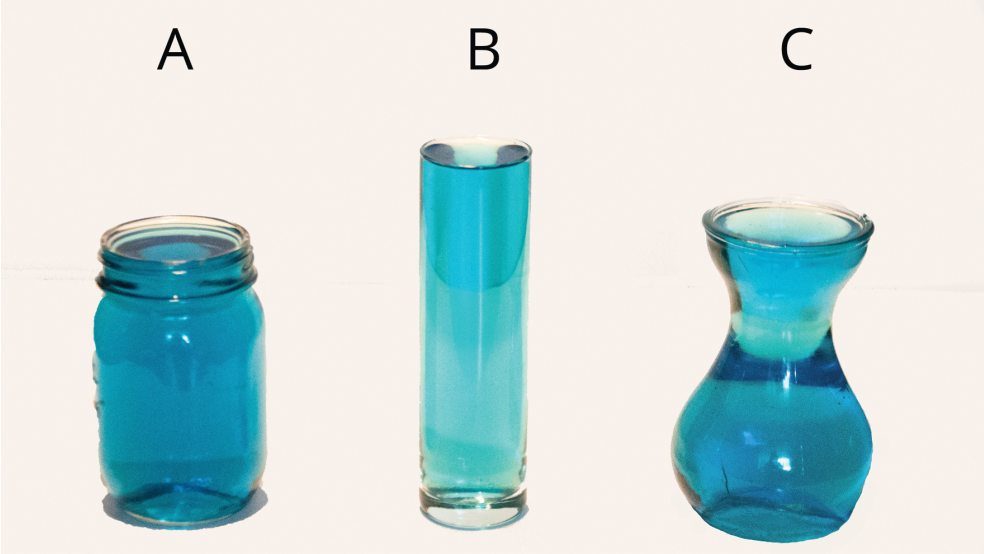
Representations of Linear Relationships

Let's write equations from real situations.

6.1 Which Holds More?



Which container holds the most liquid? The least?

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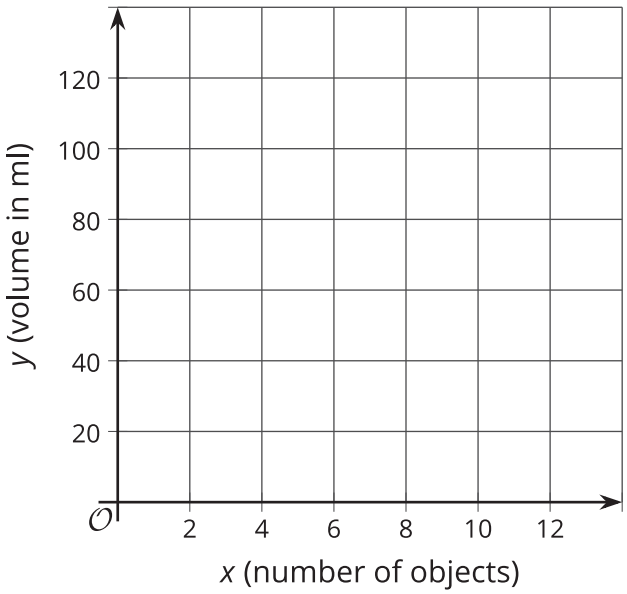
6.2 Rising Water Levels

1. Record the data in the table. (You may not need all the rows.)
2. What is the volume, V, in the cylinder after you add x objects? Explain your reasoning.

number of objects	volume in ml

3. If you wanted to make the water reach the highest mark on the cylinder, how many objects would you need?

4. Plot and label points that show your measurements from the experiment.
5. Plot and label a point that shows the volume of the water before you added any objects.
6. The points should fall on a line. Use a straightedge to graph this line.
7. Calculate the slope of the line. What does the slope mean in this situation?



8. What is the vertical intercept? What does the vertical intercept mean in this situation?

6.3 Telling Stories

1. Consider a new cylinder that is filled with 25 ml of water. Identical beads that have a volume of 0.75 ml are dropped into the cylinder one at a time.

   a. Write an equation that describes the volume in the cylinder as beads are added. Use V for the total volume in the cylinder and b for the number of beads.

   b. How would your original equation change if the cylinder was only filled with 12 ml of water?

   c. How would your original equation change if larger beads that had a volume of 1.25 ml were used?

2. A situation is represented by the equation $y = 5 + \frac{1}{2}x$.

   a. Create a story for this situation.

   b. What does the 5 represent in your situation?

   c. What does the $\frac{1}{2}$ represent in your situation?

Lesson 6 Summary

A glass cylinder is filled with 50 ml of water. Marbles, each with a volume of 3 ml, are dropped into the cylinder one at a time. With each marble, the water level increases in height by an amount equivalent to a volume of 3 ml. This constant rate of change means there is a linear relationship between the number of marbles and the total volume in the cylinder. If 1 marble is added, the total volume increases by 3 ml. If 2 marbles are added, the total volume increases by 6 ml. If x marbles are added, the total volume goes up $3x$ ml.

This means that the total volume, y, for x marbles is $y = 3x + 50$. The 3 represents the rate of change, or slope of the graph, and the 50 represents the initial amount, or vertical intercept of the graph.

Any linear relationship can be expressed in the form $y = mx + b$ using just the rate of change, m, and the initial amount, b. For example, the equation $y = 5x + 20$ could be used to describe a different scenario where marbles, each with a volume of 5 ml, are added to a cylinder that initially had 20 ml of water.