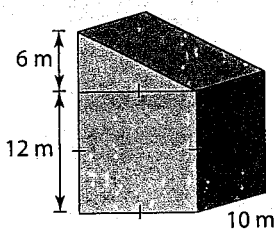
Show You Know

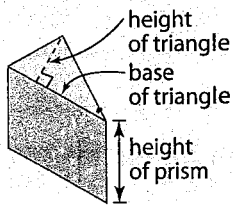
Determine the volume of the composite prism.



Connect and Reflect

Key Ideas

- To determine the volume of a right prism with any shape of base, use the formula V = area of base × height of prism.
- Volume of a triangular prism = (base × height of triangle in base ÷ 2) × height of prism
- You can solve problems involving volumes of prisms and cylinders in a variety of ways.
- To determine the volume of a composite object, find the volume of each prism in the object and add all the volume calculations.

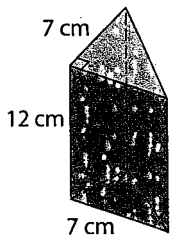


Practise

For help with #1 and #2, refer to Example 1 on page 79.

1. Determine the volume of each right triangular prism.

a)



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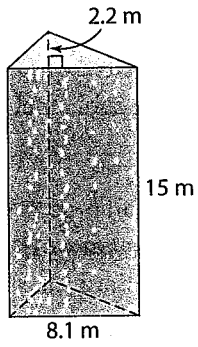
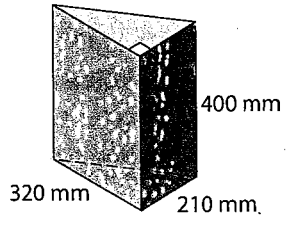


c)



2. What is the volume of each right triangular prism?

a) base of triangle = 12 m
height of triangle = 3 m
height of prism = 8 m

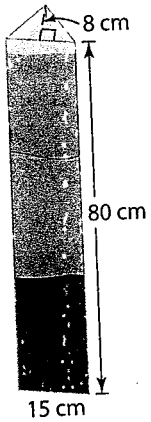
b) base of triangle = 3 m
height of triangle = 7 m
height of prism = 8 m

c) base of triangle = 15 cm
height of triangle = 8 cm
height of prism = 20 cm

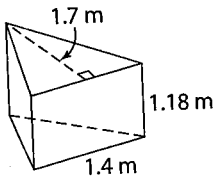
d) base of triangle = 10 mm
height of triangle = 9.1 mm
height of prism = 11.3 mm

For help with #3 and #4, refer to Example 2 on page 80.

3. A glass vase in the shape of a right triangular prism is filled with coloured sand as a decoration. What is the volume of the vase?



4. An artist has 6 triangular prisms like the one shown. He wants to stack them up to a height of at least 6.8 m.



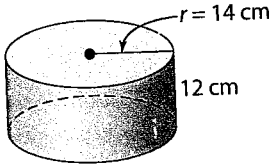
a) Does he have enough small prisms?

b) What is the volume of the new stacked prism to the nearest hundredth of a metre?

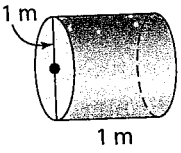
For help with #5 to #7, refer to Example 3 on page 81.

5. Determine the volume of each cylinder.

a)



b)



6. What is the volume of each cylinder?

a) radius = 5 cm, height = 8 cm

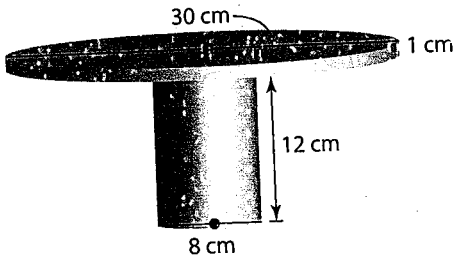
b) height = 25 cm, radius = 4.5 cm

c) diameter = 8 cm, height = 12 cm

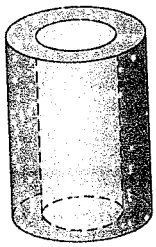
7. Two cylinders have the same volume. The first cylinder has a diameter of 10 cm and a height of 30 cm. The second cylinder has a diameter of 8 cm. What is the height of the second cylinder, to the nearest tenth of a centimetre?

