Reasoning about Equations and Tape Diagrams (Part 1)

Let's see how tape diagrams can help us answer questions about unknown amounts in stories.

4.1 Math Talk: Seeing Structure

Solve each equation mentally.

- $2x = 6$
- $2x + 5 = 11$
- $2x + 10 = 16$
- $506 = 500 + 2x$

4.2 Situations and Diagrams

Draw a tape diagram to represent each situation. For some of the situations, you need to decide what to represent with a variable.

1. Diego has 7 packs of markers. Each pack has x markers in it. After Lin gives him 9 more markers, he has a total of 30 markers.

2. Elena is cutting a 30-foot piece of ribbon for a craft project. She cuts off 7 feet, and then cuts the remaining piece into 9 pieces that are the same length.

3. Andre makes 9 pounds of modeling clay. He donates 7 pounds to the school craft club and keeps the rest to divide equally among the 30 students in his art class.

4.3 Situations, Diagrams, and Equations

Each situation in the previous activity is represented by one of the equations.

- $30 = 9x + 7$
- $30x + 7 = 9$
- $7x + 9 = 30$

1. Match each situation to an equation.
2. Find the solution to each equation. Use your diagrams to help you reason.
3. What does each solution tell you about its situation?

Lesson 4 Summary

Many situations can be represented by equations. Writing an equation to represent a situation can help us express how quantities in the situation are related to each other, and can help us reason about unknown quantities whose value we want to know. Here are two situations:

1. A camp counselor has a large bag that contains 34 cups of coconut. She uses 10 cups to make some trail mix. Then she uses the rest of the bag to make 144 identical granola bars. Campers want to know how much coconut is in each bar.
2. Kiran is trying to save $144 to buy a new guitar. He has $34 and is going to save $10 a week from money he earns mowing lawns. He wants to know how many weeks it will take him to have enough money to buy the guitar.

We see the same three numbers in the situations: 10, 34, and 144. How could we represent each situation with an equation?

In the camp situation, there is one part of 10 and then 144 equal parts of unknown size that all add together to 34. This can be represented by the equation $10 + 144x = 34$. Since 24 is needed to get from 10 to 34, the value of x is $(34 - 10) \div 144$ or $\frac{1}{6}$. There is $\frac{1}{6}$ cup of coconut in each serving.

In Kiran's situation, there is one part of 34 and then an unknown number of equal parts of size 10 that all add together to 144. This can be represented by the equation $34 + 10x = 144$. Since it takes 11 groups of 10 to get from 34 to 144, the value of x in this situation is $(144 - 34) \div 10$, or 11. It will take Kiran 11 weeks to raise the money for the guitar.