HOUGHTON MIFFLIN HARCOURT

Response to Intervention

FOR THE COMMON CORE STATE STANDARDS FOR MATHEMATICS

1

TIER 1 LESSONS

GRADE 6

HOUGHTON MIFFLIN HARCOURT

Response to Intervention

FOR THE COMMON CORE STATE STANDARDS FOR MATHEMATICS

GRADE 6

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PROVIDES Tier 1 Intervention for Every Common Core Standard

HOUGHTON MIFFLIN HARCOURT

Expressions and Equations

▶ **Apply and extend previous understandings of arithmetic to algebraic expressions.**

▶ **Reason about and solve one-variable equations and inequalities.**

▶ **Represent and analyze quantitative relationships between dependent and independent variables.**

LESSON 49

Exponents

OBJECTIVE Write and evaluate expressions involving exponents.

CC.6.EE.1

An **exponent** tells how many times a number is used as a factor.

The **base** is the number being multiplied repeatedly.

For example, in 2^5, 5 is the exponent and 2 is the base.
$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$

Write the expression 4^5 using equal factors. Then find the value.

Step 1 Identify the base.

The base is 4.

Step 2 Identify the exponent.

The exponent is 5.

Step 3 Write the base as many times as the exponent tells you. Place a multiplication symbol between the bases.

$4 \times 4 \times 4 \times 4 \times 4$

You should have one less multiplication symbol than the value of the exponent.

$4 \times 4 \times 4 \times 4 \times 4 = 1{,}024$

Step 4 Multiply.

So, $4^5 = 1{,}024$.

Write as an expression using equal factors. Then find the value.

1. 3^4

2. 2^6

3. 4^3

4. 5^3

5. 10^4

6. 8^5

7. 11^4

8. 15^2

9. 10^7

10. 25^4

Expressions and Equations

Exponents

Use one or more exponents to write the expression.

1. 6×6

_____
6^2

2. $11 \times 11 \times 11 \times 11$

_____

3. $9 \times 9 \times 9 \times 9 \times 7 \times 7$

_____

Find the value.

4. 9^2

_____

5. 6^4

_____

6. 1^6

_____

7. 5^3

_____

8. 10^5

_____

9. 23^2

_____

10. Write 144 with an exponent by using 12 as the base.

_____

11. Write 343 with an exponent by using 7 as the base.

_____

Problem Solving

12. Each day Sheila doubles the number of push-ups she did the day before. On the fifth day, she does $2 \times 2 \times 2 \times 2 \times 2$ push-ups. Use an exponent to write the number of push-ups Shelia does on the fifth day.

_____

13. The city of Beijing has a population of more than 10^7 people. Write 10^7 without using an exponent.

_____

Evaluate Expressions Involving Exponents

CC.6.EE.1

OBJECTIVE Use the order of operations to evaluate expressions involving exponents.

A **numerical expression** is a mathematical phrase that includes only numbers and operation symbols.

You **evaluate** the expression when you perform all the computations.

To evaluate an expression, use the **order of operations.**

Order of Operations
1. Parentheses
2. Exponents
3. Multiply and Divide
4. Add and Subtract

Evaluate the expression $(10 + 6^2) - 4 \times 10$.

Step 1 Start with the *parentheses*. Use the order of operations for the computations inside the parentheses.

$10 + 6^2$
Find the value of the number with an *exponent*. Rewrite as multiplication:
$10 + 6^2 = 10 + 6 \times 6$
Multiply and divide from left to right:
$10 + 6 \times 6 = 10 + 36$
Add and subtract from left to right:
$10 + 36 = 46$

Step 2 Rewrite the original expression, using the value from Step 1 for the part in parentheses.

$(10 + 6^2) - 4 \times 10 = \mathbf{46} - 4 \times 10$

Step 3 Now that the parentheses are cleared, look for *exponents*.

There are no more *exponents*, so go on to the next step in the order of operations.

Step 4 *Multiply and divide* from left to right.

$46 - 4 \times 10 = 46 - 40$

Step 5 *Add and subtract* from left to right.

$46 - 40 = 6$

So, $(10 + 6^2) - 4 \times 10 = 6$.

Evaluate the expression.

1. $8^2 - (7^2 + 1)$

2. $5 - 2^2 + 12 \div 4$

3. $8 \times (16 - 2^4)$

_____

_____

_____

4. $3^2 \times (28 - 20 \div 2)$

5. $(30 - 15 \div 3) \div 5^2$

6. $(6^2 - 3^2) - 9 \div 3$

_____

_____

_____

Evaluate Expressions Involving Exponents

CC.6.EE.1

Evaluate the expression.

1. $5 + 17 - 10^2 \div 5$

$5 + 17 - 100 \div 5$

$5 + 17 - 20$

$22 - 20$

2

2. $7^2 - 3^2 + 4$

_____

3. $2^4 \div (7 - 5)$

_____

4. $(8^2 + 36) \div (4 \times 5^2)$

_____

5. $12 + 21 \div 3 + 2^5 \times 0$

_____

6. $(12 - 8)^3 - 24 + 3$

_____

Place parentheses in the expression so that it equals the given value.

7. $12 \times 2 + 2^3$; value: 120

_____

8. $7^2 + 1 - 5 \times 3$; value: 135

_____

Problem Solving

9. Hugo is saving for a new baseball glove. He saves $10 the first week, and $6 each week for the next 6 weeks. The expression $10 + 6^2$ represents the total amount in dollars he has saved. What is the total amount Hugo has saved?

_____

10. A scientist placed fish eggs in a tank. Each day, twice the number of eggs from the previous day hatch. The expression 5×2^6 represents the number of eggs that hatch on the sixth day. How many eggs hatch on the sixth day?

_____

LESSON 51 — Write Algebraic Expressions

OBJECTIVE Write algebraic expressions.

CC.6.EE.2a

Word problems use expressions that you can write with symbols. An **algebraic expression** has at least one variable. A **variable** is a letter or symbol that represents one or more numbers. Writing algebraic expressions for words helps you solve word problems.

These are a few common words that are used for operations.

add (+)	**subtract (−)**	**multiply (×)**	**divide (÷)**
sum	difference	product	quotient
increased by	minus	times	divided by
plus	decreased by		
more than	less		
	less than		

17 more than x
$x + 17$

"More than" means add.
"17 more than x" means add 17 to x.

**four times the
sum of 7 and n**
$4 \times (7 + n)$

"Times" means multiply.
"Sum" means add.
The words mean multiply 4 by $(7 + n)$.

A number next to a variable always shows multiplication.
For example, **5n** means the same as **5 × n**.

Write an algebraic expression for the word expression.

1. b divided by 9

_____

2. c more than 5

_____

3. d decreased by 29

_____

4. 8 times g

_____

5. p increased by 12

_____

6. the quotient of k and 14

_____

7. 17 less than the product of 3 and m

_____

8. 2 less than the quotient of d and 16

_____

Write Algebraic Expressions

Write an algebraic expression for the word expression.

1. 13 less than p

$$\underline{\quad p - 13 \quad}$$

2. the sum of x and 9

_____

3. 6 more than the difference of b and 5

_____

4. the sum of 15 and the product of 5 and v

_____

5. the difference of 2 and the product of 3 and k

_____

6. 12 divided by the sum of h and 2

_____

7. the quotient of m and 7

_____

8. 9 more than 2 multiplied by f

_____

9. 6 minus the difference of x and 3

_____

10. 10 less than the quotient of g and 3

_____

11. the sum of 4 multiplied by a and 5 multiplied by b

_____

12. 14 more than the difference of r and s

_____

Problem Solving

13. Let h represent Mark's height in inches. Suzanne is 7 inches shorter than Mark. Write an algebraic expression that represents Suzanne's height in inches.

_____

14. A company rents bicycles for a fee of $10 plus $4 per hour of use. Write an algebraic expression for the total cost in dollars for renting a bicycle for h hours.

_____

LESSON 52 **Identify Parts of Expressions**
OBJECTIVE Identify and describe parts of expressions.

CC.6.EE.2b

Each part of an expression between the operation signs $+$ or $-$ is a **term**.
A coefficient is a number multiplied by a variable, or letter.

Describe the parts of the expression $6b - 7$. Then write a word expression.

Step 1 Identify the terms.

There are two terms: $6b$ and 7.

Step 2 Describe the terms.

The first term shows multiplication: $6b = 6 \times b$
$6b$ is the product of 6 (the coefficient) and b (the variable).

The second term is the number 7.

Step 3 Identify the operation separating the terms.

Subtraction gives the difference of the two terms in the expression.

Step 4 Write a word expression.

"the difference of 6 times b and 7"
or
"7 less than the product of 6 and b"

**Identify the parts of the expression. Then write a word
expression for the numerical or algebraic expression.**

1. $5 \times (m - 2)$

Identify the parts. _____

Describe the parts. _____

_____

Identify the operations. _____

Write a word expression. _____

2. $12 \div 2 + 7$

_____

_____

_____

_____

3. $8y + (2 \times 11)$

_____

_____

_____

_____

Identify Parts of Expressions

CC.6.EE.2b

Identify the parts of the expression. Then write a word expression for the numerical or algebraic expression.

1. $(16 - 7) \div 3$

The subtraction is the difference

of 16 and 7. The division is the

quotient of the difference and 3.

