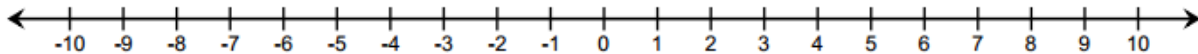


Name \_\_\_\_\_

Date \_\_\_\_\_

1. Diamond used a number line to add. She started counting at 10, and then she counted until she was on the number  $-4$  on the number line.
- a. If Diamond is modeling addition, what number did she add to 10? Use the number line below to model your answer.



- b. Write a real-world story problem that would fit this situation.

- c. Use absolute value to express the distance between 10 and  $-4$ .

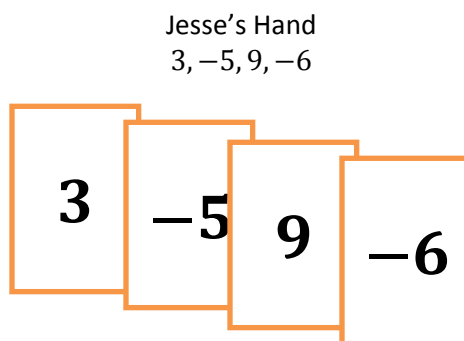
2. What value of  $a$  will make the equation a true statement? Explain how you arrived at your solution.

$$\left(-\frac{3}{4} + \frac{4}{3}\right) + a = 0$$

3. Every month, Ms. Thomas pays her car loan through automatic payments (withdrawals) from her savings account. She pays the same amount on her car loan each month. At the end of the year, her savings account balance changed by  $-\$2,931$  from payments made on her car loan.
- a. What is the change in Ms. Thomas' savings account balance each month due to her car payment?

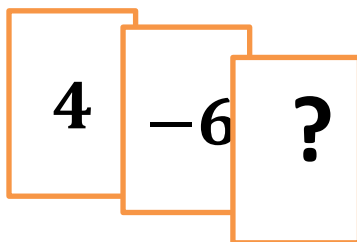
- b. Describe the total change to Ms. Thomas' savings account balance after making six monthly payments on her car loan. Model your answer using a number sentence.

4. Jesse and Miya are playing the integer card game. The cards in Jesse's hand are shown below:



- a. What is the total score of Jesse's hand? Support your answer by showing your work.
- b. Jesse picks up two more cards, but they do not affect his overall point total. State the value of each of the two cards, and tell why they do not affect his overall point total.

- c. Complete Jesse's new hand to make this total score equal zero. What must be the value of the "?" card? Explain how you arrived at your answer.



5. Michael's father bought him a 16-foot board to cut into shelves for his bedroom. Michael plans to cut the board into 11 equal size lengths for his shelves.
- a. The saw blade that Michael will use to cut the board will change the length of the board by  $-0.125$  inches for each cut. How will this affect the total length of the board?

b. After making his cuts, what will the exact length of each shelf be?

6. Bryan and Jeanette were playing the Integer Card Game like the one you played in class. They were practicing adding and subtracting integers. Jeanette had a score of  $-10$ . Bryan took away one of Jeanette's cards. He showed it to her. It was a  $-8$ . Jeanette recalculated her score to be  $-2$ , but Bryan disagreed. He said that her score should be  $-18$  instead. Read their conversation and answer the question below.

*"No Jeanette, removing a negative card means the same thing as subtracting a positive. So negative 10 minus negative eight is negative eighteen."*

*"It does not! Removing a negative card is the same as adding the same positive card. My score will go up. Negative 10 minus negative 8 is negative 2."*

Based on their disagreement, who, if anyone, is right? Explain.

7. The table below shows the temperature changes Monday morning in Bedford, New York over a 4-hour period after a cold front came through.

- a. If the beginning temperature was  $-13^{\circ}\text{F}$  at 5:00 a.m., what was the temperature at 9:00 a.m.?

Change in Temperature	
5:00 a.m. – 6:00 a.m.	$-3^{\circ}\text{F}$
6:00 a.m. – 7:00 a.m.	$-2^{\circ}\text{F}$
7:00 a.m. – 8:00 a.m.	$-6^{\circ}\text{F}$
8:00 a.m. – 9:00 a.m.	$7^{\circ}\text{F}$

- b. The same cold front hit Hartford, Connecticut the next morning. The temperature dropped by  $7^{\circ}\text{F}$  each hour from 5:00 a.m. – 9:00 a.m. What was the beginning temperature at 5:00 a.m. if the temperature at 9:00 a.m. was  $-10^{\circ}\text{F}$ ?

