

2.5 Problem Solving

Name _____

Substitute the given values into each formula and solve for the variable indicated.

1. $P = 2L + 2W$

(a) $L = 2.5$, $W = 1.15$, find P .

$$P = 2L + 2W$$

$$P = 2 \cdot 2.5 + 2 \cdot 2.5$$

$$P = 5 + 2.30$$

$$P = 7.3$$

(b) $P = 51$, $L = 15.5$, solve for W .

$$P = 2L + 2W$$

$$51 = 2 \cdot 15.5 + 2W$$

$$51 = 31 + 2W$$

$$\begin{array}{r} -31 \\ -31 \end{array}$$

$$20 = 2W$$

$$10 = W$$

(c) $W = 50$, $P = 265$, solve for L .

$$P = 2L + 2W$$

$$265 = 2L + 2 \cdot 50$$

$$265 = 2L + 100$$

$$\begin{array}{r} -100 \\ -100 \end{array}$$

$$165 = 2L$$

$$82.5 = L$$

2. $F = \frac{9}{5}C + 32$

(a) $C = 55$, find F .

(b) $F = 32$, solve for C .

(c) $F = 104$, solve for C .

Translate each sentence into an equation and solve for the unknown number.

3. The **product** of a **number** and three is the same as the **sum** of the **number** and seven. Find the number.

$$n \cdot 3 = n + 7$$

$$3n = n + 7$$

$$\begin{array}{r} -n \\ -n \end{array}$$

$$2n = 7$$

$$\frac{2n}{2} = \frac{7}{2}$$

$$n = \frac{7}{2}$$

The
number
is $\frac{7}{2}$.

4. Five less than three times a number is four more than the number. Find the number.

Answers: 1. (a) $P = 7.3$, (b) $W = 10$, (c) $L = 82.5$; 3. $\frac{7}{2}$

Solve.

5. If a car salesperson earns a 4% commission, how many dollars worth of sales must she get in a month to earn \$4700 in commissions?

$$4\% \text{ of how much sales} = \$4700?$$

$$0.04 \cdot x = 4700$$

$$\frac{.04x}{.04} = \frac{4700}{.04}$$

$$x = 117,500$$

She must get \$117,500 in sales in order to earn \$4700 in commission.

6. The price of laptop computers is expected to decrease by 5% in the next year. If the cost decreases as predicted, how much will a computer currently priced at \$950 cost in the next year?

7. A 96 inch pipe is cut into two pieces where the second piece is three times as long as the first piece. How long is each piece?

Let x = first piece

Then $3x$ = second piece

$$x + 3x = 96$$

$$4x = 96$$

$$\frac{4x}{4} = \frac{96}{4}$$

$$x = 24$$

$$3x = 3 \cdot 24 = 72$$

The pieces are 24 inches and 72 inches.

8. A 96 inch pipe is cut into two pieces where the second piece is sixteen inches longer than the first piece. How long is each piece?

Answers: 5. \$117,500; 7. 24, 72

Solve.

9. Find the length and width of a rectangular piece of property whose length is 5 foot more than twice its width and has a perimeter of 550 feet.

Length	$2x + 5$
Width	x

$$\begin{aligned} \text{Perimeter} &= 2 \cdot \text{length} + 2 \cdot \text{width} \\ 550 &= 2 \cdot (2x + 5) + 2 \cdot x \\ 550 &= 4x + 10 + 2x \\ 550 &= 4x + 2x + 10 \\ 550 &= 6x + 10 & x &= 90 \\ \underline{-10} & & & 2x + 5 = 2 \cdot 90 + 5 \\ & & & = 180 + 5 \\ & & & = 185 \\ 540 &= 6x \\ \frac{540}{6} &= \frac{6x}{6} & \text{Width} &= 90 \\ & & \text{Length} &= 185 \end{aligned}$$

10. Find the length and width of a rectangular field whose length is 10 feet less than twice its width and has a perimeter of 580 feet.

Length	
Width	

11. A handful of dimes and quarters is worth \$3.30. There are three times as many dimes as quarters. Find the number of each type of coin.

	dimes	quarters	total
No. coins	$3x$	x	
Value of coins	$.10(3x)$	$.25(x)$	3.30

$$\begin{aligned} .3x + .25x &= 3.30 \\ .55x &= 3.30 \\ \frac{.55x}{.55} &= \frac{3.30}{.55} \\ x &= 6 \\ 3x &= 3 \cdot 6 = 18 \end{aligned}$$

There are 18 dimes and 6 quarters.

12. A handful of dimes and quarters is worth \$3.55. There are four more dimes than quarters. Find the number of each type of coin.

	dimes	quarters	total
No. coins			
Value of coins			

Answers: 9. 90 width, 185 length; 11. 18 dimes, 6 quarters

Solve.

