THE SCHOOL DISTRICT OF PHILADELPHIA

Grade: 6 **Subject:** Math (worksheets taken from enVision Mathematics, Grade 6)

Topic: Writing and solving one-step equations using properties of equality
What Your Student is Learning: Students are learning how to write equations and solve them. To solve them, they are applying properties of equality in order to maintain balance.

Background and Context for Parents:
In younger grades, students have written equations to represent real world situations. They are exploring this more now, better understanding how variables can represent unknowns, and how they can find those unknowns by isolating the variable.

It is important that students understand that an equation represents a balance. A good activity to support this concept of balance is to present equations and to ask, True or False? How do you know?
Examples:
2 + 5 = 7 + 1 (False)
9 - 7 = 8 - 6 (True)
5 + 8 + 3 = 8 + 8 (True)
2(3 + 7) = 6 + 7 (False)

With the concept of balance in mind, students can begin to tackle **Pages 4-5**. The Key Idea for this page is: A solution of an equation is a value for the variable that makes the equation true. For example, for the equation x + 5 = 12, 7 is a solution, because 7 + 5 = 12. 8 is not a solution, because 8 + 5 ≠ 12. Students need to understand that they can substitute the value in for the variable to test to see if it is true. Think about how a substitute takes the teachers place, or a substitute takes the place of a sports player.

Before students can "solve" equations, they need to understand that there are some properties of equality that they can use. They will apply these properties on **Pages 6-7.**
The Addition Property of Equality states that the two sides of an equation stay equal when the same amount is added to both sides. For example, I know that 3 + 2 = 5. If I add 1 to both sides, it is still true: 3 + 2 + *1* = 5 + *1*. Imagine a balance scale where you add a 1 pound weight to both sides. It still balances.

The Subtraction Property of Equality states that when you subtract the same amount from both sides of an equation, the two sides of the equal stay equal. For example, I know that 3 + 2 = 5. If I subtract 1 from both sides, it is still true: 3 + 2 - 1 = 5 - 1. Imagine a balance scale where you remove a 1 pound weight from both sides. It still balances.

The Multiplication Property of Equality states that when you multiply both sides of an equation by the same amount, the two sides stay equal. For example, 3 + 2 = 5. If I multiply both sides by 2, it is still true: (3 + 2) x 2 = 5 x 2. Imagine a balance scale where you double the weight on both sides. It still balances.

The Division Property of Equality states that when you divide both sides of an equation by the same non-zero amount, the two sides of the equation stay equal. For example, 4 + 2 = 6. If I divide both sides by 2, it is still true: (4 + 2) ÷ 2 = 6 ÷ 2. Imagine a balance scale where you cut the weight in half on both sides. It still balances.

Now, on **Pages 8-9**, students will apply those properties to solve equations that involve addition and subtraction. Two examples:

x + 5 = 12	20 = x - 12
x + 5 - 5 = 12 - 5	20 + 12 = x - 12 + 12
x = 7	32 = x

Students can solve real world problems by applying this skill. If I can represent a problem with an equation, I can solve it. For example: I have some fish. After buying 6 more fish, I will have 27 fish. How many fish do I have right now?

$$x + 6 = 27$$
$$x + 6 - 6 = 27 - 6$$
$$x = 21$$ → I have 21 fish right now.

Pages 10-11 are very similar except that now the equations involve multiplication and division. Students can continue to apply properties in order to solve. Two examples:

$$8x = 24 \qquad x \div 6 = 9$$
$$8x \div 8 = 24 \div 8 \qquad x \div 6 \cdot 6 = 9 \cdot 6$$
$$x = 3 \qquad x = 54$$

Students will again need to apply to the real world. For example: Apples cost $3 each. If I spend $27, how many apples did I buy?

$$3x = 27$$
$$3x \div 3 = 27 \div 3$$
$$x = 9$$ → I bought 9 apples.

Sometimes making sense of the word problem is harder than solving! Ask what is happening in the problem. Once they have written the equation, ask what each part represents. For example, for the last one, the 3 represents the cost per apple. X is the number of apples that I bought. When I multiply cost times the total number, the cost is $27.

The last worksheets in this section are **Pages 12-13.** This is a combination of the last two pages (solving equations involving addition, subtraction, multiplication, and division), but it is made more challenging by the inclusion of rational numbers. The strategies for solving are the same, but the problems are less intuitive because they likely cannot be solved with mental math. Students can use calculators to help them!

Ways to support your student:

- Read the problem outloud to them.
- Remember, the topic is about strategies, so encourage them to use their strategies. This way students will have a better understanding of place value and create their own understanding allowing for them to be more flexible with the math.
- Before giving your student the answer to their question or specific help, ask them "What have you tried so far?, What do you know?, What might be a next step?
- After your student has solved it, and before you tell them it's correct or not, have them explain to you how they got their solution and if they think their answer makes sense.

Online Resources for Students:
https://solveme.edc.org/mobiles/ These are fun intuitive puzzles where students are finding the value of unknown shapes in order to balance mobiles.

Videos to support:

https://www.khanacademy.org/math/pre-algebra/pre-algebra-equations-expressions/pre-algebra-one-step-add-sub-equationss/v/adding-and-subtracting-the-same-thing-from-both-sides

https://www.khanacademy.org/math/pre-algebra/pre-algebra-equations-expressions/pre-algebra-one-step-mult-div-equations/v/simple-equations

GET READY! 4

Review What You Know!

Vocabulary

Choose the best term from the box to complete each definition.

algebraic expression
coefficient
equation
evaluate
variable

1. In $6x$, x is a(n) ____________.
2. $x + 5$ is an example of a(n) ____________.
3. ____________ an expression to find its value.
4. The expressions on each side of the equal sign in a(n) ____________ are equal.

Equality

Tell whether the equation is true or false.

5. $6 + 2 = 2 + 6$
6. $2.5 - 1 = 1 - 2.5$
7. $\frac{1}{2} \times 3 = 3 \times \frac{1}{2}$
8. $\frac{3}{4} \div 5 = \frac{3}{4} \times \frac{1}{5}$
9. $5 \div \frac{1}{3} = \frac{5}{3}$
10. $\frac{2}{3} \times 5 = \frac{10}{15}$

Expressions

Evaluate each expression.

11. $x - 2$ for $x = 8$
12. $2b$ for $b = 9$
13. $3\frac{3}{4} + y$ for $y = \frac{5}{6}$
14. $\frac{15}{x}$ for $x = 3$
15. $5.6t$ for $t = 0.7$
16. $4x$ for $x = \frac{1}{2}$

Order of Operations

17. Explain the order in which you should compute the operations in the expression below. Then evaluate the expression.

$[(33 \div 3) + 1] - 2^2$

Graphing in the Coordinate Plane

18. Describe how to plot point $A(-6, 2)$ on a coordinate plane.

Name ________________________________

Reteach to Build Understanding
4-1

An **equation** is a mathematical sentence that uses an equal sign to show that two expressions are equal. An equation is true when both sides are equal.

The equation $12 - 6.7 = 5.3$ is true.

An equation may contain a variable. A **solution of an equation** is a value of the variable that makes the equation true.

The solution of the equation $8m = 72$ is 9.

Determine whether a number is a solution of an equation by substituting that number for the variable in the equation.

1. Tell whether the equation $35 \div r = 5$ is true or false for $r = 7$. __________

What is the solution of this equation? __________

2. Substitute each value in the set for the variable to determine whether it is the solution of the equation $16.6 - t = 11.9$.

$t = 3.6, 4.4, 4.7, 5.4$

Try 3.6.
$16.6 - 3.6 = 13$, so 3.6 is not the solution.

a. Try 4.4.

$16.6 -$ __________ $= 12.2$, so 4.4 __________ the solution.

b. Try 4.7. Explain.

____

c. Try 5.4. Explain.

____

d. The solution of the equation $16.6 - t = 11.9$ is __________.

On the Back!

3. Tell which given value of the variable is the solution of the equation.
$9.4 = k + 5.07$ $k = 3.33, 4.33, 4.47, 14.47$

Name ______________________________________

Build Mathematical Literacy
4-1

Read the problem. Use the KNWS strategy to help understand how to solve the problem.

There are 27 pennies on one side of a pan balance and 18 pennies on the other. To make the pans balance, Hillary thinks 5 pennies should be added to the higher pan; Sean thinks 8 pennies should be added; and Rachel thinks 9 pennies should be added. Use the equation $27 = 18 + p$ to determine who is correct.

