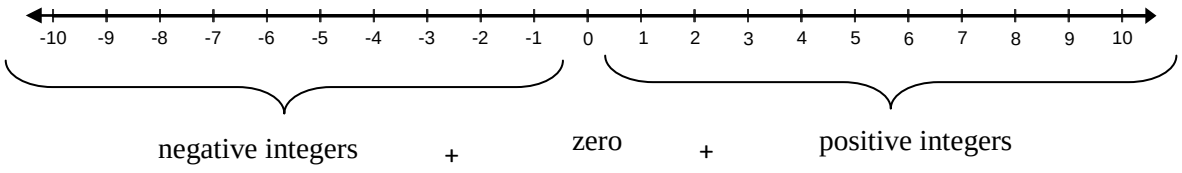
Math 6 Notes – Integers

We use positive and negative numbers daily in real life. *Positive numbers* are those numbers greater than zero. They can be written with a positive (+) sign in front of them, but we usually write a positive number without the sign. *Negative numbers* are those numbers less than zero. They must be written with the sign –. Common situations that use positive/negative numbers are those involving temperature (above/below zero), business (profit, loss), bank accounts (deposits/withdrawals), sea level (above/below), and football (gain/loss of yardage). We refer to this set of numbers as the integers.

Integers are defined as the set of all whole numbers {0, 1, 2, …} and their opposites. One way to show this is listing its members like this {... , –3, –2, –1, 0, 1, 2, 3, …} or more simply {…, -1, 0 +1, …}, or describing the members in words like this {whole numbers and their opposites}.

INTEGERS



Be sure to clarify with students:

- *The number 0 is neither positive or negative.*
- *As you look/travel to the right on the number line, the values are increasing (getting larger).*
- *As you look/travel to the left on the number line, the values are decreasing (getting smaller).*

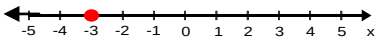
***NVACS 6.NS.C.6c – Find and position integers** and other rational numbers **on a horizontal or vertical number line diagram;** find and position pairs of integers and other rational numbers on a coordinate plane.*

NVACS 6.NS.C.6 – Understand a rational number as a point on the number line. Extend number line diagrams** and coordinate axes **familiar from previous grades to represent points on the line** and in the plane with negative number coordinates**.

Students need to be able to create number lines that include the negative numbers. As they begin to create this extended number line, we can begin to find and position integers. Graphing integer points on a number line diagram (both horizontal and vertical orientation) should be relatively simple. When asked to graph a number or "position" a number, we find the location of the value and shade a small circle or point at that location.

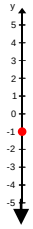
Math 6 Notes – Integers

Example: *Graph -3 on the number line to the right.*

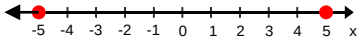


Example: *The temperature in Streeter, ND is 1 degree below zero. Graph -1 on the number line to the right*

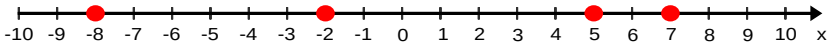
.



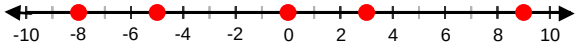
Example: *Graph 5 and its opposite on the number line.*



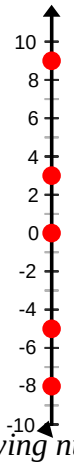
Example: *Graph the given set on the number line below.* { –2, 7, –8, 5}



Example: *Graph the following points:* ***3, –5, 0, 9, –8***

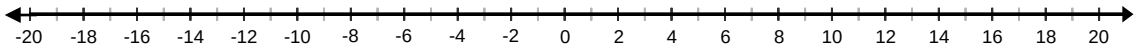


or



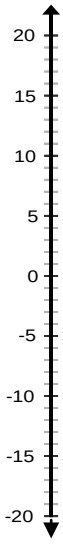
Example: *On the horizontal number line below, graph (position) the following numbers.*

3, –6, 1, –14 , 0, 15, –1, 7, –11



Math 6 Notes – Integers

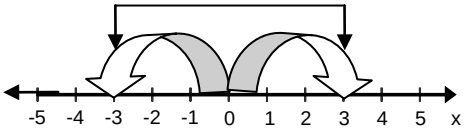
Example: ***Locate the following numbers on a vertical number line.*** **–5, 18, –14 , 0, 3, –1, 4,**



NVACS 6.NS.C.5 – Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

Opposites are numbers that are the same distance from 0 on a number line but on the other side of 0.

– 3 and 3 are opposites



Examples: Name the opposite of each number:

–43
positive eleven
9
zero
negative 14
+98

Math 6 Notes – Integers

Examples: For each given real-world context below, identify the event that represents its opposite (makes the meaning of 0 in the situation):

Spending $4
Losing 8 pounds
Riding the elevator up 2 floors
A store credit of $10
A temperature of 7° below zero
4,000 miles above sea level
A penalty of 5 yards in football
A withdrawal of $100 from your savings account
300 years ago
2,000 miles south of the border
70 miles west of the Appalachian Mountains
Gaining 0 pounds last week
Losing 0 yards in soccer
Raising 0 dollars for charity
Saving $5
A zero charge

Examples: Using real-world contexts, identify opposite situations that represent 0.

Answers may vary*

The temperature rises 9 degrees and then falls 9 degrees.
You earn $5 and then you spend $5.
The train travelled 500 miles north, then returned 500 miles south.
A person loses ten pounds then gains ten pounds.
You enter an elevator on the ground floor and you go up 2 floors and then down 2 floors.
A football team gains 20 yards then loses 20 yards.
Traveling 10 miles west, then 10 miles east.
A hydrogen atom has 0 charge because its two constituents are oppositely charged. [(It has one proton (+1) and one electron (−1).]

*Other examples may include above and below sea level, credit and debits, deposits and withdrawals, etc.

Example: Harriet deposits $32 in the bank. Then she writes checks totaling $32. Does she have more or less in her account than at the beginning? How much more or less?

Example: Marsha hiked Angel Trails that runs 5 miles north. She then hikes back to where she started from. Which best describes the total change in miles for the entire hike?

A	**10**
B	**5**
C	**0**
D	**-5**

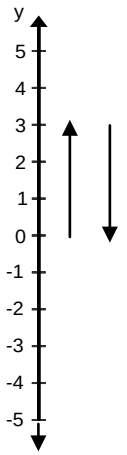
Math 6 Notes – Integers

Example: Show the meaning of 0 in each situation.

We know … if you only have \$3 and you spend \$3 that you are broke, you have zero dollars .

… that a gain of 3 yards and a loss of 3 yards is zero.

SHOW….We can show this on a number line …



Example: *A submarine dives 20 fathoms beneath the surface. This is shown as – 20. What number would show the submarine returning to the surface?*

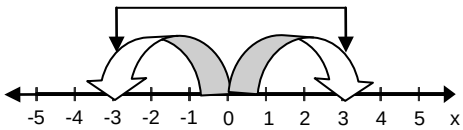
Example: *The submarine travels north 182 kilometers. This is shown by +182. What number would show the return trip?*

NVACS 6.NS.C.6a – Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., – (–3) = 3, and that 0 is its own opposite.

