Solving Literal Equations

A **Literal Equation** is an equation containing more than one variable. We can solve a literal equation for any one variable in terms of the others. For example, if we wish to solve $x - y = b$ for x, we will need to add y to each side of the equation in order to isolate x: $x - y = b$

$$x - y + y = b + y$$
$$x = b + y$$

Example: Solve $AC = V$ for A. Divide both sides of the equation by C in order to isolate A:

$\frac{AC}{C} = \frac{V}{C}$ Cancel the C's on the left side of the equal sign.

$$A = \frac{V}{C}$$

Example: Solve $2x + y = 5$ for y:

$$2x + y = 5$$
$$2x - 2x + y = 5 - 2x$$
$$y = 5 - 2x$$

Example: Solve $2x + 3y = 6$ for y:

$$2x + 3y = 6$$
$$2x - 2x + 3y = 6 - 2x$$
$$3y = 6 - 2x$$
$$\frac{3y}{3} = \frac{6 - 2x}{3}$$
$$y = \frac{6 - 2x}{3}$$

Note: This answer could also be written as

$$y = -\frac{6}{3} - \frac{2x}{3} \text{ or}$$
$$y = 2 - \frac{2x}{3}$$

Example: Solve $4(2x - 3b) = 7x + 5b$ for x:

$$4(2x - 3b) = 7x + 5b$$
$$8x - 12b = 7x + 5b$$

$$8x - 7x - 12b = 7x - 7x +$$
$$5b\ x - 12b = 5b$$
$$x - 12b + 12b = 5b + 12b$$
$$x = 17\ b$$

Example: Solve the following equation for y:

$x\ y\ 1$ _+ = Multiply every term by the LCD, 15.

$\overline{5}$ 3 5 $3\ x + 5y = 3$

$$3\ x - + = - 3x5y\ \ 3\ \ 3x$$
$$5\ y = - 33x$$
$$\frac{5\ y}{5} = \frac{3 - 3x}{5}$$
$$y = \frac{3 - 3x}{5}$$

Example: Solve the following equation for h:

$$V = \pi\ r\ h^2$$
$$V\ \pi\ r\ h^{2}$$
$$= \pi\ r\ {}_2\ \pi\ r$$
$$2$$
$$V\_\_\_\_$$
$$= h\ {}_2$$
$$\pi\ r$$

Exercises: Solve the following equations for the indicated variable.

1. $A = LW$ for L

2. $I = prt$ for r

10. $4\ x + 3a = 3x - 2a$ for x 3. $P = 2\ L + 2W$ for W

11. $3(\ x + 2y) = 4$ for x

4. $x + y = 5$ for x

5. $3\ x + y = 7$ for y

13. $\frac{a}{3} + = \frac{y}{3}\ p$ for y

14. $\frac{1}{2}(\ p - = q)\ m$ for

7. $A = \frac{a + b}{2}$ for a

8. $A = \pi\ r^{2}$ for π

______**Answers:**

1. $L = \frac{A}{W}$ 2. $r = \frac{I}{pt}$ 3. $W = $ P

$2\ a = 2\ A - b$ 8. $\pi = \frac{}{r}$

6. $y = \frac{c - ax}{b}$ 7.

11. $x = \frac{4 - 6y}{3}$ 12. $y = \frac{-5 - 6x}{18}$ 13. $y = 3$

6. $ax + by = c$ for y

9. $V = \frac{1}{3}\pi r h^2$ for h

12. $6(x + 3y) = -5$ for y

15. $\frac{3}{4}(2x + y) = \frac{1}{2}$ for y

14. $q = p - 2m$

15. $y = 7 - 3x$

$x = -5a$

4. $x = 5 - y$

5. $y = \frac{2 - 6x}{3}$

9. 10. $h = \frac{3V}{\pi r^2}$