1. What facts do you **KNOW** from the problem? Underline the important facts in the problem.

2. Draw a picture of what is known from the problem.

3. What information do you **NOT** need to know from the problem? Circle any facts in the problem that are not needed.

4. What does the problem **WANT** you to find?

5. What **STRATEGY** will you use to solve the problem? List the steps to solve the problem.

Name ______________________

Reteach to Build Understanding
4-2

The **Addition Property of Equality** states that when you add the same amount to both sides of an equation, the two sides of the equation stay equal.

$22 - 7 = 15$, so $(22 - 7) + 10 = 15 + 10$.

The **Subtraction Property of Equality** states that when you subtract the same amount from both sides of an equation, the two sides of the equation stay equal.

$25 + 12 = 37$, so $(25 + 12) - 9 = 37 - 9$.

The **Multiplication Property of Equality** states that when you multiply both sides of an equation by the same amount, the two sides of the equation stay equal.

$18 - 4 = 14$, so $(18 - 4) \times 3 = 14 \times 3$.

The **Division Property of Equality** states that when you divide both sides of an equation by the same nonzero amount, the two sides of the equation stay equal.

$8 + 6 = 14$, so $(8 + 6) \div 7 = 14 \div 7$.

Complete the statements. Tell which property of equality was used.

1. If $\frac{y}{8} = 4$, then $\frac{y}{8} \times 8 = 4 \times$ ______. ______________________

2. If $4 + x = 34$, then $4 + x - 4 = 34 -$ ______. ______________________

3. If $3.5m = 14$, then $3.5m \div 3.5 = 14 \div$ ______. ______________________

4. If $g - 6 = 10$, then $g - 6 + 6 = 10 +$ ______. ______________________

On the Back!

5. Tell which property of equality was used.

$$6z = 90$$
$$6z \div 6 = 90 \div 6$$

Name ______________________________

Build Mathematical Literacy
4-2

Review the Key Concept from the lesson. Answer the questions to help understand how to read a Key Concept.

KEY CONCEPT

You can use the properties of equality to write equivalent equations.

Addition Property of Equality

$7 + 3 = 10$

$(7 + 3) + a = 10 + a$

Add the same amount to each side to keep the equation balanced.

Subtraction Property of Equality

$7 + 3 = 10$

$(7 + 3) - a = 10 - a$

Subtract the same amount from each side to keep the equation balanced.

Multiplication Property of Equality

$7 + 3 = 10$

$(7 + 3) \times a = 10 \times a$

Multiply each side of the equation by the same amount to keep the equation balanced.

Division Property of Equality

$7 + 3 = 10$

$(7 + 3) \div a = 10 \div a$

Divide each side of the equation by the same non-zero amount to keep the equation balanced.

1. What is the main idea of the Key Concept?

2. What are the two ways the main idea is shown?

3. What is shown in gray? Why is that information important?

4. Why is the Key Concept separated by dotted lines into four sections?

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Name ______________________________

Reteach to Build Understanding
4-3

Operations that *undo* each other, like addition and subtraction, have an **inverse relationship**.

To solve an equation, use inverse operations.

If a number is added to the variable, subtract it from both sides.

If a number is subtracted from the variable, add it to both sides.

1. What operation is being used in the equation? $x + 15 = 22$

____

2. What operation has an inverse relationship to the operation identified in Exercise 1? $x + 15 - \square = 22 - \square$

$x = \square$

____

3. To solve the equation, subtract ______ from both sides of the equation.

4. What operation is being used in the equation? $y - 11 = 20$

____

5. What operation has an inverse relationship to the operation identified in Exercise 4? $y - 11 + \square = 20 + \square$

$y = \square$

____

6. To solve the equation, add ______ to both sides of the equation.

On the Back!

7. Write an equation to represent the balance shown below and solve for the variable.

Name ________________________________

Build Mathematical Literacy
4-3

Read the problem. Answer the questions to help understand the problem. Then tell whether the information used to answer the question was directly stated in the text (DS), implied in the text (I), or based only on previous knowledge (PK).

Clare had *t* books. After she bought 8 more books, she had 24. Write and solve an equation to find the number of books Clare started with.

1. How many books did Clare buy?

2. What does it mean that "Clare had *t* books"?

3. What operation will be used to write an equation for the problem?

4. Will the value of *t* be greater than or less than 24?

5. What will you find by writing and solving an equation?

6. Which property of equality will be used to solve for *t*?

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Name ______________________________

Reteach to Build Understanding
4-4

Multiplication and division have an **inverse relationship**.

Inverse operations can be used to solve equations.

$5p = 35$	$m \div 8 = 4$
$5p \div 5 = 35 \div 5$	$m \div 8 \cdot 8 = 4 \cdot 8$
$p = 7$	$m = 32$

1. Solve the equation $9p = 54$.

$9p = 54$

$9p \div 9 = 54 \div$ ________

$p =$ ________

Which property of equality did you use to solve the equation?

____

2. Solve the equation $x \div 4 = 30$.

$x \div 4 = 30$

$x \div 4 \cdot$ ________ $= 30 \cdot$ ________

$x =$ ________

Which property of equality did you use to solve the equation?

____

3. Maria solved the equation $7d = 56$ and found the solution $d = 8$.

She can check her solution by substituting ________ for d in the original equation.

$7d = 56$

$7 \cdot$ ________ $=$ ________

________ $=$ ________ It checks.

On the Back!

4. Explain how to solve the equation $8 = \frac{p}{12}$.

Name ______________________________

Build Mathematical Literacy
4-4

Read the problem. Answer the questions to help you understand the problem.

Write a division equation and a multiplication equation to represent the problem.

Lolo typed 1,125 words in 15 minutes. Let *w* represent the number of words typed each minute. If Lolo typed the same number of words each minute, how many words did she type in 1 minute?

1. Underline the important facts in the problem.

2. Is the problem phrased to more easily write a division equation or a multiplication equation? Explain.

3. How can the problem be rephrased so that you could write the other type of equation?

4. Which Property of Equality would be used to solve each equation?

5. Why is it important to say in the problem that Lolo typed the same number of words each minute?

Name ______________________________

Reteach to Build Understanding
4-5

You can use inverse relationships of operations and the properties of equality to solve equations with rational numbers.

1. To solve $3\frac{3}{4} + r = 5\frac{3}{8}$, use the ____________ Property of Equality.

$$3\frac{3}{4} + r = 5\frac{3}{8}$$

$$3\frac{3}{4} + r - 3\frac{3}{4} = 5\frac{3}{8} - \_\_\_\_\_$$

$$r = \_\_\_\_\_$$

2. A water cooler contained 5.2 liters of water. Some water was added until the cooler contained 22.1 liters of water. How many times as much water is there in the cooler now?

$$5.2x = 22.1$$

$$5.2x \div \_\_\_\_\_ = 22.1 \div 5.2$$

$$\_\_\_\_\_ = \_\_\_\_\_$$

There is ______ times as much water now.

3. Emiyo has used $2\frac{1}{4}$ gallons of paint. This is $\frac{2}{3}$ of the total amount of paint. How much paint, p, did Emiyo have to start?

a. Write an equation to describe the situation.

____

b. Rename the mixed number in the equation as a fraction.

____

c. Use inverse operations and multiply by the reciprocal of $\frac{2}{3}$ to solve.

d. Emiyo started with ______ gallons of paint.

$$\frac{2}{3}p = \frac{9}{4}$$

$$\frac{\square}{2} \times \frac{2}{3}p = \frac{9}{4} \times \frac{3}{\square}$$

$$\square p = \frac{\square}{8}$$

$$p = 3\frac{\square}{\square}$$

On the Back!

4. Solve the equation $p \div 8.2 = 9.3$ and check your solution.

Name ______________________________

Build Mathematical Literacy
4-5

Read the problem below. Circle True or False for each statement about the problem.

The scientific name for the little bumps on your tongue is *fungiform papillae*. Each bump can contain many taste buds. The number of taste buds a person has varies. There are three general classifications of taste: supertaster, medium taster, and nontaster. Suppose a supertaster has 8,640 taste buds. Solve the equation $4.5n = 8{,}640$ to find the number of taste buds, n, a nontaster may have.

