Grade 6 Unit 4: Extending Rationals to Negatives

Unit Length: 10 days

Updated 9/23/19

UBD Stage One

Essential Questions

- How do negative rationals fit into the number line?
- What real-world applications use negative rational numbers?

Enduring Understandings

- Previous understandings of number and ordering extend to all rationals, including negative rational numbers. Negative rationals are seemingly "backwards" on the number line since it mirrors the positive side of the number line.
- Students should reference contexts from class problems including money applications, geometric references, and inequality situations.

Standards

Read an in depth explanation by the writers of the standards: Progressions

When attending to precision at grade level, use the highlighted words to communicate mathematically.

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

AR.MATH.CONTENT.6.NS.C.5

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

AR.MATH.CONTENT.6.NS.C.6

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

AR.MATH.CONTENT.6.NS.C.6.A

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.*

AR.MATH.CONTENT.6.NS.C.6.B

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.

AR.MATH.CONTENT.6.NS.C.6.C

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.

AR.MATH.CONTENT.6.NS.C.7
Understand ordering and absolute value of rational numbers.

AR.MATH.CONTENT.6.NS.C.7.A
Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right.*

AR.MATH.CONTENT.6.NS.C.7.B
Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write -3C > -7C to express the fact that -3C is warmer than -7C*.

AR.MATH.CONTENT.6.NS.C.7.C
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. *For example, for an account balance of -30 dollars, write |-30| = 30 to describe the size of the debt in dollars.*

AR.MATH.CONTENT.6.NS.C.7.D
Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.*

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

Reason about and solve inequalities

AR.MATH.CONTENT.6.EE.B.5
Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

AR.MATH.CONTENT.6.EE.B.8
Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

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

AR.MATH.CONTENT.6.G.A.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 these techniques in the context of solving real-world and mathematical problems.

UBD Stage Two- Tasks

These are common formative assessment tasks for discussion in PLCs.

- Student Self Assessment: 6 Unit 4 Target Scale
- 6 Unit 4 District Formative Assessment

UBD Stage Three- Additional Tasks

Choose tasks according to student thinking. If alternative tasks are used, please submit a copy to the District TOSA to help build unit problem banks.

The following badges are linked to language support tools to be used in conjunction with the UbD units created by the district ToSAs.

Language Support, Notetaker, and Structured Student Talk Badges (NT)						
Cause and Effect	Compare Contrast	Question & Conjecture	Explain & Describe	Proposition Support	Sequence	Multiple Representations
L	L	L	L	L	L	
NT	NT	NT	NT	NT	NT	NT
Think Write Pair Share	Give One, Get One	Talking Stick	Lines of Communication	Agree, Agree, Disagree	Collaboration PlanIT	Act Aspire Support
SST	SST	SST	SST	SST		ACT Aspire

The following table represents beginning levels of technology integration, as written, within the lessons. Increased levels can occur from changes in delivery.

Substitution  **Augmentation**  **Modification**  **Redefinition** 	**S**: Technology acts as a direct tool substitute with no functional change **A**: Technology acts as a direct tool substitute with functional improvement **M**: Technology allows for significant project/task redesign **R**: Technology allows for the creation of new tasks – previously inconceivable

Enduring Understanding: Previous understandings of number and ordering extend to all rationals, including negative rational numbers.			
Essential Questions: How do negative rationals fit into the number line? What real-world applications use negative rational numbers?			10 days
Language Support Companion Planner This document can help add language scaffolds to any lesson			
Learning Goal	**Task (possible SAMR)**	**Class Starter/ Exit Slip**	**Extension/ Scaffolding**
Students will understand a rational number as a point on a horizontal and vertical number line and will describe and elaborate their relative positions by speaking.	Temperature Sort and Number Line Expansion		Extra Practice: Cards for Comparing Instruction Page Cards Page 1 Cards Page 2
Students will propose and support reasons for different orders of rational numbers by writing sentences.	The Ordering Game and The Ordering Game Follow Up And Comparing Temperatures Adapted from: Illustrative Math	*Talk about use of inequality symbols, identifying on a number line.* Class Starters- Rationals Use 1-2 each day throughout the unit to start the class	
Required: Collect and Report Data Give this DFA question as a class starter or exit slip.	DFA 6 Unit 4.1		Timing: Reg Ed: *5 min* ELL: *10 or 15 min* (according to LEP)
Students will understand the absolute value of a rational number as its distance from zero on the number line and will be able to describe the meaning of absolute value.	Wrestling Weights	Class Starter: Absolute Value Matching Cards Instruction Page for Teachers Cards Page 1 Cards Page 2	
Students will distinguish comparisons of absolute value from statements about order by writing comparison statements.	Opposites	Class Starter: Pressure Readings Possible HW or Extra Practice: Decimal Maze Use as a homework assignment to review decimal operations	Extension: Jumping Flea Use Screencastify to show the flea's jumps in the problem. Answer all problems in the narration. Share screencast with absent students.
Students will find and position rational numbers on a horizontal number line and will	Desmos: Inequalities	Class Starters: True or False Inequalities	

