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| 7th Unit 3 –Equations  Performance Task 3 |
| ***Standard(s) Addressed:***  **7.NS.1a**. Describe situations in which opposite quantities combine to make 0.  **7.NS.1d**. Apply properties of operations as strategies to add and subtract rational numbers.  **7.EE.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.  **7.EE.2** Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.  **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.  **7.EE.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.  a. Solve word problems leading to equations of the form *px + q = r* and *p(x + q) = r*, where *p*, *q*, and *r* are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. |
| ***Task:***  Word Problems and Equations  For each word problem define a variable *x*, represented by  in the Hands-On Equation diagrams. Write an equation for each word problem so that the equation is represented by one of the two scale pictures. State which scale would match your equation. Then solve the equation for x and write a sentence to state the solution(s).     |  |  | | --- | --- | | Scale 1 | Scale 2 | |  |  |  1. Two consecutive even numbers have a sum of 50. What are the numbers?   Scale: \_\_\_\_\_\_\_ Define variable: Let *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation and Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Solution: The two numbers are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. What are three consecutive numbers such that the first and third numbers have a sum of 50?   Scale: \_\_\_\_\_\_\_ Define variable: Let *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation and Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Solution: The three numbers are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. Johnny is thinking of a number. He says that two more than his number is equal to 50. What is the number that he is thinking of?   Scale: \_\_\_\_\_\_\_ Define variable: Let *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation and Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Solution: The number Johnny is thinking of is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. Megan and Johnny ran a 5k over the weekend. Megan’s time was 2 minutes more than Johnny’s. Combined, their total time was 50 minutes. How fast did each person run?   Scale: \_\_\_\_\_\_\_ Define variable: Let *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation and Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Solution: Johnny’s Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Megan’s Time: \_\_\_\_\_\_\_\_\_\_\_\_\_   1. The width of a rectangle is two centimeters shorter than the length. The length is 50 centimeters. What is the width?   Scale: \_\_\_\_\_\_\_ Define variable: Let *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation and Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Solution: The width is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   1. Two times the sum of a number x and one is equal to 50. What is the value of x?   Scale: \_\_\_\_\_\_\_ Define variable: Let *x* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Equation and Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Solution: The value of x is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  For each example, define a variable *x*, represented by  in the Hands-On Equation diagrams. Represent an equation for each word problem using the Hands-on Equation scale. Then, solve the equation.   1. Katie has 16 dollars more than the amount of money that Jenna has. If Katie has $50, how much does Jenna have?   Let  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_     1. Katie has 16 dollars more than Jenna. Combined, they have $50. How much does Jenna have?   Let  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    Solve each word problem by defining a variable, setting up a pictoral scale or writing an equation and solving.   1. Marsh Middle School has *g* sixth grade students and twice that many seventh graders. When all of the sixth and seventh graders attend an assembly, the school must be sure to have 423 seats. How many sixth graders and seventh graders are at Marsh Middle School? 2. James owns a roofing company. He charges a flat fee of $175 to start the appointment and an additional $35 per hour of work. The Smith family wrote James’ roofing company a check for $402.50. How many hours did the roofing company work at the Smith house? |