1. Each bump on your tongue contains just one taste bud. **True** **False**

2. Everyone has the same number of taste buds. **True** **False**

3. There are three categories of tasters. **True** **False**

4. A medium taster has 8,640 taste buds. **True** **False**

5. A nontaster has no taste buds. **True** **False**

6. The variable, n, represents the number of taste buds a nontaster has. **True** **False**

7. A supertaster has 4.5 times as many taste buds as a nontaster. **True** **False**

8. The answer to the equation will tell how many times more taste buds a supertaster has than a nontaster. **True** **False**

THE SCHOOL DISTRICT OF PHILADELPHIA

Answer Keys

GET READY! TOPIC 4

Review What You Know!

Vocabulary

Choose the best term from the box to complete each definition.

algebraic expression
coefficient
equation
evaluate
variable

1. In $6x$, x is a(n) variable.

2. $x + 5$ is an example of a(n) algebraic expression.

3. Evaluate an expression to find its value.

4. The expressions on each side of the equal sign in a(n) equation are equal.

Equality

Tell whether the equation is true or false.

5. $6 + 2 = 2 + 6$ True

6. $2.5 - 1 = 1 - 2.5$ False

7. $\frac{1}{2} \times 3 = 3 \times \frac{1}{2}$ True

8. $\frac{3}{4} \div 5 = \frac{3}{4} \times \frac{1}{5}$ True

9. $5 \div \frac{1}{3} = \frac{5}{3}$ False

10. $\frac{2}{3} \times 5 = \frac{10}{15}$ False

Expressions

Evaluate each expression.

11. $x - 2$ for $x = 8$ 6

12. $2b$ for $b = 9$ 18

13. $3\frac{3}{4} + y$ for $y = \frac{5}{6}$ $4\frac{7}{12}$

14. $\frac{15}{x}$ for $x = 3$ 5

15. $5.6t$ for $t = 0.7$ 3.92

16. $4x$ for $x = \frac{1}{2}$ 2

Order of Operations

17. Explain the order in which you should compute the operations in the expression below. Then evaluate the expression.

$[(33 \div 3) + 1] - 2^2$

You perform the operation in parentheses first and then the operation in brackets. Simplify the exponent next, and finally subtract. 8

Graphing in the Coordinate Plane

18. Describe how to plot point $A(-6, 2)$ on a coordinate plane.

Start at the origin (0, 0) and move left six units along the x-axis to -6. Next, move up two units following the y-axis. Draw a point at that location and label it A.

Name ______________________

Reteach to Build Understanding
4-1

An **equation** is a mathematical sentence that uses an equal sign to show that two expressions are equal. An equation is true when both sides are equal.

The equation $12 - 6.7 = 5.3$ is true.

An equation may contain a variable. A **solution of an equation** is a value of the variable that makes the equation true.

The solution of the equation $8m = 72$ is 9.

Determine whether a number is a solution of an equation by substituting that number for the variable in the equation.

1. Tell whether the equation $35 \div r = 5$ is true or false for $r = 7$. true

What is the solution of this equation? 7

2. Substitute each value in the set for the variable to determine whether it is the solution of the equation $16.6 - t = 11.9$.

$t = 3.6, 4.4, 4.7, 5.4$

Try 3.6.
$16.6 - 3.6 = 13$, so 3.6 is not the solution.

a. Try 4.4.

$16.6 -$ 4.4 $= 12.2$, so 4.4 is not the solution.

b. Try 4.7. Explain.

$16.6 - 4.7 = 11.9$, so 4.7 is the solution.

c. Try 5.4. Explain.

$16.6 - 5.4 = 11.2$, so 5.4 is not the solution.

d. The solution of the equation $16.6 - t = 11.9$ is 4.7.

On the Back!

3. Tell which given value of the variable is the solution of the equation.
$9.4 = k + 5.07$ $k = 3.33, 4.33, 4.47, 14.47$ 4.33

Name ______________________________

Build Mathematical Literacy
4-1

Read the problem. Use the KNWS strategy to help understand how to solve the problem.

There are 27 pennies on one side of a pan balance and 18 pennies on the other. To make the pans balance, Hillary thinks 5 pennies should be added to the higher pan; Sean thinks 8 pennies should be added; and Rachel thinks 9 pennies should be added. Use the equation $27 = 18 + p$ to determine who is correct.

1. What facts do you **KNOW** from the problem? Underline the important facts in the problem.
   Check students' work.

2. Draw a picture of what is known from the problem.
   Check students' work.

3. What information do you **NOT** need to know from the problem? Circle any facts in the problem that are not needed.
   Check students' work. No facts should be circled.

4. What does the problem **WANT** you to find?
   The number of pennies that should be added to make the pans balance and which student is correct

5. What **STRATEGY** will you use to solve the problem? List the steps to solve the problem.
   Sample answer: Substitute each student's estimate of the number of pennies to be added for *p* in the equation. Then determine which value of *p* makes the equation true.

Name ______________________________

Reteach to Build Understanding
4-2

The **Addition Property of Equality** states that when you add the same amount to both sides of an equation, the two sides of the equation stay equal.

$22 - 7 = 15$, so $(22 - 7) + 10 = 15 + 10$.

The **Subtraction Property of Equality** states that when you subtract the same amount from both sides of an equation, the two sides of the equation stay equal.

$25 + 12 = 37$, so $(25 + 12) - 9 = 37 - 9$.

The **Multiplication Property of Equality** states that when you multiply both sides of an equation by the same amount, the two sides of the equation stay equal.

$18 - 4 = 14$, so $(18 - 4) \times 3 = 14 \times 3$.

The **Division Property of Equality** states that when you divide both sides of an equation by the same nonzero amount, the two sides of the equation stay equal.

$8 + 6 = 14$, so $(8 + 6) \div 7 = 14 \div 7$.

Complete the statements. Tell which property of equality was used.

1. If $\frac{y}{8} = 4$, then $\frac{y}{8} \times 8 = 4 \times$ **8**. **Multiplication Property of Equality**
2. If $4 + x = 34$, then $4 + x - 4 = 34 -$ **4**. **Subtraction Property of Equality**
3. If $3.5m = 14$, then $3.5m \div 3.5 = 14 \div$ **3.5**. **Division Property of Equality**
4. If $g - 6 = 10$, then $g - 6 + 6 = 10 +$ **6**. **Addition Property of Equality**

On the Back!

5. Tell which property of equality was used.

$6z = 90$
$6z \div 6 = 90 \div 6$

Division Property of Equality

Name ______________________________

Build Mathematical Literacy
4-2

Review the Key Concept from the lesson. Answer the questions to help understand how to read a Key Concept.

KEY CONCEPT

You can use the properties of equality to write equivalent equations.

Addition Property of Equality

$7 + 3 = 10$

$(7 + 3) + a = 10 + a$

Add the same amount to each side to keep the equation balanced.

Subtraction Property of Equality

$7 + 3 = 10$

$(7 + 3) - a = 10 - a$

Subtract the same amount from each side to keep the equation balanced.

Multiplication Property of Equality

$7 + 3 = 10$

$(7 + 3) \times a = 10 \times a$

Multiply each side of the equation by the same amount to keep the equation balanced.

Division Property of Equality

$7 + 3 = 10$

$(7 + 3) \div a = 10 \div a$

Divide each side of the equation by the same non-zero amount to keep the equation balanced.

1. What is the main idea of the Key Concept?
   Sample answer: It is possible to write an equation that is equivalent to a given equation by using the properties of equality.
2. What are the two ways the main idea is shown?
   Sample answer: With equations and in words
3. What is shown in gray? Why is that information important?
   Sample answer: The operations on both sides of an equation and the name of the operation; It highlights what you can do to both sides of an equation to find an equivalent equation.
4. Why is the Key Concept separated by dotted lines into four sections?
   Sample answer: There are four properties of equality, and each section explains one property.

Name ______________________________

Reteach to Build Understanding
4-3

Operations that *undo* each other, like addition and subtraction, have an **inverse relationship**.

To solve an equation, use inverse operations.

If a number is added to the variable, subtract it from both sides.

If a number is subtracted from the variable, add it to both sides.

1. What operation is being used in the equation? $x + 15 = 22$

   Addition

2. What operation has an inverse relationship to the operation identified in Exercise 1? $x + 15 - \boxed{15} = 22 - \boxed{15}$

   $x = \boxed{7}$

   Subtraction

3. To solve the equation, subtract **15** from both sides of the equation.

4. What operation is being used in the equation? $y - 11 = 20$

   Subtraction

5. What operation has an inverse relationship to the operation identified in Exercise 4? $y - 11 + \boxed{11} = 20 + \boxed{11}$

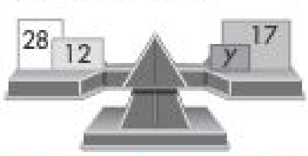
   $y = \boxed{31}$

   Addition

6. To solve the equation, add **11** to both sides of the equation.

On the Back!

