

Mid-Chapter Quiz

Translate each sentence into an equation.

1. The sum of three times a and four is the same as five times a .

SOLUTION:

Rewrite the verbal sentence so it is easier to translate. *The sum of three times a and four is the same as five times a is the same as three times a plus four equals five times a .*

three times a number a	plus	four	equals	five times a number a
$3a$	+	4	=	$5a$

The equation is $3a + 4 = 5a$.

2. One fourth of m minus six is equal to two times the sum of m and 9.

SOLUTION:

Rewrite the verbal sentence so it is easier to translate. *One fourth of m minus six is equal to two times the sum of m and 9 is the same as One fourth times m minus six is equal to two times the quantity m plus 9.*

one fourth of m	minus	six	equals	two times the quantity m plus 9
$\frac{1}{4}m$	−	6	=	$2(m + 9)$

The equation is $\frac{1}{4}m - 6 = 2(m + 9)$.

3. The product of five and w is the same as w to the third power.

SOLUTION:

Rewrite the verbal sentence so it is easier to translate. *The product of five and w is the same as w to the third power is the same as five times w equals w to the third power.*

five 5	times •	w w	equals =	w to the third power w^3
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The equation is $5w = w^3$.

Mid-Chapter Quiz

4. **MARBLES** Drew has 50 red, green and blue marbles. He has six more red marbles than blue marbles and four fewer green marbles than blue marbles. Write and solve an equation to determine how many blue marbles Drew has.

SOLUTION:

To write the equation, let b = the number of blue marbles. Express the other colors in terms of b .

Six more red than blue	and	four fewer green than blue	plus	blue	equals	50
$b + 6$	+	$b - 4$	+	b	=	50

The equation is $3b + 2 = 50$.

$$3b + 2 = 50$$

$$3b + 2 - 2 = 50 - 2$$

$$3b = 48$$

$$\frac{3b}{3} = \frac{48}{3}$$

$$b = 16$$

Drew has 16 blue marbles.

Solve each equation. Check your solution.

5. $p + 8 = 13$

SOLUTION:

$$p + 8 = 13$$

$$p + 8 - 8 = 13 - 8$$

$$p = 5$$

Check:

$$p + 8 = 13$$

$$5 + 8 = 13$$

$$13 = 13$$

6. $-26 = b - 3$

SOLUTION:

$$-26 = b - 3$$

$$-26 + 3 = b - 3 + 3$$

$$-23 = b$$

Check:

$$-26 = b - 3$$

$$-26 = -23 - 3$$

$$-26 = -26$$

Mid-Chapter Quiz

7. $\frac{t}{6} = 3$

SOLUTION:

$$\frac{t}{6} = 3$$

$$6\left(\frac{t}{6}\right) = 6(3)$$

$$t = 18$$

Check:

$$\frac{t}{6} = 3$$

$$\frac{18}{6} = 3$$

$$3 = 3$$

8. **MULTIPLE CHOICE**

Solve the equation $\frac{3}{5}a = \frac{1}{4}$.

A $\frac{3}{20}$

B 2

C $\frac{5}{12}$

D -3

SOLUTION:

$$\frac{3}{5}a = \frac{1}{4} \quad \text{Original equation}$$

$$\frac{5}{3}\left(\frac{3}{5}a\right) = \frac{5}{3}\left(\frac{1}{4}\right) \quad \text{Multiply each side by } \frac{5}{3}$$

$$a = \frac{5}{12} \quad \text{Simplify.}$$

Choice C is the correct answer.

Mid-Chapter Quiz

Solve each equation. Check your solution.

9. $2x + 5 = 13$

SOLUTION:

$$2x + 5 = 13 \quad \text{Original}$$

$$2x + 5 - 5 = 13 - 5 \quad \text{Subtract 5.}$$

$$2x = 8 \quad \text{Simplify.}$$

$$\frac{2x}{2} = \frac{8}{2} \quad \text{Divide by 2.}$$

$$x = 4 \quad \text{Simplify.}$$

Check:

$$2x + 5 = 13$$

$$2(\overset{?}{4}) + 5 = 13$$

$$8 + \overset{?}{5} = 13$$

$$13 = 13$$

10. $-21 = 7 - 4y$

SOLUTION:

