8.4 Solving Equations: $ax = b + cx$, $ax + b = cx + d$, $a(bx + c) = d(ex + f)$

Explore Equations With Variables on Both Sides

The following notes provide guidelines to help you adapt the Explore Equations With Variables on Both Sides section in *MathLinks 9*.

- Provide each pair of students with four cups, four paper clips, three dimes, and four nickels. Encourage students to use these manipulatives to model the diagrams in this exercise rather than draw the models.
- Allow students to work in groups of four to complete #2.

Examples

- Have students complete the Warm Up to review how to use the reverse order of operations to isolate the variable, and how to combine like terms when adding the coefficients of the variables.

Working Example 1:

- Introduce this Example by drawing a table as shown below. Randomly place numbers in columns 1 and 2. Ask students to determine the total value. As a class, discuss how to calculate the total value: Value of Each Coin × Expression (Number of Coins) = Total Value.

Nickels	Dimes	Total Value
3	2	0.35

- Before starting the Show You Know, demonstrate using the following table. As a class, complete the table. Once students understand the problem, allow them to complete the Show You Know.

Number of Quarters	Total Value of Quarters	Number of Nickels (20 More Than the # of Quarters)	Total Value of Nickels
1			

Working Example 2:

- After solving this equation, demonstrate that students can also subtract $5.5w$ from both sides.
- Encourage students to write the reasoning beside the steps (e.g., subtract to isolate the variable).

Working Example 3:

- Students may be confused about why they distribute 6 through the brackets. Explain that $\frac{1}{3}(2x-1)$ is all one term. Review how to multiply by the lowest common multiple and then reduce: $6 \times \frac{1}{3}(2x-1) = \frac{6}{3}(2x-1) = 2(2x-1)$.

Communicate the Ideas, Practise, and Apply

- For #7, encourage students to highlight "76 more pennies than nickels." Remind them to use this statement to create expressions for the number of pennies and the number of nickels.
- For #9, explain why they must find the length of each rectangle before calculating the area. Explain what p represents and that they will use it to find the area.
- Provide students who need additional practice with **BLM 8–8 Section 8.4 Extra Practice**.

Math Link

- Review how to write and solve equations with a variable on both sides of the equal sign.
- Review how to use guess and check as well as solve algebraically.

Common Errors

- Students may combine terms that are not alike, since variables appear on both sides of the equal sign.

R$_x$ Have students highlight or box the terms with a variable. Make sure they include the sign in the box.