Visually, we can see opposites are the same distance from zero located on different sides of zero. When we write math symbols for the words "the opposite of" we can show it as "–" or "– ( )".

Looking for the opposite of 3, we see

3 and – 3 are opposites

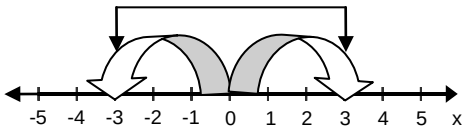


One way to describe this is the opposite of moving 3 steps to the right, is 3 steps to the left.
So, the opposite of 3, is –3. We can show this as – (+3) = –3 or – (3) = –3.

Math 6 Notes – Integers

Looking for the opposite of –3, we see

–3 and 3 are opposites

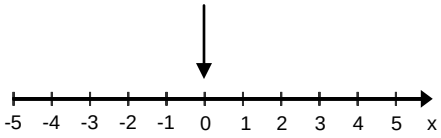


One way to describe this is the opposite of moving 3 steps to the left, is 3 steps to the right.
So, the opposite of –3, is +3. We can show this as – (–3) = 3.

Hopefully this makes sense, when you see – (–9) and read it as " the opposite of " negative nine the answer is nine. – (–9) = 9

Some students may need to 'walk a number line' that you create on the floor of your classroom to understand this concept. Be sure to use numerous examples for them to practice moving right and left, or using a vertical number line (temperatures) to move up and down.

Looking for the opposite of 0, we see no movement to the left or right of zero, so the opposite of 0.



One way to describe this is the opposite of moving 0 steps to the right, is moving 0 steps to the left.

So, the opposite of zero, is 0. We can show this as – (0) = 0.

NVACS 6.NS.C.7 – Understand ordering and absolute value of rational numbers.

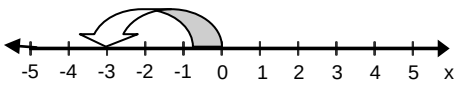
NVACS 6.NS.C.7c– Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

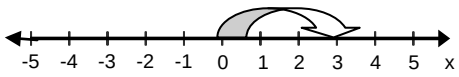
Absolute Value – is the distance from 0 on a number line.
We use the symbol $| \ |$ to represent absolute value.

For example, the absolute value of –3 can be written $|-3|$.

Examples: $|-3| = 3$ since –3 is 3 units from 0.

$|3| = 3$ since 3 is 3 units from 0.





So both $|-3|$ ***and*** $|3|$ equal 3 because the distance from zero is 3 units. It doesn't matter which direction. Absolute value represents a distance, that is why it is **always nonnegative**.

$|+5| = 5$ since 5 is 5 units from 0.

$|-19| = 19$ $\quad\quad$ $|0| = 0$

Students need to understand the if $|x| = 5$ then $x = 5$ and $x = -5$.
We can write that as $x = \pm 5$.

Example: *Find the absolute value of each of the following.*

$|9| =$ $\quad$ $|-4| =$ $\quad$ $|6| =$

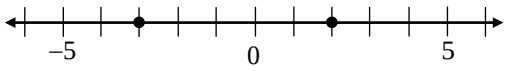
$|-7| =$ $\quad$ $|-11| =$ $\quad$ $|0| =$

NVACS 6.NS.C.7b – Write, interpret, and explain statements of order for rational numbers in real-world contexts.

The number line can also help us when we are asked to compare and order integers. Remind students that values on a number line increase as we move from left to right. Particularly troublesome for some students is the comparison of two negatives. (A "rule" that makes sense to students is that the larger negative number is always the one closest to zero.) values on a number line increase as we move from left to right. Values on a number line decrease as we move from right to left. (**L**eft means **L**ess)

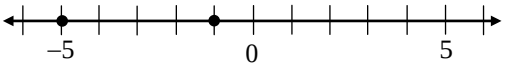
Example: Which is larger, -3 *or* 2 ?

Graphing on a number line, we can see that -3 *lies to the left of* 2, *so* -3 is less than 2



This $-3 < 2$ so 2 is greater than -3 *makes sense as a person standing at 2 miles above sea level is higher (greater) than a person standing at 3 miles below sea level.*

Example: Which is larger, -5 *or* -1 ?



Graphing on a number line, we can see that -5 *lies to the left of* -1, *so* -5 *is less than* -1, (this also means -1 is larger than -5)

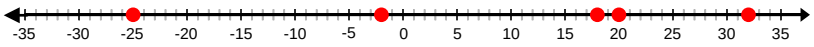
$-5 < -1$ *or* $-1 > -5$

This makes sense as 1 degree below zero (-1) *is larger (warmer) than 5 degrees below zero.*

Math 6 Notes – Integers

Some students understand comparing and ordering better using a vertical line diagram (as opposed to a horizontal line diagram), so be sure to use both!

Once a student can compare two integers, ordering is a simple task. They could also use a number line.



Example: Order the integers from least to greatest. $-2,\ 18,\ 20, -25,\ 32$

(To begin, some students may need to graph the values on a number line to determine the order.)

The number furthest to the left on the number line would be -25*, so it is the smallest number. When ordering, negatives are always smaller than positives, so* -2 *would be the next number. 18, 20 and 32 would follow.*

$-25, -2,\ 18,\ 20,\ 32$

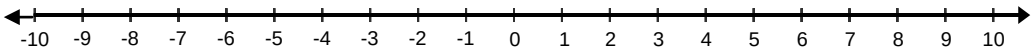
So we could say and write $-25 < -2 < 18 < 20 < 32$. Notice on the number line the least value is the farthest left and working my way to the right the number values are getting greater in value.

It is important for the students to understand that:

- As you move to the right on a number line the values get bigger.
- As you move to the left on a number line the values get smaller.

We can generalize this to say:

- Positives are greater in value than negatives.
- Positives are greater in value than zero.
- Negatives are less or smaller in value than positives.
- Negatives are less or smaller in value than zero.



Example: Compare . Write < or >. (If needed use the number line above.)

9 ___ *5* *4* ___ *7* *0* ___ *6* -2 ___ 3 5 ___ -1 -3 ___4

-1 ___ -2 -8 ___ -4 -6 ___ -1 -7 ___ 7 -6 ___ -4 -3 ___ 0

Example: Write **two** inequalities to compare the given values.

11 and 7 11 > 7 and 7 < 11 12 and –6 _____

0 and –4 _____ –7 and –3 _____

–1 and –8 _____ –9 and –2 _____

Math 6 Notes – Integers

Example: In Fargo, North Dakota the temperature was -20° below zero.
In Las Vegas, Nevada the temperature was 40° above zero.
Write an inequality that compares the temperature in these two cities.
_____

Example: ***What is the least nonnegative number?*** _____

What is the greatest negative integer? _____

What is the smallest negative integer? _____

What is the smallest positive integer? _____

What is the greatest positive integer? _____

NVACS 6.NS.C.7a – Interpret statements of inequality as statements about the relative position of two numbers on a number line.

When ordering, e.g., –25, 32, –2, students should be able to explain $-25 < -2$ which means –25 is smaller (less) than –2. Applying this situation to temperature, or sea level, students should be able to explain that –25 is the coldest (or lowest altitude), –2 is the next coldest (or next low altitude) and 32 is the warmest (or highest altitude).

