

MTH 60

Section 2.4 Formulas

Example: Solve $I = Prt$ for r .

$$I = Prt$$

$$\frac{I}{Pt} = \frac{Prt}{Pt}$$

$$\frac{I}{Pt} = r$$

$$r = \frac{I}{Pt}$$

Example: Solve $P = C + MC$ for M .

$$P = C + MC$$

$$P - C = C + MC - C$$

$$P - C = MC$$

$$\frac{P - C}{C} = \frac{MC}{C}$$

$$\frac{P - C}{C} = M$$

$$M = \frac{P - C}{C}$$

Example: Solve $P = C + MC$ for C .

$$P = C + MC$$

$$P = C(1 + M)$$

$$\frac{P}{1 + M} = \frac{C(1 + M)}{1 + M}$$

$$\frac{P}{1 + M} = C$$

$$C = \frac{P}{1 + M}$$

use the distributive property
in reverse.

use the distributive property
to check.

Example: Solve $A = \frac{1}{2}(a + b)$ for b .

$$A = \frac{1}{2}(a + b)$$

$$2 \cdot A = 2 \cdot \frac{1}{2}(a + b)$$

$$2A = 1(a + b)$$

$$2A = a + b$$

$$2A - a = a + b - a$$

$$2A - a = b$$

$$b = 2A - a$$

Example: Solve $Ax + By = C$ for y .

$$Ax + By = C$$

$$Ax + By - Ax = C - Ax$$

$$By = C - Ax$$

$$\frac{By}{B} = \frac{C - Ax}{B}$$

$$y = \frac{C - Ax}{B}$$

Example: Solve $y = (a + b)x - 8$ for x .

$$y = (a + b)x - 8$$

$$y + 8 = (a + b)x - 8 + 8$$

$$y + 8 = (a + b)x$$

$$\frac{y + 8}{a + b} = \frac{(a + b)x}{a + b}$$

$$\frac{y + 8}{a + b} = x$$

$$x = \frac{y + 8}{a + b}$$

Section 2.5 An Introduction to Problem Solving

See pages 156 - 157 for a summary of translating English phrases to algebraic expressions.

A Strategy for Solving Word Problems

- Step 1. Read the problem carefully. Attempt to state the problem in your own words and state what is given and what the problem is looking for. Define a variable (let a variable represent one of the unknown quantities in the problem).
- Step 2. If necessary, write expressions for any other unknown quantities in the problem in terms of the variable you defined.
- Step 3. Write an equation in your variable that translates, or models, the conditions of the problem.
- Step 4. Use algebra to solve the problem.
- Step 5. Check the solution *in the original wording* of the problem, not in the equation obtained from the words.
- Step 6. Answer the question in a complete sentence.

Example: Eight subtracted from six times a number is 298. Find the number.

Let t represent the number.

$$6t - 8 = 298$$

$$6t - 8 + 8 = 298 + 8$$

$$6t = 306$$

$$\frac{6t}{6} = \frac{306}{6}$$

$$t = 51$$

scratch:

$$\begin{array}{r} 51 \\ 6 \overline{)306} \\ \underline{-30} \\ 6 \\ \underline{} \\ 0 \end{array}$$

Check!

$$\begin{array}{r} 51 \\ \times 6 \\ \hline 306 \end{array}$$

$$306 - 8 = 298$$

The number is 51.

Example: Three times the sum of five and a number is 48. Find the number.

Let q represent the number.

$$3(5 + q) = 48$$

$$15 + 3q = 48$$

$$15 + 3q - 15 = 48 - 15$$

$$3q = 33$$

$$\frac{3q}{3} = \frac{33}{3}$$

$$q = 11$$

Check:

$$5 + 11 = 16$$

$$3(16) = 48$$

The number is 11.

Example: Five more than four times a number is that number increased by 35. Find the number.

Let D represent the number.

$$4D + 5 = D + 35$$

$$4D + 5 - 5 = D + 35 - 5$$

$$4D = D + 30$$

$$4D - D = D + 30 - D$$

$$3D = 30$$

$$\frac{3D}{3} = \frac{30}{3}$$

$$D = 10$$

Check:

$$4 \cdot 10 + 5 = 40 + 5 \\ = 45$$

$$10 + 35 = 45$$

The number is 10.

Example: If the quotient of three times a number and four is decreased by three, the result is nine. Find the number.

Let H represent the number

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

$$\frac{3H}{4} - 3 + 3 = 9 + 3$$

$$\frac{3H}{4} = 12$$

$$4\left(\frac{3H}{4}\right) = 4(12)$$

$$\frac{12H}{4} = 48$$

$$3H = 48$$

The number is 16.

$$\rightarrow \frac{3H}{3} = \frac{48}{3}$$

$$H = 16$$

check:

$$3 \cdot 16 = 48$$

$$\frac{48}{4} = 12$$

$$12 - 3 = 9 \checkmark$$

Example: After a 20% reduction, you purchase a TV for \$720. What was the TV's price before the reduction?

