

Literacy

APS

UNit of Study-5

**gSE GRade 6**

**Mathematics**

**Teacher Resource Guide**

Rational Explorations: Numbers and their Opposites

***(January 4– February 3)***

In this unit, students extend their previous understandings of numbers and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers.  They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.  Students then apply their understanding of the coordinate plane to graph polygons and find vertical or horizontal distances between points.  [Adapted from CCSS Grade 6 p. 39]

(Georgia Standards of Excellence Framework; *GSE Grade 6 Mathematics*  *Unit 7*)

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| **Standards Addressed** | **Duration: Maximum of 22 Days**  **Georgia Standards of Excellence – Mathematics**  (Cluster emphasis is indicated by the following icons. Please note that 70% of the time should be focused on the Major Content. ◊ Major Content  □ Supporting Content**)**  ◊ **Apply and extend previous understandings of numbers to the system of rational numbers.**    **MGSE6.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.  **MGSE6.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.  **MGSE6.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.  **MGSE6.NS.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.  **MGSE6.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.  **MGSE6.NS.7** Understand ordering and absolute value of rational numbers.  **MGSE6.NS.7a** Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.  **MGSE6.NS.7b** Write, interpret, and explain statements of order for rational numbers in real-world contexts.  **MGSE6.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.  **MGSE6.NS.7d** Distinguish comparisons of absolute value from statements about order.  **MGSE6.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.  **Standards for Mathematical Practice**  ***SMP 1. Make sense of problems and persevere in solving them***.  Students make sense of problems involving points in the coordinate plane.   |  |  | | --- | --- | | **Students:** | **Because Teachers:** | | * Read the task carefully. * Draw pictures, diagrams, tables, or use objects to make sense of the task. * Discuss the meaning of the task with classmates. * Make choices about which solution path to take. * Try out potential solution paths and make changes as needed. * Check answers and makes sure solutions are reasonable and make sense. * Explore other ways to solve the task. * Persist in efforts to solve challenging tasks, even after reaching a point of frustration. | * Provide rich tasks aligned to the standards. * Allow students time to initiate a plan; uses question prompts as needed to assist students in developing a pathway. * Continually ask students if their plans and solutions make sense. * Question students to see connections to previous solution attempts and/or tasks to make sense of current task. * Consistently ask students to defend and justify their solution by comparing solution paths. * Provide appropriate time for students to engage in the productive struggle of problem-solving. * Differentiate to keep advanced students challenged during work time. |   ***SMP 2. Reason abstractly and quantitatively.***  Students demonstrate abstract reasoning about rational numbers with their visual representations. Students consider the values of these numbers in relation to distance (number lines).   |  |  | | --- | --- | | **Students:** | **Because Teachers:** | | * Use mathematical symbols to represent situations * Take quantities out of context to work with them (decontextualizing) * Put quantities back in context to see if they make sense (contextualizing) * Consider units when determining if the answer makes sense in terms of the situation | * Provide a variety of problems in different contexts that allow students to arrive at a solution in different ways * Use think aloud strategies as they model problem solving * Attentively listen for strategies students are using to solve problems |   ***SMP 4. Model with mathematics.***  Students use number lines to compare numbers and represent inequalities in mathematical and real-world contexts.   |  |  | | --- | --- | | **Students:** | **Because Teachers:** | | * Use mathematical models (i.e. formulas, equations, symbols) to solve problems in the world * Use appropriate tools such as objects, drawings, and tables to create mathematical models * Make connections between different mathematical representations (concrete, verbal, algebraic, numerical, graphical, pictorial, etc.) * Check to see if an answer makes sense within the context of a situation and changing the model as needed | * Provide opportunities for students to solve problems in real life contexts * Identify problem solving contexts connected to student interests |   ***SMP 6. Attend to precision.***  Students attend to the language of real-world situations to determine if positive or negative quantities/distances are being represented.   |  |  | | --- | --- | | **Students:** | **Because Teachers:** | | * Communicate precisely using clear language and accurate mathematics vocabulary * Decide when to estimate or give an exact answer * Calculate accurately and efficiently, expressing answers with an appropriate degree of precision * Use appropriate units; appropriately labeling diagrams and graphs | * Explicitly teach mathematics vocabulary. * Provide opportunities for students to check the accuracy of their work. * Consistently demand and model precision in communication and in mathematical solutions (*uses and models correct content terminology*). * Expect students to use precise mathematical vocabulary during mathematical conversations (*identifies incomplete responses and asks students to revise their response*). * Require students to answer tasks with complete sentences, including units. * Question students to identify symbols, quantities, and units in a clear manner. |   **Note:** All of the Standards for Mathematical Practice (SMPs) are critical to students fully and appropriately attending to the content. Not all SMPs will occur in every lesson, however SMPs 1, 3, and 6 should be regularly apparent. ***All SMPs should be taught in tandem with the content standards.*** |
| **Enduring Understandings** | In order to support deep conceptual learning it is important that student leave this unit experience with the following understandings:   * Rational numbers and integers allow us to represent quantities in situations that we could not represent with only whole numbers. * Number lines help students model the magnitude and distance of situations involving rational numbers.     Enduring Understandings adapted from:  Barnett-Clarke, C., Fisher, W., Marks, R., & Ross, S. (2010).  *Developing Essential Understanding of Rational Numbers for Teaching Mathematics in Grades 3 - 5. Reston, VA:  The National Council of Teachers of Mathematics, Inc.* |

