

Section 2.3 Solving One-Step Equations

Solving an equation means finding the value that makes the equation true. We write the **solution set** in set brackets. $\{ \}$

Equations with Addition and Subtraction

1. Find the missing value.

a. $x + 3 = 7$

$x = 4$

$$\begin{array}{r} x + 3 = 7 \\ -3 \quad -3 \\ \hline x = 4 \end{array}$$

Take 3 off each side

b. $6 = x + 1$

$x = 5$

$$\begin{array}{r} 6 = x + 1 \\ -1 \quad -1 \\ \hline 5 = x \end{array}$$

or

$x = 5$

Solution set: $\{5\}$

Opposite Operations

2. Solve the following equations, showing your operations. State the solution set and check your answer.

a. $x - 4 = 1$

$$\begin{array}{r} x - 4 = 1 \\ +4 \quad +4 \\ \hline x = 5 \end{array}$$

$\{5\}$

check:
 $5 - 4 = 1$
 $1 = 1 \checkmark$

b. $6 = -4 + x$

$$\begin{array}{r} 6 = -4 + x \\ +4 \quad +4 \\ \hline 10 = x \end{array}$$

$\{10\}$

check:
 $6 = -4 + 10$
 $6 = 6 \checkmark$

horizontally
 $6 = -4 + x$
 $6 + 4 = -4 + 4 + x$
 $10 = x$

c. $z - (-2) = -7$

$$\begin{array}{r} z - (-2) = -7 \\ +2 \quad +2 \\ \hline z = -9 \end{array}$$

$\{-9\}$

check:
 $-9 - (-2) = -7$
 $-9 + 2 = -7$
 $-7 = -7 \checkmark$

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

$$\begin{array}{r} -\frac{1}{2} = x - \frac{3}{4} \\ +\frac{3}{4} \quad +\frac{3}{4} \\ \hline -\frac{1}{2} + \frac{3}{4} = x \\ -\frac{2}{4} + \frac{3}{4} = x \\ \frac{1}{4} = x \end{array}$$

$\{\frac{1}{4}\}$

2d. Check:

$$-\frac{1}{2} \stackrel{?}{=} \frac{1}{4} - \frac{3}{4}$$

$$-\frac{1}{2} \stackrel{?}{=} -\frac{2}{4}$$

$$-\frac{1}{2} = -\frac{1}{2} \checkmark$$

3. Solve the following equations, showing your operations. State the solution set and check your answer.

a. $y + 1 = -10$

$-1 - 1$

$y = -11$

$\{-11\}$

check:

$-11 + 1 = -10$

$-10 = -10 \checkmark$

b. $z - 12 = 5$

$+12 +12$

$z = 17$

$\{17\}$

check:

$17 - 12 = 5$

$5 = 5 \checkmark$

c. $x - 7 = 7$

$x + 7 = 7$

$-7 -7$

$x = 0$

$\{0\}$

check:

$0 - 7 = 7$

$7 = 7$

d. $t - \frac{2}{3} = -\frac{7}{6}$

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

$t = -\frac{7}{6} + \frac{2 \cdot 2}{3 \cdot 2}$

$= -\frac{7}{6} + \frac{4}{6}$

$= -\frac{3}{6}$

$= -\frac{1}{2} \quad \{-\frac{1}{2}\}$

check

$-\frac{1}{2} - \frac{2}{3} = -\frac{7}{6}$

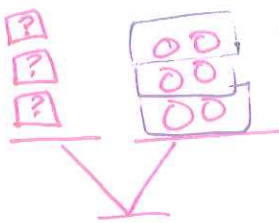
$-\frac{3}{6} - \frac{4}{6} = -\frac{7}{6}$

$-\frac{7}{6} = -\frac{7}{6} \checkmark$

Equations with Multiplication and Division

4. Find the missing value.

a. $3x = 6$



$\frac{3x}{3} = \frac{6}{3}$

$x = 2$

$\{2\}$

check:

$3(2) = 6$

$6 = 6 \checkmark$

b. $\frac{2}{2} = \frac{2t}{2}$

$1 = t$

$\{1\}$

$2 = 2(1)$

$2 = 2$

Opposite Operations

5. Solve the following equations, showing your operations. State the solution set and check your answer.

a. $3p = -6$
 $\frac{3}{3} \frac{p}{3} = \frac{-6}{3}$
 $p = -2$
 $\{-2\}$

b. $-z = 28$
 $\frac{-z}{-1} = \frac{28}{-1}$
 $z = -28$
 $\{-28\}$

check:
 $-z \stackrel{?}{=} 28$
 $-(-28) \stackrel{?}{=} 28$
 $28 = 28 \checkmark$

c. $\frac{3}{4}x = 10$ multiply both sides by the reciprocal
 $\frac{4}{3} \cdot \frac{3}{4}x = \frac{10}{1} \cdot \frac{4}{3}$ check
 $x = \frac{40}{3}$ $\{\frac{40}{3}\}$
 $\frac{3}{4} \cdot \frac{40}{3} \stackrel{?}{=} 10$
 $10 = 10 \checkmark$

d. $\frac{x}{7} = 3 \cdot 7$
 $x = 21$
 $\{21\}$

check:
 $\frac{21}{7} \stackrel{?}{=} 3$
 $3 = 3 \checkmark$

6. Solve the following equations, showing your operations. State the solution set and check your answer.

a. $15 = -3x$
 $\frac{15}{-3} = \frac{-3x}{-3}$
 $-5 = x$
 $\{-5\}$
 $15 \stackrel{?}{=} -3(-5)$
 $15 = 15 \checkmark$

b. $-7z = 8$
 $\frac{-7z}{-7} = \frac{8}{-7}$
 $z = -\frac{8}{7}$
 $\{-\frac{8}{7}\}$

check:
 $-7(-\frac{8}{7}) \stackrel{?}{=} 8$
 $8 = 8 \checkmark$

c. $-\frac{1}{5}x = -20$
 $-\frac{5}{1}(-\frac{1}{5})x = -\frac{20}{1}(-\frac{5}{1})$
 $x = 100$
 $\{100\}$
 $-\frac{1}{5}(100) \stackrel{?}{=} -20$
 $-20 = -20 \checkmark$

d. $\frac{x}{12} = -\frac{3}{4}$
 $x = -9$
 $\{-9\}$

check:
 $\frac{-9}{12} \stackrel{?}{=} -\frac{3}{4}$
 $-\frac{3}{4} = -\frac{3}{4} \checkmark$

7. Write and solve an equation in each scenario given. Include units in your answer.

a. The circumference of a frisbee is 20π cm. Find the radius.

Use the formula to make an equation

$$C = 2\pi r = 20\pi$$

Solve $\frac{2\pi r}{2\pi} = \frac{20\pi}{2\pi}$

check $2\pi(10) = 20\pi$

$$r = 10 \text{ cm}$$

The radius is 10 cm.

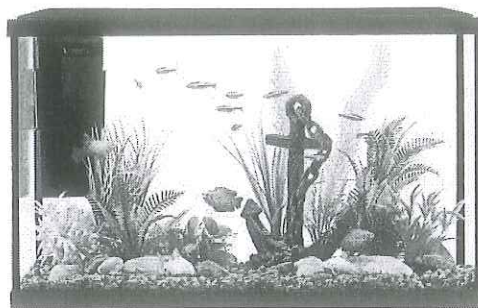


b. A fish tank has a volume of 2598.528 cubic inches. The base is 20.1 inches by 10.1 inches. Find the height of the tank.

$$V = l \cdot w \cdot h = 2598.528$$

$$\begin{aligned} (20.1)(10.1)h &= 2598.528 \\ \frac{203.01h}{203.01} &= \frac{2598.528}{203.01} \\ h &= 12.8 \text{ cm} \end{aligned}$$

The height is 12.8 cm



check: $(20.1)(10.1)(12.8) = 2598.528 \text{ cm}^3$ ✓

Section 2.4 Solving One-Step Inequalities

Do the opposite operations also work with inequalities? Let's do a test:

Add a number to each side

$$\begin{array}{r} 1 < 2 \\ +3 & +3 \\ \hline 4 < 5 \quad \checkmark \end{array}$$

Subtract a number from each side

$$\begin{array}{r} 4 < 6 \\ -3 & -3 \\ \hline 1 < 3 \quad \checkmark \end{array}$$

Multiply each side by a positive number

$$\begin{aligned} 7 \cdot 1 &< 2 \cdot 7 \\ 7 &< 14 \quad \checkmark \end{aligned}$$

Multiply each side by a negative number

$$\begin{aligned} (-3)4 &< 6(-3) \\ -12 &< -18 \quad \text{False} \\ -12 &> -18 \quad \text{True} \end{aligned}$$

Reverse the inequality when you mult or div by a -



Summary for solving inequalities:

Use all the opposite operations that we use for solving equations, except when you multiply or divide by a negative number you reverse the inequality symbol.