- c. In answering part (b), Josiah and Kate used different methods. Josiah said his method involved multiplication, while Kate said she did not use multiplication. Both students arrived at the correct answer. How is this possible? Explain.

## A Progression Toward Mastery

Assessment Task Item		STEP 1 Missing or incorrect answer and little evidence of reasoning or application of mathematics to solve the problem	STEP 2 Missing or incorrect answer but evidence of some reasoning or application of mathematics to solve the problem	STEP 3 A correct answer with some evidence of reasoning or application of mathematics to solve the problem, <u>OR</u> an incorrect answer with substantial evidence of solid reasoning or application of mathematics to solve the problem	STEP 4 A correct answer supported by substantial evidence of solid reasoning or application of mathematics to solve the problem
1	a <b>7.NS.A.1b</b>	Student answer is incorrect. Student attempts to model answer using vector addition but has more than 2 missing parts. <u>OR</u> Student answer is incorrect and did not use the number line.	Student answer is incorrect. Student attempts to model the answer using vector addition but has 1–2 missing parts, i.e., only one vector displayed, wrong direction, or incorrect starting or ending point.	Student answer is incorrect due to a minor mistake modeling the answer with vector addition. <u>OR</u> Student shows vector addition modeled correctly, but student records the incorrect answer. For example, student miscounts and ends the second vector at $-5$ or $-3$ .	Student correctly answers $-14$ and models the answer using vector addition on the number line with both arrows showing correct direction, starting point, and ending point.
	b <b>7.NS.A.1b</b>	Student answer is incorrect. No story problem is created. <u>OR</u> Student's story problem is not real-world and has significant errors such as little to no appropriate vocabulary in context to reflect addition of positive and negative numbers.	Student incorrectly interprets $10 + (-14) = -4$ and begins to create a real-world story problem; however, the story is incomplete. <u>OR</u> Student's story problem shows some evidence of a correct interpretation of $10 + (-14) = -4$ , but it is not cohesive.	Student correctly interprets $10 + (-14) = -4$ by creating a relevant real-world story problem but makes an incorrect statement or incorrect use of vocabulary. For example, student describes $-14$ as a deposit of \$14. <u>OR</u> Student creates a relevant real-world story problem based on an incorrect sum.	Student correctly interprets $10 + (-14) = -4$ by creating a relevant real-world story problem and uses appropriate and accurate vocabulary in context to reflect addition of positive and negative numbers.

	<b>c</b> <b>7.NS.A.1c</b>	Student answer is incorrect with little or no evidence of reasoning. Student does not use absolute value notation.	Student answer is incomplete but shows some evidence of reasoning. For instance, student represents the distance as $ 10 - (-4) $ , but no further correct work is shown.	Student correctly answers $ 10 - (-4)  = 14$ , but does not include steps that show subtraction as addition of the additive inverse in order to derive the correct answer. For example, student might show $ 14  = 14$ only.	Student correctly answers $ 10 - (-4)  = 14$ AND shows evidence of reasoning by including steps that show subtraction as addition of the additive inverse in order to arrive at the correct answer.
<b>2</b>	<b>7.NS.A.1b</b> <b>7.NS.A.1c</b>	Student answer is incorrect or missing. Student shows little or no evidence of understanding how to find the sum of the fractions and the opposite of the sum.	Student answer is incorrect, but explanation and/or work shows some evidence of reasoning.	Student answer is incorrect, but work and/or explanation shows solid evidence of reasoning. For example, student includes a negative on the sum $(-\frac{7}{12})$ and gives a positive additive inverse $(\frac{7}{12})$ as a final answer. <u>OR</u> Student arrives at the correct sum of $\frac{7}{12}$ , but the explanation is incomplete.	Student correctly answers $a = -\frac{7}{12}$ as the additive inverse and has no errors in the steps taken to arrive at the answer.
<b>3</b>	<b>a</b> <b>7.NS.A.2a</b> <b>7.NS.A.2b</b>	Student answer is incorrect or missing. Student shows little or no evidence of understanding the long division process.	Student answer is incorrect, but student begins the process of dividing 2,931 by 12.	Student correctly states $-\$244.25$ as the monthly change in account balance, but the work is incomplete. <u>OR</u> Student incorrectly answers due to a minor calculation error in the long division process.	Student correctly states $-\$244.25$ as the monthly change in account balance and provides the correct long division work to show that 2,931 divided by 12 equals 244.25.
	<b>b</b> <b>7.NS.A.2a</b> <b>7.NS.A.2b</b>	Student answer is incorrect or missing. Student shows little or no work and does not provide a number sentence.	Student answer is incorrect, but student demonstrates an understanding of the task involved by multiplying $244.25 \times 6$ or uses another method to indicate the multiplication process.	Student correctly describes the six month change in the account balance as $-\$1,465.50$ but fails to provide a correct number sentence. <u>OR</u> Student uses a correct method but incorrectly describes the six-month change due to a minor calculation error, which is reflected in the number sentence.	Student correctly describes the six month change in the account balance as $-\$1,465.50$ and provides a correct number sentence, such as $6(-244.25) = -1,465.50$ .