# **Lesson One Progression**

**Duration 3 - 4 days**

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| --- | --- | --- | --- | --- | --- | --- |
| **Focus Standard(s)** | | | | | | |
| ***Apply and extend previous understandings of numbers to the system of rational numbers.***  **MGSE6.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.  **MGSE6.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.  ***\*These standards are supporting prerequisite that may have to be revisited.*** | | | | | | |
| **Performance Objectives** | | | | | | |
| **As a result of their engagement with this unit…** | | | | | | |
| **MGSE6.NS.5 -SWBAT** use positive and negative numbers together **IOT** describe quantities having opposite directions or quantities.  **MGSE6.NS.6a- SWBAT** recognize opposite numbers **IOT** describe location of opposites on a number line. | | | | | | |
| **Building Coherence** | | | | | | |
| **Across Grades:**  **Within Grades:** | | | | | | |
| **Terms and Definitions** | | | | | | |
| **Absolute value:** The distance between a number and zero on the number line. The symbol for absolute value is shown in the equation  Description: http://www.regentsprep.org/Regents/math/ALGEBRA/AO7/AbsGraph.jpg  **Distance:** amount of separation between 2 points.  **Integers:** The set of whole numbers and their opposites  **Magnitude:** Greatness in size or amount  **x-axis**: The horizontal number line on the Cartesian coordinate plane.  **y-axis**: The vertical number line on the Cartesian coordinate plane | | | | **Negative numbers:** The set of numbers with a value less than zero  **Opposite number:** Two different numbers that have the same absolute value. Example: 4 and are opposite numbers because both have an absolute value of 4. They are the same distance from zero, in *opposite* directions.  **Positive number:** The set of numbers whose value is greater than zero.  **Rational number:** The set of numbers that can be written in the form where *a* and *b* are integers and .  **Sign:** a symbol that indicates whether a number is positive or negative. Example: in , the sign hows this number is read “negative four”. | | |
| **Guiding Questions** | | | | | | |
| * When are negative numbers used and why are they important? * How can I use absolute value to find the lengths of the sides of polygons on the coordinate plane? * Why is it useful for me to know the absolute value of a number? * How do I use positive and negative numbers in everyday life? * How do I use positive and negative numbers to represent quantities in real-world contexts * What are opposites, and how are opposites shown on a number line? | | | | | | |
| **Interpretations and Reminders** | | | | | | |
| * The intention of this cluster (MGSE6.NS.5-8) is to begin study of the existence of negative numbers, their connection to positive numbers, and the implication and uses of absolute value. Beginning with examples of having/owing and above/below zero sets the stage for understanding that there is a mathematical way to describe opposites. * Students should already be familiar with the counting numbers (positive whole numbers and zero), as well as with fractions and decimals (also positive). They are now ready to understand that all numbers have an opposite. Generally, negative values are introduced with integers instead of with fractions and decimals. However, it is a mistake to stop with integers values because students must understand where numbers like −4.5 and −1 belong in relation to the integers. Students often place −1 between −1 and 0 instead of between −2 and −1. * Negative and positive rational numbers should be displayed on vertical or horizontal number lines, which then can be used to solve simple problems. Demonstration of understanding of positives and negatives involves translating among words, numbers and models: given the words “7 degrees below zero,” showing it on a thermometer and writing -7; given -4 on a number line, writing a real-life example and mathematically -4. | | | | | | |
| **Misconceptions** | | | | | | |
| * Students may not understand that larger negative numbers are smaller in value. * Students may confuse the absolute value symbol with the number one. | | | | | | |
| **Suggested Learning Experiences** | | | | | | |
| **Procedural Fluency:** (Recommended for 5 - 10 minutes each day: Fluency strategies are useful to activate student voice, solicit prior knowledge and develop fluency based on conceptual understandings.) For additional fluency practice strategies see the table at the end of this document.    Manuel is hiking up to a mountain top that is 1,207 feet above sea level. Stephanie scuba dived to 23 feet below sea level. What is the difference between these two measurements?  **Graduated Measure** (The graduated measure is a quick opportunity to diagnose students’ level of comfort with the material before you begin the progression.)  Student Directions: Select a question/problem from the table below that you feel best equipped to answer successfully.   |  |  |  | | --- | --- | --- | | **Beginning** | **Developing** | **Proficient** | | What is the opposite of -2 5/8? | Which point shows the location of on the number line?    How do you know? | Which of the following fractions is closest to 0? Justify your choice.  a)  b)  c)  d) |   **Gradual Release of Responsibility**  **Focus Lesson:**  Teachers should guide students to understanding the relationship of negative numbers to positive numbers, and the meaning and uses of absolute value. The examples of having/owing and above/below zero sets the stage for understanding that there is a mathematical way to describe opposites.  *(Adapted From Illustrative Math)*  Denver, Colorado is called “The Mile High City” because its elevation is 5280 feet above sea level. Someone tells you that the elevation of Death Valley, California is −282 feet.   1. Is Death Valley located above or below sea level? Explain. 2. How many feet higher is Denver than Death Valley? 3. **What would your elevation be if you were standing near the ocean?**   **5280 ft**  First explain to students that the best way to model this situation is using a vertical number line since the problem deals with elevation.  Next model that 0 represents sea level and that 5,280 is positive since it is above sea level while 282 is negative since it is below sea level.  Using the number line model absolute value while students observe.    **0 ft**  -282 ft      **Guided Practice:**  The temperature was 36°F in Salem. In Danville, the temperature was -22°F. In which city was the weather cooler? How many degrees warmer is it in Salem?    **36 Salem**  Lower tier students can receive a number line already created with temperatures to keep pace with the guided instruction.  **0**    **-22 Danville**  Model this problem with students by giving students a blank vertical number line and first placing a zero on the number line to represent 0 degrees to conceptualize the relationship between positive integers and negative integers. Engage students in conversation around why is the number line vertical as opposed to horizontal?  Next ask students the temperature of each city and their relationship to zero on the number line. Plot with students the location of 36 degrees and –22 degrees. Engage students in questioning, “Why is 36 above 0 degrees? Why is 22 below 0 degrees? “  Solve this problem with students and guide students to understand that the relationship to zero on the number line represents the solution to the problem. Danville is located below zero so its temperature is cooler.  Determine with students that the absolute value of 36 degrees is 36, the absolute value of -22 degrees is 22. Guide students to understand the second part of the problem can be answered as the difference between the two temperatures is 58 degrees. Salem is 58 degrees warmer than Danville.  Between noon and 11:00 p.m., Tyron recorded –19°F as the change in temperature. Which best describes the change in temperature?  A. The temperature decreased by 19°F by 11:00 p.m.  B. The temperature increased 19°F by 11:00 p.m.  C. The temperature was –19°F at 11:00 p.m.  D. The temperature was 19°F at 11:00 p.m.    **Collaborative Practice:**  Have students work collaboratively using number lines to solve the following problems.    Students should make the location of the integers in relation to zero and the absolute value of the integer part of the collaboration for each question.   * The temperature outside of Brandon's house is –5°F, while the temperature outside of Nick's house is 3°F. How many degrees warmer is the temperature outside of Nick's house? * The temperature outside in Bangor, Maine is 15°F. If the temperature falls 20 degrees, what will the new temperature be, in degrees Fahrenheit? * Last December, Laurel got on a plane in Chicago where it was –17°F. She flew to Acapulco where it was 82°F. What was the difference in temperature between Chicago and Acapulco, in degrees Fahrenheit?   **Independent Practice:**  Students should solve problems independently. In addition to the solution assess students understanding of the by having students creating models (number lines) and a writing to justifying their mathematical reasoning. Number lines can be given to the students with zero or other integers placed on the number lines for lower tier students.   * The lowest score at the Rolling Hills Golf Tournament was –13. The highest score was +18. What was the range of the scores at the tournament? * In Fairbanks, Alaska, the temperature was 13 degrees outside at midnight. The temperature went down to 17 degrees by 6am. What was the temperature at 6am? * Marjorie is standing atop Driskill Mountain, the highest point in Louisiana, 166 meters above sea level. Kendall is standing in New Orleans at the lowest point in Louisiana, at –3 meters above sea level. What is the difference in elevation between where Marjorie and Kendall are standing, in meters? * The lowest temperature ever recorded on Earth is –129°F. The highest temperature ever recorded on Earth is 136°F. What is the range of recorded temperatures on Earth, in degrees Fahrenheit?       The Blue Chargers football team had the ball on their own 20-yard line. On first down, they gained 4 yards and moved to the 24-yard line. On the next two downs, the Blue Chargers gained 4 yards and –6 yards, respectively. On what yard line were the Blue Chargers after 3 downs? | | | | | | |
| **Additional Unit Assessments** | | | | | | |
| **Assessment**  **Name** | **Assessment** | | **Assessment Type** | | **Standards Addressed** | **Cognitive Rigor** |
| What’s Your Sign? |  | | Scaffolding Task | | MGSE6.NS.5  MGSE6.NS.6a | DOK 2 |
| Is It Warmer in Miami? |  | | Learning Task | | MGSE6.NS.5  MGSE6.NS.6a | DOK 2 |
| Mile High |  | | Learning Task | | MGSE6.NS.5  MGSE6.NS.6a | DOK 2 |
| **Differentiated Supports** | | | | | | |
| *Learning Difficulty* | | *Students create visual models of* positive *and negative numbers to describe quantities having opposite directions or values*.   * *Provide number lines for students with integers and rational numbers.* * *Create vocabulary banks with examples of, debits/credits, elevation, and temperature.* * *Translate words into pictures/diagrams to represent quantities in real-world contexts.* * *YouTube or Learn zillion video of using number lines to recognize opposite signs.* * *Nearpod presentation app to reinforce concept of opposites, absolute values, changes in temperature.* | | | | |
| *High Achieving* | | *• Have students justifying their mathematical reasoning both orally and in writing when students are*  *• Have students create writing with transitional words explaining temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge* | | | | |
| *English as a Second Language* | | *• Students create visual models of* positive *and negative numbers to describe quantities having opposite directions or values*.   * *Provide number lines for students with integers and rational numbers.* * *Create vocabulary banks with examples of, debits/credits, elevation, and temperature.* * *Translate words into pictures/diagrams to represent quantities in real-world contexts.* * *YouTube or Learn zillion video of using number lines to recognize opposite signs.* * *Nearpod presentation app to reinforce concept of opposites, absolute values, changes in temperature.* | | | | |
| Online/Print Resources | | | | | | |
| Digital Resources | | **MGSE6.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.  <https://www.illustrativemathematics.org/content-standards/6/NS/C/5/tasks/277> <https://www.illustrativemathematics.org/content-standards/6/NS/C/5/tasks/278> <http://figurethis.nctm.org/challenges/c46/challenge.htm> | | | | |
| Print Resources | |  | | | | |
| Manipulatives and Tools | | Number lines, geoboards, grid paper, colored pencils, grid whiteboards | | | | |

