Gym Use (ECR)

Overview

Students are asked to write and use expressions representing basketball field goals and gym membership fees.

Standards

Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*

c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $v = s^3$ *and* $A = 6s^2$ *to find the volume and surface area of a cube with side lengths* $s = ½$.

Reason about and solve one-variable equations and inequalities.

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.

6.EE.B.7 Solve real-world and mathematical problems by writing and solving equation of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.EE.A.2a	• 5.OA.A.2 • 5.OA.B.3	1. Write an expression to represent "the sum of a number and 9." a. *n + 9* 2. Write an expression to represent "Linzey makes some cookies, and John makes 6 more." a. c + 6	• http://www.illustrativemathematics.org/illustrations/556 • http://www.illustrativemathematics.org/illustrations/590 • http://learnzillion.com/lessonsets/69-read-write-and-evaluate-algebraic-expressions
6.EE.A.2c	• 5.OA.A.2 • 5.OA.B.3	1. What is the value of 3x if x = 5? a. 15 2. What is the value of x + 15 if x = 12? a. 27	• http://www.illustrativemathematics.org/illustrations/139 • http://learnzillion.com/lessonsets/69-read-write-and-evaluate-algebraic-expressions
6.EE.B.6	• 6.EE.A.2	1. If 3n is equal to 36, then what does the *n* represent? a. 12 2. If 5n is equal to 25, then what does 4n represent?	• http://www.illustrativemathematics.org/illustrations/421 • http://www.illustrativemathematics.org/illustrations/540 • http://learnzillion.com/lessonsets/556-

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
		a. 20 3. http://www.illustrativemathematics.org/illustrations/425	understand-that-variables-represent-unknown-numbers-and-use-variables-to-solve-problems • http://learnzillion.com/lessonsets/490-use-variables-to-represent-numbers-and-write-expressions-to-solve-problems
6.EE.B.7	• 5.NF.A.1 • 5.NF.B.4 • 6.NS.A.1	1. Solve 5m = 60. a. m = 12 2. Solve 6 + w = 12. a. w = 6 3. http://www.illustrativemathematics.org/illustrations/1107	• http://learnzillion.com/lessonsets/577-solve-problems-by-writing-and-solving-equations-of-the-form-x-p-q-and-px-q • http://learnzillion.com/lessonsets/269-solve-problems-with-equations-xpq-and-pxq • http://learnzillion.com/lessonsets/72-write-problems-using-algebraic-expressions

Real-World Preparation: The following question will prepare students for some of the real-world components of this task:

What is a gym membership fee? A gym membership fee is an amount paid for a set time of use at a gym. For example, a yearly membership could be purchased. This membership would allow a member to use the gym for a year.

After the Task

Students may struggle with determining how many goals the two people make during the last 20 minutes. They may want to solve for the whole time. This could be a misunderstanding of the question or an inability to understand the parts of the expression and what they mean. They may copy totals from the table when answering questions about the gym membership.

Student Extended Constructed Response

1. Suzy is shooting basketballs at Bob's Gym. She makes 9 field goals. After 10 minutes, her friend Joshua joins her. They shoot basketballs together for another 20 minutes.

   a. Write an expression for the total number of field goals Suzy and Joshua make during the 30 minutes they spend at the gym. Be sure to define the variable used in the expression.

   b. Altogether, Suzy and Joshua made 27 goals. Use the expression you created to determine the number of field goals they made in the last 20 minutes. Explain your thinking.

2. The following chart details monthly membership costs at Bob's Gym.

Number of Months	Cost ($)
3	60
5	100
9	180

   a. Write an expression to represent the cost of (*m*) number of months of gym use.

   b. Suzy wants to purchase a 7-month membership. How much will the membership cost? Justify your answer.

   c. If she has $250, what is the maximum number of months for which she can purchase a membership? Justify your answer.

