CCGPS Frameworks Student Edition

Mathematics

6th Grade
Unit 7: Rational Explorations: Numbers and their Opposites

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"Making Education Work for All Georgians"

Unit 7
Rational Explorations: Numbers and their Opposites

TABLE OF CONTENTS

OVERVIEW

In this unit students will:

- understand that positive and negative numbers are used together to describe quantities having opposite directions or values.
- 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.
- 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.
- 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.
- 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.
- understand ordering and absolute value of rational numbers.
- interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
- write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 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.
- distinguish comparisons of absolute value from statements about order.
- solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane.

Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as estimation, mental computation, and basic computation facts should be addressed on an ongoing basis. Ideas related to the eight practice standards should be addressed constantly as well. To assure that this unit is taught with the appropriate emphasis, depth, and rigor, it is important that the tasks listed under "Evidence of Learning" be reviewed early in the planning process. A variety of resources should be utilized to supplement this unit. This unit provides much needed content information, but excellent learning activities as well. The tasks in this unit illustrate the types of learning activities that should be utilized from a variety of sources.

STANDARDS ADDRESSED IN THIS UNIT

Mathematical standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics.

KEY STANDARDS

Apply and extend previous understandings of numbers to the system of rational numbers.

MCC6.NS.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, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

MCC6.NS.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.

MCC6.NS.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.

MCC6.NS.6b Understand signs of number 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.

MCC6.NS.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.

MCC6.NS.7 Understand ordering and absolute value of rational numbers.

MCC6NS.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

MCC6.NS.7b Write, interpret, and explain statements of order for rational numbers in real-world contexts.

MCC6.NS.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.

MCC6.NS.7d Distinguish comparisons of absolute value from statements about order.

MCC6.NS.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.

Solve real-world and mathematical problems involving area, surface area, and volume.

MCC6.G.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply those techniques in the context of solving real-world mathematical problems.

Standards for Mathematical Practice:

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning , strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately) and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. **Make sense of problems and persevere in solving them.** In grade 6, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"

2. **Reason abstractly and quantitatively.** In grade 6, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. **Construct viable arguments and critique the reasoning of others.** In grade 6, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" "Does that always work?" They explain their thinking to others and respond to others' thinking.

4. **Model with mathematics.** In grade 6, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students begin to explore covariance and represent two quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5. **Use appropriate tools strategically.** Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 6 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three dimensional figures.

6. **Attend to precision**. In grade 6, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations or inequalities.

7. **Look for and make use of structure.** Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions
(i.e. $6 + 2x = 3\ (2 + x)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality), c=6 by division property of equality). Students compose and decompose two- and three dimensional figures to solve real world problems involving area and volume.

8. **Look for and express regularity in repeated reasoning.** In grade 6, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b \div c/d = ad/bc$ and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between covariance, rates, and representations showing the relationships between quantities.

ENDURING UNDERSTANDINGS

- Negative numbers are used to represent quantities that are less than zero such as temperatures, scores in games or sports, and loss of income in business.
- Absolute value is useful in ordering and graphing positive and negative numbers.
- Positive and negative numbers are often used to solve problems in everyday life.
- Rational numbers are points on a number line
- Numbers in ordered pairs indicate locations in quadrants of the coordinate plane

CONCEPTS/SKILLS TO MAINTAIN

In order for students to be successful, the following skills and concepts need to be maintained

- Changing between fractions and decimals
- Finding area of squares, rectangles, and triangles, and finding the perimeter of squares and rectangles.

SELECTED TERMS AND SYMBOLS

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

The definitions below are for teacher reference only and are not to be memorized by the students. Students should explore these concepts using models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

The websites below are interactive and include a math glossary suitable for middle school children. **Note – At the middle school level, different sources use different definitions. Please preview any website for alignment to the definitions given in the frameworks.**

http://www.amathsdictionaryforkids.com/
This web site has activities to help students more fully understand and retain new vocabulary

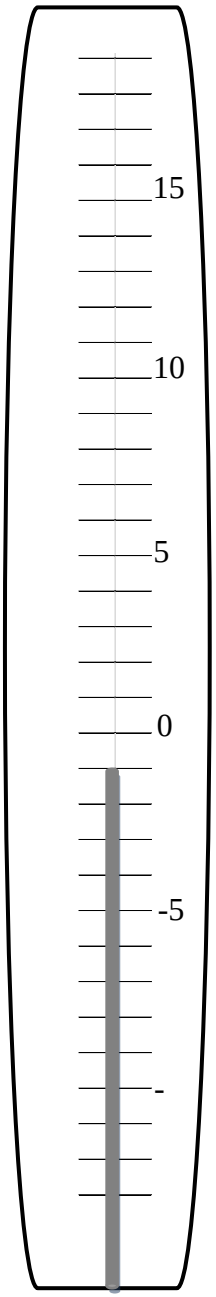
http://intermath.coe.uga.edu/dictnary/homepg.asp
Definitions and activities for these and other terms can be found on the Intermath website. Intermath is geared towards middle and high school students.