| ***Solution and Rubric:***  For each word problem define a variable *x*, represented by  in the Hands-On Equation diagrams. Write an equation for each word problem so that the equation is represented by one of the two scale pictures. State which scale would match your equation. Then solve the equation for x and write a sentence to state the solution(s).   |  |  | | --- | --- | | Scale 1 | Scale 2 | |  |  |  1. Two consecutive even numbers have a sum of 50. What are the numbers?   Scale: \_\_\_ 2\_\_\_\_ Define variable: Let *x* = The first number x + 2 = The second number  Equation and Work: x + x + 2 = 50  2x + 2 = 50  2x = 48  x = 24  Solution: The two numbers are 24 and 26.   1. What are three consecutive numbers such that the first and third numbers have a sum of 50?   Scale: \_\_\_ 2\_\_\_\_ Define variable: Let *x* = The first number x + 1 = The second number  x + 2 = The third number  Equation and Work: x + x + 2 = 5  2x + 2 = 50  2x = 48  x = 24  Solution: The three numbers are: 24, 25 and 26   1. Johnny is thinking of a number. He says that two more than his number is equal to 50. What is the number that he is thinking of?   Scale: \_\_\_1\_\_\_ Define variable: Let *x* = the number  Equation and Work: x + 2 = 50  x = 48  Solution: The number Johnny is thinking of is 48   1. Megan and Johnny ran a 5k over the weekend. Megan’s time was 2 minutes more than Johnny’s. Combined, their total time was 50 minutes. How fast did each person run?   Scale: \_\_\_2\_\_\_\_ Define variable: Let *x* = Johnny’s time. x + 2 = Megan’s time  Equation and Work: x + x + 2 = 5  2x + 2 = 50  2x = 48  x = 24  Solution: Johnny’s Time: \_\_\_24 minutes\_\_\_\_ Megan’s Time: \_\_\_26 minutes\_\_\_\_   1. The width of a rectangle is two centimeters shorter than the length. The length is 50 centimeters. What is the width?   Scale: \_\_\_1\_\_\_\_ Define variable: Let *x* = the width x + 2 = length  Equation and Work: x + 2 = 50  x = 48  Solution: The width is 48 centimeters.   1. Two times the sum of a number x and one is equal to 50. What is the value of x?   Scale: \_\_\_2\_\_\_\_ Define variable: Let *x* = a number  Equation and Work: 2(x + 1) = 50  2x + 2 = 50  2x = 48  x = 24  Solution: The value of x is 24  For each example, define a variable *x*, represented by  in the Hands-On Equation diagrams. Represent an equation for each word problem using the Hands-on Equation scale. Then, solve the equation.   1. Katie has 16 dollars more than the amount of money that Jenna has. If Katie has $50, how much does Jenna have?   Let  = Amount of money Jenna has  16 50    x + 16 = 50  x = 34 Jenna has $34   1. Katie has 16 dollars more than Jenna. Combined, they have $50. How much does Jenna have? X + x + 16 = 50   Let  = Amount of money Jenna has  16 = Amount Katie has  16 50    x + x + 16 = 50  2x + 16 = 50  2x = 34 x = 17 Jenna has $17. (Katie has $33)  Solve each word problem by defining a variable, setting up a pictoral scale or writing an equation and solving.   1. Marsh Middle School has *g* sixth grade students and twice that many seventh graders. When all of the sixth and seventh graders attend an assembly, the school must be sure to have 423 seats. How many sixth graders and 7th graders are at Marsh Middle School?   g = number of sixth graders  2g = number of seventh graders.  g + 2g = 423  3g = 423  g = 141  There are 141 6thgraders and 282 7th graders   1. James owns a roofing company. He charges a flat fee of $175 to start the appointment and an additional $35 per hour of work. The Smith family wrote James’ roofing company a check for $402.50. How many hours did the roofing company work at the Smith house?   h = hours  175 + 35h = 402.50  35h = 227.50  h = 6.5 hour   |  |  |  |  | | --- | --- | --- | --- | | 4 | 3 | 2 | 1 | | •Student demonstrates complete understanding of the mathematical concepts.  •The solutions completely address all mathematical concepts presented in the task.  •Where required, there is a clear, proficient explanation of the solution. | •Student demonstrates nearly complete understanding of mathematical concepts.  •The solutions address almost all of the mathematical concepts presented in the task. Minor errors may exist.  •Where required, there is a clear, explanation of the solution. | •Student demonstrates a vague understanding of the mathematical concepts.  •The solutions address some, but not all the mathematical concepts presented in the task.  •Where required, explanations are incomplete or not clear. | •Student demonstrates limited or no understanding of the mathematical concepts.  •The solutions do not address any of the mathematical concepts in the task.  •There is no explanation of the solution. | |
| ***Source(s):***  *Adapted from:* [*http://www.insidemathematics.org/assets/common-core-math-tasks/photographs.pdf*](http://www.insidemathematics.org/assets/common-core-math-tasks/photographs.pdf) |