Let T represent the TV's price (in \$) before the reduction.

20% of the original price = reduction

original price — 20% of the original price = sale price

$$T - 0.20T = 720$$

$$0.80T = 720$$

$$\frac{0.8T}{0.8} = \frac{720}{0.8}$$

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$$T = 900$$

Scratch:

$$\begin{array}{r} 900 \\ 8 \overline{) 7200} \\ \underline{-72} \\ 000 \end{array}$$

check:

$$\begin{array}{r} 900 \\ \times 0.8 \\ \hline 7200 \end{array}$$

The original price of the TV was \$900.

2.3

③

$$4x - 9x + 22 = 3x + 30$$

$$-5x + 22 = 3x + 30$$

$$-5x + 22 - 22 = 3x + 30 - 22$$

$$-5x = 3x + 8$$

$$-5x - 3x = 3x + 8 - 3x$$

$$-8x = 8$$

$$\frac{-8x}{-8} = \frac{8}{-8}$$

$$x = -1$$

Check: $x = -1$

$$4x - 9x + 22 = 3x + 30$$

$$4(-1) - 9(-1) + 22 = 3(-1) + 30$$

$$-4 + 9 + 22 = -3 + 30$$

$$5 + 22 = 27$$

$$27 = 27 \checkmark$$

The solution is -1 .

2.3

$$\textcircled{11} \quad 38 = 30 - 2(x-1)$$

$$38 = 30 - 2x - 2(-1)$$

$$38 = 30 - 2x + 2$$

$$38 = 32 - 2x$$

$$38 - 32 = 32 - 2x - 32$$

$$6 = -2x$$

$$\frac{6}{-2} = \frac{-2x}{-2}$$

$$-3 = x$$

Check: If $x = -3$

$$30 - 2(x-1) = 30 - 2(-3-1)$$

$$= 30 - 2(-4)$$

$$= 30 + 8$$

$$= 38 \checkmark$$

The solution is -3 .

2.3

$$(39) \quad 20 - \frac{z}{3} = \frac{z}{2}$$

$$6\left(20 - \frac{z}{3}\right) = 6\left(\frac{z}{2}\right)$$

$$120 - \frac{6z}{3} = \frac{6z}{2}$$

$$120 - 2z = 3z$$

$$120 - 2z + 2z = 3z + 2z$$

$$120 = 5z$$

$$\frac{120}{5} = \frac{5z}{5}$$

$$24 = z$$

Check: $z = 24$

$$20 - \frac{24}{3} = \frac{24}{2}$$

$$20 - 8 = 12$$

$$12 = 12 \checkmark$$

The solution is 24.

2.3

(4)

$$\frac{y}{3} + \frac{2}{5} = \frac{y}{5} - \frac{2}{5}$$

$$15\left(\frac{y}{3} + \frac{2}{5}\right) = 15\left(\frac{y}{5} - \frac{2}{5}\right)$$

$$\frac{15y}{3} + \frac{30}{5} = \frac{15y}{5} - \frac{30}{5}$$

$$5y + 6 = 3y - 6$$

$$5y + 6 - 3y = 3y - 6 - 3y$$

$$2y + 6 = -6$$

$$2y + 6 - 6 = -6 - 6$$

$$2y = -12$$

$$\frac{2y}{2} = \frac{-12}{2}$$

$$y = -6$$

check: $y = -6$

$$\frac{y}{3} + \frac{2}{5} = \frac{y}{5} - \frac{2}{5}$$

$$\frac{-6}{3} + \frac{2}{5} = \frac{-6}{5} - \frac{2}{5}$$

$$-2 + \frac{2}{5} = \frac{-8}{5}$$

$$\frac{-2}{1} \cdot \frac{5}{5} + \frac{2}{5} = \frac{-8}{5}$$

$$\frac{-10}{5} + \frac{2}{5} = \frac{-8}{5}$$

$$\frac{-8}{5} = \frac{-8}{5} \checkmark$$

The solution is -6 .

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2.3

(13)

$$\frac{x}{2} - \frac{x}{4} + 4 = x + 4$$

$$4\left(\frac{x}{2} - \frac{x}{4} + 4\right) = 4(x + 4)$$

$$\frac{4x}{2} - \frac{4x}{4} + 16 = 4x + 16$$

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

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

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

$$x = 4x$$

$$x - x = 4x - x$$

$$0 = 3x$$

$$\frac{0}{3} = \frac{3x}{3}$$

$$0 = x$$

Check: $x = 0$

$$\frac{x}{2} - \frac{x}{4} + 4 = x + 4$$

$$\frac{0}{2} - \frac{0}{4} + 4 = 0 + 4$$

$$0 - 0 + 4 = 4$$

$$4 = 4$$

The solution is 0.