Measuring and Comparing Volumes

You will need
- linking cubes
- a variety of small boxes shaped like rectangular prisms

GOAL

Determine and compare the volumes of 3-D objects, and create 3-D objects with the same volume.

Stefan is packing for an overnight camping trip. He wants to pack everything in a small bag.

❓ Which game will take up less space in Stefan's bag?

Stefan's Strategy

To figure out the **volume** of the Pick-Up Sticks box, I can use linking cubes to build a **rectangular prism** that's the same size and then count the cubes.

volume

The amount of space occupied by a 3-D object

For example, this structure has a volume of 5 cubes.

There are 10 layers, with 8 cubes in each layer. The volume of the Pick-Up Sticks box is 80 cubes.

Now I'll build a rectangular prism that's the same size as the Monopoly Card Game box.
There are two layers, with $8 \times 6 = 48$ cubes in each layer. The volume of this game box is 96 cubes.
The box for Pick-Up Sticks will take up less space, so I'll pack that game.

Reflecting

A. Is it possible to create a different rectangular prism with the same volume as the Monopoly box? Try this and describe the prism you make.

B. Why can't you tell from the volume of an object how tall or how wide the object is?

Checking

1. **a)** Get a small box. Use Stefan's strategy to estimate its volume in cubes. Explain what you did.
   b) Compare your box to a classmate's box. Which box has the greater volume? How do you know?

Practising

2. Build each linking-cube object. What is the volume of each object?

a)

b)

c)
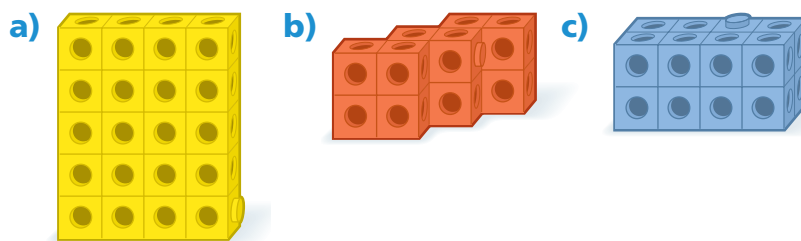
3. a) Use linking cubes to build a box that has a square base.
   b) Describe your box. How many layers does it have? How many cubes are in each layer?
   c) What is the volume of your box?
   d) Build a different box with the same volume. How many layers does this box have? How many cubes are in each layer?

4. Make two different rectangular prisms with each volume below. Record your work by describing the number of cubes in each layer and the number of layers.
   a) 36 cubes   **b)** 30 cubes

5. A rectangular prism has five equal layers of linking cubes.
   a) List two volumes that the prism could have. Describe the layers of cubes for each volume.
   b) List two volumes that the prism could not have. Explain your thinking.

6. Andrew made a prism with a volume of 20 cubes. Then he built another prism using 20 larger cubes. Did the volume increase or stay the same? Explain.

7. Why is a linking cube a better unit to use for measuring volume than a marble?

8. If one rectangular prism is twice as tall as another rectangular prism, could they have the same volume? Build models or draw pictures to help you explain.