Word expression: the quotient of

the difference of 16 and 7 and 3

2. $20 + 5 \times 9$

_____

_____

_____

_____

3. $2e - f$

_____

_____

_____

_____

4. $8 + 6q + q$

_____

_____

_____

_____

Identify the terms of the expression. Then give the coefficient of each term.

5. $11r + 7s$

_____

_____

6. $6g - h$

_____

_____

Problem Solving

7. Adam bought granola bars at the store. The expression $6p + 5n$ gives the number of bars in p boxes of plain granola bars and n boxes of granola bars with nuts. What are the terms of the expression?

_____

8. In the sixth grade, each student will get 4 new books. There is one class of 15 students and one class of 20 students. The expression $4 \times (15 + 20)$ gives the total number of new books. Write a word expression for the numerical expression.

_____

LESSON 53

Evaluate Algebraic Expressions and Formulas

CC.6.EE.2c

OBJECTIVE Evaluate algebraic expressions and formulas.

To evaluate an algebraic expression or formula, substitute the value for the variable. Then follow the order of operations.

Evaluate $5x + x^3$ for $x = 3, 2, 1,$ and 0.

$5x + x^3$ for $x = 3$	$5x + x^3$ for $x = 2$	$5x + x^3$ for $x = 1$	$5x + x^3$ for $x = 0$
$5 \times 3 + 3^3$	$5 \times 2 + 2^3$	$5 \times 1 + 1^3$	$5 \times 0 + 0^3$
$5 \times 3 + 27$	$5 \times 2 + 8$	$5 \times 1 + 1$	$5 \times 0 + 0$
$15 + 27$	$10 + 8$	$5 + 1$	$0 + 0$
42	18	6	0

To evaluate an expression with more than one variable, substitute each variable's value. Then follow the order of operations.

Evaluate $4c - 7 + 2d$ for $c = 2$ and $d = 5$.

$4 \times 2 - 7 + 2 \times 5$

$8 - 7 + 10$

$1 + 10$

11

So, $4c - 7 + 2d = 11$ for $c = 2$ and $d = 5$.

Evaluate the expression for $x = 3, 2, 1,$ and 0.

1. $13 + 6x$

2. $5x + 2$

3. $2x + 3 + x^2$

4. $2x + x^2$

_____   _____   _____   _____

Evaluate the expression for the given values of the variables.

5. $7x + y + 16$ for
$x = 2, y = 3$

6. $8a + 11 - 2b$ for
$a = 4, b = 2$

7. $12b - 2c + 3$ for
$b = 5, c = 10$

_____   _____   _____

Evaluate Algebraic Expressions and Formulas

CC.6.EE.2c

Evaluate the expression for the given values of the variables.

1. $w + 6$ for $w = 11$

$11 + 6$

17

2. $r - 9$ for $r = 20$

_____

3. $17 - 2c$ for $c = 7$

_____

4. $b^2 - 4$ for $b = 5$

_____

5. $(h - 3)^2$ for $h = 5$

_____

6. $x + x^2$ for $x = 6$

_____

7. $m + 2m + 3$ for $m = 12$

_____

8. $9a - 5a$ for $a = 7$

_____

9. $4 \times (21 - 3h)$ for $h = 5$

_____

10. $7m - 9n$ for $m = 7$ and $n = 5$

_____

11. $d^2 - 9k + 3$ for $d = 10$ and $k = 9$

_____

12. $3x + 4y \div 2$ for $x = 7$ and $y = 10$

_____

Problem Solving

13. The formula $P = 2\ell + 2w$ gives the perimeter P of a rectangular room with length ℓ and width w. A rectangular living room is 26 feet long and 21 feet wide. What is the perimeter of the room?

_____

14. The formula $c = 5(f - 32) \div 9$ gives the Celsius temperature in c degrees for a Fahrenheit temperature of f degrees. What is the Celsius temperature for a Fahrenheit temperature of 122 degrees?

_____

LESSON 54 **Problem Solving • Combine Like Terms**

OBJECTIVE Combine like terms by applying the strategy *use a model*.

CC.6.EE.3

Use a bar model to solve the problem.

Each hour a company assembles 10 bikes. It sends 6 of those bikes to stores and keeps the rest of the bikes to sell itself. The expression $10h - 6h$ represents the number of bikes the store keeps to sell itself for h hours of work. Simplify the expression by combining like terms.

Read the Problem

What do I need to find?	**What information do I need to use?**	**How will I use the information?**
I need to simplify the expression ___*10h − 6h*___.	I need to use the like terms 10h and ___*6h*___.	I can use a bar model to find the difference of the ___*like*___ terms.

Solve the Problem

Draw a bar model to subtract ___*6h*___ from ___*10h*___. Each square represents h, or $1h$.

10 *h*

h	h	h	h	h	h	h	h	h	h

h	h	h	h	h	h

6 *h*   ___*4*___ *h*

The model shows that $10h - 6h = $ ___*4h*___.

So, a simplified expression for the number of bikes the store keeps is ___*4h*___.

---

1. Bradley sells produce in boxes at a farmer's market. He put 6 ears of corn and 9 tomatoes in each box. The expression $6b + 9b$ represents the total pieces of produce in b boxes. Simplify the expression by combining like terms.

   _____

2. Andre bought pencils in packs of 8. He gave 2 pencils to his sister and 3 pencils from each pack to his friends. The expression $8p - 3p - 2$ represents the number of pencils Andre has left from p packs. Simplify the expression by combining like terms.

   _____

Problem Solving • Combine Like Terms

CC.6.EE.3

Read each problem and solve.

1. A box of pens costs $3 and a box of markers costs $5. The expression $3p + 5p$ represents the cost in dollars to make p packages that includes 1 box of pens and 1 box of markers. Simplify the expression by combining like terms.

$3p + 5p = 8p$

2. Riley's parents got a cell phone plan that has a $40 monthly fee for the first phone. For each extra phone, there is a $15 phone service charge and a $10 text service charge. The expression $40 + 15e + 10e$ represents the total phone bill in dollars, where e is the number of extra phones. Simplify the expression by combining like terms.

_____

3. A radio show lasts for h hours. For every 60 minutes of air time during the show, there are 8 minutes of commercials. The expression $60h - 8h$ represents the air time in minutes available for talk and music. Simplify the expression by combining like terms.

_____

4. A publisher sends 100 books to each bookstore where its books are sold. At each store, about 3 books are sold at a discount to employees and about 40 books are sold during store weekend sales. The expression $100s - 3s - 40s$ represents the approximate number of the publisher's books sold at full price in s stores. Simplify the expression by combining like terms.

_____

5. A sub shop sells a meal that includes an Italian sub for $6 and chips for $2. If a customer purchases more than 3 meals, he or she receives a $5 discount. The expression $6m + 2m - 5$ shows the cost in dollars of the customer's order for m meals, where m is greater than 3. Simplify the expression by combining like terms.

_____

LESSON 55 — Generate Equivalent Expressions

OBJECTIVE Use the properties of operations to generate equivalent algebraic expressions.

CC.6.EE.3

Equivalent expressions are two or more expressions that are equal for any value of the variable in the expressions. You can use the properties of operations to write equivalent expressions.

Write an equivalent expression for $4c + 2 + c$.

Step 1 Identify like terms. $4c$ and c

Step 2 Use properties of operations to combine like terms.
Commutative Property of Addition: switch 2 and c
Associative Property of Addition: group $4c$ and c
Add $4c$ and c.

$$4c + 2 + c = 4c + c + 2$$
$$= (4c + c) + 2$$
$$= 5c + 2$$

Use properties of operations to write an equivalent expression by combining like terms.

1. $7x + 2x + 5x$

2. $8a + 11 - 2a$

3. $12b - 8b + 3$

_____   _____   _____

4. $9c - 6 + c$

5. $4p + 1 - p$

6. $8y - 2y + y$

_____   _____   _____

Use the Distributive Property to write an equivalent expression.

7. $3(m + 7)$

8. $4(2t + 3)$

_____   _____

9. $5(9 + 6r)$

10. $8(4n - 2n)$

_____   _____

Generate Equivalent Expressions

CC.6.EE.3

Use properties of operations to write an equivalent expression by combining like terms.

1. $7h - 3h$

         4h
_____

2. $5x + 7 + 2x$

_____

3. $16 + 13p - 9p$

_____

4. $y^2 + 13y - 8y$

_____

5. $5(2h + 3) + 3h$

_____

6. $12 + 18n + 7 - 14n$

_____

Use the Distributive Property to write an equivalent expression.

7. $2(9 + 5k)$

_____

8. $5(3m + 2)$

_____

9. $6(g + h)$

_____

10. $4d + 8$

_____

11. $21p + 35q$

_____

12. $18x + 9y$

_____

Problem Solving

13. The expression $15n + 12n + 100$ represents the total cost in dollars for skis, boots, and a lesson for n skiers. Simplify the expression $15n + 12n + 100$. Then find the total cost for 8 skiers.

_____

14. Casey has n nickels. Megan has 4 times as many nickels as Casey has. Write an expression for the total number of nickels Casey and Megan have. Then simplify the expression.

_____

LESSON 56 **Identify Equivalent Expressions**

OBJECTIVE Identify equivalent algebraic expressions.