4	a  7.NS.A.1a 7.NS.A.1b	Student answer is incorrect or missing. Student shows little or no evidence of understanding how to add integers.	Student uses a correct representation to find the sum of $3 + (-5) + 9 + (-6)$ but has several errors in the process.	Student correctly states a score of 1 but does not provide enough work to support the answer.	Student correctly states a score of 1 and creates an expression to represent the sum of all four card values, correctly adding the integers.
	b  7.NS.A.1a 7.NS.A.1b	Student does not state the values of 2 cards whose sum is zero and is unable to provide a correct written explanation.	Student explains that the 2 cards must total zero but does not correctly state 2 integers whose sum is zero.	Student correctly states the values of two opposite numbers, such as $-2$ and $2$ but does not provide a complete written explanation to tell why they do not affect the overall point total.	Student correctly states the values of two opposite numbers, such as $-2$ and $2$ , and explains that because they are opposites, their sum is zero, so the overall point total will not change.
	c  7.NS.A.1a 7.NS.A.1b	Student answer is incorrect or missing. Student work shows little or no evidence of understanding of adding $4$ and $-6$ and then finding the opposite of their sum.	Student completes the first step by adding $4$ and $-6$ to arrive at $-2$ , but does not complete any further correct steps. Student's explanation is incomplete.	Student correctly answers $2$ but does not justify the answer through a written response. <u>OR</u> Student incorrectly answers $-2$ but correctly explains the process of finding the sum of $-6$ and $4$ and then finding the opposite of their sum.	Student correctly answers $2$ and the explanation of how he or she arrived at $2$ indicates a sound understanding of finding the sum of the $4$ and $-6$ and then finding the opposite of the sum.
5	a  7.NS.A.2 7.NS.A.3	Student answer is incorrect or missing. Student work shows little or no evidence of understanding of the process involved.	Student answer is incomplete. The student states the board would be shortened but does not determine the amount of change in the board's length.	Student uses a sound process and shows solid evidence of reasoning. Student knows that the board length would be shortened, but the amount stated is incorrect due to a minor calculation error. <u>OR</u> Student multiplies $-0.125 \times 10$ to get $-1.25$ but does not provide a written explanation to interpret $-1.25$ in the context of the situation.	Student correctly answers that the length of the board will be shortened by $1.25$ inches and shows the correct calculations and/or diagram to support the answer.

