1.

$$3(x-6) = 8 - x$$
$$3x - 18 = 8 - x$$
$$3x + x - 18 = 8 - x + x$$
$$4x - 18 + 18 = 8 + 18$$
$$4x = 26$$
$$\left(\frac{1}{4}\right)(4x) = \left(\frac{1}{4}\right)(26)$$
$$x = \frac{26}{4} = \frac{13}{2}$$

one solution

2.

$$\frac{1}{3}(12x + 3) = 2(2x + 5)$$
$$\frac{1}{3}(12x) + \frac{1}{3}(3) = 2(2x) + 2(5)$$
$$4x + 1 = 4x + 10$$
$$0 + 1 = 0 + 10$$
$$1 = 10$$

no solution, $\varnothing$

3.

$$-2(x-3) + 4 = -\frac{1}{2}(4x - 8) + 6$$
$$-2(x) - (-2)(3) + 4 = -\frac{1}{2}(4x) - \left(-\frac{1}{2}\right)(8) + 6$$
$$-2x + 6 + 4 = -2x + 4 + 6$$
$$-2x + 10 = -2x + 10$$
$$0 + 10 = 0 + 10$$
$$10 = 10$$

all real numbers, $\mathbb{R}$

4.

$$-(6x + 5) = 3x + (x - 15)$$
$$-6x - 5 = 4x - 15$$
$$-6x + 6x - 5 = 4x + 6x - 15$$
$$-5 + 15 = 10x - 15 + 15$$
$$10 = 10x$$
$$\left(\frac{1}{10}\right)(10) = \left(\frac{1}{10}\right)(10x)$$
$$x = 1$$

one solution

5.

x: first integer, $x + 1$: second integer, $x + 2$: third integer

$$x + (x + 1) + (x + 2) = 51$$
$$3x + 3 = 51$$
$$3x + 3 - 3 = 51 - 3$$
$$3x = 48$$
$$(\frac{1}{3})(3x) = (\frac{1}{3})(48)$$
$$x = 16$$

The numbers are 16, 17, and 18.

6.

x: unknown; $P = 53$

$$53 = x + 1 + 3x - 5 + 2x + 7$$
$$53 = 6x + 3$$
$$53 - 3 = 6x + 3 - 3$$
$$(\frac{1}{6})(50) = (\frac{1}{6})(6x)$$
$$x = \frac{50}{6} = \frac{25}{3}$$

7.

$$Ax + By = C;\ B$$
$$Ax - Ax + By = C - Ax$$
$$By = C - Ax$$
$$(\frac{1}{y})(By) = (\frac{1}{y})(C - Ax)$$
$$B = \frac{C - Ax}{y}$$

8.

$$A = \frac{h}{2}(a + b); b$$
$$(\frac{2}{h})(A) = (\frac{2}{h})\frac{h}{2}(a + b)$$
$$\frac{2A}{h} = a + b$$
$$\frac{2A}{h} - a = a - a + b$$
$$b = \frac{2A}{h} - a$$

9.

$$\frac{2}{7}x - \frac{1}{2} = \frac{5}{14}$$
$$14(\frac{2}{7}x - \frac{1}{2}) = (14)(\frac{5}{14})$$
$$14(\frac{2}{7}x) - 14(\frac{1}{2}) = (14)(\frac{5}{14})$$
$$4x - 7 = 5$$
$$4x + 0 = 12$$
$$4x = 12$$
$$1x = 3$$
$$x = 3$$

10.

$$\begin{aligned}
0.21x + 0.5 &= 0.32x - 0.16 \\
100(0.21x + 0.5) &= 100(0.32x - 0.16) \\
100(0.21x) + 100(0.5) &= 100(0.32x) - 100(0.16) \\
21x + 50 &= 32x - 16 \\
0 + 50 &= 11x - 16 \\
50 &= 11x - 16 \\
66 &= 11x - 0 \\
66 &= 11x \\
6 &= 1x \\
x &= 6
\end{aligned}$$