- **Absolute value:** The distance between a number and zero on the number line. The symbol for absolute value is shown in the equation $|-8| = 8$.
- **Coordinates:** An ordered pair, (x, y), that locates a point in a plane.
- **Inequality**: Any mathematical sentence that contains the symbols > (greater than), < (less than), ≤ (less than or equal to), or ≥ (greater than or equal to).
- **Integers:** The set of whole numbers and their opposites $\{\ldots -3, -2, -1, 0, 1, 2, 3, \ldots\}$
- **Negative numbers:** The set of numbers less than zero
- **Opposite number:** Two different numbers that have the same absolute value. Example: 4 and -4 are opposite numbers because both have an absolute value of 4.
- **Ordered Pair:** A pair of numbers, (x, y), that indicate the position of a point on the Cartesian Plane.
- **Origin:** The point of intersection of the vertical and horizontal axes of a Cartesian plane. The coordinates of the origin are (0, 0).
- **Positive number:** The set of numbers greater than zero.
- **Rational number:** The set of numbers that can be written in the form $\frac{a}{b}$ where a and b are integers and $b \neq 0$.
- **Sign:** a symbol that indicates whether a number is positive or negative. Example: in -4, the $(-)$ sign hows this number is read "negative four".
- **x-axis**: The horizontal number line on the Cartesian coordinate plane.
- **x-coordinate**: The first number of in ordered pair; the position of a point relative to the vertical axis

- **y-axis**: The vertical number line on the Cartesian coordinate plane
- **y-coordinate**: The second number in an ordered pair; the position of a point relative to the horizontal axis

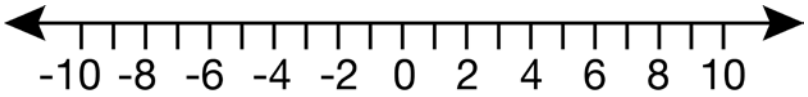
Learning Task: What's Your sign?
Part I: Representing numbers on a number line.

Directions: Use the thermometer to answer the questions. Use a blue colored pencil to represent colder temperatures, and use a red colored pencil to represent warmer temperatures.



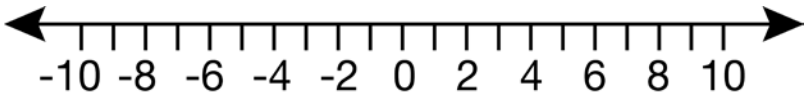
1A. Which temperature is colder, $-10°$ or $0°$?

1B. Plot both numbers on the number line below.



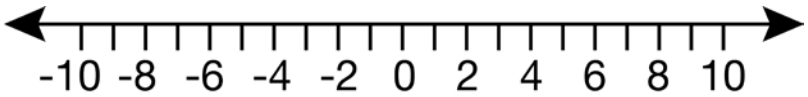
2A. Which temperature is colder, $-5°$ or $0°$?

2B. Plot both numbers on the number line.



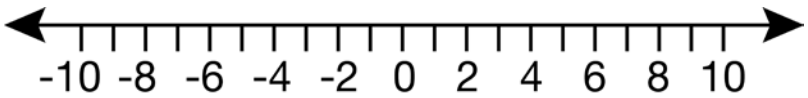
3A. Which temperature is warmer, $-6°$ or $-9°$?

3B. Plot both numbers on the number line.



4A. Which temperature is warmer, $-2°$ or $-5°$?

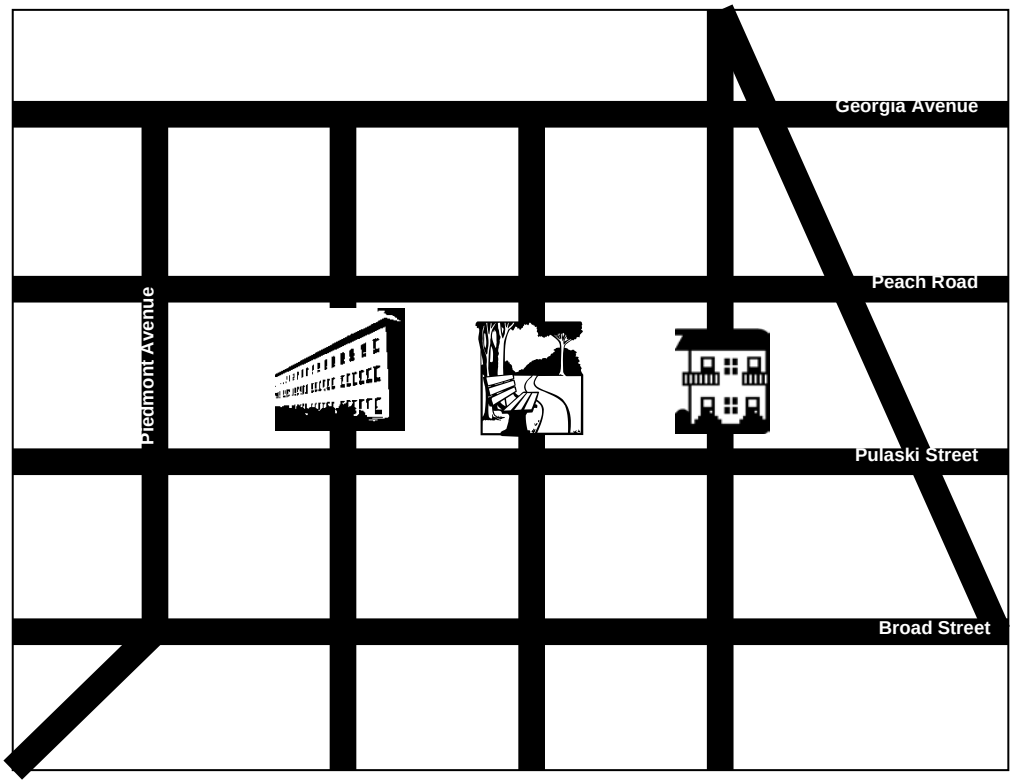
4B. Plot both numbers on the number line.