Reflection

What can be said about a given list of numbers if the greatest number in the list is zero?

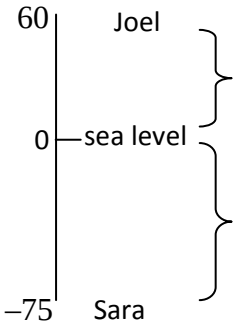
What can be said about a given list of numbers if the greatest number in the list is negative?

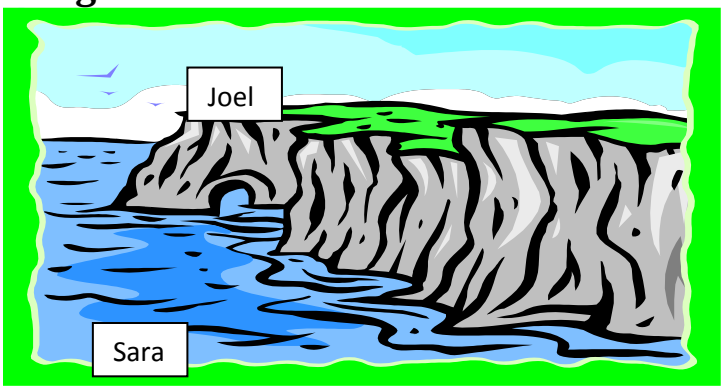
NVACS 6.NS.C.7d – Distinguish comparisons of absolute value from statements about order.

Example: While vacationing on a Caribbean island, Sally chose to scuba dive while Joel is cliff diving. If Sally is diving at 75 feet below sea level and Joel is on a cliff 60 feet above sea level, who is farther from sea level? Who has a higher altitude?

To answer **who is farther from sea level** we really are talking about absolute values. This is more understandable if we draw a picture.

Math 6 Notes – Integers





Joel is 60 feet from sea level but Sara is 75 feet from sea level. So, $|-75| > |60|$ or a distance of 75 feet is greater than a distance of 60 feet so Sara is farther from sea level.

When asked "**Who has a higher altitude**?" we see that Joel has a higher altitude, but know that because 60 > –75.

In real-world situations, absolute values are often used instead of negative numbers. For example, if John writes a check for $25, we write that as –$25, but we say that he **owes** $25. Remember when someone owes (a positive amount of) money, this means he has a negative balance.

Example: Doug borrows $3.00 for lunch money since he forgot his at home. How do we write that using math symbols? –$3 or –$3.00

Example: Maria's credit card balance is –$200. Does Maria owe $200 or have $200? Owes $200

Example: Sam spends $25. Represent this in math symbols. –$25 or –25

Example: Sam spends more than $25. Represent this in math symbols and explain it in words. Sam's debt could be –$26, –$27, –$28, etc. Sam owes more than $25

Comparisons

Example: Rebecca **earns** $500 **more** than Lee earns.
This means that Rebecca's income is greater or higher, or makes more money than Lee.

Example: Rebecca **earns** $500 **less** than Lee earns.
This means that Rebecca's income is less or makes less money than Lee.

Example: Rebecca **charges** $100 **more** than Lee.
This means that Rebecca's debt is greater than Lee's. She owes more than Lee.

Example: Rebecca **charges** $100 **less** than Lee.

This means that Rebecca's debt is less than Lee. She owes less than Lee.

Example: Salvadore owes the department store $15 more than Lee owes. This means that Salvadore's balance is less than Lee's balance.

Reflection

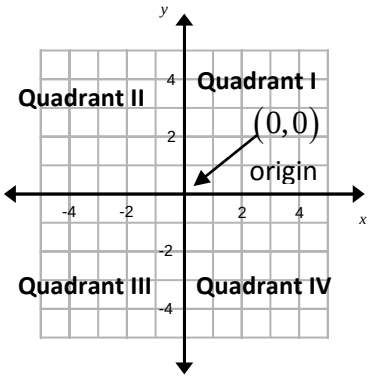
Example: Negative numbers are less than positive numbers. Does this mean that the absolute value of a negative number must be less than the absolute value of a positive number? Explain. No, for example $-8 < 3$ but $|-8| > |3|$ (because the distance from –8 to 0 is greater than the distance from 3 to 0.

NVACS 6.NS.C.6 – *Understand a rational number as a point on the number line.* ***Extend*** *number line diagrams and* ***coordinate axes familiar from previous grades to represent points*** *on the line and* ***in the plane with negative number coordinates.***

NVACS 6.NS.C.6c – *Find and position integers and other rational numbers on a horizontal or vertical number line diagram;* ***find and position pairs of integers*** *and other rational numbers* ***on a coordinate plane.***

The Coordinate Plane

The way to locate points in a plane is on a ***coordinate grid***, also known as the ***Cartesian Coordinate System*** or a ***Cartesian graph***. A coordinate plane is formed by intersecting two number lines at a right angle. The horizontal number line is referred to as the ***x-axis***, and the vertical line is the ***y-axis***. The point of intersection is at zero on both number lines, and it is called the ***origin***. The axes divide the coordinate plane into four quadrants. The point representing the origin is not "in" any quadrant. Any point on the *x*-axis or the *y*-axis would not be "in" a quadrant.



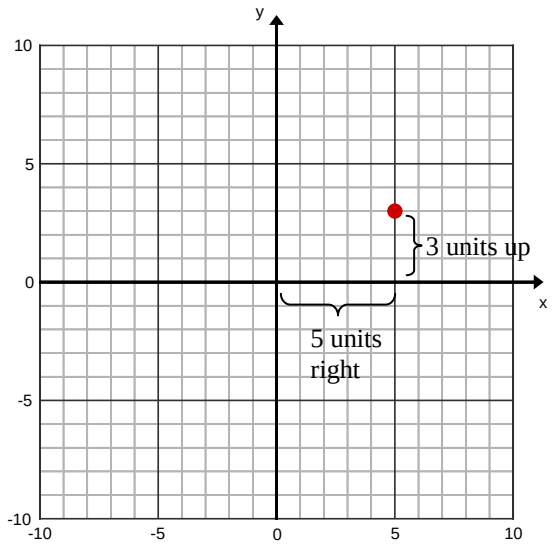
You can name any point on this plane with two numbers, called *coordinates*. The first number, the *x-coordinate*, is the distance from the origin along the *x*-axis. The second number, the *y-coordinate*, is the distance from the origin along the *y*-axis. The pair of numbers is always named in order, first *x*, then *y*; hence, they are called an ***ordered pair***, (x, y). One way to remember the order is that ordered pairs are listed in alphabetical order: (x, y), (**h**orizontal axis, **v**ertical axis). Another suggestion is to remind students they learned to crawl (*x*-axis) before they could jump (*y*-axis).

Math 6 Notes – Integers

Just like we agree in the USA to drive on the right side of the road, so mathematicians have agreed that the first value in an ordered pair tells you how many units to move right or left. The second value in an ordered pair tells you how many units to move up or down.