8. Solve each inequality and graph each solution on a number line. Write the solution set in interval and set-builder notation.

Solve the Inequality	Number Line Graph	Interval	Set-builder Notation
a. $x+3 > 9$ $\frac{-3 \quad -3}{x > 6}$		$(6, \infty)$	$\{x x > 6\}$
b. $t-6 \leq 8$ $\frac{+6 \quad +6}{t \leq 14}$		$(-\infty, 14]$	$\{t t \leq 14\}$
c. $\frac{7}{2} \cdot 6 > \frac{2}{7}x \cdot \frac{7}{2}$ $21 > x$ $x < 21$ <p>put variable on left side</p>		$(-\infty, 21)$	$\{x x < 21\}$
d. $-3x \geq -21$ $\frac{-8 \quad -3}{x \leq 7}$ <p>reverse the inequality</p>		$(-\infty, 7]$	$\{x x \leq 7\}$

More Practice

9. Solve and check each equation and write the solution set.

a. $-9 + x = -1$
 $+9 \quad +9$
 $-9 + 8 = -1$
 $-1 = -1 \checkmark$
 $x = 8$
 $\{8\}$

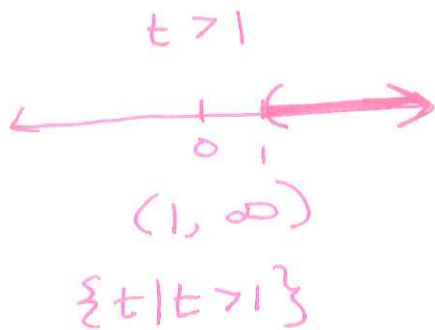
b. $\frac{2}{7}r = -20 \cdot \frac{2}{1}$
 $\frac{1}{2}(-40) = -20$
 $-20 = -20 \checkmark$
 $r = -40$
 $\{-40\}$

c. $-k = \frac{5}{2}$ it's easier to multiply by -1 because of the fraction
 $-1(-k) = \frac{5}{2}(-1)$
 $k = -\frac{5}{2}$
 $\{-\frac{5}{2}\}$
 $-\left(-\frac{5}{2}\right) = \frac{5}{2}$
 $\frac{5}{2} = \frac{5}{2} \checkmark$

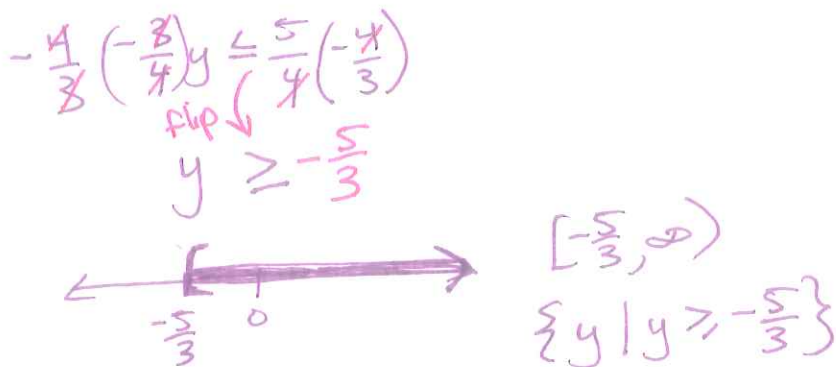
d. $4 = x - 15$
 $+15 \quad +15$
 $19 = x$
 $\{19\}$
 $4 = 19 - 15$
 $4 = 4 \checkmark$

10. Solve each inequality and draw the solution set on a number line. Write the solution set in interval and set-builder notation.

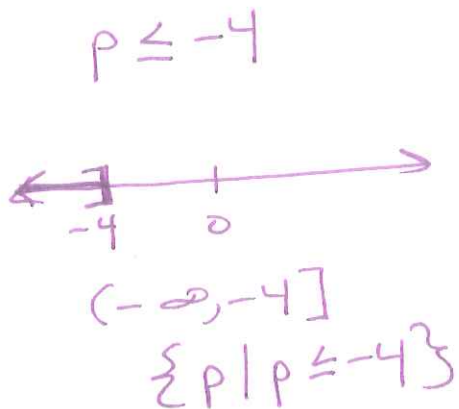
a. $-2 + t > -1$
 $+2 \quad +2$



b. $-\frac{3}{4}y \leq \frac{5}{4}$



c. $5p \leq -20$
 $\frac{1}{5} \quad \frac{1}{5}$



d. $11 > x - 9$

$+9 \quad +9$
 $20 > x$ put x on the left
 $x < 20$