For help with #8 to #10, refer to Example 4 on page 82.

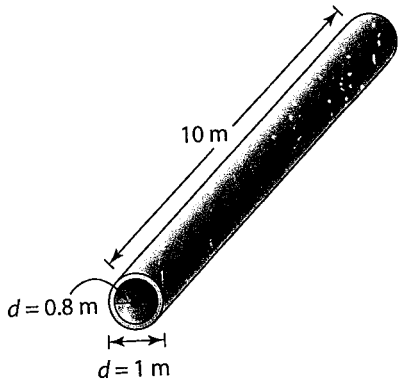
8. Determine the volume of glass required to make this cake stand.



9. The object shown is hollow. Explain how you would determine its volume.



10. A concrete drain is 10 m long, with an outside diameter of 1 m and an inside diameter of 0.8 m. Determine the volume of concrete required to make the drain, to the nearest tenth of a cubic metre.

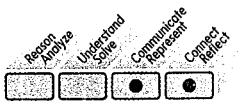


Apply

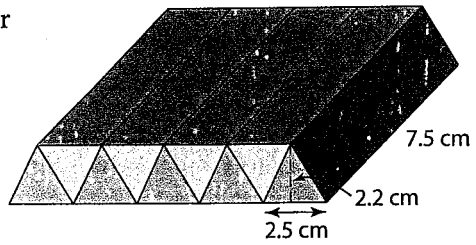
11. Copy and complete the table for a right triangular prism.

Base (cm)	Height of Triangle (cm)	Height of Prism (cm)	Volume (cm^3)
7	2		70
18		10	1080
	14	5	700

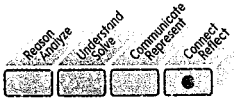
12. **Competency Check** Kwan is building a concrete ramp to his back door. He wants to determine the volume of concrete needed for the ramp. What measurements does he need to know? Justify your response using an example and illustration.



13. A manufacturer makes right triangular prisms for refracting light. The prisms are packed in boxes that are 12.5 cm wide, 2.5 cm tall, and 22.5 cm long. If the bottom row is stacked as shown, how many prisms can fit in a box? The dimensions of one prism are shown.



14. In a school cafeteria, 2 garbage cans are filled up every lunch hour. Each garbage can is a cylinder with a radius of 25 cm and a height of 95 cm.



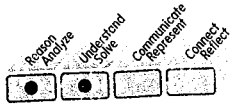
a) Determine the volume of garbage produced each day in the cafeteria.

b) Determine the volume of garbage produced in a 5-day week.

c) The school's environment club wants to reduce the weekly garbage to below 470 000 cm^3 by encouraging students to recycle. To reach this goal, what is the maximum number garbage cans that can be filled each lunch hour?

15. Fatima wants to fill a circular wading pool. She does not have a hose, so she uses a rectangular pail that she fills from a tap. The inside diameter of the pool is 120 cm and it is 25 cm deep. The inside dimensions of the pail are 30 cm × 22 cm × 24 cm deep. How many pails of water does Fatima have to carry to fill the pool to a depth of 18 cm?

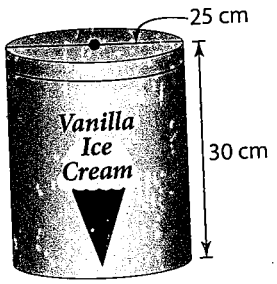
16. Shashi and Sonia want the biggest-sized popcorn at the movie theatre. One container is a cube with 7.1-cm sides. The other is a cylinder with a radius of 4.2 cm and a height of 8 cm.



a) Which container should Shashi and Sonia choose?

b) What price should the manager charge for each container? Justify your answer.

