

1-1 Study Guide and InterventionFor all problem sets
do evens OR odds**Words and Expressions**

Translate Verbal Phrases into Expressions A **numerical expression** contains a combination of numbers and operations such as addition, subtraction, multiplication, and division. Verbal phrases can be translated into numerical expressions by replacing words with operations and numbers.

+	-	×	÷
plus	minus	times	divide
the sum of	the difference of	the product of	the quotient of
increased by	decreased by	of	divided by
more than	less than		among

Example

Write a numerical expression for each verbal phrase.

- a. the product of seventeen and three

Phrase the **product** of seventeen and threeExpression 17×3

- b. the total number of pencils given to each student if 18 pencils are shared among 6 students

Phrase 18 shared **among** 6Expression $18 \div 6$ **Exercises**

Write a numerical expression for each verbal phrase.

- eleven less than twenty
- twenty-five increased by six
- sixty-four divided by eight
- the product of seven and twelve
- the quotient of forty and eight
- sixteen more than fifty-four
- six groups of twelve
- eighty-one decreased by nine
- the sum of thirteen and eighteen
- three times seventeen

1-2 Study Guide and Intervention**Variables and Expressions**

Translate Verbal Phrases An **algebraic expression** is a combination of variables, numbers, and at least one operation. A **variable** is a letter or symbol used to represent an unknown value. To translate verbal phrases with an unknown quantity into algebraic expressions, first define the variable.

Algebraic Expressions		
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">The letter x is most often used as a variable.</div> <div style="text-align: center;">$x + 3$</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">$7d$ means $7 \times d$. mn means $m \times n$.</div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">$7d - 2$</div> <div style="text-align: center;">mn</div> </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">$\frac{b}{5}$ means $b \div 5$.</div> <div style="text-align: center;">$\frac{b}{5}$</div>

Example Translate each phrase into an algebraic expression.

a. five inches longer than the length of a book

Words five inches longer than the length of a book

Variable Let b represent the length of the book.

Expression $b + 5$

b. two less than the product of a number and eight

Words two less than the product of a number and eight

Variable Let n represent the unknown number.

Expression $8n - 2$

Exercises

Translate each phrase into an algebraic expression.

1. eight inches taller than Mycala's height
2. twelve more than four times a number
3. the difference of sixty and a number
4. three times the number of tickets sold
5. fifteen dollars more than a saved amount
6. the quotient of the number of chairs and four
7. a number of books less than twenty-three
8. five more than six times a number
9. seven more boys than girls
10. twenty dollars divided among a number of friends minus three

1-3 Study Guide and Intervention

Properties

Properties of Addition and Multiplication In algebra, there are certain statements called **properties** that are true for any numbers.

Property	Explanations	Example
Commutative Property of Addition	$a + b = b + a$	$6 + 3 = 3 + 6$ $9 = 9$
Commutative Property of Multiplication	$a \cdot b = b \cdot a$	$4 \cdot 5 = 5 \cdot 4$ $20 = 20$
Associative Property of Addition	$(a + b) + c = a + (b + c)$	$(3 + 4) + 7 = 3 + (4 + 7)$ $14 = 14$
Associative Property of Multiplication	$(a \cdot b) \cdot c = a \cdot (b \cdot c)$	$(2 \cdot 5) \cdot 8 = 2 \cdot (5 \cdot 8)$ $80 = 80$
Additive Identity	$a + 0 = 0 + a = a$	$10 + 0 = 0 + 10 = 10$
Multiplicative Identity	$a \cdot 1 = 1 \cdot a = a$	$5 \cdot 1 = 1 \cdot 5 = 5$
Multiplicative Property of Zero	$a \cdot 0 = 0 \cdot a = 0$	$15 \cdot 0 = 0 \cdot 15 = 0$

Example 1 Is subtraction of whole numbers associative? If not, give a counterexample.

$(9 - 4) - 2 \stackrel{?}{=} 9 - (4 - 2)$	State the conjecture.
$5 - 2 \stackrel{?}{=} 9 - 2$	Simplify.
$3 \stackrel{?}{=} 7$	Simplify.

This is a counterexample. So, subtraction of whole numbers is not associative.

Example 2 Name the property shown by the statement.

$15 \times b = b \times 15$	The order of the numbers and variables changed. This is the Commutative Property of Multiplication.
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Exercises

- State whether the following conjecture is true or false: The multiplicative identity applies to division also. If false, give a counterexample.

Name the property shown by each statement.