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| --- | --- |
| **Textbook Alignment** | |
| MGSE6.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. | Chapter 12 p.835–836, 837–844, 845–846, 863–865  Lesson 1: Integers and Graphing  Inquiry Lab: Integers  Inquiry Lab: Absolute Value |
| MGSE6.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. | Chapter 12 p.837–844, 847–854  Lesson 1: Integers and Graphing  Lesson 2: Absolute Value |

# **Lesson Two Progression**

**Duration 8 - 10 days**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Focus Standard(s)** | | | | | | | |
| ***Apply and extend previous understandings of numbers to the system of rational numbers.***  **MGSE6.NS.7** Understand ordering and absolute value of rational numbers.  **MGSE6.NS.7a** Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.  **MGSE6.NS.7b** Write, interpret, and explain statements of order for rational numbers in real-world contexts.  **MGSE6.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.  **MGSE6.NS.7d** Distinguish comparisons of absolute value from statements about order. | | | | | | | |
| **Performance Objectives** | | | | | | | |
| **As a result of their engagement with this unit…** | | | | | | | |
| **MGSE6.NS.7a-SWBAT** use statements about relative position on the number line **IOT** interpret statements of inequality.  **MGSE6.NS.7b-SWBAT** write and compare rational numbers **IOT** explain and interpret statements of order in real-world contexts.  **MGSE6.NS.7c-SWBAT** understand and find absolute value on the number line **IOT** interpret absolute value statements as magnitude in real-world contexts.  **MGSE6.NS.7d-SWBAT** understand order and absolute value **IOT** distinguish comparisons of the two. | | | | | | | |
| **Building Coherence** | | | | | | | |
| |  | | --- | | **Across Grades:**  **Within Grades:** | | | | | | | | |
| **Terms and Definitions** | | | | | | | |
| **Absolute value:** The distance between a number and zero on the number line. The symbol for absolute value is shown in the equation .  **Distance:** amount of separation between 2 points.  **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  **Magnitude:** Greatness in size or amount | | | | | **Negative numbers:** The set of numbers with a value less than zero  **Opposite number:** Two different numbers that have the same absolute value. Example: 4 and are opposite numbers because both have an absolute value of 4. They are the same distance from zero, in *opposite* directions.  **Positive number:** The set of numbers whose value is greater than zero.  **Rational number:** The set of numbers that can be written in the form where *a* and *b* are integers and . | | |
| **Guiding Questions** | | | | | | | |
| * Why is it useful for me to know the absolute value of a number? * What are opposites, and how are opposites shown on a number line? * How do statements of inequality help me place numbers on a number line? * How can I use number lines to find the distances between points? | | | | | | | |
| **Interpretations and Reminders** | | | | | | | |
| * Number lines give the opportunity to model absolute value as the distance from zero. Simple comparisons can be made and order determined. Order can also be established and written mathematically: -3° C > -5° C or -5° C < -3° C. * Absolute values should be used to relate contextual problems to their meanings and solutions. Using number lines to model negative numbers, prove the distance between opposites, and understand the meaning of absolute value easily transfers to the creation and usage of four quadrant coordinate grids. * Students should be led to recognize the distance from zero as the absolute value or magnitude of a rational number and need multiple experiences to understand the relationships between numbers, absolute value, and statements about order. | | | | | | | |
| **Misconceptions** | | | | | | | |
| * Students may not understand that larger negative numbers are smaller in value. * Students may confuse the absolute value symbol with the number one. * Students might be confused when they work with the absolute values of negative numbers. For negative numbers, as the value of the number decreases, the absolute value increases. * Students may also erroneously think that taking the absolute value means to “change the sign of a number,” which is true for negative numbers but not for positive numbers or 0. | | | | | | | |
| **Suggested Learning Experiences** | | | | | | | |
| **Procedural Fluency:** (Recommended for 5 - 10 minutes each day: Fluency strategies are useful to activate student voice, solicit prior knowledge and develop fluency based on conceptual understandings.) For additional fluency practice strategies see the table at the end of this document.      A.Noah, Leon, Trenton, Makenzie  B.Trenton, Noah, Makenzie, Leon  C.Leon, Trenton, Noah, Makenzie  D.Makenzie, Trenton, Leon, Noah  **Graduated Measure** (The graduated measure is a quick opportunity to diagnose students’ level of comfort with the material before you begin the progression.)   |  |  |  | | --- | --- | --- | | **Beginning** | **Developing** | **Proficient** | | Graph the integer and its opposite on the number line. | Use the number line to compare the integers. Write < or >.     1. -8 \_\_ 7 2. 4 \_\_ -7 3. -16 \_\_ -6 4. 11 \_\_ -11 | Graph the integers on a number line. Then order them from least to greatest.   1. -6; 3; -5; 8      1. 6; -7; -8; 0 |   **Gradual Release of Responsibility**  Focus Lesson  Begin the focus lesson by showing students two number lines and modeling how integers can be renumbered when locating rational numbers on the number line.    Model the following problem to students using a number line to locate the rational numbers.  A scientist recorded the differences in weights of mice after a change in the diet and exercise routine. The differences were: 1 ½ ounce, 0.5 ounce, 2.5 ounce, and ¾ ounce. List the weight of the mice from least to greatest. What is the largest weight of the mice?    Model to students that the number line can be renumbered as halves and finding the decimal equivalent for 1 ½ and ¾. Model finding the decimal equivalent of 1 ½ =1.5 and ¾ =.75 along with modeling comparing the decimal equivalents.  1 ½ = 1.50  ¾ = .75  ½ = .50  Plot the rational numbers on the number line modeling for students how the location determines if the rational numbers are less or greater when comparing. For example ¾ is to the right of 0.5 since it is equivalent to .75 and 0.75 > .5    Guided Practice:  The difference in the runners’ goals and their actual times is shown. Use a number line to plot the runner’s differences from least to greatest.   |  |  | | --- | --- | | **Runner** | **Difference** | | **Sean** | **7/3** | | **Lacey** | **-5/2** | | **Maura** | **0** | | **Amos** | **-2** | | **Kenny** | **-12/4** | | **Andrea** | **-3.25** |         With students model that the number line can be broken into thirds between each integer then guide students to simplify 7/3 and that 7/3 =2 1/3.      Model with students the location of 2 1/3. What two integers is 2 1/3 between? Where between the two integers will we plot 2 1/3? Plot the point 2 1/3 with students on the number line. Guide students to simplify -5/2 and -12/4 and what two integers the rational numbers are between then plot -5/2.      Determine with students if any other rational numbers can be simplified to determine their location. Can we simplify -12/4? Will simplify this rational number determine its location? Plot the rational number -12/4 with students.  