CC.6.EE.4

Use properties to determine whether 5a + 7(3 + a) and 12a + 21 are equivalent.

Step 1 Rewrite the first expression using the Distributive Property. Multiply 7 and 3 and multiply 7 and a.

$$5a + 7(3 + a) = 5a + 21 + 7a$$

Step 2 Use the Commutative Property of Addition. Switch 21 and 7a.

$$= 5a + 7a + 21$$

Step 3 Use the Associative Property of Addition to group like terms. 5a and 7a are like terms.

$$= (5a + 7a) + 21$$

Step 4 Combine like terms.

$$= 12a + 21$$

Compare the expressions: 12a + 21 and 12a + 21. They are the same.
So, the expressions 5a + 7(3 + a) and 12a + 21 are equivalent.

Use properties to determine whether the expressions are equivalent.

1. 6(p + q) and 6p + q

2. 7y − 15 + 2y and 9y − 15

3. 1 + (8r + 9) and (2 + 8) + 8r

_____

_____

_____

4. 0 × 11 + 5n and 5n

5. 16s − 4 + s and 12s

6. 11d × 2 and 22d

_____

_____

_____

7. 10(e + 0.5g) and 10e + 5g

8. 8m + (9m − 1) and 8m − 8

9. 7(1 × 2h) and 21h

_____

_____

_____

Identify Equivalent Expressions

CC.6.EE.4

Use properties of operations to determine whether the expressions are equivalent.

1. $2s + 13 + 15s$ and $17s + 13$

_____ **equivalent** _____

2. $5 \times 7h$ and $35h$

_____

3. $10 + 8v - 3v$ and $18 - 3v$

_____

4. $(9w \times 0) - 12$ and $9w - 12$

_____

5. $11(p + q)$ and $11p + (7q + 4q)$

_____

6. $6(4b + 3d)$ and $24b + 3d$

_____

7. $14m + 9 - 6m$ and $8m + 9$

_____

8. $(y \times 1) + 2$ and $y + 2$

_____

9. $4 + 5(6t + 1)$ and $9 + 30t$

_____

10. $9x + 0 + 10x$ and $19x + 1$

_____

11. $12c - 3c$ and $3(4c - 1)$

_____

12. $6a \times 4$ and $24a$

_____

Problem Solving

13. Rachel needs to write 3 book reports with b pages and 3 science reports with s pages during the school year. Write an algebraic expression for the total number of pages Rachel will need to write.

_____

14. Rachel's friend Yassi has to write $3(b + s)$ pages for reports. Use properties of operations to determine whether this expression is equivalent to the expression for the number of pages Rachel has to write.

_____

LESSON 57 **Solutions of Equations**

OBJECTIVE Determine whether a number is a solution of an equation.

CC.6.EE.5

An **equation** is a statement that two mathematical expressions are equal.

Some equations include only numbers, operation signs, and an equal sign. Example: $2 + 17 = 19$

Other equations also include variables, such as x. Example: $50 - x = 37$

For an equation with a variable, a **solution** is a value of the variable that makes the equation true.

Equation: $8.6 + m = 13$	Is $m = 5.3$ a solution?	Is $m = 4.4$ a solution?
Step 1 Write the equation.	$8.6 + m = 13$	$8.6 + m = 13$
Step 2 Substitute the given number for the variable m.	$8.6 + \textbf{5.3} \overset{?}{=} 13$	$8.6 + \textbf{4.4} \overset{?}{=} 13$
Step 3 Add.	$13.9 \neq 13$	$13 = 13$
	($\neq$ means *does not equal*)	
Decide whether the equation is true.	The equation is not true. So, $m = 5.3$ is **not a solution**.	The equation is true. So, $m = 4.4$ is a **solution**.

Determine whether the given value of the variable is a solution of the equation.

1. $p - 4 = 6$; $p = 10$

_____ $- 4 \overset{?}{=} 6$

_____ $\bigcirc$ 6

_____

2. $15.2 + y = 22$; $y + 6.8$

_____

3. $n + 3 = 16$; $n = 12$

_____

4. $7.4 - k = 5$; $k = 3.4$

_____

5. $1\frac{1}{2} + t = 3\frac{1}{2}$; $t = 2$

_____

6. $4x = 36$; $x = 8$

_____

Solutions of Equations

Determine whether the given value of the variable is a solution of the equation.

1. $x - 7 = 15$; $x = 8$

$$\underline{\quad 8 \quad} - 7 \overset{?}{=} 15$$

$$\underline{\quad 1 \quad} \neq 15$$

not a solution

2. $c + 11 = 20$; $c = 9$

_____

3. $7n = 7$; $n = 0$

_____

4. $\frac{1}{3}h = 6$; $h = 2$

_____

5. $a - 1 = 70$; $a = 71$

_____

6. $\frac{7}{8} + j = 1$; $j = \frac{1}{8}$

_____

7. $16.1 + d = 22$; $d = 6.1$

_____

8. $9 = \frac{3}{4}e$; $e = 12$

_____

9. $15.5 - y = 7.9$; $y = 8.4$

_____

Problem Solving

10. Terrance needs to score 25 points to win a game. He has already scored 18 points. The equation $18 + p = 25$ gives the number of points p that Terrance still needs to score. Determine whether $p = 7$ or $p = 13$ is a solution of the equation, and tell what the solution means.

_____

_____

_____

11. Madeline has used 50 sheets of a roll of paper towels, which is $\frac{5}{8}$ of the entire roll. The equation $\frac{5}{8}s = 50$ can be used to find the number of sheets s in a full roll. Determine whether $s = 32$ or $s = 80$ is a solution of the equation, and tell what the solution means.

_____

_____

_____

LESSON 58 — Solutions of Inequalities

OBJECTIVE Determine whether a number is a solution of an inequality.

CC.6.EE.5

An **inequality** is a mathematical sentence that compares expressions. A **solution of an inequality** is a value for a variable that makes the inequality true.

For the inequality $a < 3$ (a is less than 3), $a = 1$ is a solution because 1 is less than 3. $a = 3$ is not a solution because 3 is not less than 3.

Inequalities use these symbols: $<$ (less than), $>$ (greater than), $\leq$ (less than or equal to), and $\geq$ (greater than or equal to).

	For the inequality $x \leq 5$, is $x = 3$ a solution?	For the inequality $y > 8$, is $y = 3$ a solution?
Step 1 Understand the inequality.	$x \leq 5$ means "x is less than or equal to 5." Any value that is equal to 5 or less than 5 is a solution.	$y > 8$ means "y is greater than 8." Any value that is greater than 8 is a solution.
Step 2 Decide whether the value is a solution.	3 is less than 5, so $x = 3$ is a solution.	3 is not greater than 8, so $y = 3$ is not a solution.

Determine whether the given value of the variable is a solution of the inequality.

1. $m \geq 4$; $m = 2$

m $\geq$ 4 means "m is

_____

_____ 4."

$m = 2$ is _____

2. $k < 7$; $k = 5$

_____

3. $z \geq 12$; $z = 12$

_____

4. $y \leq 3$; $y = 6$

_____

5. $n > 13$; $n = 8$

_____

6. $t < 7$; $t = 5$

_____

Give two solutions of the inequality.

7. $x > 4$

_____ ; _____

8. $p \leq 3$

_____ ; _____

9. $v \geq 9$

_____ ; _____

Solutions of Inequalities

Determine whether the given value of the variable is a solution of the inequality.

1. $s \geq {}^-1$; $s = 1$

$$1 \overset{?}{\geq} {}^-1$$

_____ solution

2. $p < 0$; $p = 4$

_____

3. $y \leq {}^-3$; $y = {}^-1$

_____

4. $u > \dfrac{{}^-1}{2}$; $u = 0$

_____

5. $q \geq 0.6$; $q = 0.23$

_____

6. $b < 2\dfrac{3}{4}$; $b = \dfrac{2}{3}$

_____

7. $j \leq {}^-5.7$; $j = {}^-6$

_____

8. $a > {}^-8$; $a = {}^-7.5$

_____

9. $w \geq 4.5$; $w = 4.45$

_____

Give two solutions of the inequality.

10. $k <, 2$

_____

11. $z \geq {}^-3$

_____

12. $f \leq {}^-5$

_____

Problem Solving

13. The inequality $s \geq 92$ represents the score s that Jared must earn on his next test to get an A on his report card. Give two possible scores that Jared could earn to get the A.

_____

14. The inequality $m \leq \$20$ represents the amount of money that Sheila is allowed to spend on a new hat. Give two possible money amounts that Sheila could spend on the hat.

_____

LESSON 59 **Use Algebraic Expressions**
OBJECTIVE Use algebraic expressions to solve problems.

CC.6.EE.6

You can use an algebraic expression to help solve a word problem.
Use a variable to represent the unknown number.

Ina wants to serve salad at her party. She will need one head of lettuce for every 6 guests who attend. Write an expression she could use for deciding how much lettuce she needs.

Step 1 Decide what operation the problem uses.

Each head of lettuce will serve 6 people. Divide the number of guests by 6.

Step 2 Identify the unknown number.

The problem does not state how many guests will attend. Use the variable g for the number of guests.

Step 3 Write a word expression. Then use the word expression to write an algebraic expression.

"the number of guests divided by 6"

$g \div 6$ or $\dfrac{g}{6}$

Ina finds out that 18 guests will attend. Evaluate the expression for this number of guests.