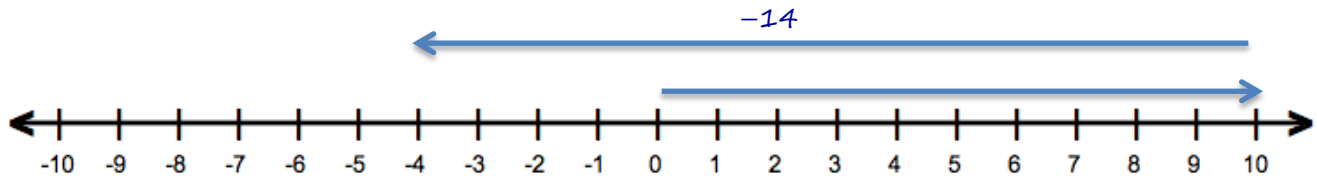
	<b>b</b>  <b>7.NS.A.2</b> <b>7.NS.A.3</b>	Student answer is incorrect or missing. Student work shows little or no evidence of correct reasoning.	Student answer is incorrect. Student work shows some understanding of the steps involved and there is evidence of the division process.	Student incorrectly answers the exact length of each shelf to be $1.\overline{45}$ feet and shows work for dividing 16 by 11 to arrive at the answer. <u>OR</u> Student follows the correct process of subtracting 1.25 inches from 192 inches, and then dividing 190.75 by 11 but arrives at an incorrect answer due to a computational error in the long division process.	Student correctly answers the exact length of each shelf to be $17.34\overline{09}$ inches and the correct steps and long division work are shown to support the answer.
6	<b>7.NS.A.1c</b>	Student answer is incorrect or missing. Student work shows little or no evidence of correct reasoning.	Student answer is incorrect. Uses evidence of some reasoning to justify answer but does not know the rule for subtracting negative numbers and cannot apply it in context.	Student correctly answers <i>Jeanette</i> and uses evidence of reasoning by knowing the rule for subtracting negative numbers and provides some justification of the correct answer by applying this rule in context. For example, student may only paraphrase Jeanette's statement with no further explanation of his or her own.	Student correctly answers <i>Jeanette</i> , uses solid evidence of reasoning by knowing the rule for subtracting negative numbers, and provides substantial justification of the correct answer by applying this rule in context with further explanation or a mathematical model.
7	<b>a</b>  <b>7.NS.A.1d</b>	Student answers incorrectly with little or no evidence of understanding of how to add integers.	Student does not arrive at the correct answer. Student work indicates some degree of understanding, as at least one pair of integers is correctly added.	Student correctly answers $-17^{\circ}\text{F}$ but does not show sufficient work to support the answer.	Student correctly answers $-17^{\circ}\text{F}$ and has no errors in the steps taken to arrive at the answer.
	<b>b</b>  <b>7.NS.A.3</b>	Student answers incorrectly with little or no evidence of understanding how to work backwards to find the beginning temperature.	Student answers incorrectly but is able to set up a correct visual model or numerical expression to represent the situation, such as $-10 - (-7)(4)$ .	Student correctly answers $18^{\circ}\text{F}$ but student's work is incomplete. <u>OR</u> Student answers incorrectly due to a calculation error but uses the correct process.	Student correctly answers $18^{\circ}\text{F}$ and has no errors in the steps taken to arrive at the answer.

	<p><b>c</b></p> <p><b>7.NS.A.1b</b> <b>7.NS.A.2a</b></p>	<p>Student provides no explanation.</p> <p><u>OR</u></p> <p>Student states that the situation is not possible.</p>	<p>Student answers only part of the question. For instance, student explains how Josiah used multiplication to arrive at a correct answer but is unable to explain how Kate used a different operation to arrive at the same answer.</p>	<p>Student indicates an understanding of multiplication as repeated addition, but the explanation in student's written response is not complete.</p>	<p>Student responds by indicating that a drop of 7 degrees four times can be represented by multiplication or repeated addition:  <math>(-7) + (-7) + (-7) + (-7)</math>.</p> <p><u>OR</u></p> <p>Student responds by indicating that a drop of 7 degrees four times can be represented by multiplication or repeated subtraction:  <math>0 - 7 - 7 - 7 - 7</math>.</p>
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Name \_\_\_\_\_

Date \_\_\_\_\_

1. Diamond used a number line to add. She started counting at 10, and then she counted until she was on the number  $-4$  on the number line.
- a. If Diamond is modeling addition, what number did she add to 10? Use the number line below to model your answer.



- b. Write a real-world story problem that would fit this situation.

*Diamond had \$10 and put it in the bank. She forgot about the monthly bank fee of \$14.*

*Now her account has a balance of  $-\$4$ .*

- c. Use absolute value to express the distance between 10 and  $-4$ .

$$|10 - (-4)|$$

$$|10 + 4|$$

$$|14|$$

$$14$$

*The distance between 10 and  $-4$  is 14.*

2. What value of  $a$  will make the equation a true statement? Explain how you arrived at your solution.

$$\left(-\frac{3}{4} + \frac{4}{3}\right) + a = 0$$

$$\begin{aligned} &\left(-\frac{3}{4} + \frac{4}{3}\right) \\ &\left(\frac{-9}{12} + \frac{16}{12}\right) \\ &\frac{7}{12} \end{aligned}$$

$$\begin{aligned} \frac{7}{12} + a &= 0 \\ a &= -\frac{7}{12} \end{aligned}$$

*"a" has to be  $-\frac{7}{12}$  because that's the additive inverse of  $\frac{7}{12}$*

3. Every month, Ms. Thomas pays her car loan through automatic payments (withdrawals) from her savings account. She pays the same amount on her car loan each month. At the end of the year, her savings account balance changed by  $-\$2,931$  from payments made on her car loan.