Guide students to determine if the decimal place value of -3.25 can determine its location on the number line. Is -3.25 to the left or right of -3? How many units will -3.25 be from -3?  Model with students setting -3.25=--3 25/100=-3 ¼. Last guide students to understanding the location of the remaining rational numbers and model for students the location and plotting of these numbers.        Collaborative Practice  Students will work collaboratively creating number lines, determining the location of rational numbers and plotting rational numbers on the number lines.  Tier the collaborative and independent practice by providing lower tier students with the number line created with integers and the location of one or two rational numbers.   * In one week, Kateira’s plant grew 0.58 inch, Stefano’s plant grew 1 − 2 inch, Kayla’s plant grew 0.4 inch, and Mirenda’s plant grew 5 −−11 inch. Find and list the rational numbers on a number line from least to greatest. * Paige wants to sell a certain number of roses each month. The difference between her goal and her actual sales is shown. Using a number line order the difference from least to greatest.  |  |  | | --- | --- | | Month | Difference | | January | -4 1/2 | | February | 6.8 | | March | 2 5/8 | | April | -1.7 |      * A submarine’s depth levels are recorded in the table at the below. Order the depth of the submarine on a number line from least to greatest.  |  | | --- | | Depth | | -4.3 | | -82.5 | | -42 4/5 | | -13 1/8 |   Independent Practice:  Students will work independently using number lines to locate and plot rational number lines. The independent practice can be furthered assessed by allowing students to justify their mathematical reasoning of determining the location of the points.   * Each homeroom recorded the difference in costs for making a movie from their budget. Which homeroom exceeded their budget the most? Justify your answer by plotting the differences on a number line from least to greatest.  |  |  | | --- | --- | | **Homeroom** | **Difference** | | **A** | **104 1/4** | | **B** | **-56.40** | | **C** | **104 2/5** | | **D** | **-32.5** |  * A runner wants to run the 100-meter dash in 13 seconds or less. The table shows the difference between his goal and his actual times. Order the differences from least to greatest on a number line      |  |  | | --- | --- | | Race | Difference Between Goals &Actual Times | | 1 | -1.2 | | 2 | 2 1/8 | | 3 | -2/3 | | 4 | 1.1 |               https://apsk12.edutrax.us/data/57787A1.jpg         https://apsk12.edutrax.us/data/57787A2.jpg  .         https://apsk12.edutrax.us/data/57787A3.jpg          https://apsk12.edutrax.us/data/57787A4.jpg    Additional Formative Assessment: Use the following example to allow student the opportunity to interpret and explain statements about position of rational numbers in context.  **Part 1:** 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.  Plot and label points P, Q, R, and T on the coordinate plane. https://gcps.desire2learn.com/d2l/lor/viewer/viewFile.d2lfile/6605/4865/cp2.jpg  **Part 2:** 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.  a. 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  b. 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  c. 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  d. When the diver swims to –10 feet, the diver’s distance to the ocean floor will be equal to the diver’s distance to the top of the water.   True  False | | | | | | | |
|  | | | | | | | |
| **Additional Unit Assessments** | | | | | | | |
| **Assessment**  **Name** | **Assessment** | | **Assessment Type** | | | **Standards Addressed** | **Cognitive Rigor** |
| Representing Rational Numbers on the Number Line |  | | Learning/Scaffolding Task | | | MGSE6.NS.7 MGSE.NS.7a MGSE6.NS.7b MGSE6.NS.7c MGSE6.NS.7d | DOK 2 |
| Absolute Value and Ordering |  | | Learning/Scaffolding  Task | | | MGSE6.NS.7 MGSE.NS.7a MGSE6.NS.7b MGSE6.NS.7c MGSE6.NS.7d | DOK 2 |
| Planning A Field Trip |  | | Learning/Scaffolding Task | | | MGSE6.NS.7 MGSE.NS.7a MGSE6.NS.7b MGSE6.NS.7c MGSE6.NS.7d | DOK 2 |
| **Differentiated Supports** | | | | | | | |
| *Learning Difficulty* | | *Students create visual models of* positive *and negative numbers to describe absolute value of rational numbers.*   * *Provide number lines for students with integers and rational numbers to scaffold ordering rational numbers.* * *Create vocabulary banks with examples of rational numbers, absolute value, comparing/ordering.* * *Translate words into pictures/diagrams to represent quantities in real-world contexts.* * *YouTube or Learn zillion video of using number lines to recognize opposite signs, locating rational number on number lines, comparing and ordering rational numbers.* * *Nearpod presentation app to reinforce concept of locating rational numbers on a number line, comparing and ordering rational numbers.* | | | | | |
| *High Achieving* | | *• Have students justifying their mathematical reasoning both orally and in writing when students are locating, ordering, and comparing rational numbers.*  *• Have students create open ended questions/word problems from number lines with rational numbers.* | | | | | |
| *English as a Second Language* | | *Students create visual models of* positive *and negative numbers to describe absolute value of rational numbers.*   * *Provide number lines for students with integers and rational numbers to scaffold ordering rational numbers.* * *Create vocabulary banks with examples of rational numbers, absolute value, comparing/ordering.* * *Translate words into pictures/diagrams to represent quantities in real-world contexts.* * *YouTube or Learn zillion video of using number lines to recognize opposite signs, locating rational number on number lines, comparing and ordering rational numbers.*   *Nearpod presentation app to reinforce concept of locating rational numbers on a number line, comparing and ordering rational numbers.* | | | | | |
|  | | | | | | | |
| Digital Resources | | **MGSE6.NS.7 Understand ordering and absolute value of rational numbers.**  [**https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/283**](https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/283)  [**https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/284**](https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/284)  [**https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/285**](https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/285)  [**https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/286**](https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/286)  [**https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/288**](https://www.illustrativemathematics.org/content-standards/6/NS/C/7/tasks/288)  [**http://ccsstoolbox.agilemind.com/parcc/middle\_1.html**](http://ccsstoolbox.agilemind.com/parcc/middle_1.html)  **MGSE6NS.7a** Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.  <http://www.yummymath.com/2014/weather-extremes/> | | | | | |
| Print Resources | |  | | | | | |
| Manipulatives and Tools | | Number lines, geoboards, grid paper, colored pencils, grid whiteboards | | | | | |
| **Textbook Alignment** | | | | | | | |
| MGSE6.NS.7 Understand ordering and absolute value of rational numbers. | | | | Chapter 12 p.845–846, 847–854, 855–862, 867–870, 871–878, 879–886  Lesson 2: Absolute Value  Lesson 3: Compare and Order Integers  Lesson 4:Terminating and Repeating Decimals  Lesson 5: Compare and Order Rational Numbers  Inquiry Lab: Absolute Value  Inquiry Lab: Number Line | | | |