2. $75 + 25 = 25 + 75$	3. $2 \cdot (3 \cdot 4) = (2 \cdot 3) \cdot 4$
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4. $14 \cdot 1 = 14$	5. $p \cdot 0 = 0$
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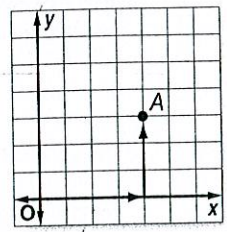
1-4 Study Guide and Intervention

Ordered Pairs and Relations

Ordered Pairs In mathematics, a **coordinate system** is used to locate points. The horizontal number line is called the **x-axis** and the vertical number line is called the **y-axis**. The point where the two axes intersect is the **origin** (0, 0). An **ordered pair** of numbers is used to locate points in the coordinate plane. The point (4, 3) has an **x-coordinate** of 4 and a **y-coordinate** of 3.

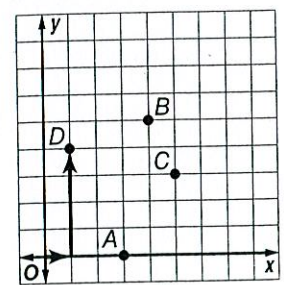
Example 1 Graph A(4, 3) on the coordinate plane.

- Step 1** Start at the origin.
- Step 2** Since the x-coordinate is 4, move 4 units to the right.
- Step 3** Since the y-coordinate is 3, move 3 units up. Draw a dot.



Example 2 Write the ordered pair that names point D.

- Step 1** Start at the origin.
- Step 2** Move right on the x-axis to find the x-coordinate of point D, which is 1.
- Step 3** Move up the y-axis to find the y-coordinate, which is 4.

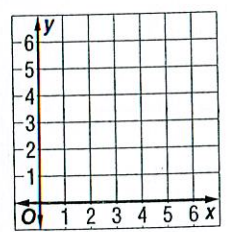


The ordered pair for point D is (1, 4).

Exercises

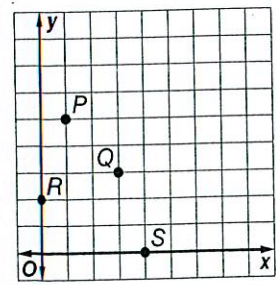
Graph each ordered pair on the coordinate plane.

- | | |
|------------|------------|
| 1. A(4, 1) | 2. B(2, 0) |
| 3. C(1, 3) | 4. D(5, 2) |
| 5. E(0, 3) | 6. F(6, 4) |



Refer to the coordinate plane shown at the right. Write the ordered pair that names each point.

- | | |
|------|-------|
| 7. P | 8. Q |
| 9. R | 10. S |



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1-5 Study Guide and Intervention

Words, Equations, Tables, and Graphs

Represent Functions Functions are relations in which each member of the domain is paired with *exactly* one member in the range. The **function rule** describes the operation(s) which must be performed on a domain value to get the corresponding range value.

Function tables organize and display the input values (the x -coordinates), the function rule, and the output values (the y -coordinates).

Example **TICKETS** June is ordering tickets for a show. Tickets cost \$22 each and there is a \$6 surcharge per order. Make a function table for 4 different input values and write an algebraic expression for the rule. Then state the domain and range of the function.

Step 1 Create a function table showing the input, rule, and output. Enter 4 different input values.

Input (x)	Rule: $22x + 6$	Output (y)
1	$22(1) + 6$	28
2	$22(2) + 6$	50
3	$22(3) + 6$	72
4	$22(4) + 6$	94

Step 2 The phrase "Tickets cost \$22 each and there is a \$6 surcharge per order" translates to $22x + 6$. Use the rule to complete the table.

Step 3 The domain is {1, 2, 3, 4}. The range is {28, 50, 72, 94}.

Exercises

For each ticket cost and surcharge given below, make a function table for 4 different input values and write an algebraic expression for the rule. Then state the domain and range of the function.

1. Ticket cost: \$8; surcharge: \$1.50

Input (x)	Rule:	Output (y)

2. Ticket cost: \$12; surcharge: \$3

Input (x)	Rule:	Output (y)

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1-5 Skills Practice

Words, Equations, Tables, and Graphs

Copy and complete each function table. Then state the domain and range of the function.