7. Write an equation to represent the balance shown below and solve for the variable.



$28 + 12 = y + 17; y = 23$

Name ______________________________

Build Mathematical Literacy
4-3

Read the problem. Answer the questions to help understand the problem. Then tell whether the information used to answer the question was directly stated in the text (DS), implied in the text (I), or based only on previous knowledge (PK).

Clare had *t* books. After she bought 8 more books, she had 24.
Write and solve an equation to find the number of books Clare started with.

1. How many books did Clare buy?
   Clare bought 8 books. (DS)

2. What does it mean that "Clare had *t* books"?
   It means that the number of books Clare had is unknown. (PK)

3. What operation will be used to write an equation for the problem?
   Addition will be used to write an equation. (I)

4. Will the value of *t* be greater than or less than 24?
   The value of *t* will be less than 24. (I)

5. What will you find by writing and solving an equation?
   You will find the number of books Clare started with. (DS)

6. Which property of equality will be used to solve for *t*?
   The Subtraction Property of Equality will be used. (PK)

THE SCHOOL DISTRICT OF PHILADELPHIA

Name ______________________

Reteach to Build Understanding
4-4

Multiplication and division have an **inverse relationship**.

Inverse operations can be used to solve equations.

$5p = 35$	$m \div 8 = 4$
$5p \div 5 = 35 \div 5$	$m \div 8 \cdot 8 = 4 \cdot 8$
$p = 7$	$m = 32$

1. Solve the equation $9p = 54$.

$9p = 54$

$9p \div 9 = 54 \div$ 9

$p =$ 6

Which property of equality did you use to solve the equation?

Division Property of Equality

2. Solve the equation $x \div 4 = 30$.

$x \div 4 = 30$

$x \div 4 \cdot$ 4 $= 30 \cdot$ 4

$x =$ 120

Which property of equality did you use to solve the equation?

Multiplication Property of Equality

3. Maria solved the equation $7d = 56$ and found the solution $d = 8$.

She can check her solution by substituting 8 for d in the original equation.

$7d = 56$

$7 \cdot$ 8 $=$ 56

56 $=$ 56 It checks.

On the Back! Multiply both sides of the equation by 12.

4. Explain how to solve the equation $8 = \frac{p}{12}$.

Name ______________________________

Build Mathematical Literacy
4-4

Read the problem. Answer the questions to help you understand the problem.

Write a division equation and a multiplication equation to represent the problem.

Lolo typed 1,125 words in 15 minutes. Let *w* represent the number of words typed each minute. If Lolo typed the same number of words each minute, how many words did she type in 1 minute?

1. Underline the important facts in the problem.
   Check students' work.
2. Is the problem phrased to more easily write a division equation or a multiplication equation? Explain.
   Sample answer: Division equation; The problem starts with the number of words typed in 15 minutes and asks for the number of words typed in 1 minute. To go from a greater number of minutes to a lesser number of minutes requires division.
3. How can the problem be rephrased so that you could write the other type of equation?
   Sample answer: Lolo typed for 15 minutes at a constant rate of *w* words typed each minute. If Lolo typed a total of 1,125 words, how many words did she type in 1 minute?
4. Which Property of Equality would be used to solve each equation?
   Sample answer: Multiplication Property of Equality for the division equation and Division Property of Equality for the multiplication equation
5. Why is it important to say in the problem that Lolo typed the same number of words each minute?
   Sample answer: Division is based on equal parts. So, to use division in the equation, Lolo must have typed an equal number of words per minute.

Name ______________________

Reteach to Build Understanding
4-5

You can use inverse relationships of operations and the properties of equality to solve equations with rational numbers.

1. To solve $3\frac{3}{4} + r = 5\frac{3}{8}$, use the **Subtraction** Property of Equality.

$$3\frac{3}{4} + r = 5\frac{3}{8}$$
$$3\frac{3}{4} + r - 3\frac{3}{4} = 5\frac{3}{8} - \mathbf{3\frac{3}{4}}$$
$$r = \mathbf{1\frac{5}{8}}$$

2. A water cooler contained 5.2 liters of water. Some water was added until the cooler contained 22.1 liters of water. How many times as much water is there in the cooler now?

$$5.2x = 22.1$$
$$5.2x \div \mathbf{5.2} = 22.1 \div 5.2$$
$$\mathbf{x} = \mathbf{4.25}$$

There is **4.25** times as much water now.

3. Emiyo has used $2\frac{1}{4}$ gallons of paint. This is $\frac{2}{3}$ of the total amount of paint. How much paint, p, did Emiyo have to start?

a. Write an equation to describe the situation.

$\mathbf{\frac{2}{3}p = 2\frac{1}{4}}$

b. Rename the mixed number in the equation as a fraction.

$\mathbf{\frac{2}{3}p = \frac{9}{4}}$

c. Use inverse operations and multiply by the reciprocal of $\frac{2}{3}$ to solve.

d. Emiyo started with $\mathbf{3\frac{3}{8}}$ gallons of paint.

$$\frac{2}{3}p = \frac{9}{4}$$
$$\frac{\boxed{3}}{2} \times \frac{2}{3}p = \frac{9}{4} \times \frac{3}{\boxed{2}}$$
$$\boxed{1}p = \frac{\boxed{27}}{8}$$
$$p = 3\frac{\boxed{3}}{\boxed{8}}$$

On the Back!

4. Solve the equation $p \div 8.2 = 9.3$ and check your solution.

$$\mathbf{p \div 8.2 \times 8.2 = 9.3 \times 8.2} \qquad \mathbf{76.26 \div 8.2 = 9.3}$$
$$\mathbf{p = 76.26} \qquad \mathbf{9.3 = 9.3}$$

Name ___________________________

Build Mathematical Literacy
4-5

Read the problem below. Circle True or False for each statement about the problem.

The scientific name for the little bumps on your tongue is *fungiform papillae*. Each bump can contain many taste buds. The number of taste buds a person has varies. There are three general classifications of taste: supertaster, medium taster, and nontaster. Suppose a supertaster has 8,640 taste buds. Solve the equation $4.5n = 8,640$ to find the number of taste buds, n, a nontaster may have.

1. Each bump on your tongue contains just one taste bud. **True** **False**

2. Everyone has the same number of taste buds. **True** **False**

3. There are three categories of tasters. **True** **False**

4. A medium taster has 8,640 taste buds. **True** **False**

5. A nontaster has no taste buds. **True** **False**

6. The variable, n, represents the number of taste buds a nontaster has. **True** **False**

7. A supertaster has 4.5 times as many taste buds as a nontaster. **True** **False**

8. The answer to the equation will tell how many times more taste buds a supertaster has than a nontaster. **True** **False**

THE SCHOOL DISTRICT OF PHILADELPHIA

Grade: 6 **Subject:** Math (from enVision Mathematics, Common Core, 2020, Grade 6)

Topic: Understanding, Writing, & Solving Inequalities

What Your Student is Learning: Understand the symbols required to write an inequality, write inequalities to describe mathematical situations, describe solutions to an inequality, & represent solutions to an inequality on a number line,

Background and Context for Parents: Students have previously worked with the concept of inequalities since kindergarten in comparing two values, this is the first time they are formally seeing a coefficient with a variable and more than one term on either side of the inequality sign.

An inequality is a math sentence that contains the inequality symbol. It describes a situation that has an infinite number of numerical possibilities. Different inequality symbols include

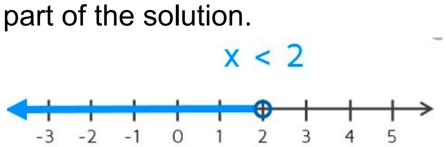
- > is greater than
- < is less than
- ≥ is greater than or equal to
- ≤ is less than or equal to
- ≠ is not equal to

This is one of the first times students have the opportunity to consider inequalities both conceptually and abstractly.

On page 30 Students first need to know how to write an inequality given a situation. For example, “The maximum weight an elevator can hold is 2,200 pounds.” The inequality that represents the situation would be w ≤ 2200.