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| --- | --- |
| MGSE6.NS.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. | Chapter 12 p.855–862, 871–878, 879–886  Lesson 3: Compare and Order Integers  Lesson 4:Terminating and Repeating Decimals  Lesson 5: Compare and Order Rational Numbers |
| MGSE6.NS.7b Write, interpret, and explain statements of order for rational numbers in real-world contexts. | Chapter 12 p.855–862, 879–886  Lesson 3: Compare and Order Integers  Lesson 5: Compare and Order Rational Numbers |
| MGSE6.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. | Chapter 12 p.845–846, 847–854  Lesson 2: Absolute Value  Inquiry Lab: Absolute Value |
| MGSE6.NS.7d Distinguish comparisons of absolute value from statements about order. | Chapter 12 p.845–846, 847–854, 855–862  Lesson 2: Absolute Value  Lesson 3: Compare and Order Integers  Inquiry Lab: Absolute Value |

# **Lesson Three Progression**

**Duration 3 - 4 days**

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| --- | --- | --- | --- | --- | --- | --- |
| **Focus Standard(s)** | | | | | | |
| **MGSE6.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.  **MGSE6.NS.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.  **MGSE6.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. | | | | | | |
| **Performance Objectives** | | | | | | |
| **As a result of their engagement with this unit…** | | | | | | |
| **MGSE6.NS.6**- **SWBAT** understand and extend rational numbers to negative numbers **IOT** represent points on the number line and on the coordinate plane.  **MGSE6.NS.6b**- **SWBAT** understand the signs of ordered pairs in all four quadrants **IOT** recognize and describe ordered pairs that only differ by signs as reflections across one or both axes.  **MGSE6.NS.6c**- **SWBAT** use horizontal number lines, vertical number lines, and the coordinate plane **IOT** represent points on the number line and on the coordinate plane. | | | | | | |
| **Building Coherence** | | | | | | |
| **Across Grades:**  **Within Grades:** | | | | | | |
| **Terms and Definitions** | | | | | | |
| **Absolute value:** The distance between a number and zero on the number line. The symbol for absolute value is shown in the equation .  **Cartesian Coordinate Plane:** A plane containing two perpendicular axes (x and y) intersecting at a point called origin (0, 0).  **Coordinates:** An ordered pair, , that locates a point in a plane.  **Distance:** amount of separation between 2 points.  **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  **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 | | | | **Negative numbers:** The set of numbers with a value less than zero  **Opposite number:** Two different numbers that have the same absolute value. Example: 4 and are opposite numbers because both have an absolute value of 4. They are the same distance from zero, in *opposite* directions.  **Ordered Pair:** A pair of numbers,, that indicate the position of a point on the Cartesian coordinate Plane.  **Origin:** The point of intersection of the vertical and horizontal axes of a Cartesian coordinate plane. The coordinates of the origin are (0, 0).  **Positive number:** The set of numbers whose value is greater than zero.  **Rational number:** The set of numbers that can be written in the form where *a* and *b* are integers and .  **Sign:** a symbol that indicates whether a number is positive or negative. Example: in , the sign hows this number is read “negative four”.  **Magnitude:** Greatness in size or amount | | |
| **Guiding Questions** | | | | | | |
| * When is graphing on the coordinate plane helpful? * What are opposites, and how are opposites shown on a number line? * How can I use coordinates to find the distances between points? * How can I use number lines to find the distances between points? * How can I use absolute value to find the lengths of the sides of polygons on the coordinate plane? | | | | | | |
| **Interpretations and Reminders** | | | | | | |
| * Using number lines to model negative numbers, prove the distance between opposites, and understand the meaning of absolute value easily transfers to the creation and usage of four quadrant coordinate grids. * Points can now be plotted in all four quadrants of a coordinate grid. * Differences between numbers can be found by counting the distance between numbers on the grid. Actual computation with negatives and positives is handled in Grade 7. * Students should be led to recognize the distance from zero as the absolute value or magnitude of a rational number and need multiple experiences to understand the relationships between numbers, absolute value, and statements about order. | | | | | | |
| **Misconceptions** | | | | | | |
| * Students may confuse the order of the quadrants numbering them incorrectly * May not plot points that are positioned on the x axis or y axis correctly * May interchange the x, y coordinates when locating points in quadrants. | | | | | | |
| **Suggested Learning Experiences** | | | | | | |
| **Procedural Fluency:** (Recommended for 5 - 10 minutes each day: Fluency strategies are useful to activate student voice, solicit prior knowledge and develop fluency based on conceptual understandings.) For additional fluency practice strategies see the table at the end of this document.        **Graduated Measure** (The graduated measure is a quick opportunity to diagnose students’ level of comfort with the material before you begin the progression.)  Student Directions: Select a question/problem from the table below that you feel best equipped to answer successfully. | | | | | | |
| |  |  |  | | --- | --- | --- | | **Beginning** | **Developing** | **Proficient** | |  |  | How are the points (4,9) and Q(-4,9) related? |     **Gradual Release of Responsibility**  As a reminder students have only experienced positive rational numbers before this unit. Begin this progression by modeling for students the four quadrants and how the value of the x and y coordinate in the ordered pairs determine the quadrant (location) of the point. Students should have real world experiences with plotting ordered pairs to help conceptualize the reflection of an ordered pair and determining its quadrant (location).      **Focus Lesson:**    Model for students that the signs of the x and y value determine the movement along the x and y axis. Plot the points (2, 4) and (2, -2). Model for students the reflection over the y axis occurs by changing the sign of the x coordinate to its opposite so (2,-2) reflected across the y axis is (-2,-2). The reflection of the new point (-2,-2) is then reflected over the x axis. Model for students that reflecting across the x axis is done by changing the y coordinate to its opposite. The new point reflected over the y axis is (-2, 2). Connect the points and the figure is a trapezoid.  **Guided Practice:**    Model with students plotting the points (-3,4) and (3,4). What quadrant is (-3,4) located in? What quadrant is (3,4) located in? Model with students what coordinate in (3,4) do we have to take the opposite of in order to reflect the point over the x-axis. Model with students plotting the new point and then the reflection over the y-axis. What figure is graphed on the map?  **Collaborative Practice:**        **Independent Practice:**  Morgan is drawing a map of the flower garden. He graphs the gate at (3, 4). He reflects (3, 4) across the *x*-axis. Then Morgan reflects the new point across the *y*-axis. Graph the points on the coordinate plane below. What figure is graphed on the map?        Which two points lie in the same quadrant when graphed on a coordinate plane?  **,****,** **,** | | | | | | |
| **Additional Unit Assessments** | | | | | | |
| **Assessment**  **Name** | **Assessment** | | **Assessment Type** | | **Standards Addressed** | **Cognitive Rigor** |
| Graphing on the Coordinate Plane |  | | Learning/Scaffolding Task | | MGSE6.NS.6 MGSE6.NS.6b MGSE6.NS.6c | DOK 2 |
| Reflecting Points |  | | Learning/Scaffolding Task | | MGSE6.NS.6 MGSE6.NS.6b MGSE6.NS.6c | DOK 2 |
| **Differentiated Supports** | | | | | | |
| *Learning Difficulty* | | *Students create visual models of* positive *and negative numbers to describe absolute value of rational numbers.*   * *Provide coordinate planes for students with axis numbered and certain points already given to students.* * *Create vocabulary banks with examples of reflection, origin, x axis, y axis, ordered pairs, quadrants.* * *Translate words into pictures/diagrams to represent reflections.* * *YouTube or Learn zillion video of plotting reflections, points in the coordinate plane.* * *Nearpod presentation app to reinforce reflections and locating points in certain Quadrants.* | | | | |
| *High Achieving* | | *• Have students justifying their mathematical reasoning both orally and in writing when students are locating, ordering, and comparing rational numbers.*  *• Have students create open ended questions/word problems from number lines with rational numbers.* | | | | |
| *English as a Second Language* | | *Students create visual models of* positive *and negative numbers to describe absolute value of rational numbers.*   * *Provide coordinate planes for students with axis numbered and certain points already given to students.* * *Create vocabulary banks with examples of reflection, origin, x axis, y axis, ordered pairs, quadrants.* * *Translate words into pictures/diagrams to represent reflections.* * *YouTube or Learn zillion video of plotting reflections, points in the coordinate plane.*   *Nearpod presentation app to reinforce reflections and locating points in certain Quadrants.* | | | | |
| **Online/Print Resources** | | | | | | |
| Digital Resources | | **MGSE6.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.  <https://www.illustrativemathematics.org/content-standards/6/NS/C/6/tasks/1665> <https://www.illustrativemathematics.org/content-standards/6/NS/C/6/tasks/1998> <https://www.illustrativemathematics.org/content-standards/6/NS/C/6/tasks/1999> <https://www.illustrativemathematics.org/content-standards/6/NS/C/6/tasks/2009> <http://www.shodor.org/interactivate/activities/GeneralCoordinates/> <https://www.mathsisfun.com/data/cartesian-coordinates-interactive.html> <http://www.explore.math.com/school/subject2/practice/S2U4L1/S2U4L1Pract.html> <http://www.oswego.org/ocsd-web/games/BillyBug2/bug2.html> <http://ccsstoolbox.agilemind.com/parcc/middle_1.html>  **MGSE6.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.  <http://mr-stadel.blogspot.com/2014/01/fun-with-dot-and-line.html> | | | | |
| Print Resources | |  | | | | |
| Manipulatives and Tools | | **Geoboards, Grid Paper, Grid Whiteboards, Color Pencils, Tape (Create Quadrants on Desk/Floor)** | | | | |