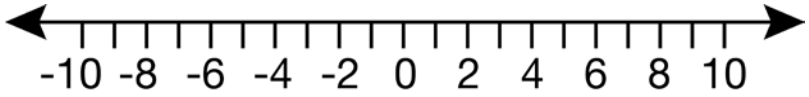
5. What do you notice about negative numbers?

Part II: Absolute Value

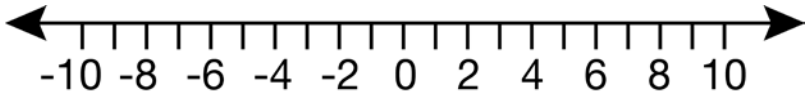
Directions: Use the diagram of the city to answer the questions. Use a blue colored pencil to graph the locations on the number line.



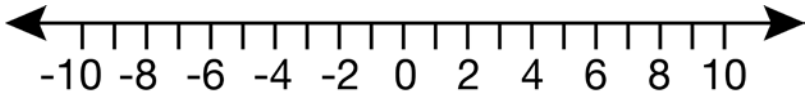
1. If the park is located at zero on the number line, plot the location of the house and school if they are located one unit from the park. What do you notice about the placement of your plots on the number line?



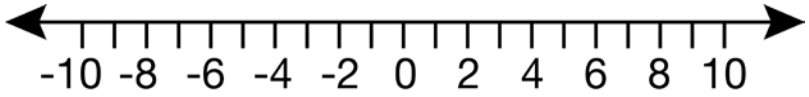
2. Plot the location of the house and school if they are two units from the park. What do you notice about the placement of your plots on the number line?



3. Plot the location of the house and school if they are five units from the park. What do you notice about the placement of your plots on the number line?



4. Plot the location of the house and school if they are nine units from the park. What do you notice about the placement of your plots on the number line?



Vocabulary Alert:
The distance between a number and zero on the number line is called **absolute value**. The symbol for absolute value is shown in this equation $|8| = 8$ and $|-8| = 8$. These are read as, "The absolute value of 8 equals 8 and the absolute value of negative 8 equals 8. This is true because the distance between 0 and 8 on the number line is 8 spaces and the distance between 0 and negative 8 on the number line is 8 spaces. Distance is always positive. One can never travel a negative distance.

5. Explain $|4|$.

6. Explain $|-7|$.

7. Explain $|8|$.

8. Explain $|-21|$.

9. Explain $|d|$.

10. Explain $|-d|$.

11. Explain $\left|-\frac{1}{4}\right|$.

12. Explain $\left|\frac{3}{5}\right|$.

13. Explain $|1.25|$.

14. Explain $|-5.6|$.

15. Explain $-|-8|$. This is read as, "The opposite of the absolute value is negative 8. Think about this. If the absolute value of negative 8 is eight, what is the opposite?

16. Explain $-|8|$. This is read as, "The opposite of the absolute value of 8. Think about this. If the absolute value of 8 is 8, what is the opposite?

17. Explain $-|12|$.

18. Explain $-|19|$.

19. Explain $-|p|$.

20. Explain $-|-7|$.

21. Explain $-|-3|$.

22. Explain $-|-p|$.

Part III: Opposites

Vocabulary Alert:
Opposite numbers are two different numbers that have the same absolute value. Example: 4 and -4 are opposite numbers because $|-4| = 4$ and $|-4| = 4$.

More about Opposite Numbers

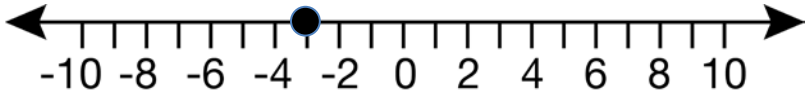
- When opposite numbers are added, the sum is zero.
- To get the opposite of a number, change the sign.
- The absolute values of opposite numbers are the same.
- Opposite numbers are equidistant from 0 on a number line.

Examples of Opposite Numbers

- 10 and -10 are the opposite numbers.
- -4 is the opposite number of 4.
- 0 is the opposite of 0.
- The opposite of the opposite of negative 3 is 3
    - Example: $-(-3) = 3$

Directions: Use the number lines to find the opposite of the plotted point. Plot the opposite of the given number using a green colored pencil.

1.



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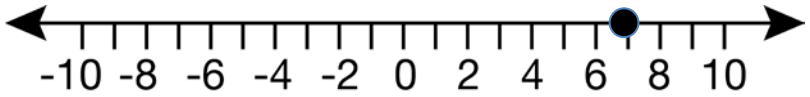
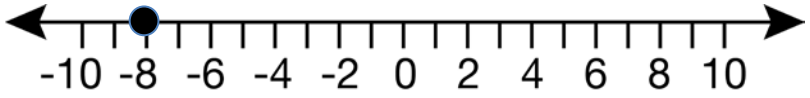
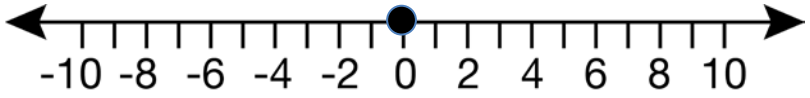


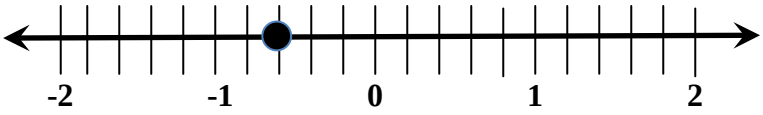
3.