Extended Constructed Response Exemplar Response

1. Suzy is shooting basketballs at Bob's Gym. She makes 9 field goals. After 10 minutes, her friend Joshua joins her. They shoot basketballs together for another 20 minutes.

   a. Write an expression for the total number of field goals Suzy and Joshua make during the 30 minutes they spend at the gym. Be sure to define the variable used in the expression.
   b + 9; b represents the number of baskets that Suzy and Joshua make together during the last 20 minutes.

   b. Altogether, Suzy and Joshua made 27 goals. Use the expression you created to determine the number of goals they made in the last 20 minutes. Explain your thinking.
   Since they scored 27 field goals over 30 minutes, b + 9 = 27. I have to take away the 9 scored by Suzy, which leaves 18 goals scored during the last 20 minutes.

2. The following chart details monthly membership costs at Bob's Gym.

Number of Months	Cost ($)
3	60
5	100
9	180

   a. Write an expression to represent the cost of *m* (number of months) for gym use.
   The cost is 20m.

   b. Suzy wants to purchase a 7-month membership. How much will the membership cost? Justify your answer.
   20(7) = 140; A 7-month membership will cost her $140.

   c. With $250 to spend, what is the maximum number of months for which she can purchase a membership? Justify your answer.
   Suzy can purchase a membership for a maximum of 12 months because 20 (12) = 240. Since she only has $10 left, she cannot purchase the 13th month.

Student Council Popcorn Sales (ECR)

Overview

This task requires students to write and identify equivalent expressions to find the amount of popcorn sold. Students are asked specifically to use the distributive property to write some expressions. Students will also have to use variables to write expressions and use substitution to show that the expressions are equivalent.

Standards

6.EE.A.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms*.

6.EE.A.3 Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y*.

6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for*.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items :
6.EE.A.2b	• 5.OA.A.2 • 5.OA.B.3 • 6.EE.A.1	1. Write an equivalent expression for 5 + 4 + 5 + 4 + 8 + 10 2. 2(5+4) + 8 + 10 (other answers are possible) 3. Identify the factors in the problem 4(5 + 9) 4. The factors are 4 and (5+9) 5. http://www.illustrativemathematics.org/illustrations/540	• http://www.illustrativemathematics.org/illustrations/556 • http://www.illustrativemathematics.org/illustrations/590 • http://www.illustrativemathematics.org/illustrations/532 • http://learnzillion.com/lessonsets/198-write-read-and-evaluate-expressions-in-which-letters-stand-for-numbers
6.EE.A.3	• 1.OA.B.3 • 3.OA.B.5 • 5.OA.A.2 • 6.NS.B.4 • 6.EE.A.2	1. Use the distributive property to rewrite the expression 4(3y + 6x) a. 12y + 24x	• http://www.illustrativemathematics.org/illustrations/139 • http://www.illustrativemathematics.org/illustrations/139 • http://www.illustrativemathematics.org/illustrations/255 • http://learnzillion.com/lessonsets/567-apply-properties-of-operations-to-generate-equivalent-expressions • http://learnzillion.com/lessonsets/480-apply-properties-of-operations-to-generate-equivalent-expressions

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items :
			• http://learnzillion.com/lessonsets/237-apply-properties-of-operations-to-generate-equivalent-expressions
6.EE.A.4	• 1.OA.B.3 • 3.OA.B.5 • 5.OA.A.2 • 6.NS.B.4 • 6.EE.A.2	1. Rewrite 3x + 3x + 6y + 6y using the distributive property a. 2(3x + 6y) 2. http://www.illustrativemathematics.org/illustrations/542 3. http://www.illustrativemathematics.org/illustrations/461	• http://www.illustrativemathematics.org/illustrations/421 • http://learnzillion.com/lessonsets/238-identify-when-two-expressions-are-equivalent • http://learnzillion.com/lessonsets/71-identify-equivalent-equations-using-balancing-scales

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

What is a student council? A student council is an organization of students within a school that helps organize fundraisers, dances, activities, and events at a school.

After the Task

This task shows students how to use expressions to help them solve and organize real-life problems. Have students find equivalent expressions using the other students in the table. Students can also substitute in dollar amounts for the expression used in part c and calculate the total amount of money Alysha and Cedric made. You could also assign values to the other student council members and have students find the total amount of money earned over the two-day period.

