

LESSON 1.1	<b>LEARNING GOALS:</b>
<h2 style="margin: 0;">Solving &amp; Rewriting Equations</h2>	<ol style="list-style-type: none"> <li>1) Solve linear equations.</li> <li>2) Rewrite literal equations.</li> <li>3) Write equations to solve real-life problems.</li> </ol> <p style="font-size: small; text-align: right; margin-top: 10px;">Common Core State Standards HSA-REI.A.1, HSA-REI.B.3, HSA-CED.A.1</p>

**CHAPTER 1.1: Solving & Rewriting Equations**

- An **EQUATION** is a statement in which two expressions are equal.
- Two equations are **EQUIVALENT** if they have the same solutions.

**EXAMPLE:**  $x - 4 = 1$  is equivalent to  $x = 5$

- When the variable is on one side of the equation, your goal is to isolate the variable.
- When there is a variable on both sides of the equation, your goal is to combine the variables on one side, and the constants on the other.

**Solve the equation for  $x$ .**

---


$$4x + 5 = 13$$

$$\quad -5 \quad -5$$

$$4x = 8$$

$$\quad \frac{4}{4} \quad \frac{8}{4}$$

$$x = 2$$

**Solve the equation for  $x$ .**

---


$$-16 = 3x + 5$$

$$\quad -5 \quad -5$$

$$-21 = 3x$$

$$\quad \frac{-21}{3} \quad \frac{3x}{3}$$

$$-7 = x$$

$$x = -7$$

**Solve the equation for  $x$ .**

---


$$3x + 2 = 5x + 10$$

$$\quad -5x \quad -5x$$

$$-2x + 2 = 10$$

$$\quad -2 \quad -2$$

$$-2x = 8$$

$$\quad \frac{-2x}{-2} \quad \frac{8}{-2}$$

$$x = -4$$

**Solve the equation for  $x$ .**

---


$$2x - 7 = 9x$$

$$\quad -2x \quad -2x$$

$$-7 = 7x$$

$$\quad \frac{-7}{7} \quad \frac{7x}{7}$$

$$x = -1$$

## NOTES 1.1 - Solving and Rewriting Equations

Solve the equation for  $x$ .

$$\begin{aligned} -6x + 20 &= 3x - 7 \\ -3x \quad -20 \quad -3x \quad -20 \\ \hline -9x &= -27 \\ \frac{-9x}{-9} &= \frac{-27}{-9} \\ x &= 3 \end{aligned}$$

Solve the equation for  $x$ .

$$\begin{aligned} 2(x + 6) &= 5x - 9 \\ 2x + 12 &= 5x - 9 \\ -3x &= -21 \\ x &= 7 \end{aligned}$$

Solve the equation for  $x$ .

$$\begin{aligned} 4(3x - 5) &= -2(-x + 8) - 6x \\ 12x - 20 &= 2x - 16 - 6x \\ 12x - 20 &= -4x - 16 \\ 16x &= 4 \\ x &= \frac{1}{4} \end{aligned}$$

Solve the equation for  $x$ .

$$\begin{aligned} 0.25x + 3 &= -1.75x - 5 \\ 2x &= -8 \\ x &= -4 \end{aligned}$$

Solve the equation for  $x$ .

$$\begin{aligned} 0.1(5x + 4) &= 3.4 + 0.6x \\ 0.5x + 0.4 &= 3.4 + 0.6x \\ -0.1x &= 3 \\ x &= -30 \end{aligned}$$

Solve the equation for  $x$ .

$$\begin{aligned} \frac{1}{3}x + \frac{1}{4} &= x - \frac{1}{6} \\ \frac{4}{12}x + \frac{3}{12} &= \frac{12}{12}x - \frac{2}{12} \\ -\frac{12}{8} \left( -\frac{8}{12}x \right) &= \left( -\frac{5}{12} \right) \cdot \frac{12}{8} \\ x &= \frac{5}{8} \end{aligned}$$

## NOTES 1.1 - Solving and Rewriting Equations

### Solve the equation for $x$ .

$$\frac{1}{2} \left( \frac{2}{3}x - \frac{1}{6} \right) = \frac{4}{3} + \frac{1}{6}x$$
$$\frac{2}{6}x - \frac{1}{12} = \frac{4}{3} + \frac{1}{6}x$$
$$\frac{2}{6}x - \frac{1}{12} = \frac{16}{12} + \frac{1}{6}x$$
$$4\left(\frac{1}{6}x\right) = \left(\frac{17}{12}\right)6$$
$$x = \frac{17}{2}$$

