Solving Equations

Fill in the guided notes as you watch the video in the Digital Toolbox.

- To solve an equation, **isolate** x (or other variable) on **one side** of the equal sign.
- Whatever you do to one side of an equation, you **must** do on the other side to maintain **equality**.
  - You will do the **opposite** (inverse) operation to isolate the variable. For example:
    - If 2 is subtracted from x, you will **add** 2 to both sides.
    - If 3 is multiplied by x, you will **divide** by 3 (or multiply by $\frac{1}{3}$) on both sides.
    - With a fraction, if $\frac{4}{5}$ is multiplied by x, you will divide by $\frac{4}{5}$ which is the same as multiplying by the reciprocal $\frac{5}{4}$.
- Remember to combine any **like terms** before solving.
  - Your final answer should have all fractions written in **simplest** form.
  - To check that your answer is correct, **substitute** the value of the variable back into the original equation.

In Algebra 1, you will learn how to clear fractions or decimals from an equation before solving.

Example 1

Complete the example as you watch the video in the Digital Toolbox.

Solve.

$$\frac{2}{7}x + 6 = 2$$

Plan

$\cdot \frac{2}{7}$ ↑ $\cdot \frac{7}{2}$

$+6$ ↑ -6

Implement

$$\frac{2}{7}x + 6 = 2$$

$$-6 \quad -6$$

$$\left(\frac{7}{2}\right)\frac{2}{7}x = {}^{-2}\cancel{4}\left(\frac{7}{\cancel{2}_{1}}\right)$$

$$x = -14$$

Explain

Subtract 6 from both sides

Multiply by the reciprocal on both sides

Simplify the fraction

Check

$$\frac{2}{7}(-14) + 6 = 2$$

$$-4 + 6 = 2$$

$$2 = 2 \checkmark$$

Example 2

Complete the example as you watch the video in the Digital Toolbox.

Solve.

$$\frac{8}{5}(x+3) = -\frac{1}{2}$$

Plan

Distribute $\frac{8}{5}$

$\cdot\frac{8}{5}$ $\cdot\frac{5}{8}$

$+\frac{24}{5}$ $-\frac{24}{5}$

Implement

$$\frac{8}{5}x + \frac{24}{5} = -\frac{1}{2}$$

$$-\frac{24}{5} \quad -\frac{24}{5}$$

$$\frac{8}{5}x = -\frac{5}{10} - \frac{48}{10}$$

$$\left(\frac{5}{8}\right)\frac{8}{5}x = -\frac{53}{\cancel{10}_{2}}\left(\frac{\cancel{5}^{1}}{8}\right)$$

$$x = -\frac{53}{16}$$

Explain

Distribute

Subtract

$\text{LCD}(2,5) = 10$

Multiply by the reciprocal

Check

$$\frac{8}{5}\left(\left(-\frac{53}{16}\right)+3\right) = -\frac{1}{2}$$

$$\frac{8}{5}\left(\left(-\frac{53}{16}\right)+\frac{48}{16}\right) = -\frac{1}{2}$$

$$\frac{8}{5}\left(-\frac{5}{16}\right) = -\frac{1}{2}\ \checkmark$$

You can review how to make a problem-solving plan in the “Problem Solving” skills lesson in Bridge Materials.

Practice

Complete the problems. Show your work.

1) $-\frac{7}{3}x+\frac{21}{4}=\frac{3}{4}$

$$-\frac{21}{4}\quad -\frac{21}{4}$$

$$-\frac{7}{3}x=-\frac{18}{4}$$

$$\left(\frac{-3}{7}\right)-\frac{7}{3}x=-\frac{9}{2}\left(\frac{-3}{7}\right)$$

$$x=\frac{27}{14}$$

2) $-4=4x+9$

$$-9\quad -9$$

$$\left(\frac{1}{4}\right)(-13)=4x\left(\frac{1}{4}\right)$$

$$x=-\frac{13}{4}$$

3) $\frac{4}{5}x-7=5$

$$+7\quad +7$$

$$\left(\frac{5}{4}\right)\frac{4}{5}x=^{3}\cancel{12}\left(\frac{5}{\cancel{4}_{1}}\right)$$

$$x=15$$

4) $-\frac{31}{8}x=\frac{9}{2}$

$$\left(-\frac{8}{31}\right)-\frac{31}{8}x=\frac{9}{\cancel{2}_{1}}\left(-\frac{\cancel{8}^{4}}{31}\right)$$

$$x=-\frac{36}{31}$$

5) $\frac{5}{4}(x+16)=20$

$$\frac{5}{4}x+16\left(\frac{5}{4}\right)=20$$

$$\frac{5}{4}x+20=20$$

$$-20\quad -20$$

$$\left(\frac{4}{5}\right)\frac{5}{4}x=0\left(\frac{4}{5}\right)$$

$$x=0$$

6) $-\frac{1}{2}x+\frac{2}{3}=\frac{4}{3}$

$$-\frac{2}{3}\quad -\frac{2}{3}$$

$$\left(\frac{-2}{1}\right)-\frac{1}{2}x=\frac{2}{3}\left(\frac{-2}{1}\right)$$

$$x=-\frac{4}{3}$$

Complete the problems. Show your work.

7) $-\frac{3}{4}x+\frac{7}{8}=\frac{3}{8}$

$-\frac{7}{8} \quad -\frac{7}{8}$

$\left(-\frac{4}{3}\right)-\frac{3}{4}x=-\frac{4}{8}\left(-\frac{4}{3}\right)$

$x=-\frac{1}{\cancel{2}_1}\left(-\frac{\cancel{4}^2}{3}\right)$

$x=\frac{2}{3}$

8) $-\frac{1}{3}(8x-6)=6$

$-\frac{8}{3}x-6\left(-\frac{1}{3}\right)=6$

$-\frac{8}{3}x+2=6$

$-2 \quad -2$

$\left(-\frac{3}{8}\right)\left(-\frac{8}{3}x\right)=\overset{1}{\cancel{4}}\left(-\frac{3}{\cancel{8}_2}\right)$

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

9) $\frac{x}{8}+3=-2$

$-3 \quad -3$

$(8)\frac{x}{8}=-5(8)$

$x=-40$

10) $\frac{1}{3}(x-2)=4$

$\frac{1}{3}x-\frac{2}{3}=4$

$+\frac{2}{3} \quad +\frac{2}{3}$

$\frac{1}{3}x=4\frac{2}{3}$

$\left(\frac{3}{1}\right)\frac{1}{3}x=\frac{14}{3}\left(\frac{3}{1}\right)$

$x=14$

11) $\frac{9}{4}x-2=7$

$+2 \quad +2$

$\left(\frac{4}{9}\right)\frac{9}{4}x=9\left(\frac{4}{9}\right)$

$x=4$

12) $\frac{x}{5}-12=3$

$+12 \quad +12$

$(5)\frac{x}{5}=15(5)$

$x=75$