Step 1 Substitute 18 for g. $\dfrac{18}{6}$

Step 2 Divide. $\dfrac{18}{6} = 3$

So, Ina will need 3 heads of lettuce.

At her last party, Ina decorated with window stickers. For this party, she wants to use 4 times as many stickers.

1. Write an expression for the number of stickers, s, Ina used at her last party.

_____

2. Use the expression to find the new number of stickers if she used 14 stickers for her last party.

_____

3. Ina wants to put an equal number of stickers on each of the windows. Write an expression to show how many stickers will go on each window, w.

_____

4. Use the expression to find the number of stickers for each window if there are 8 windows.

_____

Use Algebraic Expressions

Jeff sold the pumpkins he grew for $7 each at the farmer's market.

1. Write an expression to represent the amount of money Jeff made selling the pumpkins. Tell what the variable in your expression represents.

7p, where *p* is the number

of pumpkins

2. If Jeff sold 30 pumpkins, how much money did he make?

_____

An architect is designing a building. Each floor will be 12 feet tall.

3. Write an expression for the number of floors the building can have for a given building height. Tell what the variable in your expression represents.

_____

_____

4. If the architect is designing a building that is 132 feet tall, how many floors can be built?

_____

_____

Write an algebraic expression for each word expression.
Then evaluate the expression for these values of the variable: 1, 6, 13.5

5. The quotient of 100 and the sum of *b* and 24

_____

6. 13 more than the product of *m* and 5

_____

Problem Solving

7. In the town of Pleasant Hill, there is an average of 16 sunny days each month. Write an expression to represent the approximate number of sunny days for any number of months. Tell what the variable represents.

_____

8. How many sunny days can a resident of Pleasant Hill expect to have in 9 months?

_____

LESSON 60 **Write Equations**
OBJECTIVE Write algebraic equations.

CC.6.EE.7

To write an equation for a word sentence, write the words as mathematical expressions and write $=$ for "equals" or "is."

Write an equation for the word sentence.

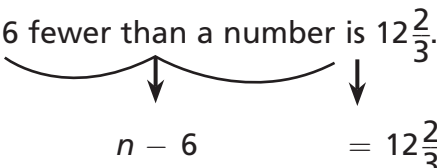
Example 1 6 fewer than a number is $12\frac{2}{3}$.

Step 1 Choose a variable.
6 fewer than a number is $12\frac{2}{3}$.
Let n represent a number.

Step 2 Identify the operation.
6 fewer than n is $12\frac{2}{3}$.
"Fewer than" means subtract.
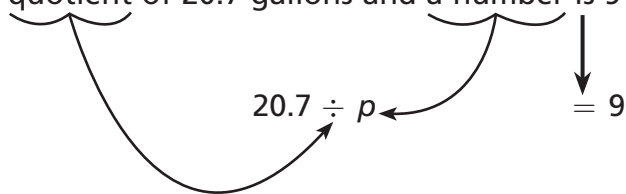
Step 3 Write an equation.
6 fewer than a number is $12\frac{2}{3}$.
$$n - 6 \qquad = 12\frac{2}{3}$$

So, the equation is $n - 6 = 12\frac{2}{3}$.

Example 2

The quotient of 20.7 gallons and a number is 9 gallons.

$$20.7 \div p \qquad = 9$$

So, the equation is $20.7 \div p = 9$.

Write an equation for the word sentence.

1. 18 more than a number is 29.

_____

2. 5.2 times a number is 46.8.

_____

3. 128 less than a number is 452.

_____

4. Four fifths of a number equals 11.

_____

5. The product of a number and 6 is 138.

_____

6. The number of miles decreased by 29.8 is 139.

_____

Write Equations

Write an equation for the word sentence.

1. 18 is 4.5 times a number.

$$18 = 4.5n$$

2. Eight more than the number of children is 24.

_____

3. The difference of a number and $\frac{2}{3}$ is $\frac{3}{8}$.

_____

4. m minutes less than 80 minutes is 15 minutes.

_____

5. A number divided by 0.5 is 29.

_____

6. The product of the number of songs and $0.99 is $7.92.

_____

Write a word sentence for the equation.

7. $x - 14 = 52$

_____

8. $2.3m = 0.46$

_____

9. $25 = k \div 5$

_____

10. $4\frac{1}{3} + q = 5\frac{1}{6}$

_____

Problem Solving

11. An ostrich egg weighs 2.9 pounds. The difference between the weight of this egg and the weight of an emu egg is 1.6 pounds. Write an equation that could be used to find the weight w, in pounds, of the emu egg.

_____

12. In one week, the number of bowls a potter made was 6 times the number of plates. He made 90 bowls during the week. Write an equation that could be used to find the number of plates p that the potter made.
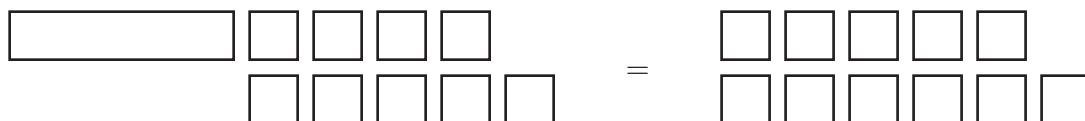
_____

LESSON 61

Model and Solve Addition Equations

**OBJECTIVE** Use models to solve addition equations.

CC.6.EE.7

You can use algebra tiles to model and solve equations. Use a long rectangle to represent the variable, and a square to represent 1.
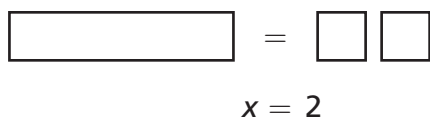
Model and solve the equation $x + 9 = 11$.

Step 1 Model the equation using algebra tiles.

Step 2 Get the variable by itself on one side of the equation.
Remove the same number of tiles from each side.
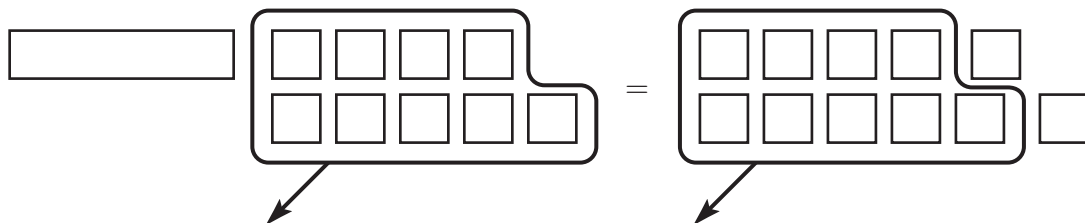
Step 3 Write the solution.

$$x = 2$$

Solve the equation by using algebra tiles or by drawing a picture.

1. $x + 4 = 10$

2. $8 = x + 2$

Model and Solve Addition Equations

CC.6.EE.7

Model and solve the equation by using algebra tiles.

1. $x + 6 = 9$ **2.** $x + 5 = 6$ **3.** $9 = x + 1$

_____ $x = 3$ _____   _____   _____

4. $8 + x = 10$ **5.** $x + 7 = 11$ **6.** $4 = 2 + x$

_____   _____   _____

Solve the equation by drawing a model.

7. $x + 4 = 7$ **8.** $x + 6 = 10$

_____   _____

Problem Solving

9. The temperature at 10:00 was 10°F. This is 3°F warmer than the temperature at 8:00. Model and solve the equation $x + 3 = 10$ to find the temperature x in degrees Fahrenheit at 8:00.

10. Jaspar has 7 more checkers left than Karen does. Jaspar has 9 checkers left. Write and solve an addition equation to find out how many checkers Karen has left.

_____   _____

LESSON 62 **Solve Addition and Subtraction Equations**

OBJECTIVE Use algebra to solve addition and subtraction equations.

CC.6.EE.7

To solve an equation, you must isolate the variable on one side of the equal sign. You can use **inverse operations:** undoing addition with subtraction or subtraction with addition. These actions are made possible by the **Addition and Subtraction Properties of Equality.**

Solve and check.

Example 1: $y + 6.7 = 9.8$ **Example 2:** $57 = x - 8$

Step 1 Look at the side with the variable. Subtract the number that is added to the variable, or add the number that is subtracted from the variable. Be sure to perform the <u>same</u> operation on <u>both</u> sides of the equation.

$y + 6.7 = 9.8$ $57 = x - 8$

$y + 6.7 - 6.7 = 9.8 - 6.7$ Subtract 6.7 from both sides. $57 + 8 = x - 8 + 8$ Add 8 to both sides.

Step 2 Simplify both sides of the equation.

$y + 6.7 = 9.8$ $57 = x - 8$

$y + 6.7 - 6.7 = 9.8 - 6.7$ $57 + 8 = x - 8 + 8$

$y + 0 = 3.1$ $65 = x + 0$

$y = 3.1$ $65 = x$

Step 3 Check your answer in the original equation.

$y + 6.7 = 9.8$ $57 = x - 8$

$3.1 + 6.7 \stackrel{?}{=} 9.8$ $57 \stackrel{?}{=} 65 - 8$

$9.8 = 9.8$ $57 = 57$

So, $y = 3.1$ is the solution.   So, $x = 65$ is the solution.

Solve and check.