Then, students need to know how to substitute values into an inequality to make it true. For example, If x < 7, which of the values is a solution of the inequality? x= 3 (true), x = 6 (true), x = 7 (false), x = 10 (false)

The number line is also important in showing some of the solutions to
an inequality. It is a graphical representation of all solutions to an inequality. An open circle on the number line shows that the number is not a solution. A closed circle on the number line shows that the number is part of the solution.



Students have the opportunity on page 32 to practice describing solutions and graphing solutions to inequalities on a number line.

Ways to support your student:

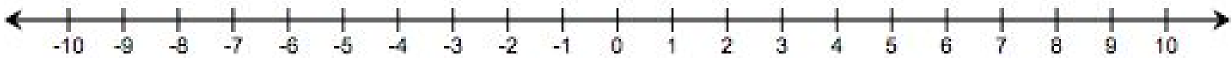
- Talk with your student about situations that contain a limitation or constraint (examples could include: at least 15 minutes of homework, less than 1 hour of TV time, at most 500 texts, express lane at the grocery store, money/budget constraints, etc). Make sure to talk about situations where they have to differentiate between > and ≥ and Have your student write inequalities to represent these situations, and draw number lines to have them graph. Let them explain their solutions to you and what they mean.

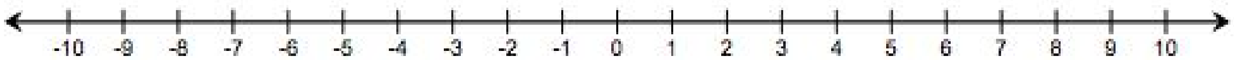
- Talk about situations where they have to differentiate between > and ≥ and < and ≤. (For example: $x < 12$ might represent “children younger than 12 years old” where $x \leq 12$ might represent “children 12 or younger”)
- Your student may struggle with the concept of an “infinite number of solutions” with inequalities. Talk with them about all the numbers in between.
- As they work through the practice, ask your student to explain what their solution means and if it makes sense in the context of the problem.

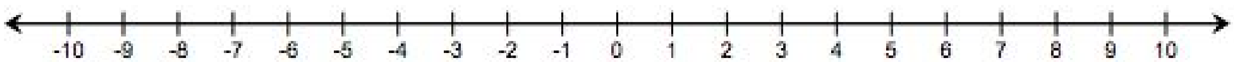
Online Resources for Students: Graphing Inequalities on a Number Line
https://www.geogebra.org/m/bYGED3dY
Khan Academy: Review & Practice of One Step Inequalities
https://tinyurl.com/hjsstzs

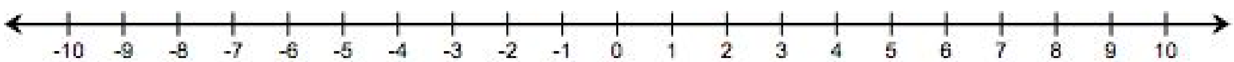
THE SCHOOL DISTRICT OF PHILADELPHIA

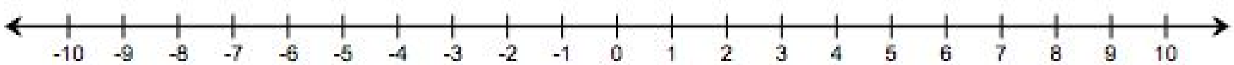
Name ____________________ Date ________________

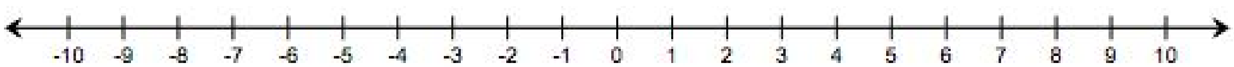


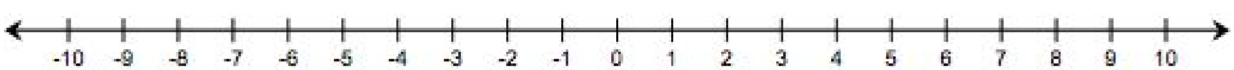


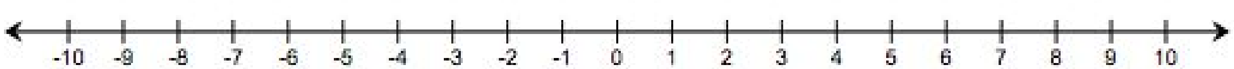












Name ____________________

Reteach to Build Understanding
4-6

A mathematical sentence that contains $<$ (less than), $>$ (greater than), $\leq$ (less than or equal to), $\geq$ (greater than or equal to), or $\neq$ (not equal to) is an **inequality**.

Inequality symbols can be used to write comparison statements.

A number, *n*, is less than 50.	$n < 50$
A number, *p*, is greater than 37.	$p > 37$
Erin's age, *e*, is greater than or equal to 12.	$e \geq 12$
Gabriel's age, *g*, is less than or equal to 15.	$g \leq 15$
Ramon's test score, *r*, is not 85.	$r \neq 85$

1. Morgan ate at least 20 blueberries. Let *m* represent the number of blueberries that Morgan ate.

a. What are three possible numbers of blueberries that Morgan could have eaten?

____

b. Could the number of blueberries that Morgan ate be exactly 20? ____________

c. Write an inequality that represents the possible numbers of blueberries that Morgan could have eaten.

____

2. Kayla is at most 56 inches tall. Let *k* represent Kayla's height.

a. What are three possible heights for Kayla?

____

b. Could Kayla's height be exactly 56 inches? ____________

c. Write an inequality that represents Kayla's possible heights. ____________

On the Back!

3. Write an inequality for the situation.

The number of teachers, *t*, at Riverside Middle School is greater than 35.

Name ______________________________

Build Mathematical Literacy
4-6

Write sentences that describe the inequalities for each situation.

1. Length of a ribbon (longer, shorter) in relation to 5 inches

>: A ribbon is longer than 5 inches.

<: ______________________________

≥: A ribbon is at least 5 inches long.

≤: ______________________________

2. Age (older, younger) of children in relation to 12 years old

>: ______________________________

<: ______________________________

≥: Children are 12 years or older.

≤: ______________________________

3. Temperature (warmer, colder) forecast in relation to 45°F

>: The temperature will be warmer than 45°F.

<: ______________________________

≥: ______________________________

≤: The temperature will be at most 45°F.

4. Distance (farther, closer) from home in relation to 1 mile

>: ______________________________

<: You are closer than 1 mile from home.

≥: ______________________________

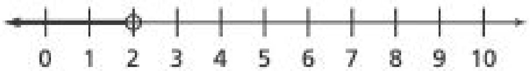
≤: You are at most 1 mile from home.

Name ______________________________

Reteach to Build Understanding
4-7

A **solution of an inequality** is a value for the variable that makes the inequality true. A number line can be used to show the solutions of an inequality.

$x < 2$



An inequality can have **infinitely many,** or an unlimited number, of solutions. For the inequality $x < 2$, every number that is less than 2 is a solution. The numbers 0, 1, -5, and -20 are four examples of the unlimited number of solutions.

1. Write "is" or "is not" in each blank to explain whether the number is a solution to the inequality $d > -2$.

3 ________ a solution because 3 ________ greater than -2.

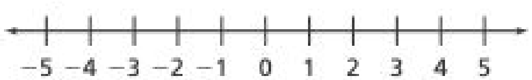
-2 ________ a solution because -2 ________ greater than -2.

2. Circle the correct term and fill in each blank to complete the steps to graph the solutions of the inequality $d > -2$. Draw the graph.

Step 1 Draw a(n) open/closed circle at ________.

Step 2 Because $d > -2$, shade all the values to the left/right of -2.

Step 3 Draw an arrow on the number line to show that the solutions go on forever.

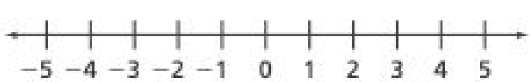


3. Circle the correct term and fill in each blank to complete the steps to graph the solutions of the inequality $y \leq 3$. Draw the graph.

Step 1 Draw a(n) open/closed circle at ________.

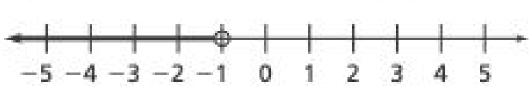
Step 2 Because $y \leq 3$, shade all the values to the left/right of 3.

Step 3 Draw an arrow on the number line to show that the solutions go on forever.



On the Back!

4. Write the inequality that the graph represents.



Name ____________________________________

Build Mathematical Literacy
4-7

Read the problem. Answer the questions to help understand the problem.