13. A person invested \$1500 more in a 5% bond than she invested in a 4% bond. The combined yearly interest from both bonds was \$282. Find the amount invested in each bond.

	5%	4%	total
Amount invested	$x + 1500$	x	
Interest earned	$.05(x + 1500)$	$.04(x)$	282

$$.05(x + 1500) + .04(x) = 282$$

$$.05x + 75 + .04x = 282$$

$$.05x + .04x + 75 = 282$$

$$.09x + 75 = 282$$

$$\underline{-.75} \quad \underline{-.75}$$

$$.09x = 207$$

$$\frac{.09x}{.09} = \frac{207}{.09}$$

$$x = 2300$$

$$x + 1500 = 2300 + 1500$$

$$= 3800$$

\$2300 was inv. at 4%
\$3800 was inv. at 5%

14. Part of \$150,000 was invested at 4% and the rest at 3%. The combined yearly interest from both was \$4974. How much was invested at each rate?

	4%	3%	total
Amount invested			
Interest earned			

15. A jeweller wants to produce 350 grams of an alloy which is 50% gold. She will do this by melting together an alloy which is 80% gold with an alloy which is 30% gold. Find the amount of each alloy she should use. Round to the nearest gram.

	80%	30%	50%
Amount of alloy	x	$350 - x$	350
Amount of gold	$.80x$	$.30(350 - x)$	$.50(350)$

$$.8x + .3(350 - x) = .5(350)$$

$$.8x + 105 - .3x = 175$$

$$.8x - .3x + 105 = 175$$

$$.5x + 105 = 175$$

$$\underline{-.105} \quad \underline{-.105}$$

$$.5x = 70$$

$$\frac{.5x}{.5} = \frac{70}{.5}$$

$$x = 140$$

$$350 - x = 350 - 140$$

$$= 210$$

140 grams of 80%
210 grams of 30%

16. A chemist want to make 500 mL of a 32% alcohol solution by mixing a 25% alcohol solution with a 50% alcohol solution. How much of each should be used to produce the desired solution?

	25%	50%	32%
Amount of solution			
Amount of alcohol			

Answers: **13.** \$3800 at 5%, \$2300 at 4%; **15.** 140 grams of 80% gold and 210 grams of 25% gold

Solve.

17. Ron can run twice as fast as Walker can walk. They start in the same place and at the same time, but go in opposite directions. At the end of 2 hours, they are 21 miles apart. How fast can Walker walk and Ron run?

	rate	time	distance
Ron	$2x$	2	$2x \cdot 2$
Walker	x	2	$x \cdot 2$

$$\begin{aligned}
 4x + 2x &= 21 \\
 6x &= 21 \\
 \frac{6x}{6} &= \frac{21}{6} \\
 x &= 3.5 \\
 2x &= 2 \cdot 3.5 \\
 &= 7
 \end{aligned}$$

Ron can run 7mph.
Walker can walk 3.5 mph.

18. Jacob can walk at a sustained rate of 3 miles per hour, while Joseph can maintain a 3.5 mile per hour rate. One hour after Jacob leaves camp, Joseph starts out to catch him. How long will it take Joseph to catch up to Jacob?

	rate	time	distance
Jacob			
Joseph			

19. Angela is 3 years older than Susan. In 7 years the sum of their ages will be 37. How old is each girl now?

	Angela	Susan
Now	$x + 3$	x
In 7 years	$x + 3 + 7$	$x + 7$

$$\begin{aligned}
 x + 3 + 7 + x + 7 &= 37 \\
 x + x + 3 + 7 + 7 &= 37 \\
 2x + 17 &= 37 \\
 \underline{-17} \quad \underline{-17} & \\
 2x &= 20 \\
 \frac{2x}{2} &= \frac{20}{2} \\
 x &= 10 \\
 x + 3 &= 10 + 3 = 13
 \end{aligned}$$

Angela is 13.
Susan is 10.

20. Jamal is twice as old as his brother Damon. Six years ago, Jamal was four times as old as his brother. Find the present age of each brother.

	Jamal	Damon
Now		
6 years ago		

Answers: 17. Walker: 3.5 mph, Ron: 7 mph; 19. Susan is 10, Angela is 13

21. Solve for y .

$$\begin{aligned}2x - 3y &= 9 \\2x - 3y &= 0x + 9 \\ \underline{-2x} \quad \quad \underline{-2x} & \\ -3y &= -2x + 9 \\ \frac{-3y}{-3} &= \frac{-2x + 9}{-3} \\ y &= \frac{-2x}{-3} + \frac{9}{-3} \\ y &= \frac{2}{3}x - 3\end{aligned}$$

22. Solve for y .

$$2x + y = C$$

Answers: **21.** $y = \frac{2}{3}x - 3$