8.9 Volumes of Prisms

Ms. Petrie bought a bag of centicubes for the classroom. Each cube measures 1 cm on every edge. The volume of each cube is 1 cm³.
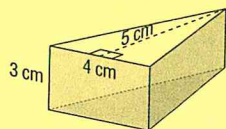
Activity: Study the Picture

Ms. Petrie asked Juanita to store as many cubes as possible in a clear plastic box. The picture shows the result.

Inquire

1. How many cubes covered the base of the box?

2. How many layers of cubes were there?

3. How many cubes were in each layer?

4. How many cubes did Juanita use to fill the box?
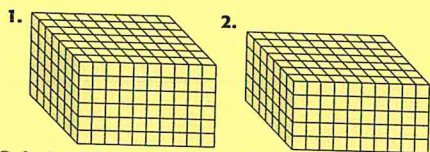
5. What is the volume of the box?
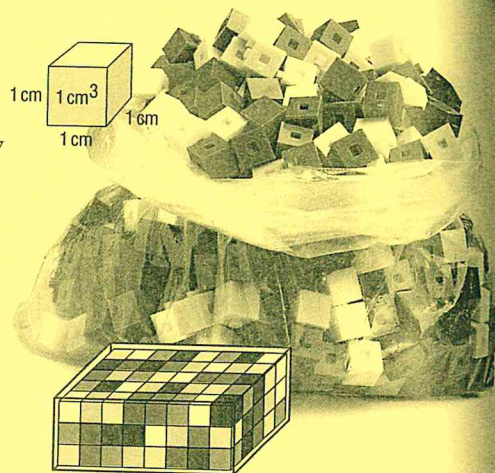
Example

Calculate the volume of the triangular prism.

Practice

Each solid is made from centicubes. Determine the dimensions of each figure and calculate its volume.

1. **2.**

Calculate the volumes of cubes with edges of the following lengths.

3. 2 cm **4.** 5 cm **5.** 8 cm **6.** 12 cm

6. Use the words "length," "width," and "height" in a sentence that explains how the volume of a rectangular prism can be calculated. Rewrite your sentence using symbols.
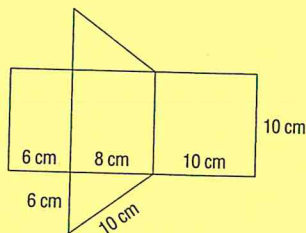
Solution

The volume of a prism is the area of the base multiplied by the height.

Area of base $\frac{1}{2} \times 4 \times 5 = 10$
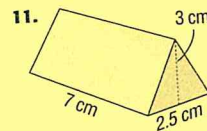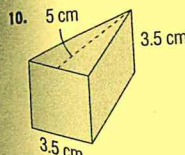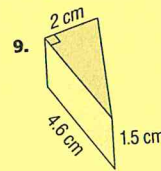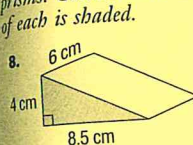Volume $10 \times 3 = 30$

The volume is 30 cm².

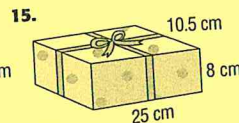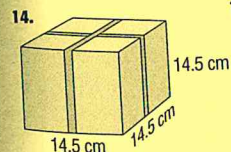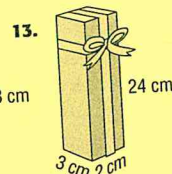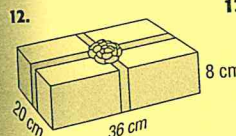**7. a)** Draw the net and construct the triangular prism.

b) Calculate the volume of the prism.
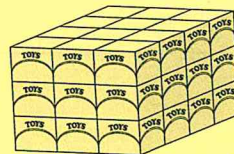
Problems and Applications

Some of Anton's building blocks are triangular prisms. Calculate the volume of each. The base of each is shaded.

8. **9.**

10. **11.**

Calculate the largest volume that each gift box can hold.
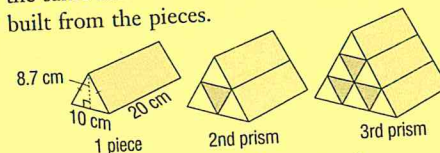
12. **13.**

14. **15.**

16. A display of toys in a store is 3 boxes long, 4 boxes wide, and 3 boxes high. Each box is 12 cm long, 8.5 cm wide, and 10 cm high.

a) What is the volume of each box?
b) What is the total volume of the display?

17. Construct and sketch 2 different rectangular prisms, each with a volume of 1000 cm³. Label each sketch with the dimensions of the prism.

18. Each piece in a set of triangular prisms is the same size. A second and third prism are built from the pieces.

1 piece   2nd prism   3rd prism

a) What is the volume of one piece?
b) What are the dimensions of the second and third prisms? What is the volume of each?
c) Sketch the fourth prism. State its dimensions and calculate its volume.
d) Describe the pattern in the 4 prisms.

19. Work with a partner. Measure the following objects to the nearest centimetre. Calculate the volume of each. Record your answers in a chart.

a) this book   **b)** a tissue box
c) a bookshelf   **d)** your desk

LOGIC POWER

A food company needs a box for its new product, Nut-n-Honey Pieces. The company orders a box that will hold 50 cm³ of the product.

a) If the box maker uses whole number dimensions, what are all the possible sets of dimensions for the box?

b) Which box would you choose? Give reasons for your decision.

c) What additional information might affect your decision?