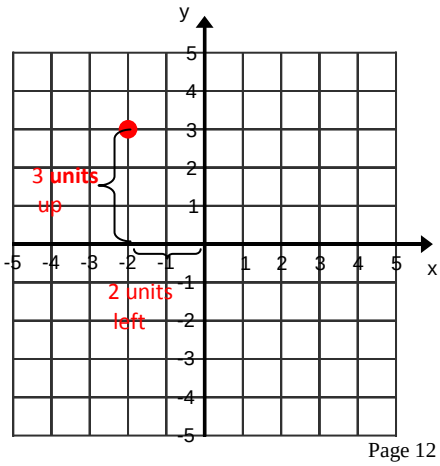
Many students can relate to map work they have done in previous grades. Many times to find a particular city on a map the location might have been called 'A, 3'. In the game B*attleship*, coordinates like these are used to identify a similar point on the game board while one attempts to blow up an opponent's ships. Similar to these experiences student need to begin working in all four quadrants of the coordinate plane.

Have students begin reviewing how to graph ordered pairs in quadrant I, e.g., (5, 3). Remind them to begin at the origin. The first coordinate, or ***x*-coordinate**, tells them to move 5 units to the **right** (because 5 is positive), then the second coordinate, or ***y*-coordinate**, tells them to move 3 units **up** (because 3 is positive). At this intersection of the horizontal and vertical lines of the graph, students plot a small circular dot we call a point. Be sure to demonstrate how to count 5 units right; some students count the original origin line as one and of course - this is incorrect.



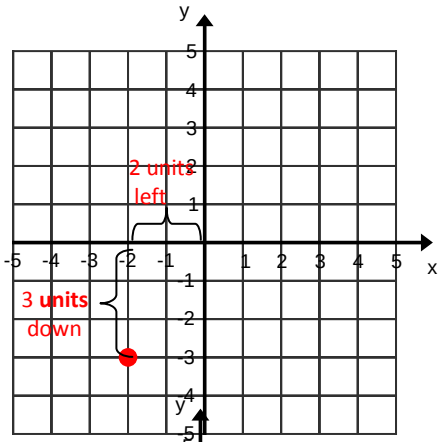
This point (5, 3) is in Quadrant I.

Given an ordered pair such as $(-2,3)$, the *x*-coordinate of –2 tells us to move 2 units to the **left** of the origin and the *y*-coordinate of 3 tells us to move 3 units **up**. So graphing $(-2,3)$ would look like the following:

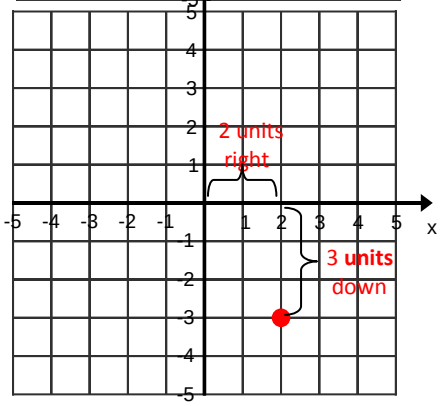


Math 6 Notes – Integers

Given an ordered pair such as $(-2,-3)$, the *x*-coordinate of –2 tells us to move 2 units to the **left** of the origin and the *y*-coordinate of 3 tells us to move 3 units **down**. So graphing $(-2,-3)$ would look like the following:



Given an ordered pair such as $(2,-3)$, the *x*-coordinate of 2 tells us to move 2 units to the **right** of the origin and the *y*-coordinate of 3 tells us to move 3 units **down**. So graphing $(2,-3)$ would look like the following:

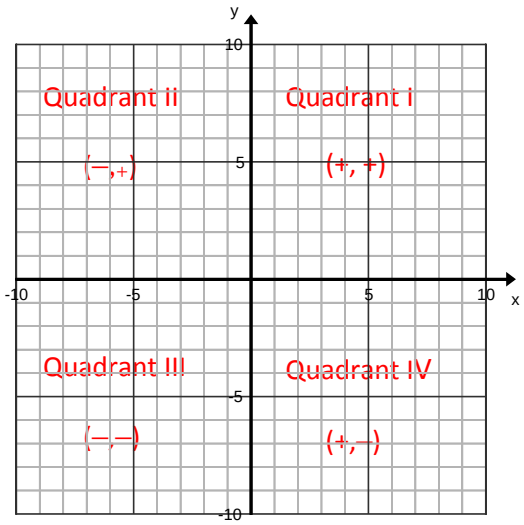


NVACS 6.NS.C.6b* – *Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

As students plot points on the grid they should develop the understanding that

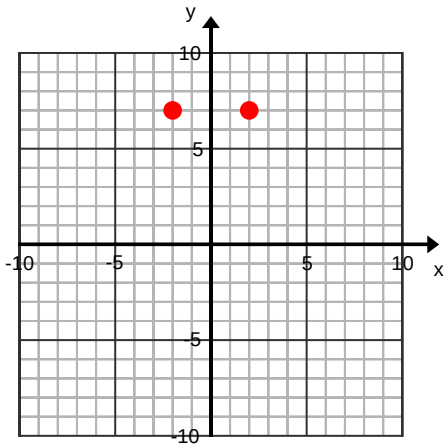
- points in quadrant I are made up of ordered pairs where both coordinates are positive numbers, (+, +).
- points in quadrant II are made up of ordered pairs where the x- coordinate is negative and the y-coordinate is positive, (–, +).
- points in quadrant III are made up of ordered pairs where both coordinates are negative numbers, (–, –).
- points in quadrant I– are made up of ordered pairs where the x- coordinate is positive and the y-coordinate is negative , (+,–).

Math 6 Notes – Integers



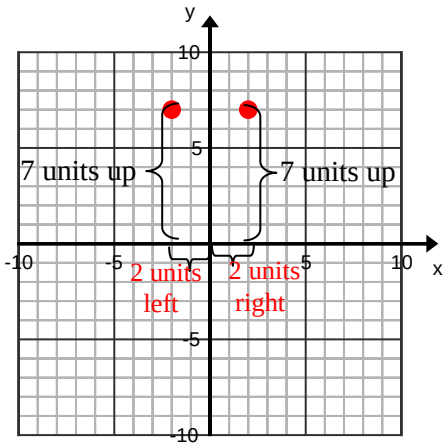
In the graph to the right, we see two points in a plane. One of the points graphed is (–2 , 7) the other is (2, 7).

We quickly notice they are both 7 units above the *x*-axis.



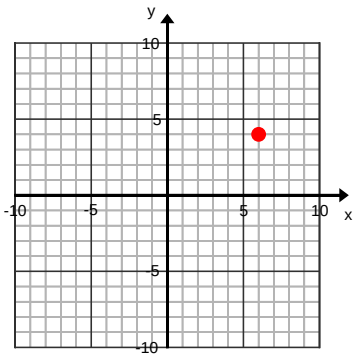
Upon further inspection, we see both points are each 2 units on either side of the *y*-axis; one is 2 units to the left and the other is two units to the right.

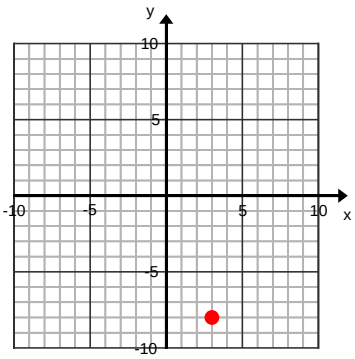
Since the 2 points have opposite *x*-coordinates but the same *y*-coordinates, we say the points are **reflected across the *y*-axis**.