Student Extended Constructed Response

Student Council Popcorn Sale

The student council at Hillcrest Middle School is having a popcorn sale to raise money for an upcoming school dance. The table below represents the total number of boxes sold by student council members over a two-day period.

	Jonna	Cedric	Miles	Alysha
Thursday	9	8	5	6
Friday	10	8	7	6

a. Which expressions represent the number of boxes of popcorn that Jonna, Cedric, Miles, and Alysha sold both days? Choose all that apply.

   a.) 2(8) + 2(6) + 19 + 12
   b.) 9 + 8 + 5 + 6
   c.) 19 + 16 + 2(12)
   d.) 9 + 10 + 2(6) + 2(8) + 5 + 7
   e.) 8 + 8 + 6 + 6 + 9 + 7

b. The expression 2(8+6) can be used to find the amount of popcorn sold by Alisha and Cedric. Identify the factors used in the expression.

c. The student council realized not everyone would like the same type of popcorn, so Cedric sold butter popcorn, and Alysha sold caramel popcorn. Cedric sold his butter popcorn for *x* dollars, and Alysha sold her caramel popcorn for *y* dollars. Write two equivalent expressions that could be used to find the total amount of money collected by Cedric and Alysha on Thursday and Friday. One of the expressions must demonstrate the distributive property. Explain how you know the expressions you have written are equivalent.

Extended Constructed Response Exemplar Response

Student Council Popcorn Sale

The student council at Hillcrest Middle School is having a popcorn sale to raise money for an upcoming school dance. The table below represents the total number of boxes sold by student council members over a two-day period.

	Jonna	Cedric	Miles	Alysha
Thursday	9	8	5	6
Friday	10	8	7	6

a. Which expressions represent the number of boxes of popcorn that Jonna, Cedric, Miles, and Alysha sold both days? Choose all that apply.

a.) 2(8) + 2(6) + 19 + 12
b.) 9 + 8 + 5 + 6
c.) 19 + 16 + 2(12)
d.) 9 + 10 + 2(6) + 2(8) + 5 + 7
e.) 8 + 8 + 6 + 6 + 9 + 7

Of the choices above, a, c, and d are equivalent expressions that represent the total amount of popcorn sold over the two-day period for all four students.

b. The expression 2(8+6) can be used to find the amount of popcorn sold by Alysha and Cedric over the two-day period. Identify the factors used in the expression.

The factors are 2 and (8 + 6)

c. The student council realized not everyone would like the same variety of popcorn, so Cedric sold butter popcorn, and Alysha sold caramel popcorn. Cedric sold his butter popcorn for *x* dollars, and Alysha sold her caramel popcorn for *y* dollars. Write two equivalent expressions that could be used to find the total amount of money collected by Cedric and Alysha on Thursday and Friday. One of the expressions must demonstrate the distributive property. Explain how you know the expressions you have written are equivalent.

Sample Answers: 6x + 6x + 8y + 8y; 8y + 8y + 6x + 6x; 2(6x + 8y); 2(8y + 6x)

**Note there are other equivalent forms that can be used, as long as one of the expressions involves the distributive property.*

Students can explain their reasoning through substitution, as long as they show equivalency. A sample explanation is given below:

I know that 6x + 6x + 8y + 8y and 2(6x + 8y) are equivalent because if I let x = 2 and y = 4, I can substitute the values for the variables. Because both expressions have the same value when I evaluate them, the expressions are equivalent.

6(2) + 6(2) + 8(4) + 8(4)	*2[6(2) + 8(4)]*
12 + 12 + 32 +32	*2(12+32)*
88	*2(44)*
	88

Cutting Grass (ECR)

Overview

This instructional task requires students to use division of fractions by fractions to solve word problems.