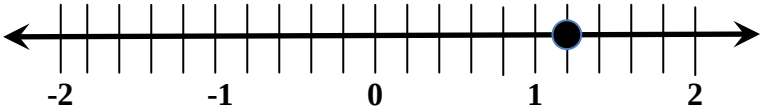
4.



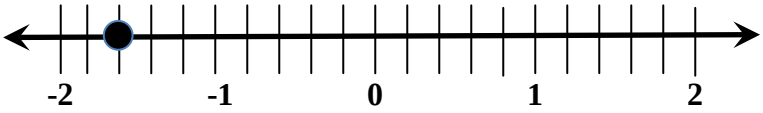
5. Plot the opposite and tell the decimal and fraction that are represented by the black and green dot.



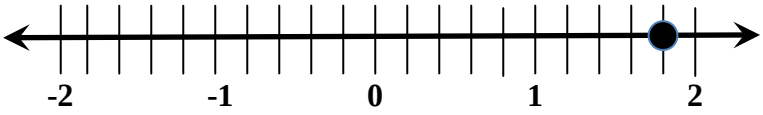
6. Plot the opposite and tell the decimal and fraction that are represented by the black and green dot.



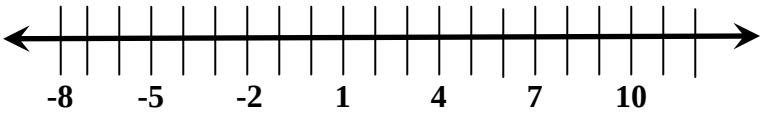
7. Plot the opposite and tell the decimal and fraction that are represented by the black and green dot.



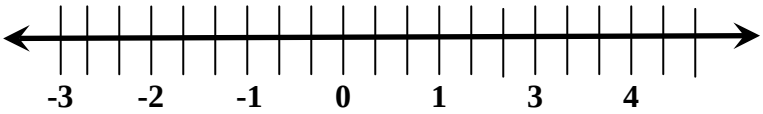
8. Plot the opposite and tell the decimal and fraction that are represented by the black and green dot.



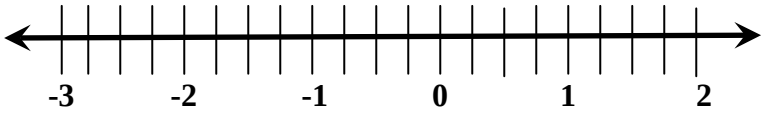
9. Plot $-(-7)$.



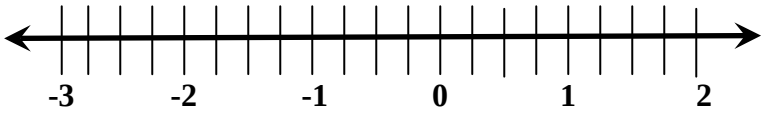
10. Plot $-(-\frac{1}{3})$.



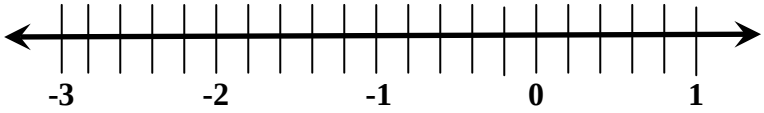
11. Plot $-(-1\frac{1}{4})$.



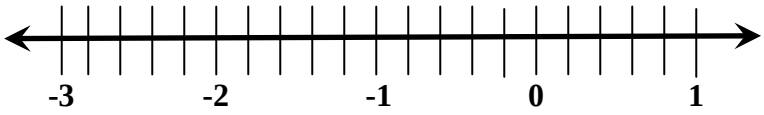
12. Plot the opposite of 1.75.



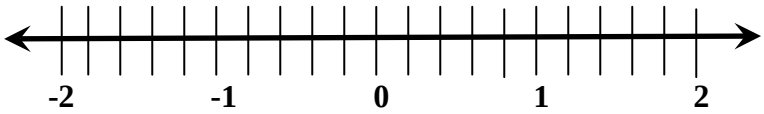
13. Plot the opposite of 0.25.



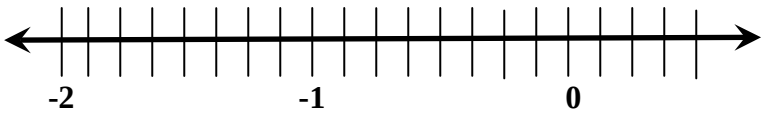
14. Plot the opposite of 0.20.



15. Plot the opposite of -1.60.



16. Plot $(-.25)$.



Answer the following:

17. In a game of football, Jared gained 12 yards on the first play of the game. On the second play of the game, Jared lost 12 yards. How many total yards did Jared gain or lose?

18. Sydney Kate's mom gave her $10 for allowance. Sydney Kate owed her dad $10 for the cool pair of socks that he purchased for her. How much money did Sydney Kate have left?

