Lesson 8: Using If-Then Moves in Solving Equations

Classwork

Opening Exercise

Recall and summarize the if-then moves.

Write $3 + 5 = 8$ in as many true equations as you can using the if-then moves. Identify which if-then move you used.

Example 1

Julia, Keller, and Israel are volunteer firefighters. On Saturday the volunteer fire department held its annual coin drop fundraiser at a streetlight. After one hour, Keller had collected $42.50 more than Julia, and Israel had collected $15 less than Keller. Altogether, the three firefighters collected $125.95. How much did each person collect?

Find the solution using a tape diagram.

What were the operations we used to get our answer?

The amount of money Julia collected is *j* dollars. Write an expression to represent the amount of money Keller collected in dollars.

Using the expressions for Julia and Keller, write an expression to represent the amount of money Israel collected in dollars.

Using the expressions written above, write an equation in terms of *j* that can be used to find the amount each person collected.

Solve the equation written above to determine the amount of money each person collected and describe any if-then moves used.

Example 2

You are designing a rectangular pet pen for your new baby puppy. You have 30 feet of fence barrier. On a whim, you decide that you would like the length to be $6\frac{1}{3}$ feet longer than the width.

Draw and label a diagram to represent the pet pen. Write expressions to represent the width and length of the pet pen.

Find the dimensions of the pet pen.

Example 3

Nancy's morning routine involves getting dressed, eating breakfast, making her bed, and driving to work. Nancy spends $\frac{1}{3}$ of the total time in the morning getting dressed, 10 minutes eating breakfast, 5 minutes making her bed and the remaining time driving to work.   If Nancy spent $35\frac{1}{2}$ minutes getting dressed, eating breakfast, and making her bed, how long was her drive to work?

Write and solve this problem using an equation. Identify the if-then moves used when solving the equation.

Is your answer reasonable? Explain.

Example 4

The total number of participants who went on the 6th grade field trip to the Natural Science Museum consisted of all of the 6th grade students and 7 adult chaperones. $\frac{2}{3}$ of the total participants rode a large bus and the rest rode a smaller bus. If **54** of them rode the large bus, how many students went on the field trip?

> **Lesson Summary**
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> Algebraic Approach: To "solve an equation" algebraically means to use the properties of operations and if-then moves to simplify the equation into a form where the solution is easily recognizable. For the equations we are studying this year (called linear equations), that form is an equation that looks like, $x =$ "a number," where the number is the solution.
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> If-then moves: If x is a solution to an equation, it will continue to be a solution to the new equation formed by adding or subtracting a number from both sides of the equation. It will also continue to be a solution when both sides of the equation are multiplied by or divided by a non-zero number. We use these if-then moves to make 0s and 1s in ways that simplify the original equation.
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> Useful First Step: If one is faced with the task of finding a solution to an equation, a useful first step is to collect like terms on each side of the equation.

Problem Set

Write and solve an equation for each problem.

1. The perimeter of a rectangle is 30 inches. If its length is three times its width, find the dimensions.
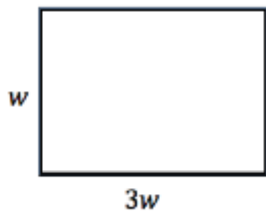
2. A cell phone company has a basic monthly plan of $40 plus $0.45 for any minutes used over 700. Before receiving his statement, John saw he was charged a total of $48.10. Write and solve an equation to determine how many minutes he must have used during the month. Write an equation without decimals.

3. A volleyball coach plans her daily practices to include 10 minutes of stretching, $\frac{2}{3}$ of the entire practice scrimmaging, and the remaining practice time working on drills of specific skills. On Wednesday, the coach planned 100 minutes of stretching and scrimmaging. How long, in hours, is the entire practice?

4. The sum of two consecutive even numbers is 54. Find the numbers.

5. Justin has $7.50 more than Eva and Emma has $12 less than Justin does. How much money does each person have if they have a total of $63?

6. Barry's mountain bike weighs 6 pounds more than Andy's. If their bikes weigh 42 pounds altogether, how much does Barry's bike weigh? Identify the if-then moves in your solution.

7. Trevor and Marissa together have 26 t-shirts to sell. If Marissa has 6 fewer t-shirts than Trevor, find how many t-shirts Trevor has. Identify the if-then moves in your solution.

8. A number is $\frac{1}{7}$ of another number. The difference of the numbers is 18. (Assume that you are subtracting the smaller number from the larger number.) Find the numbers.

9. A number is 6 greater than $\frac{1}{2}$ another number. If the sum of the numbers is 21, find the numbers.

10. Kevin is twice as old now as his brother is. If Kevin was 8 years old 2 years ago, how old is Kevin's brother now?

11. The sum of two consecutive odd numbers is 156. What are the numbers?

12. If n represents an odd integer, write expressions in terms of n that represent the next three consecutive odd integers. If the four consecutive odd integers have a sum of 56, find the numbers.

13. Six times the sum of three consecutive odd integers is -18. Find the integers.

14. I am thinking of a number. If you multiply my number by 4, add -4 to the product, then take $\frac{1}{3}$ of the sum, the result is -6. Find my number.

15. A vending machine has twice as many quarters in it as dollar bills. If the quarters and dollar bills have a combined value of $96, how many quarters are in the machine?