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| **Textbook Alignment** | |
| MGSE6.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. | Chapter 12 p.835–836, 837–844, 847–854, 867–870, 871–878,  879–886, 887–894, 895–902  Lesson 1: Integers and Graphing  Lesson 2: Absolute Value  Lesson 4: Terminating and Repeating Decimals  Lesson 5: Compare and Order Rational Numbers  Lesson 6: The Coordinate Plane  Lesson 7: Graph on the Coordinate Plane  Inquiry Lab: Integers Inquiry Lab: Number Lines |
| MGSE6.NS.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. | Chapter 12 p. 887–894, 895–902  Lesson 6: The Coordinate Plane  Lesson 7: Graph on the Coordinate Plane |
| MGSE6.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. | Chapter 12 p.835–836, 837–844, 867–870, 871–878, 879–886, 887–894, 895–902  Lesson 1: Integers and Graphing  Lesson 4: Terminating and Repeating Decimals  Lesson 5: Compare and Order Rational Numbers  Lesson 6: The Coordinate Plane  Lesson 7: Graph on the Coordinate Plane  Inquiry Lab: Integers  Inquiry Lab: Number Lines |

# **Lesson Four Progression**

**Duration 2 - 3 days**

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| **Focus Standard(s)** | | | | | | |
| **MGSE6.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. | | | | | | |
| **Performance Objectives** | | | | | | |
| **As a result of their engagement with this unit…** | | | | | | |
| **MGSE6.NS.8-**SWBAT graph points in all 4 quadrants and understand absolute value IOT solve real world and mathematical problems involving distances. | | | | | | |
| **Building Coherence** | | | | | | |
| **Across Grades:**  **Within Grades:** | | | | | | |
| **Terms and Definitions** | | | | | | |
| **Absolute value:** The distance between a number and zero on the number line. The symbol for absolute value is shown in the equation .  **Cartesian Coordinate Plane:** A plane containing two perpendicular axes (x and y) intersecting at a point called origin (0, 0).  **Coordinates:** An ordered pair, , that locates a point in a plane.  **Distance:** amount of separation between 2 points.  **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  **Magnitude:** Greatness in size or amount  **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 | | | | **Negative numbers:** The set of numbers with a value less than zero  **Opposite number:** Two different numbers that have the same absolute value. Example: 4 and are opposite numbers because both have an absolute value of 4. They are the same distance from zero, in *opposite* directions.  **Ordered Pair:** A pair of numbers,, that indicate the position of a point on the Cartesian coordinate Plane.  **Origin:** The point of intersection of the vertical and horizontal axes of a Cartesian coordinate plane. The coordinates of the origin are (0, 0).  **Positive number:** The set of numbers whose value is greater than zero.  **Quadrant:** One of the four regions on a Coordinate plane formed by the intersection of the x-axis and the y-axis.  **Rational number:** The set of numbers that can be written in the form where *a* and *b* are integers and .  **Sign:** a symbol that indicates whether a number is positive or negative. Example: in , the sign hows this number is read “negative four”.  **y-coordinate**:  The second number in an ordered pair; the position of a point relative to the horizontal axis | | |
| **Guiding Questions** | | | | | | |
| * When is graphing on the coordinate plane helpful? * What are opposites, and how are opposites shown on a number line? * How can I use coordinates to find the distances between points? * How can I use number lines to find the distances between points? | | | | | | |
| **Interpretations and Reminders** | | | | | | |
| •Using number lines to model negative numbers, prove the distance between opposites, and understand the meaning of absolute value easily transfers to the creation and usage of four quadrant coordinate grids.  • Points can now be plotted in all four quadrants of a coordinate grid. The distance between points in opposite quadrants can be found using the absolute value.  •Differences between numbers can be found by counting the distance between numbers on the grid. Actual computation with negatives and positives is handled in Grade 7.  •Students should be led to recognize the distance from zero as the absolute value or magnitude of a rational number and need multiple experiences to understand the relationships between numbers, absolute value, and statements about order. | | | | | | |
| **Misconceptions** | | | | | | |
| * Students may confuse the order of the quadrants numbering them incorrectly * May not plot points that are positioned on the x axis or y axis correctly * May not start at the origin when plotting and locating points * Students may miscount units when determining distance between points | | | | | | |
| **Suggested Learning Experiences** | | | | | | |
| **Procedural Fluency:** (Recommended for 5 - 10 minutes each day: Fluency strategies are useful to activate student voice, solicit prior knowledge and develop fluency based on conceptual understandings.) For additional fluency practice strategies see the table at the end of this document.  Have students analyze the problem and engage in “Math Talk” to discuss strategies to solve the problem.      **Graduated Measure** (The graduated measure is a quick opportunity to diagnose students’ level of comfort with the material before you begin the progression.)  Student Directions: Select a question/problem from the table below that you feel best equipped to answer successfully.   |  |  |  | | --- | --- | --- | | **Beginning** | **Developing** | **Proficient** | | Mrs. Palmer is placing a retaining wall around a garden. The coordinates of the vertices of the garden are (1, 1), (1, 5), (6, 5), and (1, 6). If each grid square has a length of 2 feet, find the perimeter of the garden. | Melinda is building a rectangular border around her bedroom window. The coordinates of the vertices of the border are (2, 3), (4, 3), (4, 7), and (2, 7). Each grid square has a length of 12 inches. Find the perimeter of the rectangle. | The Clayton family’s pool has vertices at the coordinates (0, 2), (0, 5), (2, 5), (2, 6), (5, 6), (5, 1), (2, 1), and (2, 2). If each grid square has an area of 9 square feet, what is the area of the pool? |   **Gradual Release of Responsibility**  This standard should be modeled using real world examples to ensure the standard is being taught in context. Students can determine the length of a side by counting however the standard calls for the student to use the coordinates.  