Francine received a gift card to buy cell phone apps. She says that the card's value is enough to buy any of the apps shown at the right. Let *v* be the dollar value of the gift card. Write an inequality that best describes the value of the gift card.

PHONE APPS	
RECIPES	$9.50
W02 SPORTS	$10.50
REMOTE DESKTOP	$12.00

1. What does the variable, *v*, represent?

2. When writing an inequality, where do you find the number to be used in the inequality?

3. Which inequality symbol should be used? Explain.

4. How many apps can Francine buy with the gift card? Explain.

5. Will the solution tell the exact value of the gift card? Explain.

6. Is it possible that Francine could buy all three apps using the gift card? Explain.

Answer Keys

Name ___________________________________

Reteach to Build Understanding
4-6

A mathematical sentence that contains $<$ (less than), $>$ (greater than), $\leq$ (less than or equal to), $\geq$ (greater than or equal to), or $\neq$ (not equal to) is an **inequality**.

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Gabriel's age, *g*, is less than or equal to 15.	$g \leq 15$
Ramon's test score, *r*, is not 85.	$r \neq 85$

1. Morgan ate at least 20 blueberries. Let *m* represent the number of blueberries that Morgan ate.

a. What are three possible numbers of blueberries that Morgan could have eaten?

Sample answer: 20, 21, 30

b. Could the number of blueberries that Morgan ate be exactly 20? Yes

c. Write an inequality that represents the possible numbers of blueberries that Morgan could have eaten.

$m \geq 20$

2. Kayla is at most 56 inches tall. Let *k* represent Kayla's height.

a. What are three possible heights for Kayla?

Sample answer: 36 inches, 48 inches, 50 inches

b. Could Kayla's height be exactly 56 inches? Yes

c. Write an inequality that represents Kayla's possible heights. $k \leq 56$

On the Back!

3. Write an inequality for the situation.

The number of teachers, *t*, at Riverside Middle School is greater than 35. $t > 35$

Name ____________________

Build Mathematical Literacy
4-6

Write sentences that describe the inequalities for each situation.

1. Length of a ribbon (longer, shorter) in relation to 5 inches

>: A ribbon is longer than 5 inches.

<: A ribbon is shorter than 5 inches.

≥: A ribbon is at least 5 inches long.

≤: A ribbon is at most 5 inches long.

2. Age (older, younger) of children in relation to 12 years old

>: Children are older than 12 years.

<: Children are younger than 12 years.

≥: Children are 12 years or older.

≤: Children are 12 years or younger.

3. Temperature (warmer, colder) forecast in relation to 45°F

>: The temperature will be warmer than 45°F.

<: The temperature will be colder than 45°F.

≥: The temperature will be at least 45°F.

≤: The temperature will be at most 45°F.

4. Distance (farther, closer) from home in relation to 1 mile

>: You are farther than 1 mile from home.

<: You are closer than 1 mile from home.

≥: You are at least 1 mile from home.

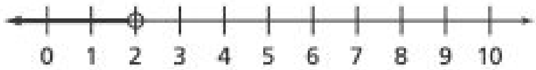
≤: You are at most 1 mile from home.

Name ______________________________

Reteach to Build Understanding
4-7

A **solution of an inequality** is a value for the variable that makes the inequality true. A number line can be used to show the solutions of an inequality.

$x < 2$



An inequality can have **infinitely many,** or an unlimited number, of solutions. For the inequality $x < 2$, every number that is less than 2 is a solution. The numbers 0, 1, −5, and −20 are four examples of the unlimited number of solutions.

1. Write "is" or "is not" in each blank to explain whether the number is a solution to the inequality $d > -2$.

3 **is** a solution because 3 **is** greater than −2.

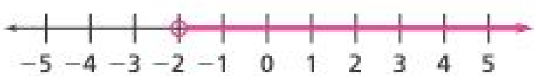
−2 **is not** a solution because −2 **is not** greater than −2.

2. Circle the correct term and fill in each blank to complete the steps to graph the solutions of the inequality $d > -2$. Draw the graph.

Step 1 Draw a(n) open/closed circle at **−2**.

Step 2 Because $d > -2$, shade all the values to the left/right of −2.

Step 3 Draw an arrow on the number line to show that the solutions go on forever.

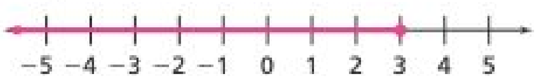


3. Circle the correct term and fill in each blank to complete the steps to graph the solutions of the inequality $y \leq 3$. Draw the graph.

Step 1 Draw a(n) open/closed circle at **3**.

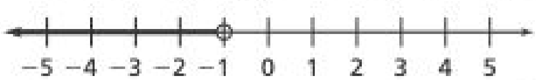
Step 2 Because $y \leq 3$, shade all the values to the left/right of 3.

Step 3 Draw an arrow on the number line to show that the solutions go on forever.



On the Back!

4. Write the inequality that the graph represents. $x < -1$



Name ______________________________

Build Mathematical Literacy
4-7

Read the problem. Answer the questions to help understand the problem.

Francine received a gift card to buy cell phone apps. She says that the card's value is enough to buy any of the apps shown at the right. Let *v* be the dollar value of the gift card. Write an inequality that best describes the value of the gift card.

PHONE APPS	
RECIPES	\$9.50
W02 SPORTS	\$10.50
REMOTE DESKTOP	\$12.00

1. What does the variable, *v*, represent?
   The dollar value of the gift card

2. When writing an inequality, where do you find the number to be used in the inequality?
   In the list of apps

3. Which inequality symbol should be used? Explain.
   $\geq$; Sample answer: The problem says that Francine has "enough to buy any of the apps," so the value of the gift card must be at least the value of the most expensive app. The symbol for *at least* is $\geq$.

4. How many apps can Francine buy with the gift card? Explain.
   At least one app; Sample answer: The problem says that she has "enough to buy any of the apps," but it does not specify whether she has enough to buy more than one app.

5. Will the solution tell the exact value of the gift card? Explain.
   No; Sample answer: It is not possible to determine the exact value of the gift card based on the information given. It is only possible to determine the least value the gift card could have.

6. Is it possible that Francine could buy all three apps using the gift card? Explain.
   Yes; Sample answer: The total of the three apps is \$32. The solution includes values greater than or equal to \$12, and \$32 $\geq$ \$12.

THE SCHOOL DISTRICT OF PHILADELPHIA

Grade: 6 **Subject:** Math (from enVision Mathematics, Common Core, 2020, Grade 6)

Topic: Independent/Dependent Variables and Using Patterns to Connect Scenarios, Equations, Graphs, and Tables.
What Your Student is Learning: ● Variables can be used to represent quantities that change in relationship to one another. The dependent variable changes in response to the independent variable. ● Patterns can be used to identify the relationship between quantities and write an equation that describes the relationship. ● Tables, graphs, and equations can be used to analyze the relationship between dependent and independent variables.
Background and Context for Parents: ● The dependent variable changes in response to the independent variable. For example: The distance the car travels, *d*, is dependent on the speed, *s*, at which the car travels (s is the independent variable and d is the dependent). ● Students will be looking for patterns in tables that have a constant relationship. They will be connecting a equation, a graph, and a table of values that all represent the same constant relationship between the independent and dependent variables.
Ways to support your student: ● Read the problem outloud to them. ● Remember, the topic is about relationships and how things are connected. Ask them if they could make a graph, equation, or table to show the relationship. Specifically highlight the relationship between x and y, not the relationships between the values of x or the relationship between the values of y. ● Before giving your student the answer to their question or specific help, ask them "What have you tried so far?, What do you know?, What might be a next step? ● Have your student make a table of values, equation, graph whenever you see a constant rate (miles per hour, beats per minute, jump rope per second). ● Graph paper can be printed from online and https://www.desmos.com/calculator can be used for students to input their equation or table to check the graph (click on the top left + sign to get the table option). ● After your student has solved it, and before you tell them it's correct or not, have them explain to you how they got their solution and if they think their answer makes sense.
Online Resources for Students: ● **https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-equations-and-inequalities/cc-6th-dependent-independent/v/dependent-and-independent-variables-exercise-example-1** (they can do the whole module**)**

Name ______________________________

Reteach to Build Understanding
4-8

A **dependent variable** is a variable whose value changes in response to another variable.

The number of eggs, *g*, produced by a farm depends on the number of chickens, *c*, on the farm.