1. $x + 13 = 27$ **2.** $38 = d - 22$ **3.** $12.4 = a + 7.9$ **4.** $w - 2\frac{3}{5} = 4\frac{2}{5}$

_____   _____   _____   _____

Solve Addition and Subtraction Equations

CC.6.EE.7

Solve the equation, and check the solution.

1. $y - 14 = 23$

$y - 14 + 14 = 23 + 14$
$y = 37$

2. $x + 3 = 15$

3. $n + \frac{2}{5} = \frac{4}{5}$

4. $16 = m - 14$

5. $w - 13.7 = 22.8$

6. $s + 55 = 55$

7. $23 = x - 12$

8. $p - 14 = 14$

9. $m - 2\frac{3}{4} = 6\frac{1}{2}$

10. $t + 0.95 = 1.25$

11. $3\frac{1}{3} = b - \frac{2}{3}$

12. $48 = d + 23$

Problem Solving

13. A recipe calls for $5\frac{1}{2}$ cups of flour. Lorenzo only has $3\frac{3}{4}$ cups of flour. Write and solve an equation to find the additional amount of flour Lorenzo needs to make the recipe.

14. Jan used 22.5 gallons of water in the shower. This amount is 7.5 gallons less than the amount she used for washing clothes. Write and solve an equation to find the amount of water Jan used to wash clothes.

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Lesson 62

LESSON 63 — Model and Solve Multiplication Equations

OBJECTIVE Use models to solve multiplication equations.

CC.6.EE.7

You can use algebra tiles or a drawing to model and solve equations.
Use a rectangle to represent the variable and a square to represent 1.
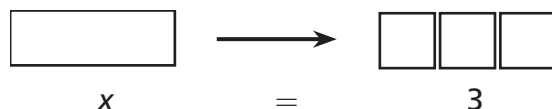
Model and solve the equation $3x = 9$.

Step 1 Model the equation using rectangles and squares.

$$3x \quad = \quad 9$$
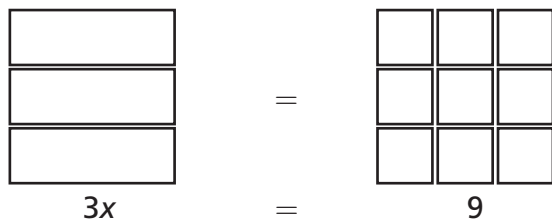
Step 2 Divide the squares into equal groups. The number of groups should be the same as the number of rectangles.

$$3x \quad = \quad 9$$
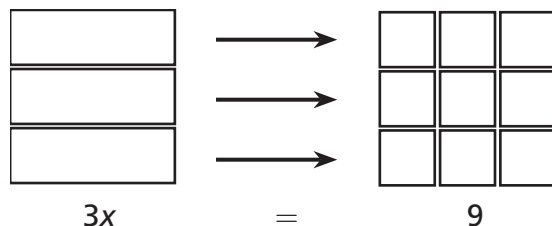
Step 3 Find the number of squares in each group.

$$x \quad = \quad 3$$

So, $x = 3$ is the solution.

Solve the equation by using algebra tiles or by drawing a picture.

1. $4x = 12$

2. $2x = 16$

CC.6.EE.7

Model and Solve Multiplication Equations

Model and solve the equation by using algebra tiles.

1. $2x = 8$ **2.** $5x = 10$ **3.** $21 = 3x$

_____ $x = 4$ _____   _____   _____

4. $4x = 20$ **5.** $6x = 6$ **6.** $4 = 2x$

_____   _____   _____

Solve the equation by drawing a model.

7. $6 = 3x$ **8.** $4x = 12$

_____   _____

Problem Solving

9. A chef used 20 eggs to make 5 omelets. Model and solve the equation $5x = 20$ to find the number of eggs x in each omelet.

_____

10. Last month, Julio played 3 times as many video games as Scott did. Julio played 18 video games. Write and solve an equation to find the number of video games Scott played.

_____

LESSON 64

Solve Multiplication and Division Equations

OBJECTIVE Use algebra to solve multiplication and division equations.

CC.6.EE.7

A multiplication equation shows a variable multiplied by a number. A division equation shows a variable divided by a number. To solve a multiplication equation, you use the **Division Property of Equality**. To solve a division equation, you use the **Multiplication Property of Equality**. These properties state that both sides of an equation remain equal when you multiply or divide both sides by the same number.

Solve and check.

Example 1: $\frac{a}{5} = 6$ **Example 2:** $2.5x = 10$

Step 1 Look at the side with the variable. Use the inverse operation to get the variable by itself.

$\frac{a}{5} = 6$ a is divided by 5. $2.5x = 10$ x is multiplied by 2.5.

$5 \times \frac{a}{5} = 6 \times 5$ Multiply both sides by 5. $\frac{2.5x}{2.5} = \frac{10}{2.5}$ Divide both sides by 2.5.

Step 2 Simplify both sides of the equation.

$\frac{a}{5} = 6$ $2.5x = 10$

$5 \times \frac{a}{5} = 6 \times 5$ $\frac{2.5x}{2.5} = \frac{10}{2.5}$

$a = 30$ $x = 4$

Step 3 Check your answer in the original equation.

$\frac{a}{5} = 6$ $2.5x = 10$

$\frac{30}{5} \stackrel{?}{=} 6$ $2.5 \times 4 \stackrel{?}{=} 10$

$6 = 6$ $10 = 10$

So, $a = 30$ is the solution. So, $x = 4$ is the solution.

Solve and check.

1. $3x = 42$ **2.** $4c = 48$ **3.** $12.8 = 3.2d$ **4.** $12 = 1.5w$

_____ _____ _____ _____

5. $\frac{z}{6} = 9$ **6.** $\frac{d}{4} = 5$ **7.** $11 = \frac{n}{2.4}$ **8.** $12 = \frac{4}{5}k$

_____ _____ _____ _____

CC.6.EE.7

Solve Multiplication and Division Equations

Solve the equation, and check the solution.

1. $8p = 96$

$$\frac{8p}{8} = \frac{96}{8}$$
$$p = 12$$
_____

2. $\frac{z}{16} = 8$

_____

3. $3.5x = 14.7$

_____

4. $32 = 3.2c$

_____

5. $\frac{2}{5}w = 40$

_____

6. $\frac{a}{14} = 6.8$

_____

7. $1.6x = 1.6$

_____

8. $23.8 = 3.5b$

_____

9. $\frac{3}{5} = \frac{2}{3}t$

_____

10. $\frac{x}{7} = 0$

_____

11. $4n = 9$

_____

12. $\frac{3}{4}g = \frac{5}{8}$

_____

Problem Solving

13. Anne runs 6 laps on a track. She runs a total of 1 mile, or 5,280 feet. Write and solve an equation to find the distance, in feet, that she runs in each lap.

_____

14. DeShawn uses $\frac{3}{4}$ of a box of rice to cook dinner. The portion he uses weighs 12 ounces. Write and solve an equation to find the weight of the full box of rice.

_____

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LESSON 65 **Problem Solving • Equations with Fractions**

OBJECTIVE Solve equations involving fractions by using the strategy *solve a simpler problem.*

CC.6.EE.7

After driving 25 miles, Kevin has traveled $\frac{2}{3}$ of the distance from his house to his friend's house. Use the equation $25 = \frac{2}{3}d$ to find the total distance d in miles to his friend's house.

Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?
I need to find the <u>distance</u> <u>in miles</u> from Kevin's house to <u>his friend's</u> <u>house</u>.	I need to use the equation $$25 = \frac{2}{3}d$$ _____.	I can use multiplication to change the equation to an equation with only <u>whole numbers</u>, not fractions. Then I can <u>solve</u> the new equation.

Solve the Problem

Step 1 Write the original equation.

Step 2 Write a simpler equation without fractions. Multiply both sides by the denominator of the fraction.

Step 3 Solve the simpler equation. Use the Division Property of Equality.

So, the total distance is 37.5 miles.

$$25 = \frac{2}{3}d$$
$$3 \times 25 = (3 \times \frac{2}{3})d$$
$$75 = \frac{6}{3}d$$
$$75 = 2d$$
$$\frac{75}{2} = \frac{2d}{2}$$
$$37.5 = d$$

Solve.

1. Alyssa's cat weighs 12 pounds, which is $\frac{3}{8}$ of the weight of her dog. Use the equation $\frac{3}{8}d = 12$ to find the weight of Alyssa's dog.

2. Randall bought 16 baseball cards from Max, which is $\frac{2}{5}$ of Max's collection. Use the equation $16 = \frac{2}{5}c$ to find the number of cards that were in Max's collection.

_____   _____

Problem Solving • Equations with Fractions

Read each problem and solve.

1. Stu is 4 feet tall. This height represents $\frac{6}{7}$ of his
brother's height. The equation $\frac{6}{7}h = 4$ can be used
to find the height h, in feet, of Stu's brother. How
tall is Stu's brother?

$$7 \times \frac{6}{7}h = 7 \times 4$$
$$6h = 28$$
$$\frac{6h}{6} = \frac{28}{6}$$
$$h = 4\frac{2}{3}$$
$$4\frac{2}{3} \text{ feet}$$

2. Bryce bought a bag of cashews. He served $\frac{7}{8}$ pound
of cashews at a party. This amount represents $\frac{2}{3}$ of the
entire bag. The equation $\frac{2}{3}n = \frac{7}{8}$ can be used to find the
number of pounds n in a full bag. How many pounds of
cashews were in the bag that Bryce bought?