Focus Lesson:  Model for students finding the distance (length) of the sides using the ordered pairs and subtracting the correct coordinates. Also use this opportunity to model strategies for students to organize their distances such as in a table or list.   |  |  | | --- | --- | | Entrance to Monkeys | 10-0=10 | | Monkeys to Gorillas | 7-0=7 | | Gorillas to Elephants | 10-7=3 | | Elephants to Tigers | 11-7=4 | | Tigers to Aquarium | 7-3=4 | | Aquarium to Rhinoceros | 11-7=4 | | Rhinoceros to Reptiles | 3-0=3 | | Reptiles to Entrance | 7-0=7 |   Each grid square on the zoo map below has a length of 200 feet. Find the total distance in feet around the zoo.      After displaying the distance (length) of the sides in a table model for students finding the total distance, in feet, around the zoo.      Guided Practice:  If the points on the coordinate plane below are the three vertices of a rectangle, what are the coordinates of the fourth vertex? How do you know? What are the length and width of the rectangle?    Guide students to understand that finding the width requires the subtraction of the y-coordinates while subtracting the x-coordinates determines the length.  **Length:** Subtract *x*-coordinates.  **Width:** Subtract *y*-coordinates.  To determine the distance along the x-axis between the point (-4, 2) and (2, 2) a student must recognize that -4 is | | or 4 units to the left of 0 and 2 is | | or 2 units to the right of zero, so the two points are total of 6 units apart along the x-axis. Students should represent this on the coordinate grid and numerically with an absolute value expression, | | +  **Collaborative Practice:**  Students will collaboratively solve problems by finding the distances between vertices. Make certain to include coordinates in context.  Listed below are the locations of six buildings that will be added to the above coordinate plane.   * Bank (-8,5) * School (-8,-6) * Park (4,5) * Post Office (-9,5) * Store (-9, -6)   For items a-d, select True or False for each statement based on the given information.   * + 1. The bank is closer to the school than the post office is from the store.   □True □False  b. The distance from the bank to the school is equal to |5|+|-6|  □True □False  c. The 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  d. The distance from the bank to the post office is equal to |8|+|-9|  □True □False  When images are not given, encourage students to draw a diagram.    Each grid square on the map has a length of 300 feet. The figure below represents the fencing around an apartment complex. What is the total distance of the fence?    **Independent Practice:**      What is the distance of the fence that surrounds the building on the grid?  CCSS_C1_Ch9_L5_Reteach1.jpg | | | | | | |
| **Additional Unit Assessments** | | | | | | |
| **Assessment**  **Name** | **Assessment** | | **Assessment Type** | | **Standards Addressed** | **Cognitive Rigor** |
| **Distances Between Points** |  | | Learning/Scaffolding Task | | MGSE6.NS.8 | DOK 2 |
| **Nome Alaska** |  | | Learning/Scaffolding Task | | MGSE6.NS.8 | DOK 2 |
| **Symbols of Inequality & The Coordinate System** |  | | Learning/Scaffolding Task | | MGSE6.NS.5 MGSE6.NS.8 | DOK 2/3 |
| **Sounds of The Band** |  | | Culminating Task | | MGSE6.NS.5 MGSE6.NS.6-6c MGSE6.NS.7-7d MGSE6.NS.8 MGSE6.G.3 | DOK 3/4 |
| **Differentiated Supports** | | | | | | |
| *Learning Difficulty* | | *Students create visual models of* polygons on the coordinate plane with some distances already determined for the student.   * *Provide coordinate planes for students with axis numbered and certain points already given to students.* * *Create vocabulary banks with examples of Area and Perimeter on a coordinate grid.* * *Translate words into pictures/diagrams to represent polygons on the grid and vertices.* * *YouTube or Learn zillion video of determining distance between vertices* * *Nearpod presentation app to reinforce drawing polygons and calculating the distances between the vertices.* | | | | |
| *High Achieving* | | *• Have students justifying their mathematical reasoning both orally and in writing when using the distances between vertices to solve real world problems.*  *• Have students create open ended questions/word problems with polygons on the coordinate plane.* | | | | |
| *English as a Second Language* | | *Students create visual models of* polygons on the coordinate plane with some distances already determined for the student.   * *Provide coordinate planes for students with axis numbered and certain points already given to students.* * *Create vocabulary banks with examples of Area and Perimeter on a coordinate grid.* * *Translate words into pictures/diagrams to represent polygons on the grid and vertices.* * *YouTube or Learn zillion video of determining distance between vertices* * *Nearpod presentation app to reinforce drawing polygons and calculating the distances between the vertices.* | | | | |
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| Digital Resources | | * <https://www.youtube.com/watch?v=1O12C9EcdFo> * <https://www.youtube.com/watch?v=K-YL2JHmcrg> * <https://www.engageny.org/resource/grade-6-mathematics-module-3-topic-c-lesson-18> * <https://learnzillion.com/resources/73005-graph-points-in-all-four-quadrants-on-the-coordinate-plane-to-solve-real-world-and-mathematical-problems-6-ns-c-8> * <http://learnzillion.com/lessonsets/192> A series of interactive online lessons and problems for 6.NS.8 * <http://www.mathopenref.com/coordblank.html> Math Open Reference - Coordinate Grid - Print Blank Grids | | | | |
| Print Resources | |  | | | | |
| Manipulatives and Tools | | Geoboards, Grid Paper, Grid Whiteboards, Color Pencils, Tape (Create Quadrants on Desk/Floor), Classroom objects on a large teacher created grid | | | | |