Math 6 Notes – Integers

Example: Given one point on the graph, identify the coordinates of the point that is its reflection across the *y*-axis.





Example: Given one point on the graph, identify the coordinates of the point that is its reflection across the *y*-axis.

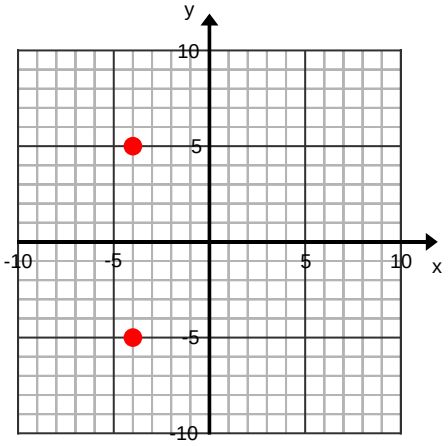
Example: A point in Quadrant I is reflected across the *y*-axis. The new point is located in Quadrant ____.

Example: A point in Quadrant II is reflected across the *y*-axis. The new point is located in Quadrant ____.

Example: A point in Quadrant III is reflected across the *y*-axis. The new point is located in Quadrant ____.

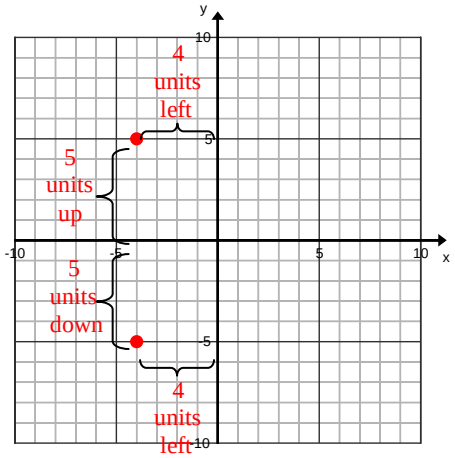
Example: A point in Quadrant IV is reflected across the *y*-axis. The new point is located in Quadrant ____.

Math 6 Notes – Integers



In this graph to the left, we see two points in a plane. One of the points graphed is (–4 , –5) the other is (–4, 5).

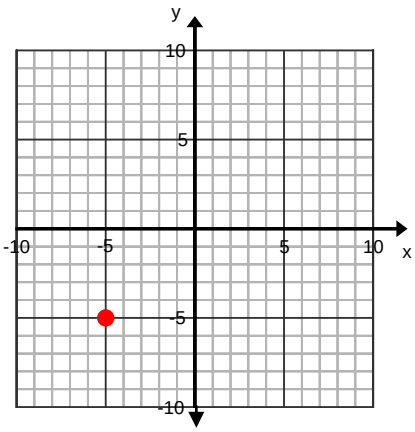
We quickly notice they are both 4 units to the left of the *y*-axis.



Upon further inspection, we see the points are each 5 units on either side of the *x*-axis; one is 5 units above and the other is 5 units below.

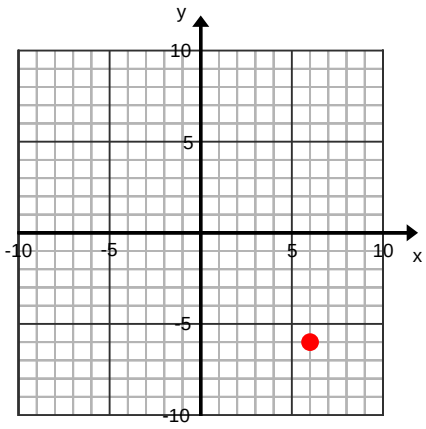
Since the two points have the same *x*-coordinates but the opposite *y*-coordinates, we say the points are **reflected across the *x*-axis.**

Example: Given one point on the graph, identify the coordinates of the point that is its reflection across the *x*-axis.



Math 6 Notes – Integers

Example: Given one point on the graph, identify the coordinates of the point that is its reflection across the *x*-axis.



Example: A point in Quadrant I is reflected across the *x*-axis. The new point is located in Quadrant ____.

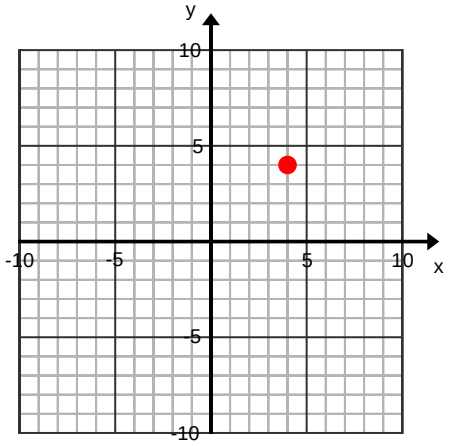
Example: A point in Quadrant II is reflected across the *x*-axis. The new point is located in Quadrant ____.

Example: A point in Quadrant III is reflected across the *x*-axis. The new point is located in Quadrant ____.

Example: A point in Quadrant IV is reflected across the *x*-axis. The new point is located in Quadrant ____.

Extension Example: A point (4, 4) is reflected twice. First it is reflected across the *x*-axis. Then that point is reflected across the *y*-axis. What are the coordinates of that final point?_____

How are the coordinates of the final point related to the coordinates of the original point?

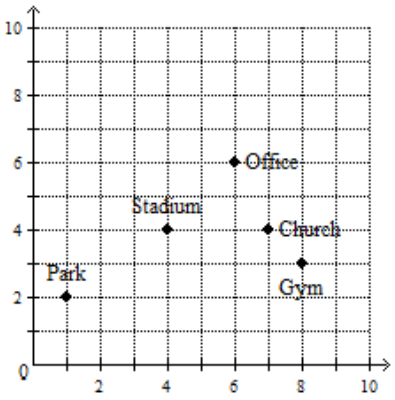


Math 6 Notes – Integers

NVACS 6.NS.C.8*– *Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Example:

Using the grid of the town, describe how you could go from the office to the gym by traveling only along the grid lines. Be sure to use units and direction in your answer. You may only change direction once on your way.



Example:

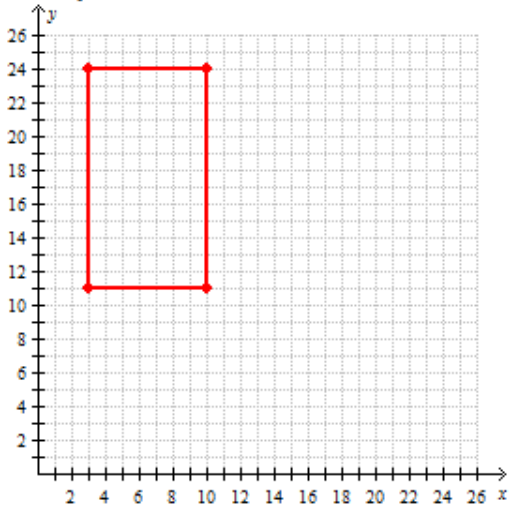
Draw quadrilateral $ABCD$ with vertices $A(-2,-1)$, $B(-5,-2)$, $C(-3,-5)$, and $D(2,-2)$. Then find the coordinates of the quadrilateral after reflecting $ABCD$ across the x-axis, and draw the image.

