3.5A Solving Two-Step Equations

Ex: Four friends each purchase a large beverage and share a $9 pizza. The total bill before tax is $16. How would you find the cost of each beverage?

subtract 9 from 16 first, then divide by 4.

To **solve** an equation, you must **isolate** the variable (get it by itself).

Inverse Operations - operations that "undo" each other, these are used to isolate a variable (addition & subtraction, multiplication & division)

The Golden Rule for Solving Equations:

Whatever you do to one side you must do to the other!

Two-step equations contain two operations and require two steps to solve. Use inverse operations to undo the steps in backwards O.O.O. order (think shoes and socks).

Solve each equation. Check by substituting.

Ex: $-3x + 5 = 2$

$-5 \quad -5$

$-3x + 0 = -3$

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

$1x = 1$

$x = 1$

√: $-3x + 5 = 2$

$-3(1) + 5 \stackrel{?}{=} 2$

$-3 + 5 \stackrel{?}{=} 2$

$2 \stackrel{\checkmark}{=} 2$

Ex: $2x + 12 = 4$

$-12 \quad -12$

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

$x = -4$

√: $2x + 12 = 4$

$2(-4) + 12 \stackrel{?}{=} 4$

$-8 + 12 \stackrel{?}{=} 4$

$4 \stackrel{\checkmark}{=} 4$

Solve each equation. Check by substituting.

Ex: $\frac{m}{2} + 6 = 10$

$-6 \quad -6$

$\frac{m}{2} + 0 = 4$

$1 \cdot \left(\frac{2}{1}\right)\frac{m}{2} = 4(2)$

$1m = 8$

$\boxed{m = 8}$

√: $\frac{m}{2} + 6 = 10$

$\left[\frac{(8)}{2} + 6 \stackrel{?}{=} 10\right.$

$4 + 6 \stackrel{?}{=} 10$

$10 \stackrel{✓}{=} 10$

Ex: $-\frac{z}{3} + 5 = 9$

$-5 \quad -5$

$\left(-\frac{3}{1}\right)\left(-\frac{z}{3}\right) = 4(-3)$

$1z = -12$

$\boxed{z = -12}$

√: $-\frac{z}{3} + 5 = 9$

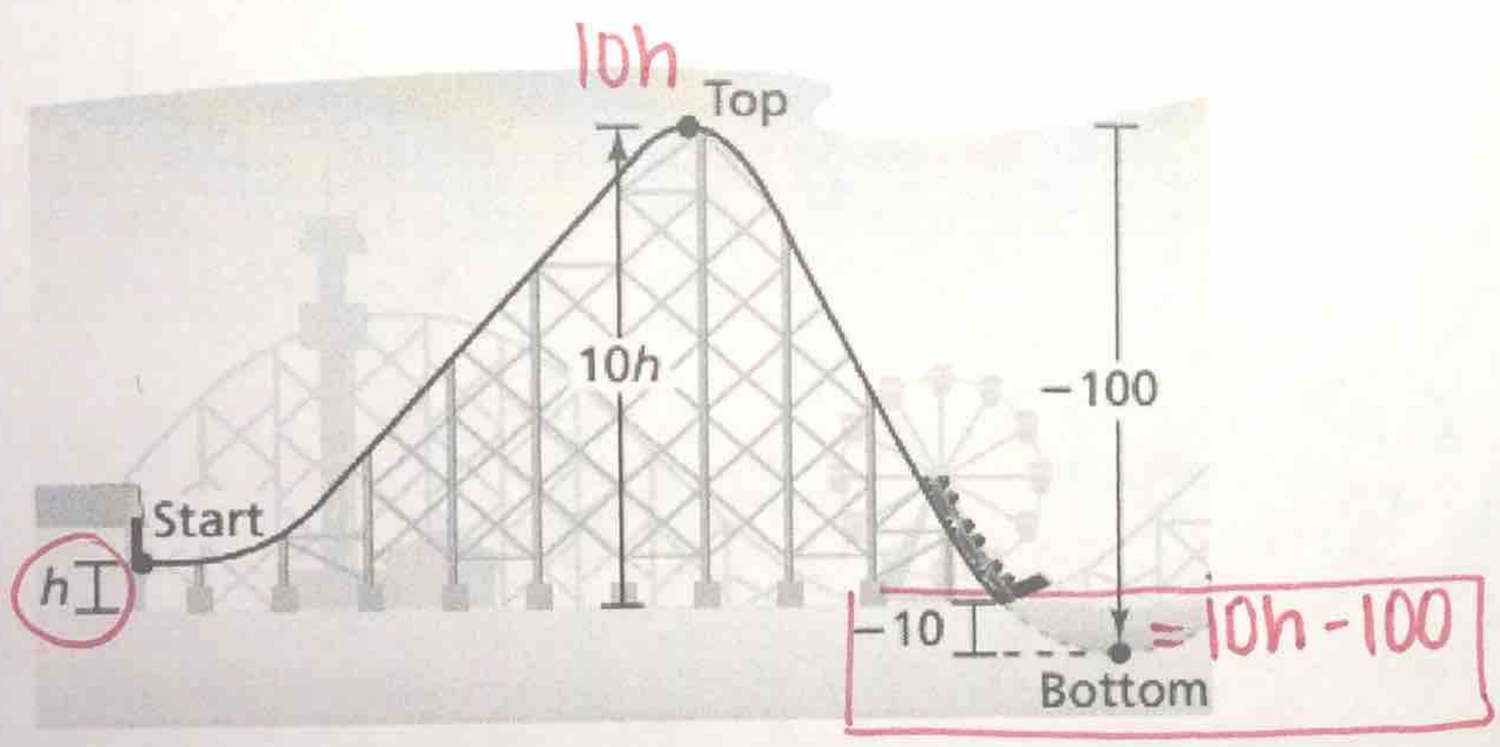
$-\frac{(-12)}{3} + 5 \stackrel{?}{=} 9$

$\left[\frac{12}{3} + 5 \stackrel{?}{=} 9\right.$

$4 + 5 \stackrel{?}{=} 9$

$9 \stackrel{✓}{=} 9$

Ex: The height at the top of a roller coaster hill is 10 times the height **h** at the starting point. The height decreases 100 feet from the top to the bottom of the hill. The height at the bottom of the hill is -10 feet. Find **h**.



$10h - 100 = -10$

$+100 \quad +100$

$\frac{10h}{10} = \frac{90}{10}$

$h = 9$

The height at the start (h) is 9 feet.

Try These:

Solve each equation. Check by substituting.

(1) $-5c + 9 = -16$

$\boxed{c = 5}$

(2) $\frac{m}{2} + 6 = 10$

$\boxed{m = 4}$