3. In Jaime's math class, 9 students chose soccer as their
favorite sport. This amount represents $\frac{3}{8}$ of the entire
class. The equation $\frac{3}{8}s = 9$ can be used to find the
total number of students s in Jaime's class. How many
students are in Jaime's math class?

4. There are 15 blueberry muffins in a large basket. This
represents $\frac{5}{9}$ of all the muffins that are in the basket.
The equation $\frac{5}{9}m = 15$ can be used to find the total
number of muffins m in the basket. How many muffins
are in the basket?

LESSON 66

Write Inequalities

OBJECTIVE Write algebraic inequalities.

CC.6.EE.8

Here are some ways to express each inequality symbol in words:

$<$	less than	under	not as much as
$\leq$	less than or equal to	at most	no more than

$>$	greater than	over	more than
$\geq$	greater than or equal to	at least	no less than

Passengers at least 12 years old pay full price for train tickets.

Write an inequality to represent the situation.

Step 1 Choose a variable. Use a to represent "age." a

Step 2 Choose an inequality symbol. "at least 12 years old" means "greater than or equal to 12." $\geq$

Step 3 Write the inequality. $a \geq 12$

Write two word sentences to represent $y < 9$.

Step 1 Identify the inequality symbol. $<$ means "less than."

Step 2 Write a word sentence that uses the variable and integer. y is less than 9.

Step 3 Write another word sentence with the same meaning. y is under 9.

Write an inequality for the word sentence.

1. The distance d Mr. Chin drove was no more than 65 miles.

_____

2. The amount of juice c in the punch is more than 3 cups.

_____

3. The age a of Mia's sister is less than 8 years.

_____

4. The temperature t was at least 30°F.

_____

Write two word sentences to represent the inequality.

5. $n \geq 23$

_____

_____

6. $p > 16$

_____

_____

Write Inequalities

Write an inequality for the word sentence. Tell what type of numbers the variable in the inequality can represent.

1. The width *w* is greater than 4 centimeters.

The inequality symbol for "is greater than" is $>$. $w > 4$, where *w* is the

width in centimeters. *w* is a positive number.

2. The score *s* in a basketball game is greater than or equal to 10 points.

_____

_____

3. The mass *m* is less than 5 kilograms.

_____

_____

4. The height *h* is greater than 2.5 meters.

_____

_____

5. The temperature *t* is less than or equal to $^-3°$.

_____

_____

Write a word sentence for the inequality.

6. $k < {}^-7$

_____

7. $z \geq 14$

_____

Problem Solving

8. Tabby's mom says that she must read for at least 30 minutes each night. If *m* represents the number of minutes reading, what inequality can represent this situation?

_____

9. Phillip has a $25 gift card to his favorite restaurant. He wants to use the gift card to buy lunch. If *c* represents the cost of his lunch, what inequality can describe all of the possible amounts of money, in dollars, that Phillip can spend on lunch?

_____

LESSON 67 **Graph Inequalities**

OBJECTIVE Represent solutions of algebraic inequalities on number line diagrams.

CC.6.EE.8

You can graph the solutions of an inequality on a number line.

Graph the inequality $n \geq 9$.

Step 1 Determine the meaning of the inequality.
$n \geq 9$ means "n is greater than or equal to 9."

Step 2 Draw a number line and circle the number given in the inequality.
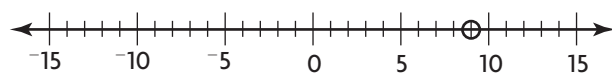
Step 3 Decide whether to fill in the circle. For $\leq$ or $\geq$, fill in the circle to show "or equal to." For $<$ or $>$, do not fill in the circle.

Since the inequality uses $\geq$, 9 is a possible solution. So, fill in the circle.
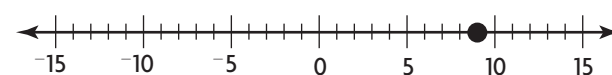
Step 4 Shade from the circle in the direction of the remaining solutions.

Since the inequality symbol is $\geq$, the shading covers all numbers greater than 9.
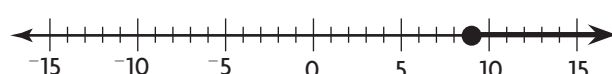
Graph the inequality.

1. $k < 8$
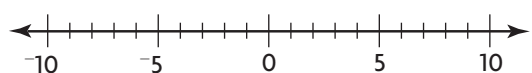
2. $r \geq 6$
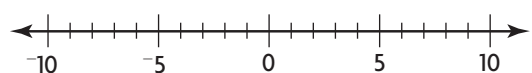
3. $w \leq 3$
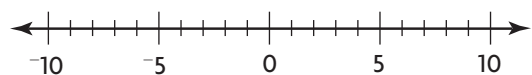
4. $x > 3$
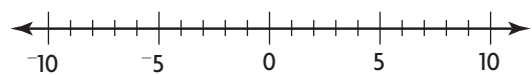
Write the inequality shown by the graph.
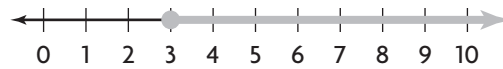
5.

6.

_____   _____
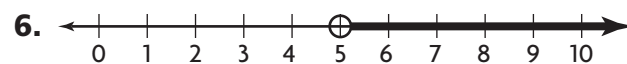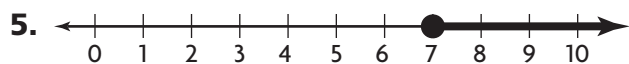
Graph Inequalities

Graph the inequality.

1. $h \geq 3$

Draw a filled-in circle at __**3**__ to show

that 3 is a solution. Shade to the __**right**__

of __**3**__ to show that values greater
than 3 are solutions.

2. $x < \dfrac{-4}{5}$
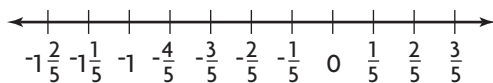
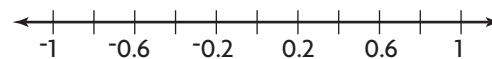**3.** $y > {}^{-}2$
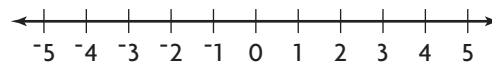
4. $b < 8$
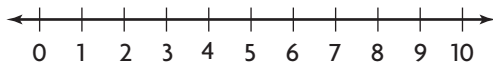
5. $m \leq 3$
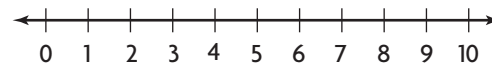
6. $n \geq 1\dfrac{1}{2}$
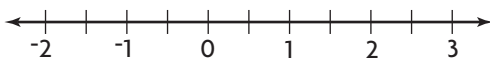
7. $c \leq {}^{-}0.4$

Write the inequality represented by the graph.
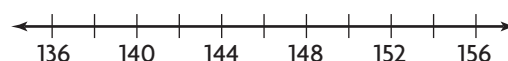
8.

_____

9.

_____
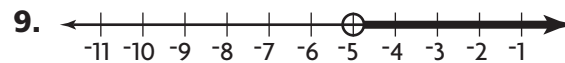
Problem Solving

10. The inequality $x \leq 2$ represents the elevation x of a certain object found at a dig site. Graph the solutions of the inequality on the number line.
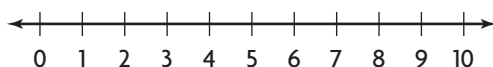
11. The inequality $x \geq 144$ represents the possible scores x needed to pass a certain test. Graph the solutions of the inequality on the number line.

Lesson 67

LESSON 68   Independent and Dependent Variables

OBJECTIVE Write an equation to represent the relationship between an independent variable and a dependent variable.

CC.6.EE.9

An equation with two variables shows a relationship between two quantities. The value of the **dependent variable** changes according to the value of the **independent variable.**

Sam rides the bus almost every day. He pays $2.50 for each bus ride.

Identify the dependent and independent variables in this situation. Then write an equation to represent the relationship between the total cost and the number of bus rides.

Step 1 Understand the relationship and identify variables.

Each bus ride costs $2.50. The total cost c for Sam's bus rides depends on the number of rides r he takes. The value of c will change when the value of r changes.

So, c is the dependent variable and r is the independent variable.

Step 2 Write an equation. The total cost will be $2.50 multiplied by the number of rides.

$c = 2.50 \times r$
(or $c = 2.50r$)

Use your equation to find out how much it would cost for Sam to take 4 bus rides.

Step 1 Think: 4 bus rides means $r = 4$.

Step 2 Substitute 4 for r in the equation.

$c = 2.50 \times r$
$c = 2.50 \times 4$
$c = 10.00$

So, Sam's total cost will be $10.00 for 4 rides.

Identify the dependent and independent variables. Write an equation to show the relationship between them. Then solve for the given value.

1. Janna is buying a netbook with a flash drive. The total cost c will include the price p of the netbook, plus $12.50 for the flash drive.

Find the total cost if the price of the netbook is $375.00.

The _____ depends on the

_____.

dependent variable: _____ independent variable:

_____ equation: _____ = _____ + _____

Total cost: $c =$ _____ + _____

$c =$ _____

Independent and Dependent Variables

Identify the independent and dependent variables. Then write an equation to represent the relationship between them.