Math 6 Notes – Integers

Example: Suppose that all blocks in a city are the same length. Streets run north and south. They are numbered consecutively, starting with First Street. Avenues run east and west. They are also numbered consecutively, starting with First Avenue.

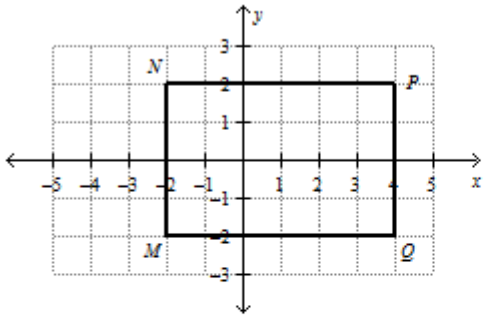
Jerome lives at the corner of Third Street and Twenty-Fourth Avenue. He walks to the bank at Third Street and Eleventh Avenue, to the post office at Tenth Street and Eleventh Avenue, and then to the barbershop on Tenth Street and Twenty-Fourth Avenue. Then Jerome walks home.

How many blocks does Jerome walk?



a. 20 blocks
b. 40 blocks
c. 91 blocks
d. 96 blocks

Example: Find the perimeter of the rectangle.



a. The perimeter of the rectangle is 10 units.
b. The perimeter of the rectangle is 16 units.
c. The perimeter of the rectangle is 20 units.
d. The perimeter of the rectangle is 24 units.

Math 6 Notes – Integers

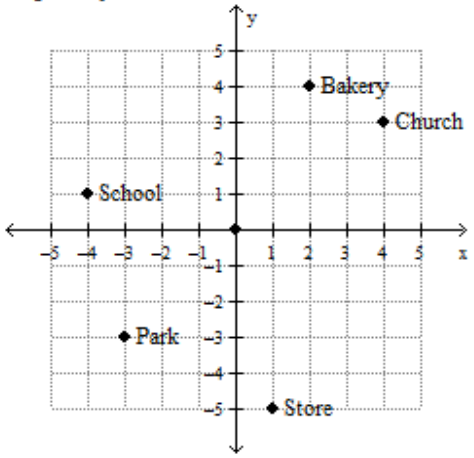
Example:

Pradeep sketches a picture on a coordinate grid. The corners of the picture are at (–5, 2), (1, 2), (1, –3) and (–5, –3). He wants to glue black ribbon around the edges of the picture. How much ribbon does Pradeep need?

a. 11 units
b. 21 units
c. 22 units
d. 30 units

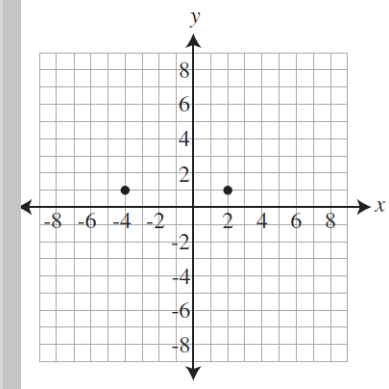
Example:

If Pablo's house is represented by the dot at the origin of the coordinate plane, and if each vertical or horizontal unit represents one block, which of the other places shown on the graph is closest to his house? Explain your answer.



Example:

The locations of two vertices of a rectangle are shown on the coordinate plane below.



Which ordered pairs could describe the locations of the other two vertices of the rectangle?

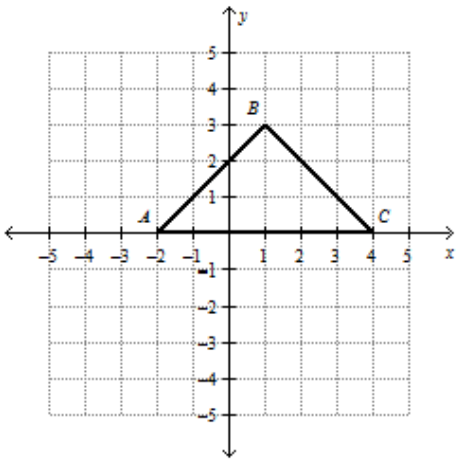
A (-3, -4) and (-3, 2)
B (-4, 5) and (5, 2)
C (-4, -5) and (2, 5)
D (-4, -3) and (2, -3)

Math 6 Notes – Integers

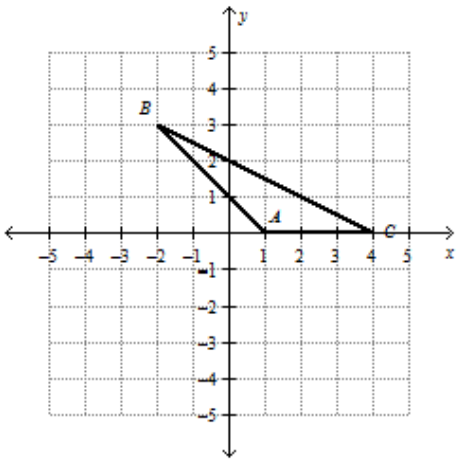
Example:

Graph the triangle with vertices $A(-2, 0)$, $B(1, 3)$, and $C(4, 0)$.

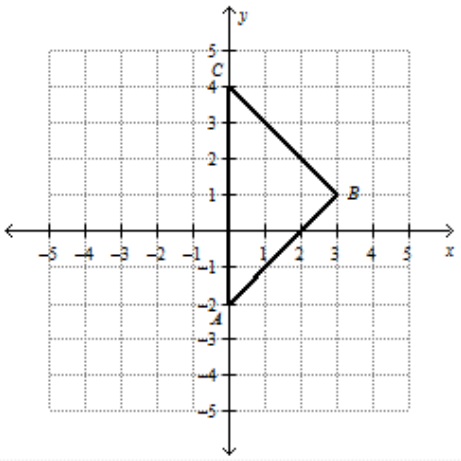
a.



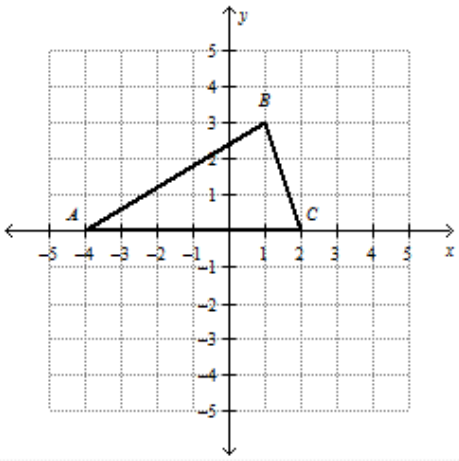
c.



b.