Standards

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.NS.A.1	• 3.OA.B.6 • 5.NF.B.7	1. $\frac{3}{4} \div \frac{2}{3} = \frac{9}{8}$ 2. What is the area of a rectangle with length $\frac{7}{8}$ $foot$ and width $\frac{2}{3}$ $foot$? $\frac{7}{12}$ $square\ feet$ 3. http://www.illustrativemathematics.org/illustrations/692 4. http://www.illustrativemathematics.org/illustrations/50 5. http://www.illustrativemathematics.org/illustrations/267	• http://www.illustrativemathematics.org/illustrations/12 • http://www.illustrativemathematics.org/illustrations/829 • http://www.illustrativemathematics.org/illustrations/1196 • http://learnzillion.com/lessonsets/701-interpret-and-compute-quotients-of-fractions • http://learnzillion.com/lessonsets/13-divide-fractions-by-fractions

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

1. What is a lawn mower? A lawn mower is a machine used to cut grass.
2. What is a gas can? A gas can is a container used to hold gas until you are ready to pour it into a machine.
3. If I am cutting grass, do I need to know the area or perimeter of the lot? This question is designed to ensure that students do not confuse area and perimeter. As you are explaining that students need to know the area of the lot, you can clarify any questions about what it means to cut grass.
4. What do you remember about volume? Volume is how much a container can hold—the capacity of a container.

After the Task

This task shows students how fractions appear in the real world. Remind students that most of the time real-world problems will involve fractions—not always simple numbers or integers. Have students write a word problem using division of fractions.

Student Extended Constructed Response

The lot next to Michael's house is empty. He wants to use it to play soccer with his friends, so he is going to cut the grass. Answer the following questions.

1. Michael's lawn mower requires $\frac{1}{3}$ of a gallon of gas to cut grass for one hour. He has $\frac{5}{6}$ of a gallon of gas in a gas can. How long can Michael cut the grass with this amount of gas? Show how you found your answer.

2. How wide is the rectangular lot if it has a length of $100\frac{1}{2}$ feet and an area of $5100\frac{3}{8}$ square feet? Show your work.

3. How long will it take Michael to cut the lot if he can cut $2550\frac{3}{16}$ square feet per hour? Show your work.

4. Does Michael have enough gas in his can to cut the lot? Justify your response.

5. Michael finds a second gas can in his garage. He uses $\frac{1}{4}$ of a gallon of the gas in the second gas can to cut the lot. If this is $\frac{2}{3}$ of the amount of gas that was originally in the second gas can, how much gas did Michael have in the second gas can when he started? Show your work.

Extended Constructed Response Exemplar Response

The lot next to Michael's house is empty. He wants to use it to play soccer with his friends, so he is going to cut the grass. Answer the following questions.

1. Michael's lawn mower requires $\frac{1}{3}$ of a gallon of gas to cut grass for one hour. He has $\frac{5}{6}$ of a gallon of gas in a gas can. How long can Michael cut the grass with this amount of gas? Show how you found your answer.

$$\frac{5}{6} \div \frac{1}{3} = \frac{5}{6} \times \frac{3}{1} = \frac{5}{2}\ hours\ or\ 2\frac{1}{2}\ hours$$

2. How wide is the rectangular lot if it has a length of $100\frac{1}{2}$ feet and an area of $5100\frac{3}{8}$ square feet? Show your work.

$$Area = length \times width$$

$$5100\frac{3}{8} = 100\frac{1}{2} \times width$$

$$width = 5100\frac{3}{8} \div 100\frac{1}{2}$$

$$width = 50\frac{3}{4}\ feet$$

3. How long will it take Michael to cut the lot if he can cut $2550\frac{3}{16}$ square feet per hour? Show your work.

$$5100\frac{3}{8} \div 2550\frac{3}{16}$$

$$\frac{40803}{8} \div \frac{40803}{16}$$

$$\frac{40803}{8} \times \frac{16}{40803}$$

$$\frac{40803 \times 16}{8 \times 40803}$$

It would take 2 hours.

4. Does Michael have enough gas in his can to cut the lot? Justify your response.

Yes, you do have enough gas to cut your lot.

You have enough gas to cut grass for $2\frac{1}{2}\ hours$. *It will take* $2\ hours$ *to cut your lot.*

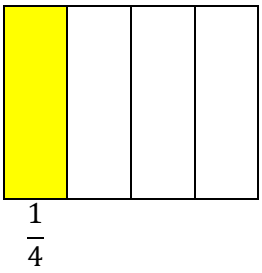
$$2\frac{1}{2}\ hours > 2\ hours$$

5. Michael finds a second gas can in his garage. He uses $\frac{1}{4}$ of a gallon of the gas in the second gas can to cut the lot. If this is $\frac{2}{3}$ of the amount of gas that was originally in the second gas can, how much gas did Michael have in the second gas can when he started? Show your work.