$$-21 = 7 - 4y \quad \text{Original}$$

$$-21 - 7 = 7 - 7 - 4y \quad \text{Subtract 7.}$$

$$-28 = -4y \quad \text{Simplify.}$$

$$\frac{-28}{-4} = \frac{-4y}{-4} \quad \text{Divide by } -4.$$

$$7 = y \quad \text{Simplify.}$$

Check:

$$-21 = 7 - 4y$$

$$-21 = 7 - 4(\overset{?}{7})$$

$$-21 = \overset{?}{7} - 28$$

$$-21 = -21$$

Mid-Chapter Quiz

11. $\frac{m}{6} - 3 = 8$

SOLUTION:

$$\frac{m}{6} - 3 = 8 \quad \text{Original equation}$$

$$\frac{m}{6} - 3 + 3 = 8 + 3 \quad \text{Add 3 to each side.}$$

$$\frac{m}{6} = 11 \quad \text{Simplify.}$$

$$6\left(\frac{m}{6}\right) = 6(11) \quad \text{Multiply each side by 6.}$$

$$m = 66 \quad \text{Simplify.}$$

Check:

$$\frac{m}{6} - 3 = 8$$

$$\frac{66}{6} - 3 \stackrel{?}{=} 8$$

$$11 - 3 \stackrel{?}{=} 8$$

$$8 = 8$$

12. $-4 = \frac{d+3}{5}$

SOLUTION:

$$-4 = \frac{d+3}{5} \quad \text{Original}$$

$$-4(5) = \left(\frac{d+3}{5}\right)(5) \quad \text{Multiply by 5.}$$

$$-20 = d + 3 \quad \text{Simplify.}$$

$$-20 - 3 = d + 3 - 3 \quad \text{Subtract 3.}$$

$$-23 = d \quad \text{Simplify.}$$

Check:

$$-4 = \frac{d+3}{5}$$

$$-4 \stackrel{?}{=} \frac{-23+3}{5}$$

$$-4 \stackrel{?}{=} \frac{-20}{5}$$

$$-4 = -4$$

Mid-Chapter Quiz

13. **FISH** The average length of a yellow-banded angelfish is 12 inches. This is 4.8 times as long as an average common goldfish.

- Write an equation you could use to find the length of the average common goldfish.
- What is the length of an average common goldfish?

SOLUTION:

- To write the equation, let g = the length of the average common goldfish.

length of yellow-banded angelfish 12	is	4.8	times as long as	an average common goldfish g
	=	4.8	•	

The equation is $12 = 4.8g$.

b.

$$12 = 4.8g$$

$$\frac{12}{4.8} = \frac{4.8g}{4.8}$$

$$2.5 = g$$

The length of the average common goldfish is 2.5 inches.

Write an equation and solve each problem.

14. Three less than three fourths of a number is negative 9. Find the number.

SOLUTION:

To write the equation, rewrite the sentence and let n represent the unknown number. *Three less than three fourths of a number is negative 9* is the same as *three fourths of a number minus three is negative 9*.

Three fourths	of	a number	minus	three	is	negative 9.
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$$\frac{3}{4} \cdot n - 3 = -9$$

The equation is $\frac{3}{4}n - 3 = -9$.

$$\frac{3}{4}n - 3 = -9$$

$$\frac{3}{4}n - 3 + 3 = -9 + 3 \quad \text{Add 3.}$$

$$\frac{3}{4}n = -6 \quad \text{Simplify.}$$

$$\frac{4}{3} \left(\frac{3}{4}n \right) = \frac{4}{3}(-6) \quad \text{Multiply by } \frac{4}{3}.$$

$$n = -8 \quad \text{Simplify.}$$

The number is -8 .

Mid-Chapter Quiz

15. Thirty is twelve added to six times a number. What is the number?

SOLUTION:

To write the equation, let n represent the unknown number.

Thirty	is	twelve	added to	six	times	a
30	=	12	+	6	•	number.
						n

The equation is $30 = 12 + 6n$.

$$30 = 12 + 6n$$

$$30 - 12 = 12 - 12 + 6n \quad \text{Subtract 12.}$$

$$18 = 6n \quad \text{Simplify.}$$

$$\frac{18}{6} = \frac{6n}{6} \quad \text{Divide by 6.}$$

$$3 = n \quad \text{Simplify.}$$

The number is 3.

16. Find four consecutive integers with a sum of 106.

SOLUTION:

To write the equation, rewrite the sentence and let n = the first of the four unknown numbers. Then the next three consecutive integers are $n + 1$, $n + 2$, and $n + 3$. The sum of these four integers equals 106, so the equation is $n + (n + 1) + (n + 2) + (n + 3) = 106$.

