Lesson 2-3

# Solving Multi-Step Equations

* The symmetric property allows the equation to be rewritten with the variables on the left: $5m - 23 + 2m = 5$

**Combining Like Terms:**

A. $5 = 5m - 23 + 2m$

| | |
|---|---|
| $5 = 5m + 2m - 23$ | Original equation |
| $5 = 7m - 23$ | Commutative Property |
| $5 + 23 = 7m - 23 + 23$ | Combine Like Terms |
| $28 = 7m$ | Undo subtraction by adding |
| $\frac{28}{7} = \frac{7m}{7}$ | Simplify (substitution property) |
| $4 = m$ | Undo multiplication by division |
| $m = 4$ | Simplify (substitution property) |

B. Martha takes her niece and nephew to a concert. She buys T-shirts and bumper stickers for them. The bumper stickers cost $1 each. Martha's niece wants 1 shirt and 4 bumper stickers, and her nephew wants 2 shirts, but no bumper stickers. If Martha's total $67, what is the cost of one shirt?

Let $c$ = cost of one shirt

| | |
|---|---|
| $c + 4(1) + 2c = 67$ | Cost of 1 shirt + 4 bumper stickers + cost of 2 shirts = total spent |
| $c + 2c + 4 = 67$ | Commutative property |
| $3c + 4 = 67$ | Combine Like Terms |
| $3c + 4 - 4 = 67 - 4$ | Undo the addition |
| $3c = 63$ | Simplify (Substitution property) |
| $\frac{3c}{3} = \frac{63}{3}$ | Undo the multiplication |
| $c = 21$ | Simplify (Substitution property) |

Try these on your own.

Lesson 2-3

# Solving Multi-Step Equations

**PRACTICE:**

1. $11m - 8 - 6m = 22$

2. $-2y + 5 + 5y = 14$

3. Noah and Kate are shopping for new guitar strings in a music store. Noah buys 2 packs of strings. Kate buys 2 packs of strings and a music book. The book costs $16. Their total cost is $72. How much is one pack of strings?

4. You have a part time job. You work for 3 h on Friday and 6 h on Saturday. You also receive an allowance of $20 per week. You earn $92 per week. How much do you earn per hour at your part-time job?

**Solving an Equation Using the Distributive Property**

C. $-8(2x - 1) = 36$

| | |
|---|---|
| $-8 \cdot 2x + -8 \cdot -1 = 36$ | Distributive Property |
| $-16x + 8 - 8 = 36 - 8$ | Subtract 8 from both sides |
| $-16x = 28$ | Simplify |
| $\frac{-16x}{-16} = \frac{28}{-16}$ | Divide |
| $x = -\frac{7}{4}$ | Simplify |

**Solving an Equation That Contains Fractions**

D. Method 1 :
Get a common denominator

LCD for 4 & 3 is 12

$\frac{3}{4}x - \frac{1}{3}x = 10$

$\frac{9}{12}x - \frac{4}{12}x = 10$

$\frac{5}{12}x = 10$

Multiply by the reciprocal

$\frac{12}{5} \cdot \frac{5}{12}x = 10 \cdot \frac{12}{5}$

$x = \frac{120}{5}$

$x = 24$

$D_1$ Method 2:
Clear the fractions from the equation

$\frac{3}{4}x - \frac{1}{3}x = 10$ Multiply by the LCD [MATH→NUM↓GCD]

$12\left(\frac{3}{4}x\right) - 12\left(\frac{1}{3}x\right) = 12(10)$

$9x - 4x = 120$

$5x = 120$

$\frac{5x}{5} = \frac{120}{5}$

$x = 24$

**Solving an Equation That Contains a Decimals**

E. $3.5 - 0.02x = 1.24$

| | |
|---|---|
| $100(3.5) - 100(0.02x) = 100(1.24)$ | Multiply each side by $10^2$ |
| $350 - 2x = 124$ | Distributive Property |
| $-350 \quad -350$ | Subtract from each side |
| $-2x = -226$ | Simplify |
| $\frac{-2x}{-2} = \frac{-226}{-2}$ | Divide each side by $^-2$ |
| $x = 113$ | Simplify |

5. $18 = 3(2x - 6)$

6. $7(3x - 4) = 49$

7. $\frac{2b}{5} + \frac{3b}{4} = 3$

8. $\frac{1}{9} = \frac{5}{6} - \frac{m}{3}$

9. $0.5x - 2.325 = 3.95$

10. $1.2 = 2.4 - 0.6x$