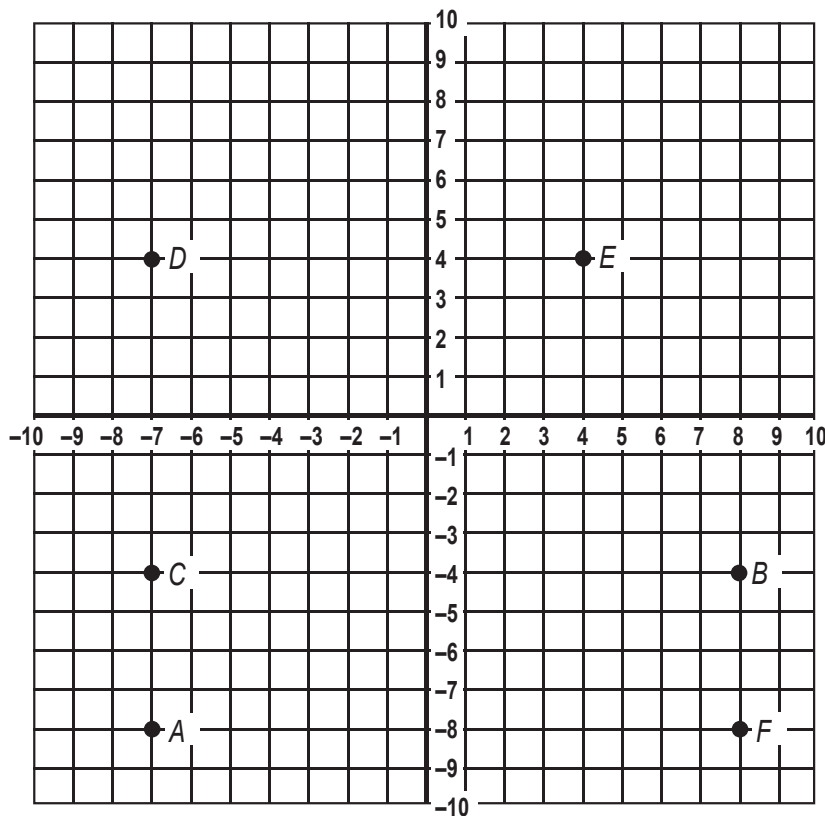


Lesson 4.6 Problem Solving in the Coordinate Plane

Use the coordinate grid to answer the questions.



A – stream

D – school

B – home

E – park

C – bookstore

F – fire station

How far is it from the fire station to the bookstore?

Begin at the fire station.

First move 15 units left. Then, move 4 units up.

$$\underline{15} + \underline{4} = \underline{19} \text{ units}$$

It takes 19 units to get from the fire station to the bookstore.

1. How far is it from school to the park? _____ units
2. How far is it from the stream to the fire station? _____ units
3. How far is it from the bookstore to home? _____ units
4. How far is it from the stream to the school? _____ units
5. How far is from the fire station to home? _____ units

Lesson 5.1 Using Exponents

A **power** of a number represents repeated multiplication of the number by itself.

$10^3 = 10 \times 10 \times 10$ and is read 10 to the third power.

In **exponential** numbers, the **base** is the number that is multiplied, and the **exponent** represents the number of times the base is used as a factor. In 2^5 , 2 is the base and 5 is the exponent.

2^5 means 2 is used as a factor 5 times.

$$2 \times 2 \times 2 \times 2 \times 2 = 32 \quad 2^5 = 32$$

Scientific notation for a number is expressed by writing the number as the product of a number between one and ten, and a power of ten.

3,000 can be written as $3 \times 1,000$ or 3×10^3 .

3×10^3 is scientific notation for 3,000.

Some powers of 10 are shown in the table at right.

10^1	10	10
10^2	10×10	100
10^3	$10 \times 10 \times 10$	1,000
10^4	$10 \times 10 \times 10 \times 10$	10,000
10^5	$10 \times 10 \times 10 \times 10 \times 10$	100,000

Use the table above to write each number in scientific notation.

a

b

c

- 30 _____
- 600,000 _____
- 40,000 _____
- 4,000 _____
- 700 _____
- 100,000 _____
- 50,000 _____
- 90 _____
- 400 _____

Write each power as the product of factors.

- 3^3 _____
- 12^2 _____
- 7^4 _____
- 5^5 _____
- 8^3 _____
- 4^4 _____
- 1^6 _____
- 6^3 _____
- 11^4 _____

Use exponents to rewrite each expression.

- $3 \times 3 \times 3$ _____
- 24×24 _____
- $2 \times 2 \times 2 \times 2$ _____
- 8×8 _____
- $4 \times 4 \times 4$ _____
- $38 \times 38 \times 38$ _____
- $7 \times 7 \times 7 \times 7 \times 7$ _____
- $6 \times 6 \times 6 \times 6 \times 6 \times 6$ _____
- $5 \times 5 \times 5 \times 5 \times 5$ _____

Evaluate each expression.