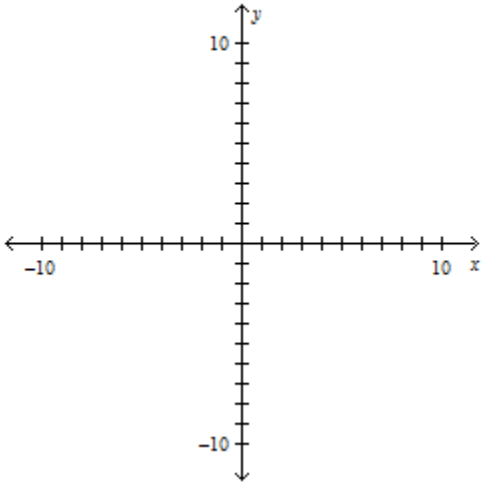


d.



Example:

$S(-1, 2)$, $T(-9, 5)$, $U(-5, 8)$; Reflect $\triangle STU$ in the x-axis.



Math 6 Notes – Integers

SBAC Example

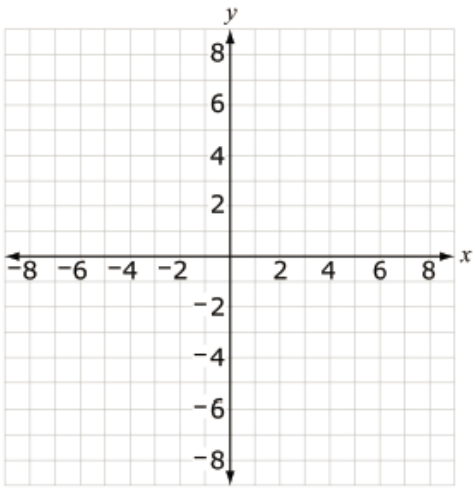
Standard: 6.NS.C.6 ***Difficulty: Medium*** ***DOK: 2*** ***Item Type: TE***

The coordinates of point *P* are $(-6, 5)$. Point *R* is a reflection of point *P* across the *x*-axis.

The coordinates of point *Q* are $(-1, 0)$. Point *T* is a reflection of point *Q* across the *y*-axis.

Part A

Plot and label points *P*, *Q*, *R*, and *T* on the coordinate plane.



Part B

The coordinates of point *V* are $(7, 4)$. Point *W* is a reflection of point *V* across the *x*-axis.

In which quadrant will point *W* be located?

(A) I

(B) II

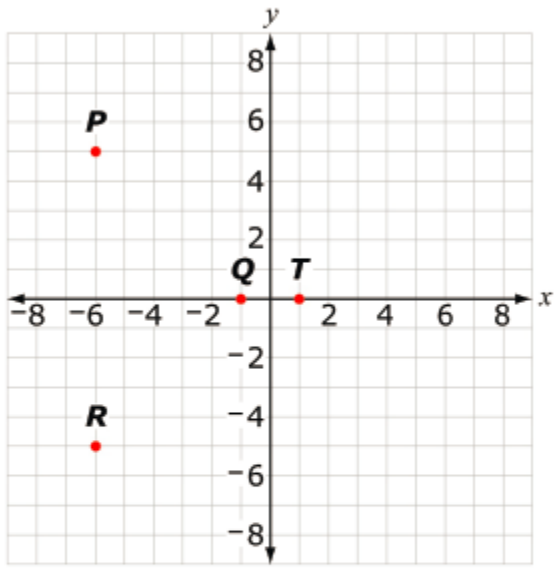
(C) III

(D) IV

Math 6 Notes – Integers

Sample Top-Score Response:

Part A



Part B

Quadrant IV

Scoring Rubric:

Part A 1 point for correctly plotting points P and R.
1 point for correctly plotting points Q and T.

Part B 1 point for correctly choosing D; Quadrant IV.

SBAC Example

Standard: 6.NS.C.7 Difficulty: Low DOK:1 Item Type: SR

The level of the top of the water in the ocean is considered to be at an altitude of zero (0) feet.

- The ocean floor at a particular dive site is – 20 feet.
- A diver is located at – 5 feet at that same site.
- The captain of a boat is located at an altitude of 15 feet, directly above the diver.

For numbers 1a – 1d, select True or False for each statement.

1a. The distance from the captain to the diver is greater than the distance from the top of the water to the ocean floor.

◯ True ◯ False

1b. The distance from the captain to the top of the water is the same as the distance from the diver to the ocean floor.

◯ True ◯ False

1c. When the diver swims to – 10 feet, the diver will be the same distance below the top of the water as the captain is above the top of the water.

◯ True ◯ False

1d. When the diver swims to – 10 feet, the diver's distance to the ocean floor will be equal to diver's distance to the top of the water.

◯ True ◯ False

Math 6 Notes – Integers

Scoring Rubric for Multi-Part Items:

Responses to this item will receive 0-2 points, based on the following:

2 points: FTFT
The student shows a thorough understanding of using the absolute value of coordinates to represent distances.

1 points: FTFF, TTFT, FTTT, FFFT
The student shows a partial understanding of using the absolute value of coordinates to represent distances and makes a single error.

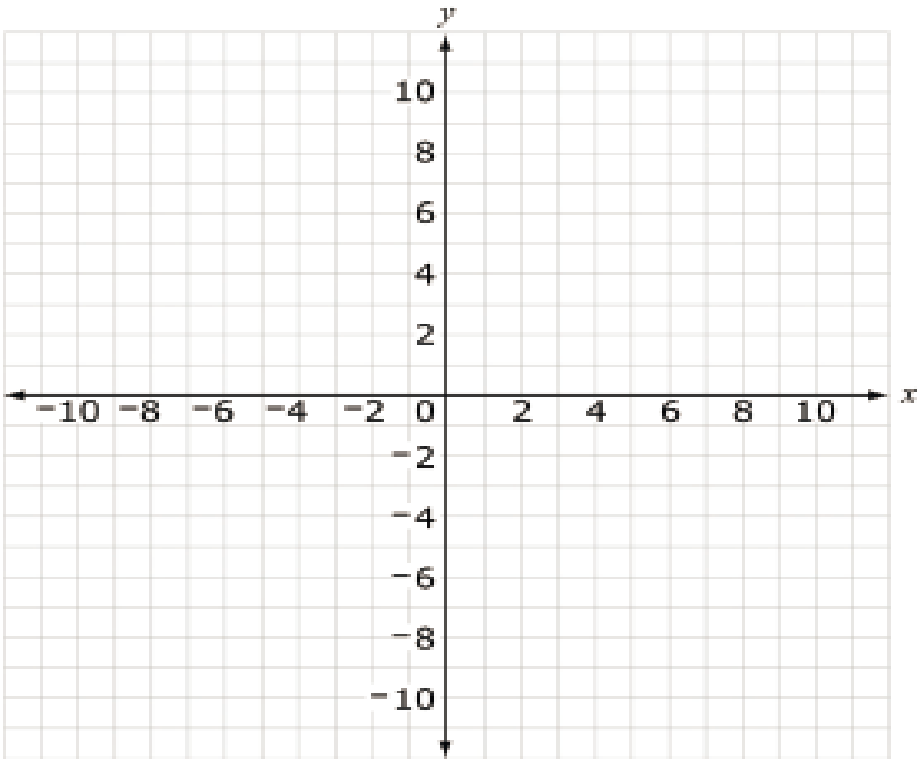
0 points: TFTF, TTTT, TFFT, FFTT, TTTF, TFTT, TFFF, FFTF, TTFF, FTTF, FFFF
The student shows a limited or inconsistent understanding of using the absolute value of coordinates to represent distances.