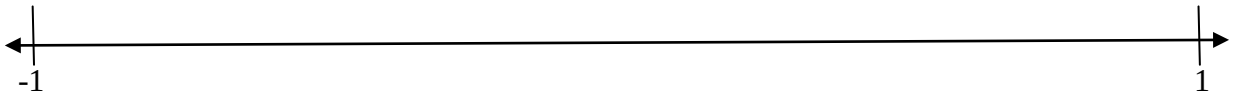
19. Brian has $60.42 in his savings account. He really wants to purchase a volleyball net along with all the supplies to be able to have a game with his neighborhood friends. Brian spent $60.42 on everything he needed. How much money does Brian now have in his savings account?

20. Ciana is on a mountain top that is 18,240 feet above sea level. How far must she walk down the mountain to reach sea level?

21. What is the sum of -6 and 6?

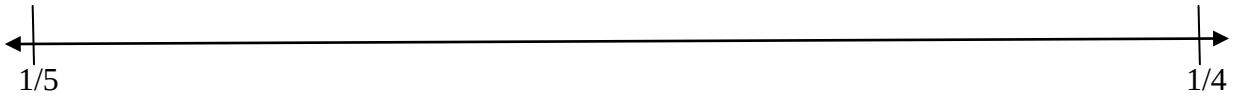
Learning Task: Representing Rational Numbers on the Number Line

Below is a number line from -1 to 1.



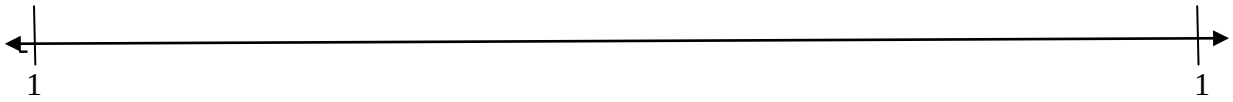
A. On the number line, mark 0, $-\frac{2}{5}$, 5, $-\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{4}$, –0.8

B. Choose one fraction and one decimal that are between $\frac{1}{5}$ and $\frac{1}{4}$ on the number line. Your fractions and your decimal should not be equivalent. Plot these on the number line below.
Below is a number line from -1 to 1.



C. Explain how you know each of your answers is between $\frac{1}{5}$ and $\frac{1}{4}$.

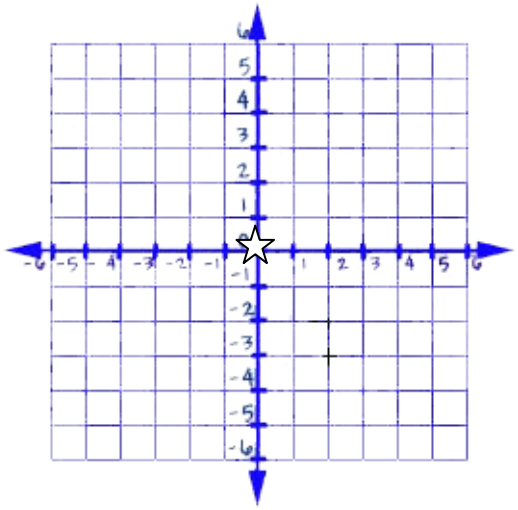
D. Plot two additional points that are opposites on the number line below. How do you know that these two points are opposites?



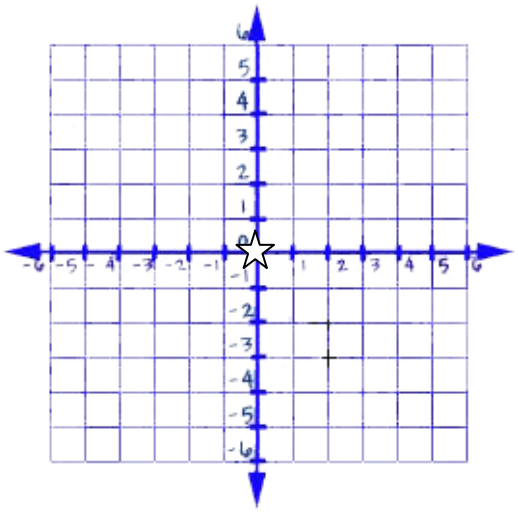
Learning Task: Symbols of Inequalities and the Coordinate System

As a middle school student, you are very familiar with the equal sign. You know that in order for two numbers to be equal, they must have the same value. Mathematicians also deal with symbols of inequality such as greater than (>) and less than (<). These two symbols of inequality can help us compare rational numbers.
Solve the following problems on the coordinate plane or number line. Use the coordinate plane or number line to help you explain your answer. You should also write a statement of inequality to justify your answer.

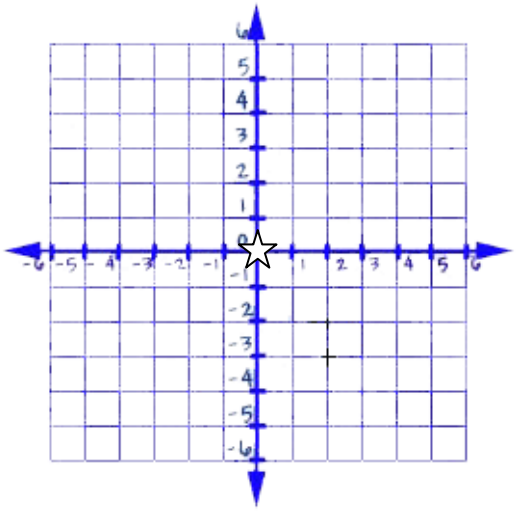
1. A grocery store is located in the center of the town at the right. The coordinates of the store are (0, 0), and the store is represented by a star. Mary lives 3 blocks east of the grocery store and Julia lives 5 blocks west of the grocery store. Plot the location of each house, and give the coordinates of Mary's house and Julie's house. How far does each girl live from the store? Who lives a greater distance from the store? Write two inequality statements to show the distance that each girl lives from the grocery store.



