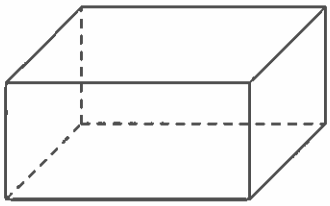
Name: _____ Class: _____ Date: _____ ID: A

Volume Problems

Problem

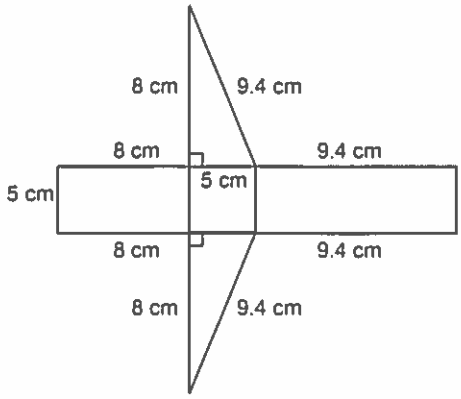
1. The volume of a piece of metal is 24 cm^3. It is melted and cast into the shape of a rectangular prism.
   a) What are the possible whole number dimensions of the metallic prism in centimetres?
   b) The metallic prism is plated with a thin layer of gold. What are the dimensions of the prism that requires the least amount of gold?

2. The area of the front face of this right rectangular prism is 39 cm^2.
   The area of the top of the prism is 65 cm^2.
   The area of each side face is 15 cm^2.
   a) What are the whole-number dimensions of the prism?
   b) What is the volume of the prism?
   Show your work.

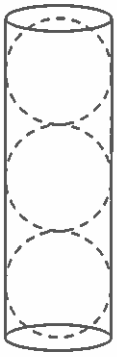


3. A right triangular prism has length 10 cm. The edges of the base measure 4 cm, 6 cm, and 7.2 cm. Find the volume and surface area of the prism. Show your work.

4. This diagram shows a net of a triangular prism. Find the volume of the prism.
   Show your work.



5. This diagram shows 3 balls closed packed in a cylindrical container.
The diameter of each ball is 13 cm. What is the volume of the container?
Explain your answer.



6. Which object has the greater volume? Explain your work.
   - A cylinder with radius 6 cm and height 5 cm
   - A cube of edge length 8 cm

Volume Problems
Answer Section

PROBLEM

1. ANS:
   a) 1 cm × 1 cm × 24 cm, 1 cm × 2 cm × 12 cm, 1 cm × 3 cm × 8 cm, 1 cm × 4 cm × 6 cm, 2 cm × 2 cm × 6 cm, 2 cm × 3 cm × 4 cm
   b) The prism that measures 2 cm by 3 cm by 4 cm requires the least amount of gold for plating.

   PTS: 1 DIF: Difficult REF: 4.5 Volume of a Right Rectangular Prism
   LOC: 8.SS4 TOP: Shape and Space (Measurement) KEY: Problem-solving Skills
2. ANS:
   Methods may vary. Sample:
   a) First find the whole number factors of 39, 65, and 15.
   $39 = 3 \times 13$
   $65 = 5 \times 13$
   $15 = 3 \times 5$
   The prism has dimensions 13 cm by 5 cm by 3 cm.
   b) Volume = base area × height
   $= 15 \times 13$
   $= 195$
   The volume of the prism is 195 cm³.

   PTS: 1 DIF: Difficult REF: 4.5 Volume of a Right Rectangular Prism
   LOC: 8.SS4 TOP: Shape and Space (Measurement)
   KEY: Communication | Problem-solving Skills
3. ANS:
   Volume of prism: $V = \frac{1}{2}bhl$
   $= \frac{1}{2} \times 4 \times 6 \times 10$
   $= 120$
   The volume of the prism is 120 cm³.
   Total area of 2 bases $= 2 \times \frac{1}{2} \times 4 \times 6$
   $= 24$
   Total area of 3 rectangular faces $= (4 \times 10) + (6 \times 10) + (7.2 \times 10)$
   $= 40 + 60 + 72$
   $= 172$
   Sum of the areas: 24 + 172 = 196
   The surface area of the prism is 196 cm².

   PTS: 1 DIF: Difficult REF: 4.6 Volume of a Right Triangular Prism
   LOC: 8.SS4 TOP: Shape and Space (Measurement) KEY: Communication

4. ANS:

$$\text{Volume} = \frac{1}{2}bhl$$
$$= \frac{1}{2} \times 5 \times 8 \times 5$$
$$= 100$$

The volume of the prism is 100 cm³.

PTS: 1 DIF: Difficult REF: 4.6 Volume of a Right Triangular Prism
LOC: 8.SS4 TOP: Shape and Space (Measurement)
KEY: Communication | Problem-solving Skills

5. ANS:

Explanations may vary. Sample:
The diameter of the cylindrical container is the same as the diameter of each ball.
Diameter of container: $d = 13$

Radius of container: $r = \frac{d}{2} = \frac{13}{2} = 6.5$

Height of container: $h = 3d = 3 \times 13 = 39$

Volume of container: $V =$ base area $\times$ height
$= \pi r^2 \times h$
$= \pi \times (6.5)^2 \times 39$
$\doteq 5177$

The volume of the container is about 5177 cm³.

PTS: 1 DIF: Difficult REF: 4.8 Volume of a Right Cylinder
LOC: 8.SS4 TOP: Shape and Space (Measurement)
KEY: Communication | Problem-solving Skills

6. ANS:

Volume of a cylinder = base area $\times$ height
$= \pi \times 6^2 \times 5$
$\doteq 565$

Volume of a cube $= 8^3$
$= 512$

The cylinder has the greater volume.

PTS: 1 DIF: Difficult REF: 4.8 Volume of a Right Cylinder
LOC: 8.SS4 TOP: Shape and Space (Measurement)
KEY: Communication | Problem-solving Skills