1. A phone call costs \$3 a minute.

Input (x)	Rule:	Output (y)
1		
5		
10		
20		

2. Jared has 4 less than 3 times the number of trophies that Zach has.

Input (x)	Rule:	Output (y)
2		
4		
6		
8		

3. The cost for a class trip is \$5 per student plus \$100 for the bus.

Input (x)	Rule:	Output (y)
18		
22		
24		
30		

4. A child's admission is \$4 more than half an adult's admission.

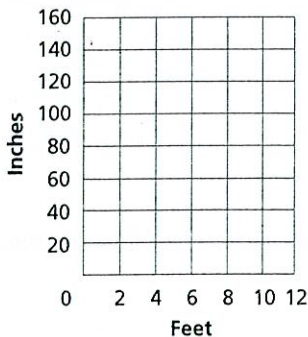
Input (x)	Rule:	Output (y)
20		
26		
30		
42		

5. **MULTIPLE REPRESENTATIONS** There are 12 inches in 1 foot.

a. **ALGEBRAIC** Write an equation to find the number of inches in any number of feet.

b. **TABULAR** Make a function table to find the number of inches in 4, 6, 8, and 10 feet.

c. **GRAPHICAL** Graph the ordered pairs for the function.



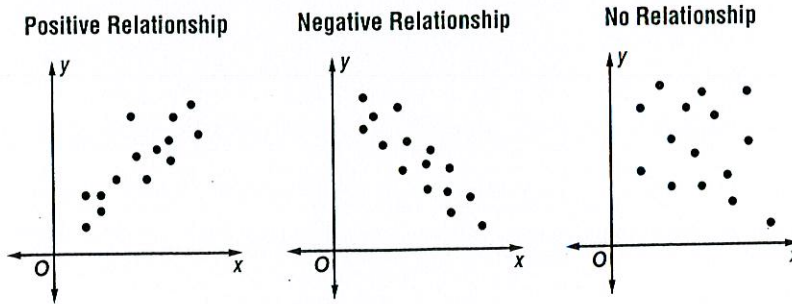
Input (x)	Rule:	Output (y)

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1-6 Study Guide and Intervention *(continued)*

Scatter Plots

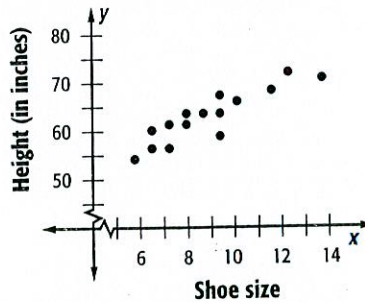
Analyze Scatter Plots A scatter plot may show a pattern or relationship of the data.



Example

SHOE SIZE AND HEIGHT Determine whether a scatter plot of shoe size and height of people at a gym might show a *positive*, *negative*, or *no* relationship. Explain your answer.

Shoe Size and Height



Height affects shoe size. A person's shoe size increases as their height increases. Therefore, a scatter plot of the data would show a positive relationship.

Exercises

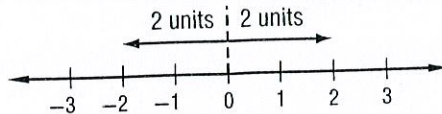
Determine whether a scatter plot of the data for the following might show a *positive*, *negative*, or *no* relationship. Explain your answer.

- fat grams and the amount of calories in food
- time spent relaxing and blood pressure levels
- age of a child and number of siblings
- age of a tree and its height

2-1 Study Guide and Intervention *(continued)*

Integers and Absolute Value

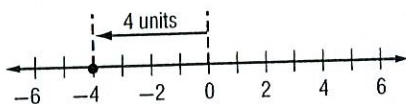
Absolute Value Numbers on opposite sides of zero and the same distance from zero have the same **absolute value**.



The symbol for absolute value is two vertical bars on either side of the number. $|2| = 2$ and $|-2| = 2$

Example 1 Evaluate each expression.

a. $|-4|$



$|-4| = 4$ On the number line, -4 is 4 units from 0.

b. $|-3| + |6|$

$$\begin{aligned} |-3| + |6| &= 3 + 6 & |-3| = 3, |6| = 6 \\ &= 9 & \text{Simplify.} \end{aligned}$$

Example 2 Evaluate $|x| - 7$ if $x = -8$.

$$\begin{aligned} |x| - 7 &= |-8| - 7 \\ &= 8 - 7 \\ &= 1 \end{aligned}$$

Replace x with -8 .
The absolute value of -8 is 8.
Simplify.

Exercises

Evaluate each expression.

1. $|-6|$

2. $|15|$

3. $|-12|$

4. $|21|$

5. $|4| - |2|$

6. $|-8| + |-3|$

7. $|-10| - |-6|$

8. $|12| + |-4|$

ALGEBRA Evaluate each expression if $x = 8$ and $y = -3$.

9. $12 + |y|$

10. $x - |y|$

11. $2|x| + 3|y|$

12. $x + |y|$

13. $6|y|$

14. $3x - 4|y|$

2-2 Study Guide and Intervention

Adding Integers

Adding Integers with the Same Sign	Add their absolute values. The sum is: <ul style="list-style-type: none"> • positive if both integers are positive. • negative if both integers are negative.
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Example 1 Find the sum $-3 + (-4)$.
 $-3 + (-4) = -7$ Add $|-3|$ and $|-4|$. The sum is negative.