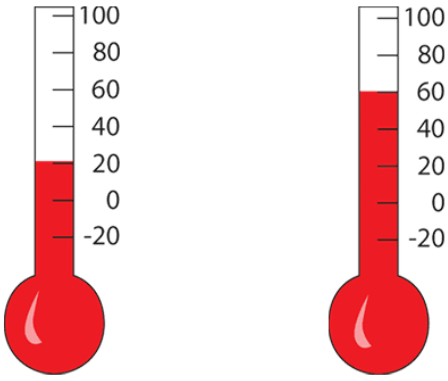
2. A grocery store is located in the center of the town at the right. The coordinates of the store are (0, 0), and the store is represented by a star. Musa lives 3 blocks east of the grocery store and Andre lives 5 blocks east of the grocery store. Plot the location of each house, and give the coordinates of Musa's house and Andre's house. How far does each boy live from the store? Who lives a greater distance from the store? Write two inequality statements to show the distance that each boy lives from the grocery store.



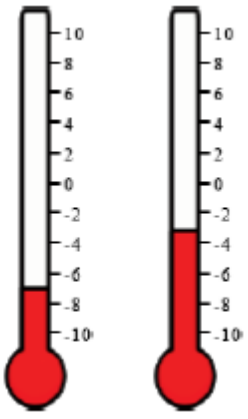
3. A grocery store is located in the center of the town at the right. The coordinates of the store are (0, 0), and the store is represented by a star. Madison lives three blocks west of the grocery store and Gavin lives 4 blocks west of the grocery store. Plot the location of each house, and give the coordinates of Madison's house and Gavin's house. How far does each person live from the store? Who lives a greater distance from the store? Write two inequality statements to show the distance that each person lives from the store.



4. There are two thermometers at the right. Write two inequality statements to describe the relationship between the two thermometers.



5. There are two thermometers at the right. Write two inequality statements to describe the relationship between the two thermometers.



6. Below is a chart showing the average depth of many of the world's oceans.

Depth's of the World's Oceans	
OCEAN	**Average Depth (feet)**
Pacific Ocean	15200 feet
Atlantic Ocean	12900 feet
Indian Ocean	13000 feet
Arctic Ocean	4000 feet

A. Draw a vertical number line with 0 as sea level to represent the depth of the oceans. Be careful when determining your scale and interval.

B. Write two inequality statements to show the following:

1. The relationship between the Pacific Ocean and the Atlantic Ocean.

2. The relationship between the Indian and the Arctic Ocean.

3. The relationship between the Atlantic Ocean and the Indian Ocean.

4. The relationship between the Pacific Ocean and the Arctic Ocean.

7. Brian has a checkbook balance of $-\$23.45$, and Kristen has a checkbook balance of -18.42. Write a statement of inequality to represent the situation. Who owes more money, Brian or Kristen?

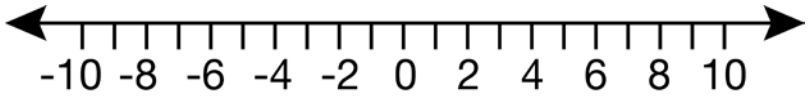
8. Robin and Trey love the cold weather. In fact, the colder the weather, the happier Robin and Trey are. Both Robin and Trey have very precious thermometers that measure the temperature to the nearest tenth of a degree. The temperature in Robin's location is $-6.8℃$ and the weather in Trey's location is $-14.2℃$. Trey tells Robin that he is warmer than she is because 14.2 is greater than 6.8, but Robin disagrees with Trey. Plot the two temperatures on a number line. Then write two statements of inequality to represent the situation. Is Robin or Trey colder?

9. Lynn and Max are divers. Lynn's depth gauge says she is 43.6 feet deep. Max's depth gauge says that he is 54.2 feet deep. Who is closer to the surface? Write two statements of inequality to describe the situation.

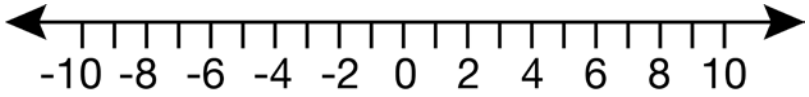
Learning Task: Graphing on the Coordinate Plane.

Number lines can be used to show numbers and their opposites. Both 3 and -3 are 3 units from zero on the number line. Graphing points and reflecting across zero on the number line extends to graphing and reflecting points across the *x*-axes (horizontal number line) or the *y*-axis (vertical number line) on a coordinate plane.

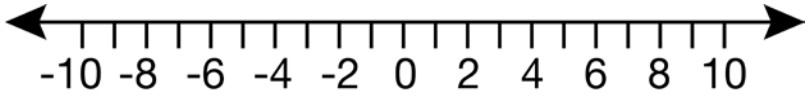
1. On the horizontal number line, plot 7 and -7. What is the distance of each point from zero? What is the distance between 7 and -7? How does absolute value help you write a number sentence to help you find the distance between 7 and -7?



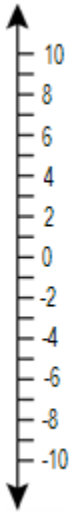
2. On the horizontal number line, plot 5 and -5. What is the distance of each point from zero? What is the distance between 5 and -5? How does absolute value help you write a number sentence to help you find the distance between 5 and -5?