Solve for n .

$$n + (n + 1) + (n + 2) + (n + 3) = 106$$

$$4n + 6 = 106 \quad \text{Simplify.}$$

$$4n = 100 \quad \text{Subtract.}$$

$$\frac{4n}{4} = \frac{100}{4} \quad \text{Divide.}$$

$$n = 25 \quad \text{Simplify.}$$

Substitute 25 for n to find remaining three numbers.

$$n + 1 = 25 + 1 \text{ or } 26$$

$$n + 2 = 25 + 2 \text{ or } 27$$

$$n + 3 = 25 + 3 \text{ or } 28$$

The four consecutive integers are 25, 26, 27, and 28.

Mid-Chapter Quiz

Solve each equation. Check your solution.

17. $8p + 3 = 5p + 9$

SOLUTION:

$$8p + 3 = 5p + 9 \quad \text{Original}$$

$$8p - 5p + 3 = 5p - 5p + 9 \quad \text{Subtract } 5p.$$

$$3p + 3 = 9 \quad \text{Simplify.}$$

$$3p + 3 - 3 = 9 - 3 \quad \text{Subtract 3.}$$

$$3p = 6 \quad \text{Simplify.}$$

$$\frac{3p}{3} = \frac{6}{3} \quad \text{Divide by 3.}$$

$$p = 2 \quad \text{Simplify.}$$

Check:

$$8p + 3 = 5p + 9$$

$$8(2) + 3 \stackrel{?}{=} 5(2) + 9$$

$$16 + 3 \stackrel{?}{=} 10 + 9$$

$$19 = 19$$

18. $\frac{3}{4}w + 6 = 9 - \frac{1}{4}w$

SOLUTION:

$$\frac{3}{4}w + 6 = 9 - \frac{1}{4}w \quad \text{Original}$$

$$\frac{3}{4}w + \frac{1}{4}w + 6 = 9 - \frac{1}{4}w + \frac{1}{4}w \quad \text{Add } \frac{1}{4}w.$$

$$1w + 6 = 9 \quad \text{Simplify.}$$

$$w + 6 - 6 = 9 - 6 \quad \text{Subtract 6.}$$

$$w = 3 \quad \text{Simplify.}$$

Check:

$$\frac{3}{4}w + 6 = 9 - \frac{1}{4}w$$

$$\frac{3}{4}(3) + 6 \stackrel{?}{=} 9 - \frac{1}{4}(3)$$

$$\frac{9}{4} + 6 \stackrel{?}{=} 9 - \frac{3}{4}$$

$$8\frac{1}{4} = 8\frac{1}{4}$$

Mid-Chapter Quiz

19. $\frac{z+6}{3} = \frac{2z}{4}$

SOLUTION:

$$\frac{z+6}{3} = \frac{2z}{4} \quad \text{Original}$$

$$(z+6)(4) = 3(2z) \quad \text{Cross multiply.}$$

$$4z + 24 = 6z \quad \text{Distribute.}$$

$$4z + 24 = 6z \quad \text{Multiply.}$$

$$4z - 4z + 24 = 6z - 4z \quad \text{Subtract } 4z.$$

$$24 = 2z \quad \text{Simplify.}$$

$$\frac{24}{2} = \frac{2z}{2} \quad \text{Divide by 2.}$$

$$12 = z \quad \text{Simplify.}$$

Check:

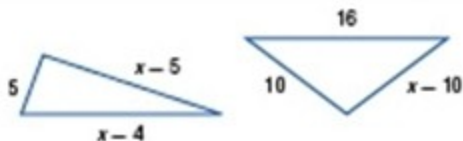
$$\frac{z+6}{3} = \frac{2z}{4}$$

$$\frac{12+6}{3} = \frac{2(12)}{4}$$

$$\frac{18}{3} = \frac{24}{4}$$

$$6 = 6$$

20. **PERIMETER** Find the value of x so that the triangles have the same perimeter.



SOLUTION:

To write the equation, write an expression for each perimeter. Set the expressions equal to each other: $5 + (x-5) + (x-4) = 16 + 10 + (x-10)$.

$$5 + (x-5) + (x-4) = 16 + 10 + (x-10)$$

$$2x - 4 = x + 16$$

$$2x - x - 4 = x - x + 16$$

$$x - 4 = 16$$

$$x - 4 + 4 = 16 + 4$$

$$x = 20$$

When $x = 20$, the triangles have the same perimeter.

