7, or 0.

➢ **Something to think about.** Explain what is strange about the answers to 2 down and 3 across. Hint: it has something to do with the meaning of the words.

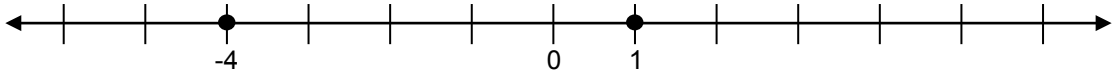
DEFINITIONS, EXPLANATIONS, AND EXAMPLES

Word or Phrase	Definition
absolute value	The absolute value $\lvert x \rvert$ of a number x is the distance from x to 0 on the number line. $\lvert 3 \rvert = 3$ and $\lvert -3 \rvert = 3$, because both 3 and -3 are 3 units from 0 on the number line. 
coordinate plane	A coordinate plane is a plane with two perpendicular number lines (coordinate axes) meeting at a point (the origin). Each point P of the coordinate plane corresponds to an ordered pair (a, b) of numbers, called the coordinates of P. The point P may be denoted $P(a, b)$. The coordinate axes are often referred to as the x-axis and the y-axis respectively. The origin has coordinates (0, 0). The x-coordinate of P is -2, and the y-coordinate of P is 3. Points on the x-axis have 0 as y-coordinates, and points on the y-axis have 0 as x-coordinates. 
even number	A number is even if it is divisible by 2. The even integers are 0, 2, 4, 6… and -2, -4, -6 … . The even whole numbers are 0, 2, 4, 6, … .
horizontal	Horizontal refers to being in the same direction as the horizon. The horizontal direction is perpendicular to the force of gravity. On a sheet of lined paper, typically horizontal is the direction that runs left to right.
inequality	An inequality is a mathematical statement that asserts the relative size or order of two objects. $5 > 3$ is an inequality (5 is greater than 3).
integers	The integers are the whole numbers and their opposites. They are the numbers 0, 1, 2, 3, … and -1, -2, -3, … .
negative number	A negative number is a number that is less than zero, written $a < 0$. The negative numbers are the numbers to the left of 0 on a horizontal number line, or below zero on a vertical number line. The numbers -2, -4.76, and $-\frac{1}{4}$ are negative. The numbers 2 and 5.3 are not negative. They are positive. The number 0 is neither negative nor positive.

Word or Phrase	Definition
odd number	A number is odd if it is *not* divisible by 2. The odd integers are 1, 3, 5,… and -1, -3, -5, … .
opposite of a number	The opposite of a number *n*, written -*n*, is its additive inverse. Algebraically, the sum of a number and its opposite is zero. Geometrically, the opposite of a number is the number on the other side of zero at the same distance from zero.  The opposite of 3 is -3, because 3 + (-3) = -3 + 3 = 0. The opposite of -3 is -(-3) = 3. Thus, the opposite of a number does not have to be negative.
ordered pair	An ordered pair of numbers is a pair of numbers with a specified order. Ordered pairs are denoted (*a*, *b*), (*x*, *y*), etc. Ordered pairs of numbers are used to represent points in a coordinate plane. The ordered pair (-4, 3) represents the point with *x*-coordinate -4 and *y*-coordinate 3. This is different from the ordered pair (3, -4). 
origin	The origin of a coordinate plane is the point (0, 0) where the vertical and horizontal coordinate axes intersect. See coordinate plane.
plane	A plane is a flat two-dimensional surface without holes that extends to infinity in all directions.
positive number	A positive number is a number that is greater than zero, written $a > 0$. The positive numbers are the numbers to the right of 0 on a number line, or above zero on a vertical number line. The numbers 3, 2.6, and $\frac{3}{7}$ are positive. The numbers -3, -2.6, $-\frac{3}{7}$, and 0 are NOT positive.
quadrants	The coordinate axes of a coordinate plane separate the plane into four regions, called quadrants. The quadrants are labeled I – IV starting from the upper right region and going counterclockwise. 
vertical	Vertical refers to being in the same direction as the force of gravity. The vertical direction is perpendicular to the horizontal direction. On a sheet of lined paper, typically the vertical direction runs up and down. 
whole numbers	The whole numbers are the natural numbers together with 0. They are 0, 1, 2, 3, … .
x-axis	See coordinate plane.
x-coordinate	See coordinate plane.
y-axis	See coordinate plane.
y-coordinate	See coordinate plane.

Integers on the Number Line

Integers (whole numbers and their opposites) may be represented on a horizontal or vertical number line.



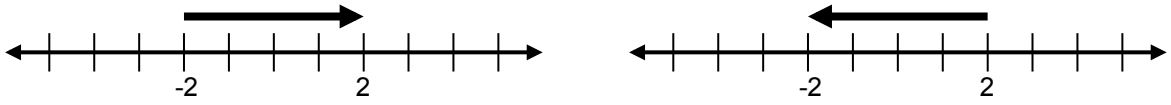
On the number line above, points are graphed at -4 and 0.

A Vector Model (An Arrow Model)

Numbers can be represented by arrows on a number line. Arrows represent distance (or length) and direction. On a number line, the sign of a number is represented by its direction. The absolute value of a number is represented by the length of the arrow from head to tail.

The first arrow represents 4. It starts at -2 and ends at 2. Its length is 4.

The second arrow represents -4. It starts at 2 and ends at -2. Its length is 4.