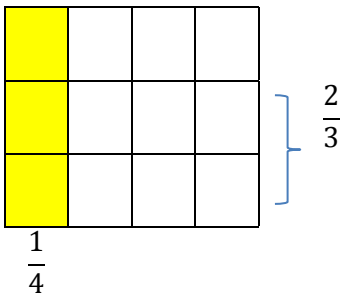
$$\frac{1}{4} \div \frac{2}{3} = \frac{1}{4} \times \frac{3}{2} = \frac{3}{8}\ gallon$$

Alternate solution method (students would likely only draw the diagram—the explanation is provided for understanding):

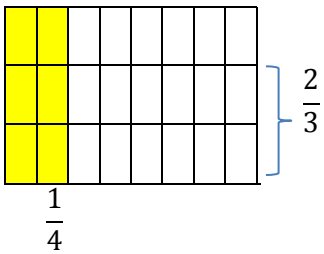
- *This model represents $\frac{1}{4}$.*



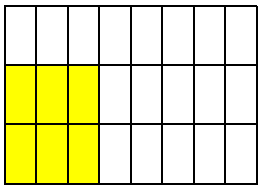
- *This model superimposes a square portioned into thirds horizontally onto the original model.*



- *Now we know the yellow $\frac{1}{4}$ area and the size of one of the factors that made that area. We have to subdivide the $\frac{1}{4}$ squares to make $\frac{1}{8}$ squares because we need to have pieces that will fit into the height that represents the 2/3 factor.*

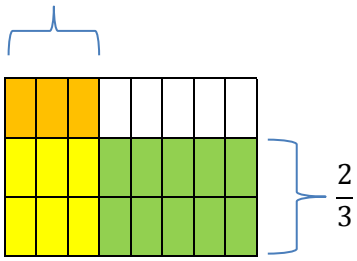


- *The product of 2/3 and another factor (the quotient) defines an area equivalent in size to 1/4. To find the quotient, move the top part of the yellow area so that it is the same height as the 2/3 factor.*



$$\frac{1}{4} \div \frac{2}{3}$$

- *Now shade the squares to the right and above the yellow area in order to see the factors one would multiply to find ¼.* ?



$$\frac{2}{3} \times ? = \frac{1}{4}$$

We know that $\frac{1}{4} \div \frac{2}{3}$ *can be thought of as* $\frac{2}{3} \times ? = \frac{1}{4}$*. There are 6 yellow parts out of 24 parts in all. The yellow area is* $\frac{1}{4}$ *of the rectangle. We know that one of the factors is* $\frac{2}{3}$*. From the orange and white areas of the rectangle, we can see that the other factor is* $\frac{3}{8}$*. Therefore* $\frac{1}{4} \div \frac{2}{3} = \frac{3}{8}$*.*

Low Temperatures (ECR)

Overview

Students will answer questions about positive and negative integers, including representing integers on a number line, comparing integers in the context of a real-world situation, and demonstrating an understanding of absolute value.

Standards

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

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.

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.

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.

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

a. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write* $-3℃ > -7℃$ *to express the fact that* $-3℃$ *is warmer than* $-7℃$.
b. 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 –3- dollars, write* $|-30| = 30$ *to describe the size of the debt in dollars.*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items :
6.NS.C.5		1. What integer would you use to represent that New Orleans is 6 feet below sea level? a. *–6* 2. Which rational number would you use to represent a deposit of $15.36 to your bank account? a. *15.36* 3. http://www.illustrativemathematics.org/illustrations/278	• http://learnzillion.com/lessonsets/447-understand-the-relationship-between-positive-and-negative-numbers-interpret-zero-and-positive-or-negative-numbers-in-realworld-contexts • http://learnzillion.com/lessonsets/94-understand-how-positive-and-negative-numbers-describe-quantities
6.NS.C.6a	• 3.NF.A.2	1. What number is opposite of 25 on the	• http://www.illustrativemathematics.org/illust