1. Sandra has a coupon to save $3 off her next purchase at a restaurant. The cost of her meal c will be the price of the food p that she orders, minus $3.

The __cost of her meal__ depends on

the __price of her food__.

dependent variable: __c__

independent variable: __p__

equation: __c__ = __$p - 3$__

2. An online clothing store charges $6 for shipping, no matter the price of the items. The total cost c in dollars is the price of the items ordered p plus $6 for shipping.

dependent variable: _____

independent variable: _____

equation: _____ = _____

3. Melinda is making necklaces. She uses 12 beads for each necklace. The total number of beads b depends on the number of necklaces n.

dependent variable: _____

independent variable: _____

equation: _____ = _____

4. Tanner is 2 years younger than his brother. Tanner's age t in years is 2 less than his brother's age b.

dependent variable: _____

independent variable: _____

equation: _____ = _____

5. Byron is playing a game. He earns 10 points for each question he answers correctly. His total score s equals the number of correct answers a times 10.

dependent variable: _____

independent variable: _____

equation: _____ = _____

Problem Solving

6. Maria earns $45 for every lawn that she mows. Her earnings e in dollars depend on the number of lawns n that she mows. Write an equation that represents this situation.

_____

7. Martin sells cars. He earns $100 per day, plus any commission on his sales. His daily salary s in dollars depends on the amount of commission c. Write an equation to represent his daily salary.

_____

LESSON 69

Equations and Tables

OBJECTIVE Translate between equations and tables.

CC.6.EE.9

You can use tables and equations to represent the relationship between two quantities.

Use the equation to complete the table. $y = x \div 4$

Step 1 Look at the equation to find the rule. The rule for finding y is $x \div 4$.

Step 2 Apply the rule and fill in the unknown values. Divide each x-value by 4.

$44 \div 4 = 11 \qquad 36 \div 4 = 9 \qquad 28 \div 4 = 7 \qquad 20 \div 4 = 5$

x	y
44	▧
36	▧
28	▧
20	▧

Write an equation for the relationship.

Input, x	30	35	40	45	50
Output, y	6	7	8	9	10

Find a pattern.

Think: "What can I do to each x-value to find its corresponding y-value?"

The y-values are less than the x-values, so try dividing or subtracting.

$x \quad\quad y \quad x \quad\quad y \quad x \quad\quad y \quad x \quad\quad y \quad x \quad\quad y$

$30 \div 5 = 6 \qquad 35 \div 5 = 7 \qquad 40 \div 5 = 8 \qquad 45 \div 5 = 9 \qquad 50 \div 5 = 10$

The pattern is to divide x by 5 to get y. The equation is $y = x \div 5$.

Write an equation for the relationship shown in the table.
Then find the unknown value in the table.

1.

x	20	40	60	80
y	23	43		83

2.

x	3	4	5	6
y	18	24	30	

_____   _____

Use the equation to complete the table.

3. $y = 7x$

Input, x	1	2	3	4
Output, y	7			

4. $y = x - 2$

Input, x	5	8	11	14
Output, y				

Equations and Tables

Use the equation to complete the table.

1. $y = 6x$

Input	Output
x	y
2	**12**
5	**30**
8	**48**

2. $y = x - 7$

Input	Output
x	y
10	
15	
20	

3. $y = 3x + 4$

Input	Output
x	y
3	
4	
5	

Write an equation for the relationship shown in the table.
Then find the unknown value in the table.

4.

x	2	3	4	5
y	16	?	32	40

_____

5.

x	18	20	22	24
y	9	10	?	12

_____

6.

x	8	10	12	14
y	13	15	17	?

_____

7.

x	14	17	20	23
y	5	?	11	14

_____

Problem Solving

8. Tickets to a play cost $11 each. There is also a service charge of $4 per order. Write an equation for the relationship that gives the total cost y in dollars for an order of x tickets.

_____

9. Write an equation for the relationship shown in the table. Then use the equation to find the estimated number of shrimp in a 5-pound bag.

Weight of bag (pounds), x	1	2	3	4
Estimated number of shrimp, y	24	48	72	96

_____

LESSON 70

Problem Solving • Analyze Relationships

CC.6.EE.9

OBJECTIVE Solve problems involving relationships between quantities by using the strategy *find a pattern*.

The table shows the number of miles an overnight train travels. If the pattern in the table continues, how far will the train travel in 10 hours?

Overnight Train Travel Rate				
Time (hours)	1	2	3	4
Distance (miles)	60	120	180	240

Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?
I need to find the __number of miles__ the train will travel in __10__ hours.	I need to find the relationship between __time__ and __distance__ shown in the table.	I will find a __pattern__ in the table and use the pattern to write an __equation__.

Solve the Problem

Look for a pattern between the number of hours and the number of miles.

Overnight Train Travel Rate				
Time in hours, h	1	2	3	4
Distance in miles, m	60	120	180	240

1×60 $2 \times \underline{60}$ $\underline{3} \times \underline{60}$ $\underline{4} \times \underline{60}$

Then write an equation to show the pattern.

Equation: $m = \underline{60} \times h$

To find the miles the train will travel in 10 hours, substitute 10 for h.

$m = \underline{60} \times \underline{10}$

$m = \underline{600}$

---

1. The table shows how much a restaurant pays for coffee. How much will the restaurant pay for 100 pounds of coffee?

Coffee Purchasing				
Pounds, p	5	10	30	60
Cost, c	$20	$40	$120	$240

_____

Problem Solving • Analyze Relationships

The table shows the number of cups of yogurt needed to make different amounts of a fruit smoothie. Use the table for 1–3.

Batches, b	3	4	5	6
Cups of Yogurt, c	9	12	15	18

1. Write an equation to represent the relationship.

The number of cups needed is ___**3**___ multiplied by the

number of batches, so ___**c**___ = ___**3**___ × ___**b**___ .

2. How much yogurt is needed for 9 batches of smoothie? _____

3. Jerry used 33 cups of yogurt to make smoothies. _____
How many batches did he make?

The table shows the relationship between Winn's age and his sister's age. Use the table for 4–6.

Winn's age, w	8	9	10	11
Winn's sister's age, s	12	13	14	15

4. Write an equation to represent the relationship. $s =$ _____

5. When Winn is 14 years old, how old will his sister be? _____

6. When Winn's sister is 23 years old, how old will Winn be? _____

LESSON 71

Graph Relationships

OBJECTIVE Graph the relationship between two quantities.

CC.6.EE.9

You can use a graph to represent a relationship.

Graph the relationship represented by the table to find the unknown value of *y*.

x	1	3	5	7
y	4	6	▮	10

Step 1 Write ordered pairs that you know.
(1, 4), (3, 6), (7, 10)

Step 2 Plot the points.
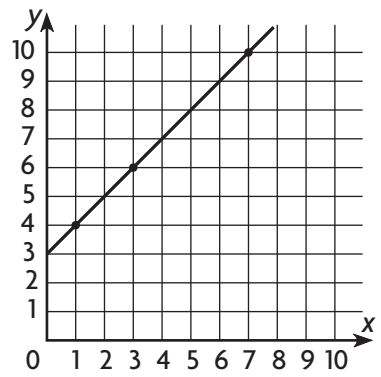
Step 3 Find the unknown *y*-value. Use a ruler to draw a line through the points. Find the *y*-value that corresponds to an *x*-value of 5.

So, when the *x*-value is 5, the *y*-value is 8.

Graph the relationship represented by the table to find the unknown value of *y*.

1.

x	1	2	3	4	5
y	3	4	▮	6	7

2.

x	2	4	6	8	10
y	8	7	▮	5	4

CC.6.EE.9
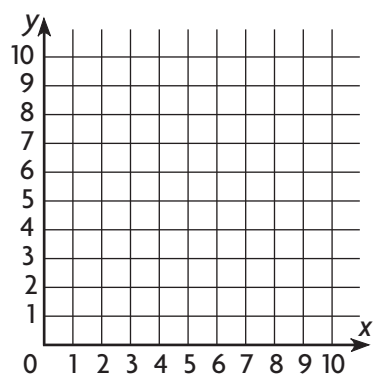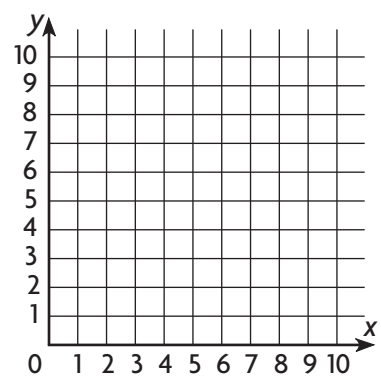
Graph Relationships

Graph the relationship represented by the table.