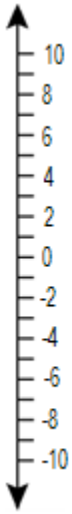
3. On the horizontal number line, plot 2 and -2. What is the distance of each point from zero? What is the distance between 2 and -2? How does absolute value help you write a number sentence to help you find the distance between 2 and -2?



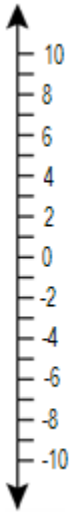
4. On the vertical number line, plot 1 and −1. What is the distance of each point from zero? What is the distance between 1 and −1? How does absolute value help you write a number sentence to help you find the distance between 1 and −1?



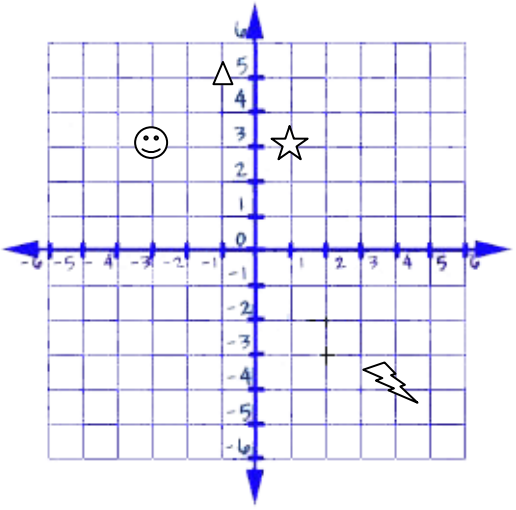
5. On the vertical number line, plot 10 and −10. What is the distance of each point from zero? What is the distance between 10 and −10? How does absolute value help you write a number sentence to help you find the distance between 10 and −10?



6. On the vertical number line, plot 8 and −8. What is the distance of each point from zero? What is the distance between 8 and −8? How does absolute value help you write a number sentence to help you find the distance between 8 and −8?



7. The points (1, 3), (-1, 5), (-3, 3), and (4, -4) have been graphed on the coordinate plane. Reflect each point across the *x*-axis. What are the coordinates of the reflected points?



When the star (1, 3) is reflected across the *x*-axis, the new point is located at _____.

When the triangle (-1, 5) is reflected across the *x*-axis, the new point is located at _____.

When the smiley face (-3, 3) is reflected across the *x*-axis, the new point is located at _____.

When the lightning bolt (4, -4) is reflected across the *x*-axis, the new point is located at _____.

What similarities do you notice between the coordinates of the original point and the reflected point?

8. The points (1, 3), (-1, 5), (-3, 3), and (4, -4) have been graphed on the coordinate plane. Reflect each point across the *y*-axis. What are the coordinates of the reflected points?

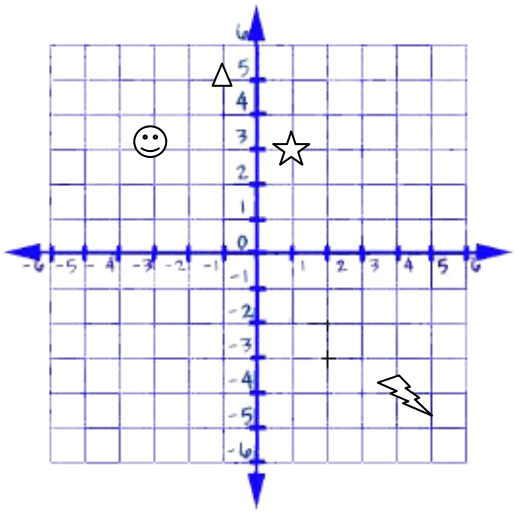
When the star (1, 3) is reflected across the *y*-axis, the new point is located at _____.

When the triangle (-1, 5) is reflected across the *y*-axis, the new point is located at _____.

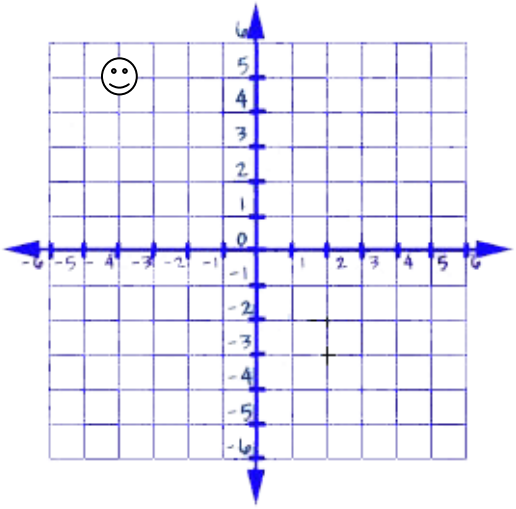
When the smiley face (-3, 3) is reflected across the *y*-axis, the new point is located at _____.

When the lightning bolt (4, -4) is reflected across the *y*-axis, the new point is located at _____.