- a. What is the change in Ms. Thomas' savings account balance each month due to her car payment?

$$\begin{array}{r} 0244.25 \\ 12 \overline{) 2931.00} \\ \underline{0} \phantom{00} \\ 29 \phantom{00} \\ \underline{-24} \phantom{00} \\ 53 \phantom{00} \\ \underline{48} \phantom{00} \\ 51 \phantom{00} \\ \underline{48} \phantom{00} \\ 30 \phantom{00} \\ \underline{24} \phantom{00} \\ 60 \phantom{00} \\ \underline{60} \phantom{00} \\ 0 \end{array}$$

*Her monthly payment is \$244.25, so her account balance changes each month by  $-\$244.25$  when her payment is made.*

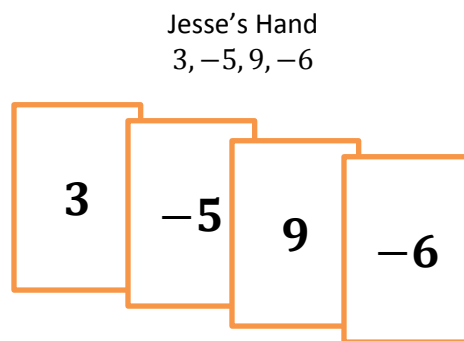
- b. Describe the total change to Ms. Thomas' savings account balance after making six monthly payments on her car loan. Model your answer using a number sentence.

$$\begin{array}{r}
 \begin{array}{ccccccc}
 & 2 & 2 & 1 & & 3 & \\
 & 2 & 4 & 4 & . & 2 & 5 \\
 \times & & & & & & 6 \\
 \hline
 \$ & 1 & 4 & 6 & 5 & . & 5 & 0
 \end{array}
 \end{array}$$

$$6 \times (-244.25) = -1465.50$$

*Ms. Thomas' car loan changed her savings account balance by  $-\$1465.50$  after 6 monthly payments.*

4. Jesse and Miya are playing the integer card game. The cards in Jesse's hand are shown below:



- a. What is the total score of Jesse's hand? Support your answer by showing your work.

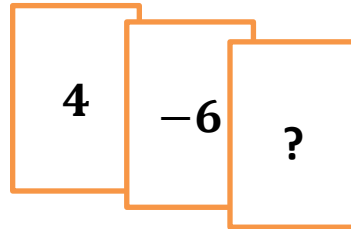
$$\begin{array}{l}
 3 + (-5) + 9 + (-6) \\
 (-2) + 3 \\
 1
 \end{array}$$

*Jesse's score is 1.*

- b. Jesse picks up two more cards, but they do not affect his overall point total. State the value of each of the two cards, and tell why they do not affect his overall point total.

*The values of the two cards must be opposites, such as -2 and 2 because opposites combine to get 0. 0 will not change the score in his hand.*

- c. Complete Jesse's new hand to make this total score equal zero. What must be the value of the "?" card? Explain how you arrived at your answer.



$$4 + (-6)$$

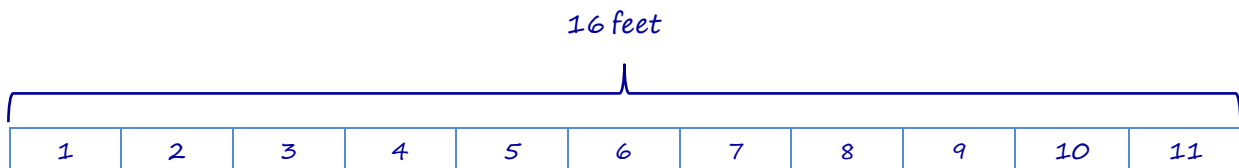
$$-2$$

$$-2 + a = 0$$

$$a = 2$$

The two given cards total  $-2$ . To get a sum of zero, I have to combine  $-2$  with its opposite 2 because additive inverses (opposites) combine to get 0.

