Solving Equations in the Form ax + b = c

In equations of the form $ax + b = c$ (read as "a times x plus b equals c"), x is a variable which represents an unknown quantity and a, b and c are constants.

EXAMPLES:

$$ax + b = c$$
$$3x + 4 = 10$$
$$-5x - 12 = 18$$
$$\frac{3}{4}m + 2 = \frac{1}{2}$$

Our goal in solving these equations is to simplify the equation to the point where we have a variable equal to a constant.

These equations will require us to use both the Addition Property of Equations and the Multiplication Property of Equations.

EXAMPLE: Solve: $3x + 4 = 10$

$3x + 4 + (-4) = 10 + (-4)$ ← Add the opposite of 4 to both sides.

$3x = 6$

$\frac{1}{3} \times 3x = 6 \times \frac{1}{3}$ ← Multiply both sides by the reciprocal of 3.

$1x = \frac{6}{3}$

$x = 2$

CHECK:

$3x + 4 = 10$

$3(2) + 4 = 10$

$6 + 4 = 10$

$10 = 10$ TRUE

EXAMPLE: Solve: $-5y - 12 = 18$

$-5y - 12 + 12 = 18 + 12$ ←Add the opposite of −12 to both sides.

$-5y = 30$

$\frac{1}{5} \times (-5y) = 30 \times -\frac{1}{5}$ ←Multiply by the reciprocal of −5.

$1y = -\frac{30}{5}$

$y = -6$

CHECK:

$-5y - 12 = 18$

$-5(-6) - 12 = 18$

$30 - 12 = 18$

$18 = 18$ TRUE

EXAMPLE: Solve: $\frac{3}{4}m + 2 = \frac{1}{2}$

$\frac{3}{4}m + 2 + (-2) = \frac{1}{2} + (-2)$ ← Add the opposite of 2 to both sides.

$\frac{3}{4}m = -\frac{3}{2}$

$\frac{4}{3} \times \frac{3}{4}m = -\frac{3}{2} \times \frac{4}{3}$ ← Multiply by the reciprocal of $\frac{3}{4}$

$1m = -\frac{12}{6}$

$m = -2$

CHECK: $\frac{3}{4}m + 2 = \frac{1}{2}$

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

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

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

$\frac{1}{2} = \frac{1}{2}$ TRUE

EXERCISES: Solve and check.

1. $5m - 6 = 9$
2. $4 - 3x = -2$
3. $-3y - 21 = 0$
4. $8z + 13 = 3$
5. $2n - \frac{3}{4} = \frac{13}{4}$
6. $\frac{x}{4} - 6 = 1$
7. $-8y - 3 = -19$
8. $\frac{2}{3}x - 1 = 5$
9. $4 = 2 - 3a$
10. $\frac{2}{5}y + 4 = 6$

KEY:

1. $m = 3$
2. $x = 2$
3. $y = -7$
4. $z = -\frac{5}{4}$
5. $n = 2$
6. $x = 28$
7. $y = 2$
8. $x = 9$
9. $a = -\frac{2}{3}$
10. $y = 5$