1.

x	1	2	3	4	5
y	25	50	75	100	125
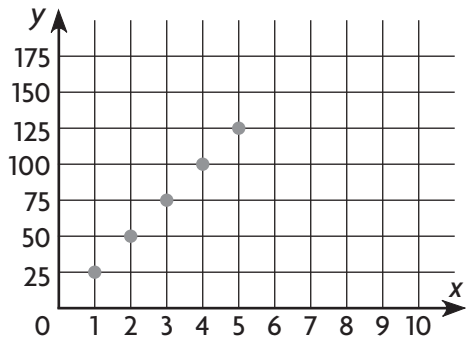
2.

x	10	20	30	40	50
y	350	300	250	200	150
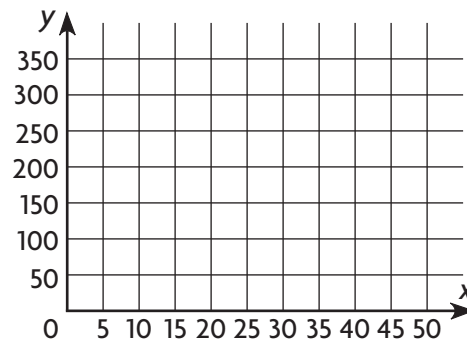
Problem Solving

3. Graph the relationship represented by the table.

Cost of DVDs

DVDs Purchased	1	2	3	4
Cost ($)	15	30	45	60

4. Use the graph to find the cost of purchasing 5 DVDs.

_____

DVDs Purchased
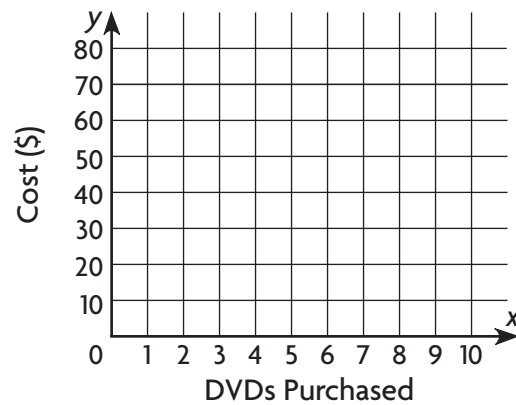
LESSON 72 **Equations and Graphs**
OBJECTIVE Translate between equations and graphs.

CC.6.EE.9

You can make a table of values for any equation. Use the table to write ordered pairs. Plot points to help you graph the equation. The graph of a **linear equation** is a straight line.

Graph the linear equation.
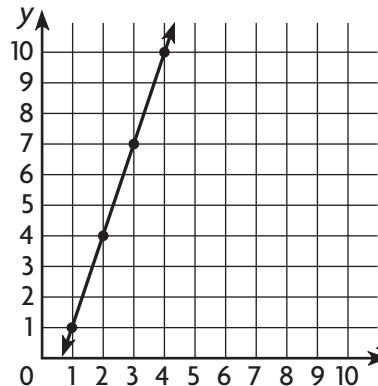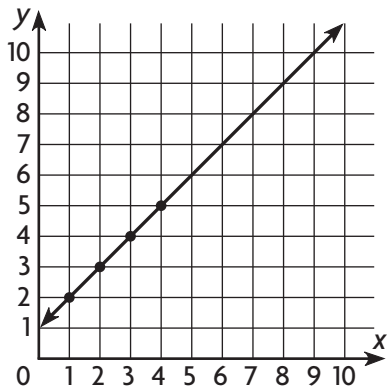
$y = x + 1$ $y = 3x - 2$

Step 1 Find ordered pairs that are solutions of the equation.

Choose four values for x. Substitute each value for x in the equation and find the corresponding value of y. Use easy values for x, such as 1, 2, 3, 4.

x	$x + 1$	y	Ordered Pair
1	$1 + 1$	2	(1, 2)
2	$2 + 1$	3	(2, 3)
3	$3 + 1$	4	(3, 4)
4	$4 + 1$	5	(4, 5)

x	$3x - 2$	y	Ordered Pair
1	$3 \cdot 1 - 2$	1	(1, 1)
2	$3 \cdot 2 - 2$	4	(2, 4)
3	$3 \cdot 3 - 2$	7	(3, 7)
4	$3 \cdot 4 - 2$	10	(4, 10)

Step 2 Graph the equation.

Graph the linear equation.
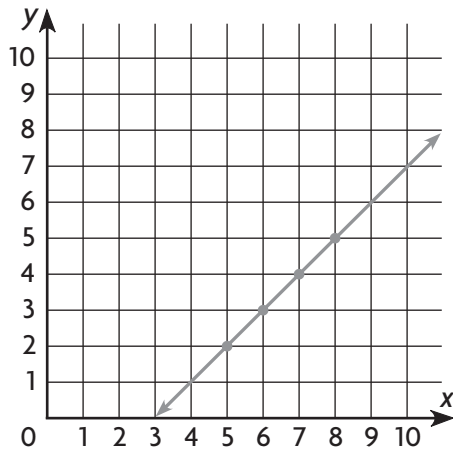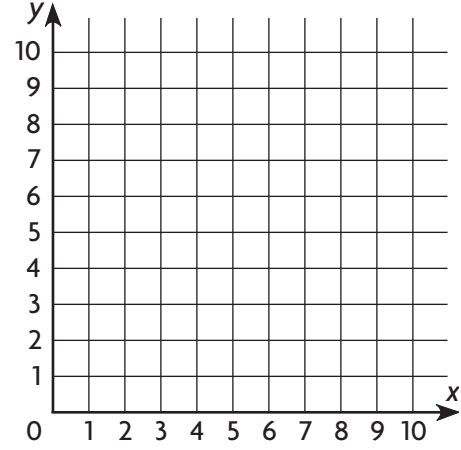
1. $y = x - 1$

2. $y = 2x - 1$

CC.6.EE.9
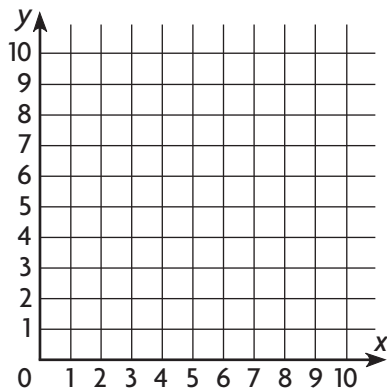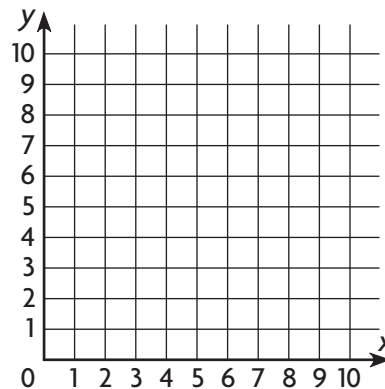
Equations and Graphs
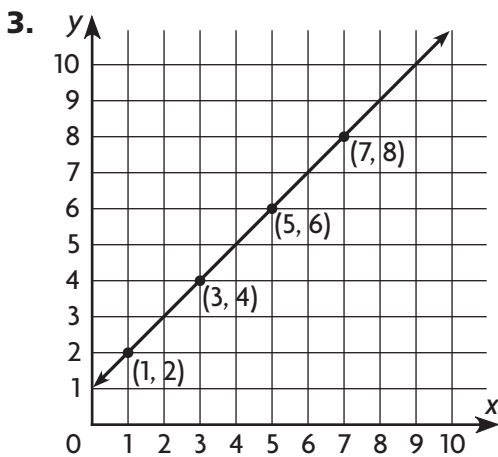
Graph the linear equation.

1. $y = x - 3$

x	y
5	2
6	**3**
7	**4**
8	**5**

2. $y = x \div 3$

Write a linear equation for the relationship shown by the graph.

3.

(7, 8)
(5, 6)
(3, 4)
(1, 2)

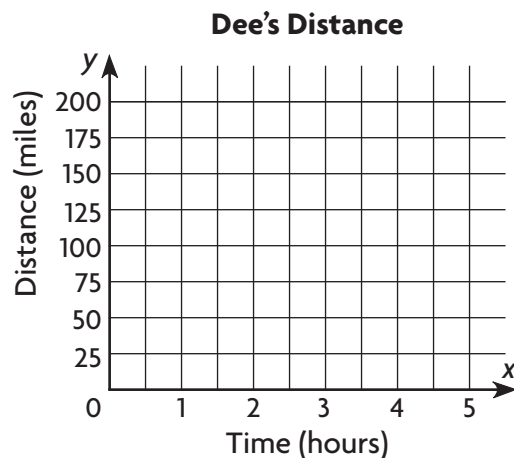_____

4.

(2, 8)
(1.5, 6)
(1, 4)

_____
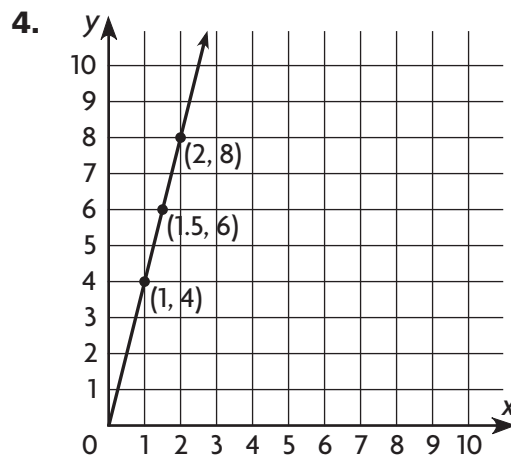
Problem Solving

5. Dee is driving at an average speed of 50 miles per hour. Write a linear equation for the relationship that gives the distance *y* in miles that Dee drives in *x* hours.

_____

6. Graph the relationship from Exercise 5.

Dee's Distance

Distance (miles)

Time (hours)

RtI

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