Mid-Chapter Quiz

21. **PRODUCTION** ABC Sporting Goods Company produces baseball gloves. Their fixed monthly production cost is \$16,000 with a per glove cost of \$15. XYZ Sporting Goods Company also produces baseball gloves. Their fixed monthly production cost is \$20,000 with a per glove cost of \$13. Find the number of gloves produced monthly, so that the total monthly production cost is the same for both companies.

SOLUTION:

To write the equation, write an expression for the production cost for each company.

For ABC Sporting goods, their monthly fixed cost is \$16,000 and per glove (variable) cost of \$5. Total cost for ABC is the total of the fixed and variable costs. Thus for ABC, Total cost = $16000 + 15x$.

For XYZ Sporting goods, their monthly fixed cost is \$10,000 and per glove (variable) cost of \$3. Total cost for XYZ is the total of the fixed and variable costs. Thus for XYZ, Total cost = $20,000 + 13x$.

Set the expressions equal to each other. The equation is $16000 + 15x = 20,000 + 13x$.

$$16000 + 15x = 20,000 + 13x$$

$$16000 + 2x = 20,000 \quad \text{Subtract } 13x.$$

$$2x = 4000 \quad \text{Subtract } 16000.$$

$$\frac{2x}{2} = \frac{4000}{2} \quad \text{Divide.}$$

$$x = 2000 \quad \text{Simplify.}$$

If each company produces 2000 gloves, their total monthly production cost will be the same.

Evaluate each expression if $x = -4$, $y = 7$, and $z = -9$.

22. $|3x - 2| + 2y$

SOLUTION:

$$\begin{aligned} |3x - 2| + 2y &= |3(-4) - 2| + 2(7) \\ &= |-12 - 2| + 14 \\ &= |-14| + 14 \\ &= 14 + 14 \\ &= 28 \end{aligned}$$

23. $|-4y + 2z| - 7z$

SOLUTION:

$$\begin{aligned} |-4y + 2z| - 7z &= |-4(7) + 2(-9)| - 7(-9) \\ &= |-28 + (-18)| - (-63) \\ &= |-46| + 63 \\ &= 46 + 63 \\ &= 109 \end{aligned}$$

Mid-Chapter Quiz

24. MULTIPLE CHOICE

Solve $|6m - 3| = 9$.

F $\{2\}$

G $\{-1, 2\}$

H $\{-3, 6\}$

J $\{-3, 3\}$

SOLUTION:

Case 1:

$$6m - 3 = 9$$

$$6m - 3 + 3 = 9 + 3 \quad \text{Add 3 to each side.}$$

$$6m = 12 \quad \text{Simplify.}$$

$$\frac{6m}{6} = \frac{12}{6} \quad \text{Divide each side by 6.}$$

$$m = 2 \quad \text{Simplify.}$$

Case 2:

$$6m - 3 = -9$$

$$6m - 3 + 3 = -9 + 3 \quad \text{Add 3 to each side.}$$

$$6m = -6 \quad \text{Simplify.}$$

$$\frac{6m}{6} = \frac{-6}{6} \quad \text{Divide each side by 6.}$$

$$m = -1 \quad \text{Simplify.}$$

The solution set is $\{-1, 2\}$. Choice G is correct.

Mid-Chapter Quiz

25. **COFFEE** Some say to brew an excellent cup of coffee, you must have a brewing temperature of 200°F , plus or minus 5 degrees. Write and solve an equation describing the maximum and minimum brewing temperatures for an excellent cup of coffee.

SOLUTION:

To write the equation, let t = the temperature of an excellent cup of coffee.

Case 1: $t - 200 = 5$

Case 2: $t - 200 = -5$

The equation is $|t - 200| = 5$.

Case 1:

$$t - 200 = 5$$

$$t - 200 + 200 = 5 + 200 \quad \text{Add 200.}$$

$$t = 205 \quad \text{Simplify.}$$

Case 2:

$$t - 200 = -5$$

$$t - 200 + 200 = -5 + 200 \quad \text{Add 200.}$$

$$t = 195 \quad \text{Simplify.}$$

The maximum brewing temperature is 205°F and the minimum brewing temperature is 195°F .