### Write an equation to solve the word problem.

The bill for the repair of your car was \$390. The cost for parts was \$215. The cost for labor was \$35 per hour. How many hours did the repair work take?

$$390 = 215 + 35h$$
$$175 = 35h$$
$$h = 5$$

The repair work took 5 hours

### Write an equation to solve the word problem.

Daniel sells magazine subscriptions and earns \$4 for every new subscriber he signs up. Daniel also earns a \$38 weekly bonus regardless of how many magazine subscriptions he sells. If Daniel wants to earn at least \$90 this week, what is the minimum number of subscriptions he needs to sell?

$$4x + 38 = 90$$
$$4x = 52$$
$$x = 13$$

Daniel needs to sell 13 subscriptions.

### Write an equation to solve the word problem.

Hablamos Cell Phone Company advertises service for 3 cents per minute, plus a monthly fee of \$29.95. If Rachel's phone bill for July was \$38.95, how many minutes did she use?

$$0.03m + 29.95 = 38.95$$
$$0.03m = 9$$
$$m = 300$$

Rachel used 300 minutes.

### Write an equation to solve the word problem.

Paul and Michelle belong to different local gyms. Michelle pays \$35 per month and a one-time registration fee of \$15. Paul pays only \$25 per month, but he had to pay a \$75 registration fee. After how many months will Michelle and Paul have spent the same amount on their gym memberships?

$$35m + 15 = 25m + 75$$
$$10m = 60$$
$$m = 6$$

After 6 months.

• So far, each equation we have solved has had only one variable,  $x$ . However, some equations will have more than one variable.

• Equations that contain two or more variables are called **LITERAL EQUATIONS**

**EXAMPLES:**  $6x + 2y = -18$

$$3 - 4a = 5b - c$$

$$A = \frac{1}{2}bh$$

• Sometimes, we must solve these equations for one of its variables.

## NOTES 1.1 - Solving and Rewriting Equations

Solve the equation for  $y$ .

$$\begin{aligned}4x + 2y &= 14 \\ -4x \quad -4x \\ \hline 2y &= \frac{-4x + 14}{2} \\ y &= -2x + 7\end{aligned}$$

Solve the equation for  $y$ .

$$\begin{aligned}-3x + 6y &= -12 \\ +3x \quad +3x \\ \hline 6y &= \frac{3x + 12}{6} \\ y &= \frac{1}{2}x + 2\end{aligned}$$

Solve the equation for  $y$ .

$$\begin{aligned}4x - 3y &= 15 \\ -3y &= -4x + 15 \\ y &= \frac{4}{3}x - 5\end{aligned}$$

Solve the equation for  $y$ .

$$\begin{aligned}-x + 6y &= -3 \\ 6y &= x - 3 \\ y &= \frac{1}{6}x - \frac{1}{2}\end{aligned}$$

Solve the equation for  $y$ .

$$\begin{aligned}7x - 4y &= 13 \\ -4y &= -7x + 13 \\ y &= \frac{7}{4}x - \frac{13}{4}\end{aligned}$$

Solve the equation for  $a$ .

$$\begin{aligned}a - b &= c \\ +b \quad +b \\ \hline a &= b + c\end{aligned}$$

## NOTES 1.1 - Solving and Rewriting Equations

Solve the equation for  $k$ .

$$7k - 3k = 8j$$

$$\frac{4k}{4} = \frac{8j}{4}$$

$$k = 2j$$

Solve the equation for  $h$ .

$$7g = 5 + 8h$$

$$\frac{7g - 5}{8} = \frac{8h}{8}$$

$$h = \frac{7g - 5}{8}$$

Solve the equation for  $q$ .

$$p = 3 - 4q + 11q$$

$$p = 3 + 7q$$

$$p - 3 = 7q$$

$$q = \frac{p - 3}{7}$$

Solve the equation for  $z$ .

$$9x = 4z + zy - 2$$

$$9x + 2 = 4z + zy$$

$$\frac{9x + 2}{4 + y} = \frac{z(4 + y)}{4 + y}$$

$$z = \frac{9x + 2}{4 + y}$$

Solve the equation for  $a$ .

$$6ab - 7ac + 8 = 3d$$

$$6ab - 7ac = 3d - 8$$

$$a(6b - 7c) = 3d - 8$$

$$a = \frac{3d - 8}{6b - 7c}$$

**HOMework:**

1.1 Worksheet - Solving and Rewriting Equations