Unit 4: Lesson 05 Solving abstract equations

Previously, we easily solved equations like

$$4x + 2 = 10$$

and were able to get specific answers (x = 2 in this case).

In the above problem, consider replacing 2 with *y* and 10 with 3*z* to produce

$$4x + y = 3z$$

Could the problem still be solved for *x*?

The answer is, “yes”; however, the answer would not be specific. Rather, it would be in terms of *y* and *z*.

Example 1: Solve 4x + y = 3z for *x*.

$$4x + y = 3z$$
$$4x + \cancel{y} - \cancel{y} = 3z - y$$
$$4x = 3z - y$$
$$\frac{\cancel{4}x}{\cancel{4}} = \frac{3z - y}{4} \quad ; \quad \boxed{x = \frac{3z - y}{4}}$$

Example 2: Solve 4x + y = 3z for *y*.

$$4x + y = 3z$$
$$\cancel{4x} + y - \cancel{4x} = 3z - 4x$$
$$y = \boxed{3z - 4x}$$

Example 3: Solve 4x + y = 3z for *z*.

$$4x + y = 3z$$

$$\frac{4x+y}{3} = \frac{\cancel{3}z}{\cancel{3}}$$

$$\boxed{\frac{4x+y}{3} = z}$$

Example 4: Solve B = J(1 + 4t) for *t*.

$$B = J(1 + 4t)$$

$$B = J + 4Jt$$

$$B - J = \cancel{J} + 4Jt \cancel{-J}$$

$$\frac{B-J}{4J} = \frac{\cancel{4J}t}{\cancel{4J}}$$

$$\boxed{\frac{B-J}{4J} = t}$$

***Example 5:** Solve (4p + 3q)7 = 2q for *q*.

$$(4p + 3q)7 = 2q$$

$$28p + 21q = 2q$$

$$28p + \cancel{21q} \cancel{-21q} = \underbrace{2q - 21q}$$

$$28p = -19q$$

$$\frac{28p}{-19} = \frac{\cancel{-19}q}{\cancel{-19}} \; ; \; \boxed{-\frac{28p}{19} = q}$$

Assignment: Solve each equation for the indicated variable.

1. y = mx + b for *x*	2. y = mx + b for *m*
3. y = mx + b for *b*	4. ax + by = c for *x*

5. 5(2p + 3q) = 9 for *q*

6. $A = \frac{1}{2} b(h)$ for *b*

7. $A = \frac{1}{2}(b_1 + b_2) h$ for *h*

8. $A = \frac{1}{2}(b_1 + b_2) h$ for b_2

9. $C = (5/9)(F - 32)$ for *F*

10. $C = (5/9)(F - 32)$ for *C*

*11. $(11x + 3c)4 = 5x$ for *x*

*12. $(11x + 3c)4 = 6c$ for *c*