The variable *g* represents the dependent variable because the number of eggs produced depends on the number of chickens on the farm.

An **independent variable** is a variable that causes the value of the dependent variable to change.

The amount of money, *m*, collected by selling popcorn depends on the number of bags of popcorn, *p*, sold.

The variable *p* represents the independent variable because the number of bags of popcorn sold causes the amount of money collected to change.

1. A restaurant is offering an omelet special for Sunday brunch. The chef can make a number of omelets, *m*, for brunch. There are a number of eggs, *g*, in the restaurant's refrigerator.

The number of __________ depends on the number of __________.

Identify each variable: independent variable ______; dependent variable ______

2. Jacob earns $5 every time his online ad is viewed, *v*. He earns *d* dollars from his ad.

The number of __________ depends on the number of __________.

Identify each variable: independent variable ______; dependent variable ______

3. Write your own situation in which the number of tennis players, *p*, is an independent variable.

____

____

____

On the Back!

4. Underline the independent variable and circle the dependent variable for the following situation: A book has a number of pages, *p*. It takes Caroline a number of hours, *h*, to read the book.

Name ___________________________________

Build Mathematical Literacy
4-8

Read the problem. Complete the directions and the table to help understand the problem.

You spend *c* dollars for *p* identical pairs of pants. A friend claims that because *c* increases if you increase *p*, and *p* increases if you increase *c*, either *c* or *p* could be the independent variable. Is your friend right or wrong? Explain.

1. Underline the two variables in the problem.

2. Draw a circle around the two assumptions that the friend uses as evidence.

3. Draw a box around the friend's claim.

4. Complete the table to determine whether the assumptions make sense and are correct.

	Rephrased in Words (without variables)	**Independent Variable**	**Dependent Variable**	**Correct? (Yes/No)**
Assumption 1	You spend more ________ when you buy more ________.			
Assumption 2	You buy more ________ when you spend more ________.			

5. Did you answer "No" in the last column for either assumption? Explain.

Name ______________________________

Reteach to Build Understanding
4-9

You can use words and numbers to write a rule for a number pattern that describes how two variables are related. The rule "multiply s by 6 to get t" is represented by the equation $6s = t$.

You can use substitution to replace a variable in an algebraic expression with a number. Use substitution to find the value of the expression $4x + 1$ when $x = 5$.

$$4x + 1$$
$$= 4(5) + 1$$
$$= 21$$

1. Find the pattern in the table and then write a rule and an equation that represents it. The rule should tell how to use each value for x to get the corresponding value for y.

x	2	4	6	8
y	3	5	7	9

Think: How can I get to the value of y if I start with the value of x?

a. Write the rule in words: ______________________________

b. Write an equation to represent the rule.

____

2. Katelyn earns 2 points for each question answered correctly on a math quiz, plus 5 extra credit points.

a. Write an expression that describes how to find Katelyn's score. Let q represent the number of questions answered correctly.

2 points for each question answered correctly, plus 5 extra credit points

______ × ______ + ______

b. Write and solve an equation that can be used to find Katelyn's score, s, if she answered 9 questions correctly.

____

On the Back!

3. Write a rule and an equation to represent the pattern in the table.

p	2	3	5	8
q	10	15	25	40

Name ________________________________

Answer the questions to help understand the problem and the table.

The table shows Brenda's age, b, when Talia's age, t, is 7, 9, and 10. Find the pattern and then write a rule and an equation that represents the pattern. Then find Brenda's age when Talia is 12.

Talia's Age, t	Brenda's Age, b
7	2
9	4
10	5
12	b

1. Which child's age is the independent variable and which is the dependent variable? Highlight words in the problem and/or parts of the table that give clues to answering this question.

2. What is the difference between writing a rule to represent the pattern shown in the table and writing an equation to represent the pattern?

3. A student says that because Brenda was 5 when Talia was 10, the equation is $b = t \div 2$. Explain the student's error and describe how to use the table correctly to write an equation.

4. Which statement describes how to complete the last part of the problem?

   Ⓐ Substitute 5 for b in your equation and solve.

   Ⓑ Substitute 12 for t in your equation and solve.

   Ⓒ Substitute 12 for b in your equation and solve.

   Ⓓ Substitute 5 for t in your equation and solve.

Name ______________________________

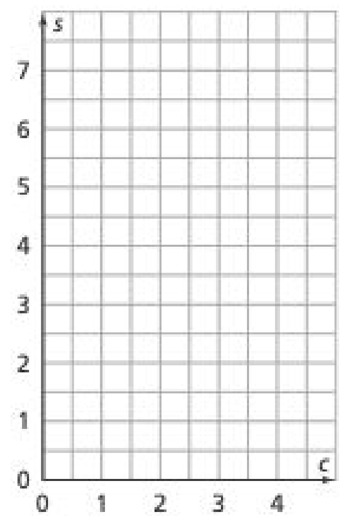
Reteach to Build Understanding
4-10

Use a table, a graph, or an equation to show the relationship between dependent and independent variables in a problem situation.

A store sells a toy car for \$1 less than twice what it costs to make the car.

1. Make a table to relate the selling price, *s*, to the cost of making the car, *c*. Then graph the ordered pairs on the coordinate plane.

c	*s*
1	1
2	____
3	____



2. Write an equation that describes the relationship.

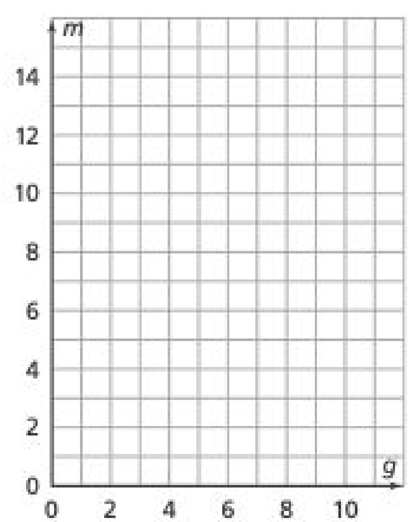
selling price = 2 times the cost minus \$1

$s =$ ____ × ____ − ____

3. What is the selling price of a toy car that costs \$4 to make? ____

On the Back!

4. Walter pays \$4 for each gallon, *g*, of gas for his lawn mower. He uses a gift card worth \$5 to reduce the amount he owes for his purchase. How much money, *m*, will Walter owe if he buys 4 gallons of gas? Make a table using 2, 3, and 4 as values for *g*. Graph the ordered pairs, and then write an equation to solve the problem.



Name ___________________________________

Build Mathematical Literacy
4-10

Review the Key Concept from the lesson. Answer the questions to help understand how to read a Key Concept.

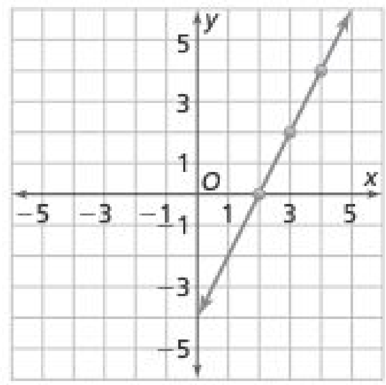
KEY CONCEPT

You can analyze the relationship between independent and dependent variables in tables and graphs. You can relate tables and graphs to an equation.

Independent Variable

$y = 2x - 4$	
x	y
2	0
3	2
4	4

Dependent Variable



1. What does the Key Concept show how to do?

2. What are the three ways to represent the relationship between the independent and dependent variables?

3. How were the values of *y* in the table determined?

4. How does the graph relate to the table?

5. How would the table change if different *x*-values were used? How would the graph change? Explain.

Answer Keys

Name ________________________________

A **dependent variable** is a variable whose value changes in response to another variable.

The number of eggs, *g*, produced by a farm depends on the number of chickens, *c*, on the farm.

The variable *g* represents the dependent variable because the number of eggs produced depends on the number of chickens on the farm.

An **independent variable** is a variable that causes the value of the dependent variable to change.

The amount of money, *m*, collected by selling popcorn depends on the number of bags of popcorn, *p*, sold.

The variable *p* represents the independent variable because the number of bags of popcorn sold causes the amount of money collected to change.

1. A restaurant is offering an omelet special for Sunday brunch. The chef can make a number of omelets, *m*, for brunch. There are a number of eggs, *g*, in the restaurant's refrigerator.

The number of **omelets** depends on the number of **eggs**.