Math 6 Notes – Integers

SBAC Examples

Standard: 6.NS.C.8 ***Difficulty: Low*** ***DOK: 1*** ***Item Type: SR***

The map of a town will be placed on a coordinate plane. City Hall will be located at the origin of the map



The locations of six other buildings that will be added to the coordinate plane are listed below.

- Bank $(-8, 5)$
- School $(-8, -6)$
- Park $(4, 5)$
- Post Office $(-9, 5)$
- Store $(-9, -6)$

For numbers 1a–1d, select True or False for each statement, based on the given information.

Math 6 Notes – Integers

1a. The bank is closer to the school than the post office is from the store.

◯True ◯False

1b. The distance from the bank to the school is equal to $|5|+|-6|$.

◯True ◯False

1c. A library has the same y-coordinate as the store. If the library is the same distance from the store as the park is from the bank, then the x-coordinate of the library is 4.

◯True ◯False

1d. The distance from the bank to the post office is equal to $|-8|+|-9|$.

◯True ◯False

Scoring Rubric for Multi-Part Items:

Each part is independently scored and worth 1 point, for a total of 4 points.

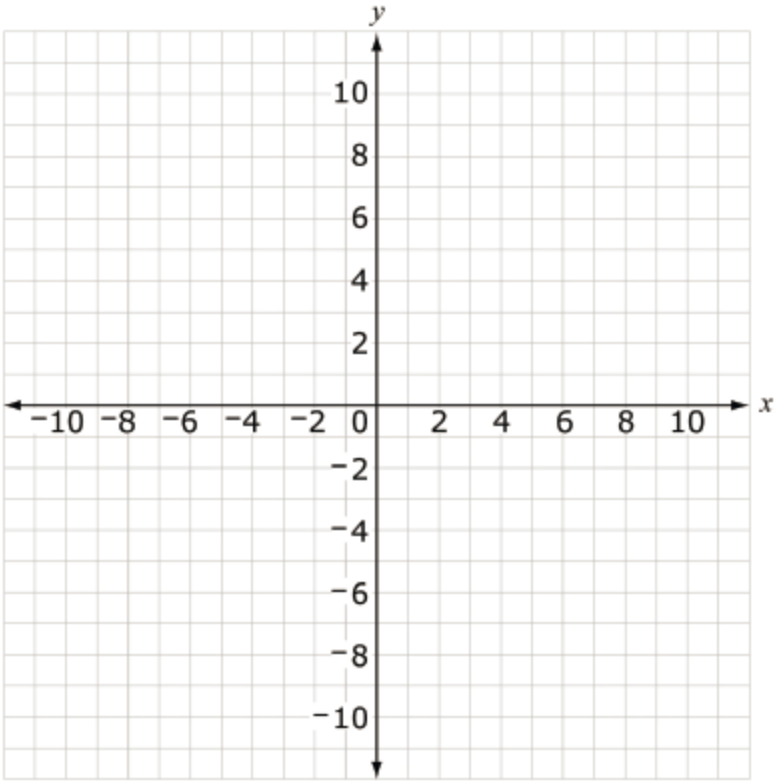
Math 6 Notes – Integers

SBAC Examples

Standard: 6.NS.C.8 ***Difficulty: Low*** ***DOK: 1*** ***Item Type: TE***

Plot four unique points on the coordinate grid that are each 5 units from the point (1, 2). Each point must contain coordinates with integer values.

To create a point, click on any space where grid lines intersect in the coordinate grid below.



TE Information:

Item Code: MAT.06.TE.1.000NS.D.278
Template: Placing Points
Interaction Space Parameters:

A. True
B. N/A
C. True
D. False

E. N/A
F. True
G. 4

Scoring Data:

Point 1: (-4,2); tolerance=0, correct score-points=0.25;
Point 2: (6,2); tolerance=0; correct score-points=0.25;
Point 3: (1,7); tolerance=0; correct score-points=0.25;
Point 4: (1,-3); tolerance=0; correct score-points=0.25;
Algorithm: SumOnly

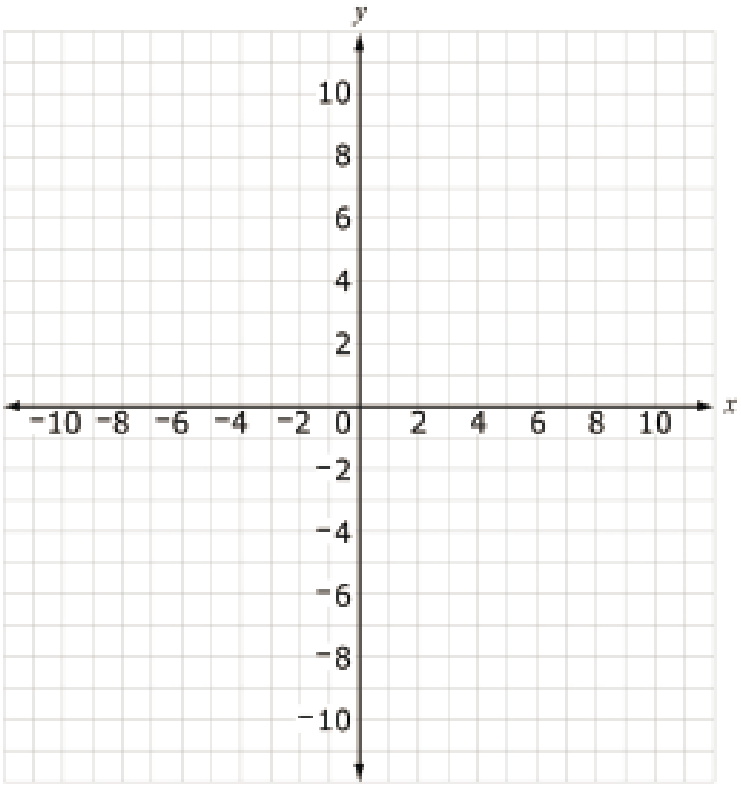
SBAC Examples

Standard: 6.NS.C.8 Difficulty: Low DOK: 1 Item Type: TE

Math 6 Notes – Integers

The map of a town is placed on a coordinate grid with each whole number distance north (N), south (S), east (E), or west (W) representing 1 block.

A grocery store has the coordinates (-2, -4). The owners of the grocery store plan to build an additional grocery store at a location that is 5 blocks to the east and 3 blocks to the north of the original store. Plot the location of the additional grocery store on the coordinate grid.



Math 6 Notes – Integers

TE Information:

Item Code: MAT.06.TE.1.000NS.D.288

Template: Placing Points

Interaction Space Parameters:

A. True
B. N/A
C. Visible
D. True
E. A compass showing north, south, east, and west is needed to the right of the coordinate plane.
F. True
G. 1

Scoring Data: SumOnly

A. 3
B. -1
C. 0
D. 1
E. 0

SBAC Example

Standard: 7.NS.A.1 ***Difficulty: Medium*** ***DOK: 2*** ***Item Type: SR***

Identify the number(s) that makes each statement true. You may select more than one number for the statement.

☐ **+5** = zero ◯ **–5** ◯ **5**