5. Michael's father bought him a 16-foot board to cut into shelves for his bedroom. Michael plans to cut the board into 11 equal size lengths for his shelves.
- a. The saw blade that Michael will use to cut the board will change the length of the board by  $-0.125$  inches for each cut. How will this affect the total length of the board?



The board will be cut in 10 places.

$$\begin{array}{r} 0.125 \\ \times 10 \\ \hline 1.250 \end{array}$$

$$-0.125 \times 10 = -1.25$$

The 10 cuts take away 1.25 inches of the total length of the board. The usable length of the board is 1.25 inches shorter than 16 feet.

- b. After making his cuts, what will the exact length of each shelf be?

*The board begins at 192 inches long.*

*$192 - 1.25 = 190.75$ . The length of the board that can be used with the blade widths removed is 190.75 inches.*

$$\begin{array}{r}
 17.34 \\
 1 \overline{) 190.75} \\
 \underline{11} \phantom{00} \\
 80 \phantom{00} \\
 \underline{77} \phantom{00} \\
 37 \phantom{00} \\
 \underline{33} \phantom{00} \\
 45 \phantom{00} \\
 \underline{44} \phantom{00} \\
 1
 \end{array}$$

*Continue the long division, and there will be a repeating remainder of 1. Therefore, the lengths of the shelves should be exactly  $17.34\overline{09}$  inches.*

6. Bryan and Jeanette were playing the Integer Card Game like the one you played in class. They were practicing adding and subtracting integers. Jeanette had a score of  $-10$ . Bryan took away one of Jeanette's cards. He showed it to her. It was a  $-8$ . Jeanette recalculated her score to be  $-2$ , but Bryan disagreed. He said that her score should be  $-18$  instead. Read their conversation and answer the question below.

*"No Jeanette, removing a negative card means the same thing as subtracting a positive. So negative 10 minus negative eight is negative eighteen."*

*"It does not! Removing a negative card is the same as adding the same positive card. My score will go up. Negative 10 minus negative 8 is negative 2."*

Based on their disagreement, who, if anyone, is right? Explain.

*Jeanette is correct that removing a negative is the same as adding the same positive card. Having a negative card in your hand decreases your score. If you remove that negative card, your score is no longer decreased by the card, so your score goes up.*



7. The table below shows the temperature changes Monday morning in Bedford, New York over a 4-hour period after a cold front came through.

- a. If the beginning temperature was  $-13^{\circ}\text{F}$  at 5:00 a.m., what was the temperature at 9:00 a.m.?

Change in Temperature	
5:00 a.m. – 6:00 a.m.	$-3^{\circ}\text{F}$
6:00 a.m. – 7:00 a.m.	$-2^{\circ}\text{F}$
7:00 a.m. – 8:00 a.m.	$-6^{\circ}\text{F}$
8:00 a.m. – 9:00 a.m.	$7^{\circ}\text{F}$

$$-13 + (-3) + (-2) + (-6) + 7$$

$$(-16) + (-8) + 7$$

$$-24 + 7$$

$$-17^{\circ}\text{F}$$

*The temperature at 9:00 a.m. was  $-17^{\circ}\text{F}$ .*

- b. The same cold front hit Hartford, Connecticut the next morning. The temperature dropped by  $7^{\circ}\text{F}$  each hour from 5:00 a.m. – 9:00 a.m. What was the beginning temperature at 5:00 a.m. if the temperature at 9:00 a.m. was  $-10^{\circ}\text{F}$ ?

$$-10 + 4(7)$$

$$-10 + 28$$

$$18^{\circ}\text{F}$$

*The beginning temperature at 5:00 a.m. was  $18^{\circ}\text{F}$ .*

- c. In answering part (b), Josiah and Kate used different methods. Josiah said his method involved multiplication, while Kate said she did not use multiplication. Both students arrived at the correct answer. How is this possible? Explain.

*The temperature change was the same for each hour, so Josiah multiplied the  $7^{\circ}$  drop by 4 hours. Kate added the  $7^{\circ}$  drop 4 times. Kate used repeated addition, which is the same as multiplication.*