- a^4 if $a = 2$ _____
- n^2 if $n = 8$ _____
- a^5 if $a = 3$ _____
- x^3 if $x = 4$ _____
- b^4 if $b = 3$ _____
- x^3 if $x = 6$ _____
- n^7 if $n = 1$ _____
- x^3 if $x = 5$ _____
- n^2 if $n = 11$ _____

Lesson 5.2 Parts of an Expression

A **variable** is a symbol, usually a letter of the alphabet, that stands for an unknown number, or quantity. $a = \text{variable}$

An **algebraic expression** is a combination of numbers, variables, and at least one operation. $x + 13$

A **term** is a number, variable, product, or quotient in an algebraic expression. In $3a + 5$, $3a$ is a term and 5 also is a term.

The term $3a$ means $3 \times a$. The number 3 is the coefficient of a . A **coefficient** is a number that multiplies a variable. In the expression $x + 5$, the coefficient of x is understood to be 1.

An **equation** is a sentence that contains an equal sign. $x + 13 = 25$

Identify each of the following as an *expression* or an *equation*.

- | | | |
|-----------------------|--------------------|-------------------------|
| a | b | c |
| 1. $3 + x$ _____ | $7 + 4 = 11$ _____ | $55 \times n$ _____ |
| 2. $x - 7 = 15$ _____ | $b - 45$ _____ | $24 = 6 \times 4$ _____ |

For each term below, identify the coefficient and the variable.

- | | |
|--|---------------------------------------|
| a | b |
| 3. $3x$ coefficient _____ variable _____ | $4y$ coefficient _____ variable _____ |
| 4. z coefficient _____ variable _____ | $5n$ coefficient _____ variable _____ |
| 5. $7b$ coefficient _____ variable _____ | m coefficient _____ variable _____ |
| 6. r coefficient _____ variable _____ | $6d$ coefficient _____ variable _____ |

Translate each phrase into an algebraic expression.

- | | |
|-----------------------------|---------------------------------|
| 7. five more than n _____ | eight decreased by x _____ |
| 8. x added to seven _____ | the product of n and 11 _____ |

Translate each sentence into an equation.

- | | |
|---|---|
| 9. Six times a number is 18. _____ | Seventy less than a number is 29. _____ |
| 10. Eight divided by a number is 2. _____ | The product of 7 and 12 is 84. _____ |

Write the following expressions in words.

- | |
|------------------------------|
| 11. $6 - n = 3$ _____ |
| 12. $5 \times 13 = 65$ _____ |

Lesson 5.3 Writing Expressions

An **equation** is a number sentence that contains an equal sign.

An **expression** is a number phrase without an equal sign.

Equations and expressions may contain only numerals, or they also may contain variables. A

variable is a symbol, usually a letter, that stands for an unknown number.

	<i>Equation</i>	<i>Expression</i>
Numerical	$3 \times 5 = 15$	$9 + 2$
Variable	$2n + 2 = 18$	$a - 5$

All equations and expressions express an idea.

3×4 means "three 4s." $6 \div 3 = 2$ means "6 divided by 3 is 2."

$n - 7$ means " n decreased by 7" or "a number decreased by 7."

$4n + 2 = 6$ means "four times a number, plus 2, is 6" or "4ns, plus 2, is 6."

Translate each phrase into an expression or an equation.

a

b

- | | |
|-------------------------------------|---------------------------------|
| 1. x increased by 5 _____ | 12 divided by a number _____ |
| 2. seven ns _____ | c less than 7 _____ |
| 3. a number added to 15 is 23 _____ | one-fourth of x _____ |
| 4. p added to 6 _____ | the product of 15 and m _____ |

Translate each sentence into an equation. Use n for an unknown number.

5. 11 decreased by a number is 7. _____
6. 8 times a number, plus 4, is 84. _____
7. A number divided by 5 is 6. _____

Write each expression in words.

8. $n - 5$ _____
9. $3n \div 6$ _____

Lesson 5.4 Equivalent Expressions

Equivalent expressions are created by simplifying values and combining terms.

$$4(6x - 5) = 24x - 20 \quad \text{Multiply each value by 4 to create an equivalent expression.}$$

$$3(4^3 + 7x) = 3(64 + 7x) \quad \text{First, calculate the value of the exponents.}$$

$$3(64 + 7x) = 192 + 21x \quad \text{Then, use the distributive property to create the equivalent expression.}$$

$$t + t + t = 3t \quad \text{Use multiplication in place of repeated addition.}$$

Create expressions equivalent to the ones below.

1. $7(4z + 8b)$ _____
2. $8(2x + 3^2)$ _____
3. $4(r + r + r + r)$ _____
4. $9(3 + 8x)$ _____
5. $4^2(3 + 6t)$ _____
6. $\frac{t + t + t}{4}$ _____
7. $2(4s^3 + 2)$ _____
8. $30(3x + 4)$ _____
9. $6(5a + 9b)$ _____
10. $9(3x + 5^4)$ _____
11. $7(c + c + c)$ _____
12. $9(2 + 7f)$ _____
13. $7^5(4g - 8d)$ _____
14. $\frac{e + e + e}{5}$ _____
15. $5(3z^6 + 3)$ _____
16. $10(y + 2)$ _____