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The Volume of Solids

Name: _____ Date: _____

Concepts

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The Area and the Volume of Solids - Secondary 3

1. A juice shop uses closed cylindrical tins with a radius of 10 cm and a height of 20 cm. For each task below, say whether it needs a **length**, an **area** or a **volume**, give the unit that answer would carry, then compute it. Use π on your calculator and round to two decimal places.

a) Printing a paper label that wraps once around the curved side, top to bottom, with no overlap.

b) Filling the tin with juice.

c) Tying a ribbon once around the rim of the lid.

The Volume of Cones

2. Find the volume of each cone. Round to two decimal places.

a) A paper snow-cone cup with a radius of 4 cm and a height of 9 cm.

b) A pile of road salt shaped like a cone, 12 m across at the base and 10 m high.

The Volume of Cylinders

3. A cylindrical compost bin is 60 cm across and 90 cm tall.

a) Find its volume in cm^3, rounded to the nearest cm^3.

b) Knowing that 1 L = 1000 cm^3, give its capacity in litres, rounded to one decimal place.

The Volume of Decomposable Solids

4. A grain silo is made of a cylinder of radius 3 m and height 8 m, topped by a cone of the same radius whose height is 4 m. Find the total volume of the silo, exactly in terms of π and then rounded to two decimal places.

The Volume of Prisms

5. Find the volume of each prism.

a) A chocolate bar shaped like a prism 15 cm long whose base is a right triangle with legs of 8 cm and 5 cm.

b) A feeding trough shaped like a prism 12 cm long whose base is a trapezoid with parallel sides of 10 cm and 6 cm and a height of 4 cm.

The Volume of Pyramids

6. Find the volume of each pyramid.

a) A square-based pyramid with a base edge of 9 cm and a height of 10 cm.

b) A pyramid whose base is a rectangle 12 cm by 5 cm, with a height of 7 cm.

The Volume of Solids Using Algebra

7. Write each volume as a simplified algebraic expression, then evaluate it for the value given.

a) A rectangular box whose width is x cm, whose length is 4 cm more than its width, and whose height is 5 cm. Evaluate for $x = 3$.

b) A cube whose edge is $2a$ cm. Evaluate for $a = 1.5$.

The Volume of Truncated Solids

8. A concrete planter is a truncated square-based pyramid. It comes from a pyramid with a base edge of 12 cm and a height of 18 cm, from which the top pyramid — base edge 4 cm, height 6 cm — has been removed. Find the volume of the planter.

The Volume of a Cube

9. Answer both parts.

a) A wooden block is a cube of edge 7 cm. Find its volume.

b) Another cube has a volume of 512 cm^3. Find its edge, then its total surface area.

The Volume of a Sphere

10. Find the volume of each sphere, rounded to two decimal places.

a) A ball with a radius of 6 cm.

b) An exercise ball with a diameter of 20 cm.

Units for Measuring Volume and their Conversion

11. Carry out each conversion, and next to each one write the factor you used and where it comes from.

a) 3.5 m^3 into cm^3.

b) 45 000 mm^3 into cm^3.

c) 0.02 m^3 into dm^3.

Units of Capacity and Their Conversion

12. Answer each part, using 1 L = 1000 mL = 1000 cm^3.

a) Convert 2.5 L into millilitres.

b) Convert 3.2 L into cm^3.

c) An aquarium is a rectangular prism 40 cm long, 25 cm wide and 30 cm high. Find its volume in cm^3, then its capacity in litres.

Units of Time and Their Conversion

13. Carry out each conversion.

a) 2 h 45 min into minutes.

b) 5400 s into hours and minutes.

c) An arena's ice resurfacer takes 8 min 30 s per pass. How long do 6 passes take, in minutes?

Synthesis — drawing on several sheets in this topic

14. A cylindrical rain barrel has a radius of 30 cm and a height of 80 cm.

a) Find its volume in cm^3, rounded to the nearest cm^3.

b) Give its capacity in litres, rounded to one decimal place.

c) During a storm, water pours in at 4.5 L/min. How long does the barrel take to fill, to the nearest minute? Give the answer in minutes and also in hours and minutes.