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| **Textbook Alignment** | |
| MGSE6.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. | Chapter 12 p.887–894, 895–902, 903–906, 907–914  Lesson 6: The Coordinate Plane  Lesson 7: Graph on the Coordinate Plane  Lesson 8: Polygons on the Coordinate plane  Inquiry Lab: Find the Distance on the Coordinate Plane |

# **Sample Fluency Strategies for Middle School**

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| **Number Talks** | Teachers can help students develop flexibility through Number Talks.  **Number Talks (The Norms):**   1. Students engage collaboratively in mental math.    1. (No Paper and Pencil) 2. Students discuss strategies in flexible groups for solving an open ended question. (5-10 minutes) 3. Students are not expected to come to a solution. The focus is “practice time” where students are developing higher order critical thinking skills. 4. Students share out strategies from their group in a whole group setting. 5. The same number talk may be revisited as an Exit Ticket or throughout the week to develop student’s processing skills and move towards the solution.   Also see: Jo Boaler Number Talks Videos |
| **Number of the Day** | Choose a number for the day. Ask students to tell you everything they know about that number. Give the students a number to consider each day. Students think of different ways to make that number. As you develop different number concepts in class, encourage your students to incorporate these concepts into the different ways they develop the number. |
| **Ordering Numbers** | Display a simple number line with two whole number coordinates, for example 0 and 1.    Have students work in pairs to come up with one fraction that could exist on that number line. Next ask each pair to come up to the board and insert their fraction. As more students add their numbers the task will get more difficult. Make sure students are justifying their choices verbally for the whole class. |
| **Picture This** | Provide students with a graph, or chart and ask them to come up with a contextual situation that makes the picture relevant |