		number line? a. *–25* 2. What is the value of –(–6)? *a. 6*	rations/169 • http://www.illustrativemathematics.org/illustrations/172 • http://learnzillion.com/lessonsets/210-position-numbers-and-their-opposites-on-a-number-line
6.NS.C.7b	• 6.NS.C.6c	1. New Orleans, Louisiana, has an elevation of –8 ft. Death Valley in California has an elevation of –282 ft Write an inequality to compare the elevations of these two places. Explain what your inequality means in terms of elevation. a. *–8 ft> –282 ft ; This means that an elevation of –8 ft is higher than an elevation of –282 ft.* 2. http://www.illustrativemathematics.org/illustrations/285	• http://learnzillion.com/lessonsets/138-interpret-statements-of-inequality-and-write-interpret-and-explain-statements-of-order-for-rational-numbers
6.NS.C.7c	• 6.NS.C.6a	1. The point *A* is placed on a number line such that its absolute value is 14. Which two integers could represent the location of point *A* on the number line? a. *14 or –14*	• http://learnzillion.com/lessonsets/191-understand-and-interpret-absolute-value-and-distinguishing-comparisons-of-absolute-value-from-statements-about-order

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

What is an almanac? An almanac is an annual calendar that contains important dates and statistical information such as astronomical data, tide tables, and weather information.

After the Task

When graphing the values on the number line for question 2, students may struggle since there are not enough marks for every number between –21 and 10. Students may need more practice with creating number lines that have different scales.

Students may also want to say that –7 is greater than –19 for question 3. Remind students to think about temperatures and to translate a greater temperature to it being warmer outside.

Students may want to explain their reasoning for question 4 as "I know the absolute value of 21 is 21." Have students state what absolute value means in any situation (the distance a value is from zero); then have students use a number line to visualize what values would be 21 units from zero.

Student Extended Constructed Response

Low Temperatures for January 2, 2014, through January 10, 2014

	Jan. 2	Jan. 3	Jan. 4	Jan. 5	Jan. 6	Jan. 7	Jan. 8	Jan. 9	Jan. 10
New York, NY	27° F	11° F	10° F	26° F	37° F	6° F	10° F	21° F	30° F
Erie, PA	14° F	16° F	16° F	33° F	-2° F	-10° F	-10° F	4° F	26° F
Detroit, MI	12° F	0° F	0° F	14° F	-5° F	-12° F	-12° F	-3° F	21° F
Fargo, ND	-25° F	-25° F	-7° F	-19° F	-24° F	-24° F	-21° F	-9° F	-21° F

Source: http://www.almanac.com/weather/history

Use the table of temperatures above to complete the following.

1. Jerry said that one day the low temperature for his hometown, Detroit, Michigan, was 12 degrees below zero. On which date could this temperature have occurred?

2. Plot the temperatures for January 8 on the number line below. Name the two cities that had opposite temperatures on this day.

3. Alicia, who lives in Fargo, North Dakota, wrote the inequality $-7°\text{F} > -19°\text{F}$ to compare the temperatures on January 4 and January 5. Explain what this comparison means about the temperatures for these two dates.

4. On January 10, Rayshon noticed that the low temperature for the city he lives in had an absolute value of 21. In which city could Rayshon live? Explain your reasoning in terms of temperature.