Two Uses of the Minus Sign

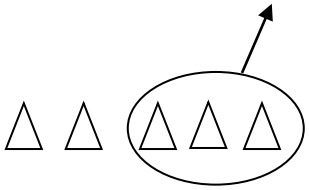
Here are two ways to interpret the minus sign, along with some examples.

When the minus sign is between two expressions, it means "subtract the second expression from the first."

Example: 5 – 3

The phrase "5 minus 3" can be read:

- 5 take away 3
- The difference between 5 and 3
- Subtract 3 from 5



In front of a number, a minus sign can mean "negative" or "opposite."

-3 is 3 units less than zero on the number line.

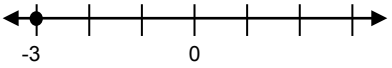
-3 is also the opposite of 3.

"Minus" can be thought of as a reflection or mirror image. In this case, we are reflecting the number line through zero.

Example: -3

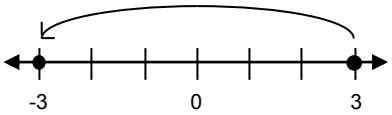
The phrase "minus 3" can be read:

- Negative 3



Pictorially, this is a location on the number line that is 3 units left of zero.

- Opposite of 3



This is the value you get by first locating 3 on the number line, and then locating that same distance on the opposite side of zero. Geometrically, minus can be thought of as a reflection or mirror image. In this case, the reflection of 3 through zero is -3.

Distance and Absolute Value

The absolute value of a number is its distance from zero on the number line.

A distance 25 units in the positive direction from zero is written $|+25| = 25$.

A distance 25 units in the negative direction from zero is written $|-25| = 25$.

The absolute value of a positive number is equal to the number itself. The absolute value of a negative number is the opposite of the number. The absolute value of zero is simply zero.

Distance is always greater than or equal to zero.

Elevation relative to sea level is measured vertically from sea level. Sea level is typically represented as elevation = 0. Therefore, elevation may be positive, negative, or zero.

The vertical number line below represents some people and animals at elevations from 25 meters below sea level (-25 m) to 25 meters above sea level (+25 m).

What	Elevation	Distance from zero (sea level)	Absolute value equation for Distance from sea level
crow	+25 m	25 m	$\|25\| = 25$
gull	+15 m	15 m	$\|15\| = 15$
swimmer	0 m	0 m	$\|0\| = 0$
dolphin	-25 m	25 m	$\|-25\| = 25$

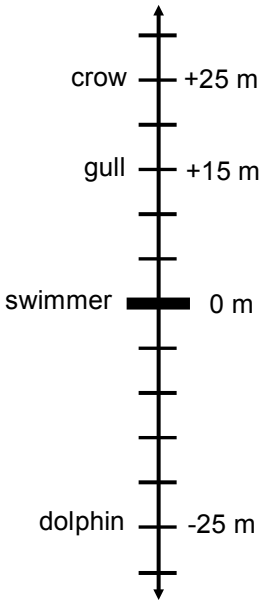
Here are some true statements about elevation:

- The gull is at a higher elevation than the dolphin: $15 > -25$
- The swimmer is at a lower elevation than the crow: $0 < 25$

Here are some true statements about absolute value:

- The dolphin and the crow are the same distance from 0: $|-25| = |25|$
- The dolphin and the crow are both 25 meters from sea level: $|-25| = |25|$

The dolphin is farther from sea level than the gull: $|-25| > |15|$



The Coordinate Plane

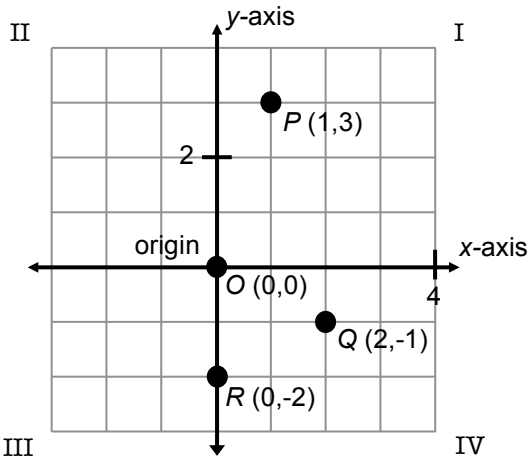
A coordinate plane is determined by a horizontal number line (the *x*-axis) and a vertical number line (the *y*-axis) intersecting at the zero on each line. The point of intersection (0, 0) of the two lines is called the origin.

Points are located using ordered pairs (*x*, *y*).

- The first number (*x*-coordinate) indicates how far the point is to the right or left of the *y*-axis.
- The second number (*y*-coordinate) indicates how far the point is above or below the *x*-axis.

The axes (plural of axis) divide the plane into four regions, called quadrants. By convention, we number the quadrants using Roman numerals I-IV, starting with the upper right quadrant (first quadrant) and moving counterclockwise to the lower right quadrant (fourth quadrant). The axes may be considered as boundary lines and are not part of any quadrant.

Point and Coordinates	Interpretation	Location
O (0, 0)	At the intersection of the axes.	origin
P (1, 3)	Start at the origin, move 1 unit right, then 3 units up.	Quadrant I
Q (2, -1)	Start at the origin, move 2 units right, then 1 unit down.	Quadrant IV
R (0, -2)	Start at the origin, move 0 units right or left, then 2 units down.	*y*-axis



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