

1 Literal Equations 2.5

By the end of this section, you should be able to solve the following problems.

1. Solve for the indicated variable.

$$5y - 3x = -2 \text{ for } x$$

2. Solve for the given variable.

$$F = \frac{9}{5}C + 32 ; \text{ for } C$$

3. Solve for the indicated variable.

$$A = \frac{h}{2}(b_1 + b_2) ; \text{ for } b_1$$

2 Concepts

In previous sections, you studied how to solve an equation for a particular number. In this section we use the exact same reasoning to solve for a particular letter. Below is an example.

2.1 Example

Solve the following equation for x_1 .

$$y - y_1 = m(x - x_1)$$

$$y - y_1 = mx - mx_1$$

$$-mx \quad -mx$$

$$\overline{y - y_1 - mx} = \overline{-mx_1}$$

$$\frac{y - y_1 - mx}{-m} = \frac{-mx_1}{-m}$$

$$\frac{y - y_1 - mx}{-m} = x_1$$

We don't like negative signs in our denominators, so change the denominator to a positive and change all the signs in the numerator to get.

$$\frac{y_1 + mx - y}{m} = x_1$$

In our next example we also solve for a single letter.

2.2 Example

Solve the following equation for x .

$$Tx + by = r$$

$$\begin{aligned}
 & -by \quad -by \\
 & \overline{Tx = -by + r} \\
 & \frac{Tx}{T} = \frac{-by + r}{T} \\
 & x = \frac{-by + r}{T}
 \end{aligned}$$

Our next example is the familiar perimeter equation.

2.3 Example

Solve for l in the following equation.

$$\begin{aligned}
 P &= 2l + 2w \\
 & -2w \quad -2w \\
 & \overline{P - 2w = 2l} \\
 \frac{P - 2w}{2} &= \frac{2l}{2} \\
 \frac{P - 2w}{2} &= l
 \end{aligned}$$

When dividing both sides by a letter or number, make sure to divide the *entire* expression on both sides by that letter or number. For example, when solving for R in the expression below we divide the entire

expression on both sides by h

$$Rh = a + b - de$$

$$\frac{Rh}{h} = \frac{a + b - de}{h}$$

$$R = \frac{a + b - de}{h}$$

3 Exercises

1. Solve for the indicated variable.

$$5y - 3x = -2 ; \text{ for } x$$

2. Solve for C.

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

3. Solve for the indicated variable.

$$A = \frac{h}{2}(b_1 + b_2) ; \text{ for } b_1$$

4 Solutions

1. Solve for the indicated variable.

$$5y - 3x = -2 ; \text{ for } x$$

$$\begin{aligned} & -5y \quad -5y \\ \hline -3x &= -2 - 5y \\ \frac{-3x}{-3} &= \frac{-2 - 5y}{-3} \\ x &= \frac{-2 - 5y}{-3} \\ x &= \frac{5y + 2}{3} \end{aligned}$$

2. Solve for C.

$$\begin{aligned} F &= \frac{9}{5}C + 32 \\ -32 & \quad -32 \\ \hline \frac{5}{9}(F - 32) &= \frac{5}{9}\left(\frac{9}{5}\right)C \\ \frac{5}{9}(F - 32) &= C \end{aligned}$$

3. Solve for the indicated variable.

$$A = \frac{h}{2}(b_1 + b_2) ; \text{ for } b_1$$

$$(2)A = (2)\frac{h}{2}(b_1 + b_2)$$

$$\frac{2A}{h} = \frac{h(b_1 + b_2)}{h}$$

$$\frac{2A}{h} = b_1 + b_2$$

$$-b_2 \quad -b_2$$

$$\frac{2A}{h} - b_2 = b_1$$