Identify each variable: independent variable ***g***; dependent variable ***m***

2. Jacob earns $5 every time his online ad is viewed, *v*. He earns *d* dollars from his ad.

The number of **dollars** depends on the number of **views**.

Identify each variable: independent variable ***v***; dependent variable ***d***

3. Write your own situation in which the number of tennis players, *p*, is an independent variable.

Sample answer: The number of matches, *m*, scheduled depends on the number of tennis players, *p*, registered for a tournament.

On the Back!

4. Underline the independent variable and circle the dependent variable for the following situation: A book has a number of pages, *p*. It takes Caroline a number of hours, *h*, to read the book.

Name ________________________________

Build Mathematical Literacy
4-8

Read the problem. Complete the directions and the table to help understand the problem.

You spend *c* dollars for *p* identical pairs of pants. A friend claims that because *c* increases if you increase *p*, and *p* increases if you increase *c*, either *c* or *p* could be the independent variable. Is your friend right or wrong? Explain.

1. Underline the two variables in the problem.
   Check students' work.

2. Draw a circle around the two assumptions that the friend uses as evidence.
   Check students' work.

3. Draw a box around the friend's claim.
   Check students' work.

4. Complete the table to determine whether the assumptions make sense and are correct.

	Rephrased in Words (without variables)	Independent Variable	Dependent Variable	Correct? (Yes/No)
Assumption 1	You spend more **dollars** when you buy more **pants**.	***p***	***c***	**Yes**
Assumption 2	You buy more **pants** when you spend more **dollars**.	***c***	***p***	**No**

5. Did you answer "No" in the last column for either assumption? Explain.
   Yes; Sample answer: Assumption 2 does not make sense because the additional amount of money may be spent on items other than pants.

Name ______________________________

Reteach to Build Understanding
4-9

You can use words and numbers to write a rule for a number pattern that describes how two variables are related. The rule "multiply s by 6 to get t" is represented by the equation $6s = t$.

You can use substitution to replace a variable in an algebraic expression with a number. Use substitution to find the value of the expression $4x + 1$ when $x = 5$.

$$4x + 1$$
$$= 4(5) + 1$$
$$= 21$$

1. Find the pattern in the table and then write a rule and an equation that represents it. The rule should tell how to use each value for x to get the corresponding value for y.

x	2	4	6	8
y	3	5	7	9

Think: How can I get to the value of y if I start with the value of x?

a. Write the rule in words: **Sample answer: Add x and 1 to get y.**

b. Write an equation to represent the rule.

Sample answer: $y = x + 1$

2. Katelyn earns 2 points for each question answered correctly on a math quiz, plus 5 extra credit points.

a. Write an expression that describes how to find Katelyn's score. Let q represent the number of questions answered correctly.

2 points for each question answered correctly, plus 5 extra credit points

$\underline{\mathbf{2}} \times \underline{\mathbf{q}} + \underline{\mathbf{5}}$

b. Write and solve an equation that can be used to find Katelyn's score, s, if she answered 9 questions correctly.

$s = 2q + 5$; 23

On the Back!

3. Write a rule and an equation to represent the pattern in the table.

p	2	3	5	8
q	10	15	25	40

Sample answer: The value of q is 5 times the value of p; $q = 5p$

Name ______________________________

Build Mathematical Literacy
4-9

Answer the questions to help understand the problem and the table.

The table shows Brenda's age, *b*, when Talia's age, *t*, is 7, 9, and 10. Find the pattern and then write a rule and an equation that represents the pattern. Then find Brenda's age when Talia is 12.

Talia's Age, *t*	Brenda's Age, *b*
7	2
9	4
10	5
12	*b*

1. Which child's age is the independent variable and which is the dependent variable? Highlight words in the problem and/or parts of the table that give clues to answering this question.

Independent: Talia's age; Dependent: Brenda's age; Check students' work.

2. What is the difference between writing a rule to represent the pattern shown in the table and writing an equation to represent the pattern?

Sample answer: A rule uses words to describe the pattern of change between the independent and dependent values in the table. An equation describes the relationship between the variables in the form of a number sentence with an equal sign.

3. A student says that because Brenda was 5 when Talia was 10, the equation is $b = t \div 2$. Explain the student's error and describe how to use the table correctly to write an equation.

Sample answer: The student looked at only one pair of values in the table. To accurately write a rule, the pattern must be true for all values in the table.

4. Which statement describes how to complete the last part of the problem?

Ⓐ Substitute 5 for *b* in your equation and solve.

Ⓑ Substitute 12 for *t* in your equation and solve.

Ⓒ Substitute 12 for *b* in your equation and solve.

Ⓓ Substitute 5 for *t* in your equation and solve.

Name ______________________________

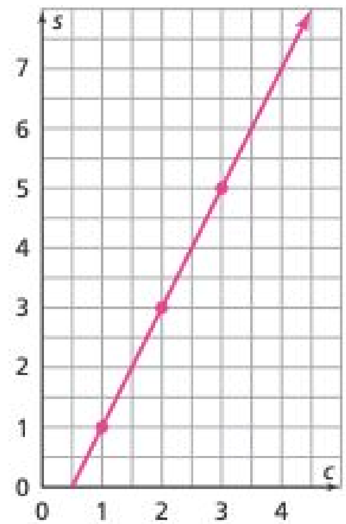
Reteach to Build Understanding
4-10

Use a table, a graph, or an equation to show the relationship between dependent and independent variables in a problem situation.

A store sells a toy car for $1 less than twice what it costs to make the car.

1. Make a table to relate the selling price, *s*, to the cost of making the car, *c*. Then graph the ordered pairs on the coordinate plane.

c	*s*
1	1
2	3
3	5



2. Write an equation that describes the relationship.

selling price = 2 times the cost minus $1

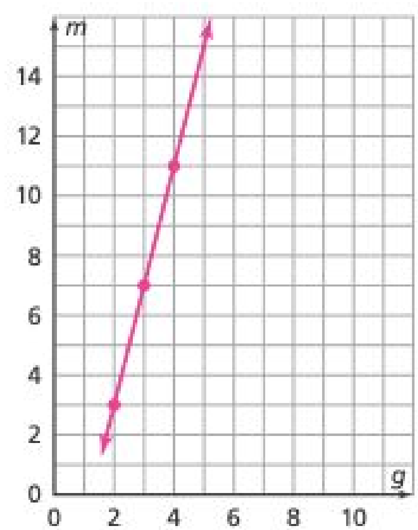
$s =$ **2** $\times$ ***c*** $-$ **1**

3. What is the selling price of a toy car that costs $4 to make? **$7**

On the Back!

4. Walter pays $4 for each gallon, *g*, of gas for his lawn mower. He uses a gift card worth $5 to reduce the amount he owes for his purchase. How much money, *m*, will Walter owe if he buys 4 gallons of gas? Make a table using 2, 3, and 4 as values for *g*. Graph the ordered pairs, and then write an equation to solve the problem.

Table should show ordered pairs (2, 3), (3, 7), and (4, 11); $m = 4g - 5$; Walter will spend $11 if he buys 4 gallons of gas.



Name ________________________________

Build Mathematical Literacy
4-10

Review the Key Concept from the lesson. Answer the questions to help understand how to read a Key Concept.

KEY CONCEPT

You can analyze the relationship between independent and dependent variables in tables and graphs. You can relate tables and graphs to an equation.

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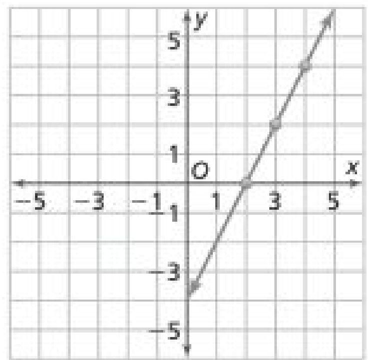
Dependent Variable



1. What does the Key Concept show how to do?

Sample answer: Describe the relationship between two variables.

2. What are the three ways to represent the relationship between the independent and dependent variables?

A table, an equation, and a graph

3. How were the values of y in the table determined?

Sample answer: Each value chosen for x was substituted into the equation to find each value of y.

4. How does the graph relate to the table?

Sample answer: The graph shows the (x, y) ordered pairs from the table plotted as points on the coordinate plane.

5. How would the table change if different x-values were used? How would the graph change? Explain.

Sample answer: If different x-values were used, the table would have different y-values as well. Although different points would be plotted on the coordinate plane, the line would not change because it represents the relationship between x and y.