Extended Constructed Response Exemplar Response

Low Temperatures for January 2, 2014, through January 10, 2014

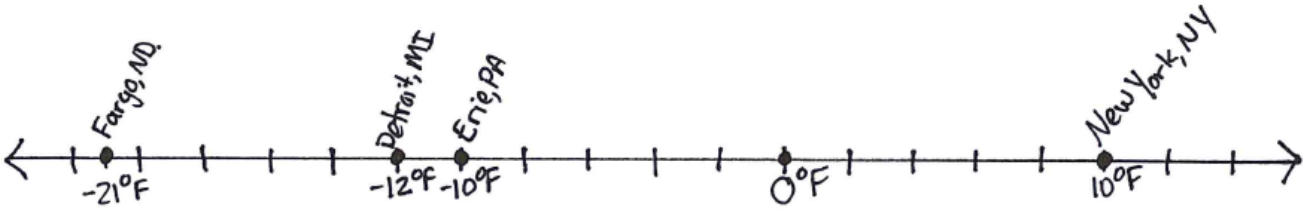
	Jan. 2	Jan. 3	Jan. 4	Jan. 5	Jan. 6	Jan. 7	Jan. 8	Jan. 9	Jan. 10
New York, NY	27° F	11° F	10° F	26° F	37° F	6° F	10° F	21° F	30° F
Erie, PA	14° F	16° F	16° F	33° F	-2° F	-10° F	-10° F	4° F	26° F
Detroit, MI	12° F	0° F	0° F	14° F	-5° F	-12° F	-12° F	-3° F	21° F
Fargo, ND	-25° F	-25° F	-7° F	-19° F	-24° F	-24° F	-21° F	-9° F	-21° F

Source: http://www.almanac.com/weather/history

Use the table of temperatures above to complete the following.

1. Jerry said that one day the low temperature for his hometown, Detroit, Michigan, was 12 degrees below zero. On which date could this temperature have occurred?
   The temperature for Detroit, Michigan, was 12 degrees below zero on January 7 or January 8 (only one date is required).

2. Plot the temperatures for January 8 on the number line below. Name the two cities that had opposite temperatures on this day.



   The two cities with opposite temperatures are Erie, Pennsylvania, and New York, New York.

3. Alicia, who lives in Fargo, North Dakota, wrote the inequality $-7°\text{F} > -19°\text{F}$ to compare the temperatures on January 4 and January 5. Explain what this comparison means about the temperatures for these two dates.

   The inequality $-7°\text{F} > -19°\text{F}$ means that the temperature on January 4 is warmer than the temperature on January 5.

4. On January 10, Rayshon noticed that the low temperature for the city he lives in had an absolute value of 21. In which city could Rayshon live? Explain your reasoning in terms of temperature.

   Rayshon could live in either Detroit, Michigan, or Fargo, North Dakota (only one city needs to be given). If the absolute value of the temperature is 21, that means the temperature is 21 degrees from zero—it could be 21 degrees above zero (Detroit, Michigan) or 21 degrees below zero (Fargo, North Dakota).
   ***Note: students only need to give one city with a valid explanation.*

Friends Meeting on Bicycles (ECR)

Overview

This task requires students to use ratios and rates related to constant speed to determine the time that friends would meet when riding their bicycles.

Standards

Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.RP.A.3b	• 6.RP.A.2 • 6.RP.A.3a	1. Alex is training to run a half-marathon, which is 13.1 miles long. Alex runs at a pace of 4 miles per hour. If the half-marathon begins at 7:00 a.m., about what time will he cross the finish line, assuming he runs at a constant rate? a. *Alex will cross the finish line at approximately 10:16 am.* 2. Jane rode her bike to visit a friend that lives 12 miles away. It took her 1.5 hours to get to her friend's house. Assuming Jane rode her bike at a constant rate, how fast was Jane riding? a. *Jan was riding at a rate of 8 miles per hour.* 3. http://www.illustrativemathematics.org/illustrations/815 4. http://www.illustrativemathematics.org/illustrations/193	1. http://www.illustrativemathematics.org/illustrations/77 2. http://www.illustrativemathematics.org/illustrations/549 3. http://www.illustrativemathematics.org/illustrations/711 4. http://learnzillion.com/lessonsets/157-solve-unitrate-problems

After the Task

Suggestions are provided for additional assistance for students who may have struggled with different components of this task.

Questions 1 and 2: Students may have struggled with finding the distance between Taylor and Anya because of the different speeds. Have students represent the distance traveled in multiple ways: a table for each person, a number line diagram, or a tape diagram. Then discuss how they would determine the distance between the two friends at given intervals.

