

**Objective:** Sole equations using properties of equality.

**Example 1:** The circumference of a circle can be found by multiplying 2 pi and the circle's radius.  $C = 2\pi r$   
Solve the equation for the variable  $r$ .

$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{C}{2\pi} = r \quad \text{Division Property of Equality}$$

**Example 2:**  $4x - 3y = 12$  is the equation of a line given in standard form. Solve for  $y$  to express the equation in slope-intercept form.

$$\begin{aligned} 4x - 3y &= 12 \\ -4x \quad -4x \\ \hline -3y &= -4x + 12 \\ \frac{-3y}{-3} &= \frac{-4x}{-3} + \frac{12}{-3} \\ y &= \frac{4}{3}x - 4 \end{aligned}$$

Subtraction Property of Equality

Division Property of Equality

**Practice:**

1)  $z = a + b + c$ , solve for  $b$

$$b = z - a - c$$

2)  $p = 2b + 2h$ , solve for  $h$

$$p - 2b = 2h$$

$$h = \frac{p - 2b}{2}$$

3)  $\frac{b - 2c}{2x} = \frac{2ax}{2x}$ , solve for  $a$

$$a = \frac{b - 2c}{2x}$$

4)  $7x + 2y = 8$ , solve for  $y$

$$2y = -7x + 8$$

$$y = -\frac{7}{2}x + 4$$

5) The surface area of a cone is  $S = \pi r l + \pi r^2$   
Where  $S$  is the surface area,  $l$  is the slant height of the cone, and  $r$  is the radius of the base. Solve the formula for  $l$ .

$$\begin{aligned} \frac{S - \pi r^2}{\pi r} &= \frac{\pi r l}{\pi r} \\ l &= \frac{S - \pi r^2}{\pi r} \end{aligned}$$

6)  $5x + 8y = -24$ , solve for  $y$

$$8y = -5x - 24$$

$$y = -\frac{5}{8}x - 3$$

7)  $v = r + at$ , solve for  $t$

$$at = v - r$$

$$t = \frac{v - r}{a}$$

8)  $2x + 3y = 6$ , solve for  $y$

$$3y = -2x + 6$$

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

9)  $p(t + 1) = x$ , solve for  $t$

$$t + 1 = \frac{x}{p}$$

$$t = \frac{x}{p} - 1$$

10)  $a = p + prt$ , solve for  $r$

$$a - p = prt$$

$$\frac{a - p}{pt} = r$$

11) The volume of a cone is  $V = \frac{1}{3}\pi r^2 h$   
Solve for  $h$ .

$$3V = \pi r^2 h$$

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

12) The First Transcontinental Railroad was built by the Central Pacific heading East out of Sacramento, CA and the Union Pacific heading West from Omaha, NE. The two lines met in Promontory, UT in 1869, about 6 years after construction began. Together the two companies laid a total of 1775 miles of track.

a. Using the variables  $C$  and  $U$ , write an equation representing each railroad and the total miles of track.

$$C + U = 1775$$

b. Solve your equation for  $U$ .

$$U = 1775 - C$$

c. If the Central Pacific laid an average of 9.6 miles of track per month, what was the average number of miles of track laid per month by its rival, the Union Pacific?

$$U = 1775 - 9.6(12)(6)$$

$$U = 1083.8$$

$$\text{Avg.} = \frac{1083.8}{72} \approx 15.1 \frac{\text{miles}}{\text{month}}$$

d. About how many miles of track did each company lay?

$$U = 1083.8 \text{ miles}$$

$$C = 691.2 \text{ miles}$$

e. Why do you think the Union Pacific was able to lay track so much more quickly than the Central Pacific?

CP had to cross Sierra Nevada Mountains  
UP was crossing the Prairie.