Adding Integers with Different Signs	Subtract their absolute values. The sum is: <ul style="list-style-type: none"> • positive if the positive integer's absolute value is greater. • negative if the negative integer's absolute value is greater.
---	--

Example 2 Find each sum.

a. $-5 + 4$
 $-5 + 4 = |-5| - |4|$ Subtract $|4|$ from $|-5|$.
 $= 5 - 4$ or 1 Simplify.
 $= -1$ The sum is negative because $|-5| > |4|$.

b. $6 + (-2)$
 $6 + (-2) = |6| - |-2|$ Subtract $|-2|$ from $|6|$.
 $= 6 - 2$ or 4 Simplify.
 $= 4$ The sum is positive because $|6| > |-2|$.

Exercises

Find each sum.

- | | | |
|-------------------|-------------------|-------------------|
| 1. $6 + (-3)$ | 2. $-3 + (-5)$ | 3. $7 + (-3)$ |
| 4. $-4 + (-4)$ | 5. $-8 + 5$ | 6. $-12 + (-10)$ |
| 7. $6 + (-13)$ | 8. $-14 + 4$ | 9. $6 + (-6)$ |
| 10. $-15 + (-5)$ | 11. $-9 + 8$ | 12. $20 + (-8)$ |
| 13. $-19 + (-11)$ | 14. $17 + (-9)$ | 15. $-16 + (-5)$ |
| 16. $-12 + 14$ | 17. $9 + (-25)$ | 18. $-36 + 19$ |
| 19. $7 + (-18)$ | 20. $-12 + (-15)$ | 21. $10 + (-14)$ |
| 22. $-33 + 19$ | 23. $-20 + (-5)$ | 24. $-12 + (-10)$ |
| 25. $-15 + 4$ | 26. $-34 + 29$ | 27. $46 + (-32)$ |

Lesson 2-2

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2-3 Study Guide and Intervention**Subtracting Integers****Subtracting Integers**

To subtract an integer, add its additive inverse.

Example 1 Find each difference.

a. $9 - 17$

$$\begin{aligned} 9 - 17 &= 9 + (-17) && \text{To subtract 17, add } -17. \\ &= -8 && \text{Simplify.} \end{aligned}$$

b. $-7 - 3$

$$\begin{aligned} -7 - 3 &= -7 + (-3) && \text{To subtract 3, add } -3. \\ &= -10 && \text{Simplify.} \end{aligned}$$

Example 2 Find each difference.

a. $4 - (-5)$

$$\begin{aligned} 4 - (-5) &= 4 + 5 && \text{To subtract } -5, \text{ add } +5. \\ &= 9 && \text{Simplify.} \end{aligned}$$

b. $-6 - (-2)$

$$\begin{aligned} -6 - (-2) &= -6 + 2 && \text{To subtract } -2, \text{ add } +2. \\ &= -4 && \text{Simplify.} \end{aligned}$$

Exercises

Find each difference.

1. $9 - 16$

2. $7 - 19$

3. $12 - 21$

4. $-5 - 3$

5. $-8 - 9$

6. $-13 - 17$

7. $7 - (-4)$

8. $9 - (-9)$

9. $-11 - (-2)$

10. $-6 - (-9)$

11. $-6 - 4$

12. $-16 - (-20)$

13. $-14 - 4$

14. $8 - (-6)$

15. $-10 - (-6)$

16. $13 - (-17)$

17. $24 - (-16)$

18. $17 - (-9)$

19. $-24 - 8$

20. $18 - (-9)$

21. $26 - 49$

22. $-45 - (-26)$

23. $-15 - (-25)$

24. $29 - (-6)$

2-4 Study Guide and Intervention

Multiplying Integers

Multiplying Integers with Different Signs

The product of two integers with different signs is negative.

Example 1 Find each product.

a. $4(-3)$

$$4(-3) = -12$$

b. $-8(5)$

$$-8(5) = -40$$

Multiplying Integers with the Same Sign

The product of two integers with the same sign is positive.

Example 2 Find each product.

a. $6(6)$

$$6(6) = 36$$

b. $-7(-4)$

$$-7(-4) = 28$$

Example 3 Find $6(-3)(-2)$.

$$6(-3)(-2) = [6(-3)](-2) \quad \text{Use the Associative Property.}$$

$$= -18(-2)$$

$$6(-3) = -18$$

$$= 36$$

$$-18(-2) = 36$$

Exercises

Find each product.