Questions 3 and 4: Students may experience difficulty when determining the time it takes to travel the remaining 9 miles as well as the total time traveled. Ask students to create a table to find the total number of miles the friends travel each hour (18 miles each hour). Then ask students to find how long it would take to travel the 63 miles total. The table created to assist with question 3 can also assist students with answering question 4.

Question 5: Students may struggle with finding the rate because the distance Anya travels is not stated in the question. Ask students how far Taylor traveled in the given time. Using Taylor's distance traveled, students should then be able to determine how far Anya would have had to travel in order to determine her speed.

Student Extended Constructed Response

Taylor and Anya live 63 miles apart. On some Saturdays, they ride their bikes toward each other's houses and meet somewhere in between. Taylor is a very consistent rider—she finds that her speed is always very close to 12.5 miles per hour. Anya rides more slowly than Taylor, but she is working out and is becoming a faster rider as the weeks go by.

1. On a Saturday in July, the two friends set out on their bikes at 8 a.m. Taylor rides at 12.5 miles per hour, and Anya rides at 5.5 miles per hour. After one hour, how far apart are they?

2. Make a table showing how far apart the two friends are after zero hours, one hour, two hours, and three hours.

3. At what time will the two friends meet? How do you know?

4. Taylor says, "If I ride at 12.5 miles per hour toward you, and you ride at 5.5 miles per hour toward me, it's the same as if you stay still and I ride at 18 miles per hour." What do you think Taylor means by this? How do you know if she is correct?

5. A couple of months later, on a Saturday in September, the two friends set out again on their bikes at 8 a.m. Taylor rides at 12.5 miles per hour. This time they meet at 11 a.m. How fast was Anya riding this time? Justify your answer.

Adapted from: http://www.illustrativemathematics.org/illustrations/137

Extended Constructed Response Exemplar Response

1. On a Saturday in July, the two friends set out on their bikes at 8 a.m. Taylor rides at 12.5 miles per hour, and Anya rides at 5.5 miles per hour. After one hour, how far apart are they?

   45 miles

2. Make a table showing how far apart the two friends are after zero hours, one hour, two hours, and three hours.

Hours	Miles Apart
0	63
1	45
2	27
3	9

Alternate Response:

Hours	Distance Anya Has Traveled	Distance Taylor Has Traveled	Miles Apart
0	0	0	63
1	5.5	12.5	45
2	11	25	27
3	16.5	37.5	9

3. At what time will the two friends meet? How do you know?
   At 3 hours, Taylor and Anya only have 9 more miles to travel before they meet. The number of miles between Taylor and Anya decreases by 18 miles per hour. Since 9 is half of 18, it will take a half hour to travel the 9 miles, so they will meet 3.5 hours later, at 11:30.

   Alternate answer: Since the distance between Taylor and Anya is decreasing at 18 miles per hour, 63/18 = 3.5 hours, so they will meet at 11:30.

4. Taylor says, "If I ride at 12.5 miles per hour toward you, and you ride at 5.5 miles per hour toward me, it's the same as if you stay still and I ride at 18 miles per hour." What do you think Taylor means by this? How do you know if she is correct?

   Taylor is correct and what she really means is that the distance between them is decreasing by 18 miles every hour, so the amount of time it will take them to meet is the same as if one person stays put and the other rides at 18 miles per hour. However, the place they meet will not be the same.

5. A couple of months later, on a Saturday in September, the two friends set out again on their bikes at 8 a.m. Taylor rides at 12.5 miles per hour. This time they meet at 11 a.m. How fast was Anya riding this time? Justify your answer.

Hours	Miles Apart
0	63
1	42
2	21
3	0

At 0 hours the friends are 63 miles apart, and at 3 hours they are 0 miles apart. The friends are getting closer at 21 miles per hour. Since Taylor is riding 12.5 miles per hour, Anya must be riding 8.5 miles per hour.

Alternate response: Students could also determine that Taylor rode 37.5 miles in the 3 hours (12.5 miles per hour x 3 hours), which would mean that Anya has to ride 25.5 miles in 3 hours (63 miles – 37.5 miles). 25.5 miles/3 hours = 8.5 miles per hour. This is Anya's rate.