make inequality statements by describing and explaining their discoveries.			
Required: Collect and Report Data Give this DFA question as a class starter or exit slip.	DFA 6 Unit 4.2		Timing: Reg Ed: *2 min* ELL: *4 or 6 min* (according to LEP)
Students will write an inequality to represent a constraint and will represent the solution on a number line and will be able to describe the graph.	Overspending and Pete's Pumpkin Patch	Number Balls Game Use as a homework assignment or an activity for kids who finish their work early. It is not intended to be used whole class.	All About Graphing Inequalities- For Teachers Pete's and Fishing Adventures Slides Collaboration PlanIT
Students will represent a constraint with an inequality and be able to describe their solution in a sentence.	Fishing Adventures	Class Starter or HW: Number Line Practice Use towards the end of the unit when students have had multiple contextual experiences with rational numbers.	6HC14 Fishing Adventures 6HC14 Rubric Honors Challenge
Required: Collect and Report Data Give this DFA question as a class starter or exit slip.	DFA 6 Unit 4.3	Timing: Reg Ed: *5 min* ELL: *10 or 15 min* (according to LEP)	Additional Lesson: Inequalities Slides Collaboration PlanIT
Students will use the coordinate plane to find distances and to describe the figures created and solve real world problems and will be able to question and conjecture by writing.	Paul's Neighborhood And Johanna's Path	Class Starter: Library on a Map SUBSTITUTION	Extension HC: 6HC15 Mars Exploration 6HC15Rubric Honors Challenge
Required: Collect and Report Data Give this DFA question as a class starter or exit slip.	DFA 6 Unit 4.4 6 Unit 4.5		Timing: Reg Ed: *7 min* ELL: *14 or 21 min* (according to LEP)
Students will graph polygons in the coordinate plane and will be able to describe and elaborate the shapes formed.	Polygons in the Plane Illustrative Math Teacher Page *Length of sides?* Geogebra: plot points and create polygons online. Add axes and grid. MODIFICATION	Class Starter: What am I?	Extension HC: 6HC16 Walking the block 6HC16 Rubric Honors Challenge

Considerations for 6th Grade Unit 4: Extending Rationals to Negatives
Where do I start? What should they know?

Expressions, Equations, and Two-Dimensional Geometry-

5.G.1
Use axes to define a coordinate system. Define the origin, x-axis, y-axis, x-coordinate, y-coordinate
5.G.2
Graph in quadrant 1 of the coordinate plane.
4.MD.2
Use 4 operations to solve word problems.
4.NF.6
Use decimal notation for fractions with denominators of 10 or 100.
3.NF.2a
Represent a fraction 1/b on a number line diagram by defining the interval 0 to 1 as the whole and partitioning it into b equal parts.
3.NF.2b
Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0.
3.MD.1
Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes e.g., by representing the problem on a number line.

Considerations for 6th Grade Unit 4: Extending Rational to Negatives
What do they need to be ready for? Where are they going?

Transformational Geometry, Linear Equations

7.NS.1
Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal and vertical number line.
7.NS.2
Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
7.NS.3
Solve real-world and mathematical problems involving the four operations with rational numbers.
7.EE.4b
Solve word problems leading to inequalities of the form $px+q>r$ or $px+q<r$. Graph the solution set of the inequality and interpret it in the context of the problem.
7.G.3
Describe the cross-sections that result from slicing 3-d figures.
8.NS.1

Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
8.NS.2
Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on the number line diagram, and estimate the value of expressions.

Common Core Standards Writing Team. (2013, September 19). Progressions for the Common Core State Standards in Mathematics (draft). Grades K–5, Geometry. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.

Common Core Standards Writing Team. (2011, December 26). Progressions for the Common Core State Standards in Mathematics (draft). Grades 6–7, Ratios and Proportional Relationships. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.