1. $-5(7)$

2. $6(-9)$

3. $-10 \cdot 4$

4. $-12 \cdot -2$

5. $5(-11)$

6. $-15(-4)$

7. $-14(2)$

8. $6(14)$

9. $-18 \cdot 2$

10. $-9(10)$

11. $12(-6)$

12. $-11(-11)$

13. $-4(-4)(5)$

14. $6(-7)(2)$

15. $-10(-4)(-6)$

16. $-7(-3)(2)$

17. $-9(4)(2)$

18. $6(-4)(-12)$

19. $11(3)(-2)$

20. $-5(-6)(7)$

21. $-3(-4)(-8)$

22. $22(3)(-3)$

23. $-8(10)(-2)$

24. $-6(5)(-9)$

2-5 Study Guide and Intervention

Dividing Integers

**Dividing Integers
with the Same Sign**

The quotient of two integers with the same sign is positive.

Example 1 Find each quotient.

a. $14 \div 2$ The dividend and the divisor have the same sign.
 $14 \div 2 = 7$ The quotient is positive.

b. $\frac{-25}{-5}$
 $\frac{-25}{-5} = -25 \div (-5)$ The dividend and divisor have the same sign.
 $= 5$ The quotient is positive.

**Dividing Integers
with Different Signs**

The quotient of two integers with different signs is negative.

Example 2 Find each quotient.

a. $36 \div (-4)$ The signs are different.
 $36 \div (-4) = -9$ The quotient is negative.

b. $-\frac{42}{6}$ The signs are different.
 $-\frac{42}{6} = -7$ The quotient is negative.

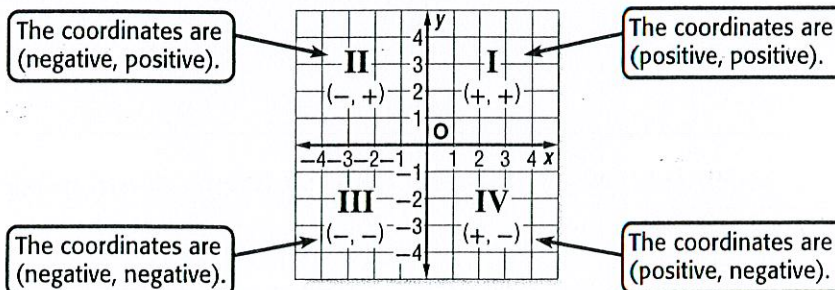
Exercises

Find each quotient.

- | | | |
|---------------------|----------------------|------------------------|
| 1. $32 \div (-4)$ | 2. $-18 \div (-2)$ | 3. $-24 \div 6$ |
| 4. $-36 \div (-2)$ | 5. $50 \div (-5)$ | 6. $-81 \div (-9)$ |
| 7. $-72 \div (-2)$ | 8. $-45 \div 3$ | 9. $-60 \div (-12)$ |
| 10. $99 \div (-11)$ | 11. $-200 \div (-4)$ | 12. $38 \div (-2)$ |
| 13. $-144 \div 12$ | 14. $100 \div (-5)$ | 15. $-200 \div (-20)$ |
| 16. $\frac{-28}{2}$ | 17. $\frac{36}{-4}$ | 18. $\frac{-150}{-25}$ |

2-6 Study Guide and Intervention

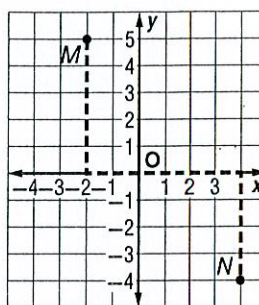
Graphing in Four Quadrants



Example Graph and label each point on a coordinate plane. Name the quadrant in which each point lies.

a. $M(-2, 5)$

Start at the origin. Move 2 units left.
Then move 5 units up and draw a dot.
Point $M(-2, 5)$ is in Quadrant II.



b. $N(4, -4)$

Start at the origin. Move 4 units right.
Then move 4 units down and draw a dot.
Point $N(4, -4)$ is in Quadrant IV.

Exercises

Graph and label each point on the coordinate plane.
Name the quadrant in which each point is located.

- | | |
|----------------|-----------------|
| 1. $A(2, 6)$ | 2. $B(-1, 4)$ |
| 3. $C(0, -5)$ | 4. $D(-4, -3)$ |
| 5. $E(2, 0)$ | 6. $F(3, -2)$ |
| 7. $G(-4, 4)$ | 8. $H(2, -5)$ |
| 9. $I(6, 3)$ | 10. $J(-5, -8)$ |
| 11. $K(3, -5)$ | 12. $L(-7, -3)$ |