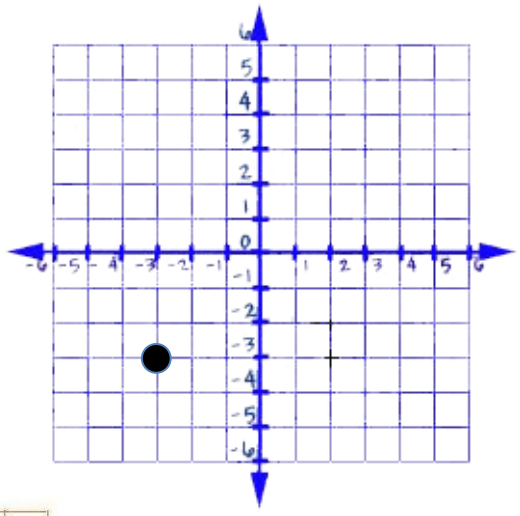
What similarities do you notice between the coordinates of the original point and the reflected point?'



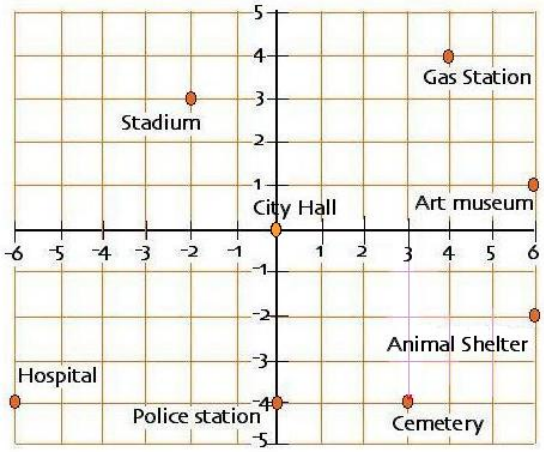
9. The smiley face, located at point (-4, 5), has been reflected across the *y*-axis**.** The new location of the smiley face is (4, 5). What is the distance between (-4, 5) and (4, 5)? Write a number sentence using the distance from the *y*-axis to help justify your answer.



10. A point, located at (-3, -4), has been reflected across the *x*-axis. The new point has the coordinates (3, -4). What is the distance between (-3, -4) and (3, -4)? Write a number sentence using the distance from the *x*-axis to help justify your answer.



Use the drawing of the city to help you answer questions 11-17.



11. What is the location of city hall? What is the location of the police station? How many blocks apart are these two buildings?

12. What is the location of the art museum? What is the location of the animal shelter? How many blocks apart are these two buildings?

13. What is the location of the hospital? What is the location of the cemetery? How many blocks apart are these two buildings?

14. What is the location of the hospital? What is the location of the police station? How many blocks apart are these two buildings?

15. The police station is being moved to its new location located at (-6, -1). Is the police station closer to, farther away from, or the same distance from the Hospital?

16. The art museum and the animal shelter are moving as well. Their movement can be described as a reflection across the *y*-axis. What are the coordinates of the new location for the art museum and the animal shelter? How many blocks are they from each other? Is this the same distance as in question 12? Why or why not?

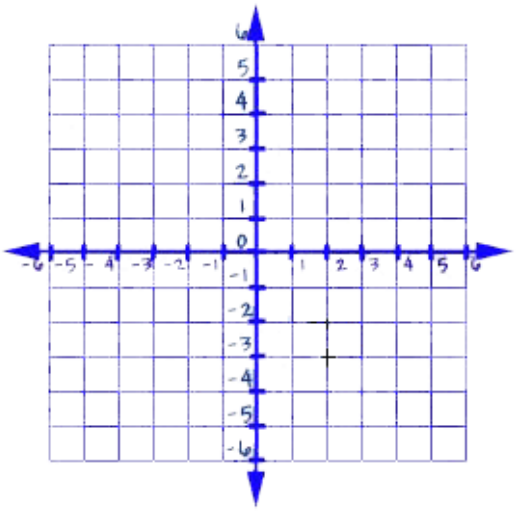
17. The stadium is also being moved. Its new location can be described as a reflection across the *x*-axis. What is the new location of the stadium? How many blocks is the new stadium from the old stadium?

18. On a map, the library is located at (-2, 2), the city hall is located at (0, 2), and the middle school is located at (0, 0).

A. Represent the locations as points on a coordinate grid with a unit of 1 mile.

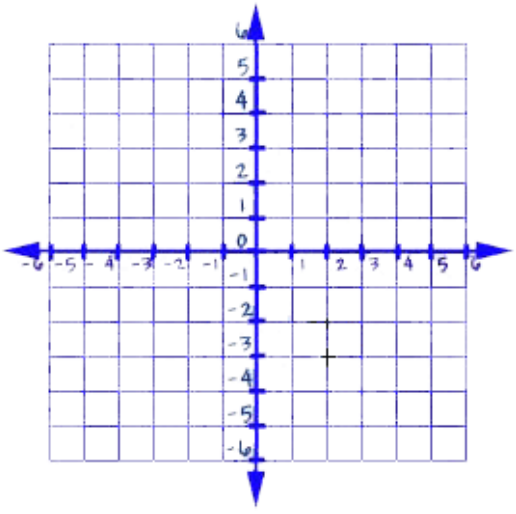
B. What shape is formed by connecting the three locations?

C. The city council is planning to place a city park in this area. How large is the area of the planned park?



19. On the map, the elementary school is located at (-4, 2), the middle school is located at (2, 2), and, the high school is located at (-4, -3).

A. The points on the map are located two miles apart. Each school forms the vertex of a rectangle. If the district office for the school system is the fourth vertex of the rectangle, what are the coordinates? How do you know?



B. What are the length and width of the rectangle?

C. What is the perimeter of the rectangle?

D. What is the area of the rectangle?