17. An ice cream shop sells cones that contain an average of 550 cm^3 of ice cream. Approximately how many cones can be made from one tub of ice cream?



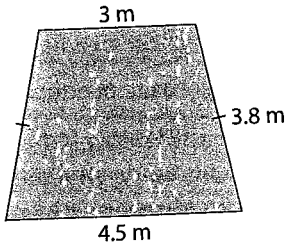
18. Drums are measured and sold in inches. They are measured "diameter by depth."

a) Determine the volume of a drum that is 9 inches by 12 inches.

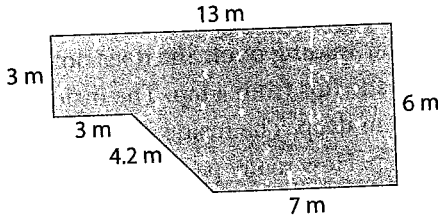
b) What is the volume of a cubic storage case that is just large enough to hold the drum?

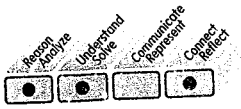
c) How many drums can fit in a van measuring 8 feet by 6.5 feet by 12 feet? There are 12 inches in 1 foot.

19. A pool with a base in the shape of a trapezoid is 1.8 metres deep. How much water does the pool hold?



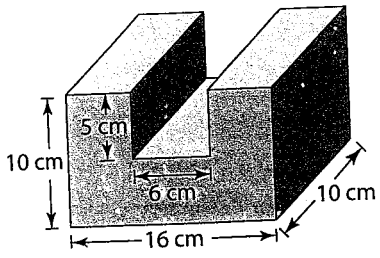
20. A landscaper has 5 m^3 of gravel to use as the base of a patio. If the gravel base is 10 cm deep and the patio has the dimensions shown, does she have enough gravel? How much extra gravel does she have, or how much more will she need?





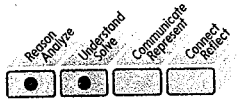
21. a) A wooden block is formed in the shape shown by cutting a right rectangular solid from a larger one. What is the volume of the block?

b) Check your calculations by using a second method to solve the problem.



Extend

22. Rectangular Prism A and Rectangular Prism B have the same length. The width of A is half the width of B. The height of A is twice the height of B. What is the difference in volume?

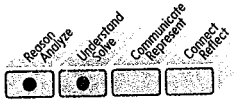


23. A rectangular tank, 40 m long by 30 m wide, is filled with 960 m^3 of water.

a) Determine the depth of water.

b) If the water drains out at a rate of 60 m^3/h, how much water is left after 2.5 h? What is the new depth of water?

c) Later, the depth of the water is 0.2 m. For how long has the tank been draining?



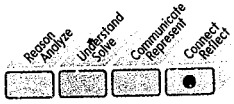
24. A cylindrical vase fits perfectly in a cube-shaped box. If the box has a volume of 8000 cm^3, what is the volume of the vase?

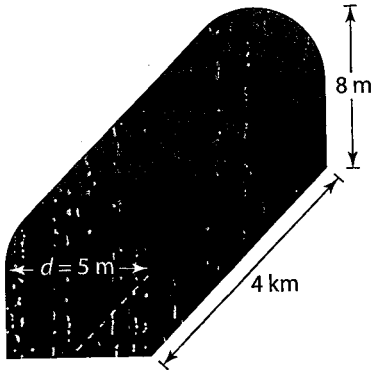
Volume of a cube = $s \times s \times s$. So, 8000 is the product of three equal numbers. What number is it?

25. The end of a car tunnel has the shape of a semicircle on top of a rectangle. The tunnel is exactly 4 km long.

a) Calculate the volume of air in the tunnel with no cars in it.

b) The air in a car tunnel must be exchanged frequently. If the exhaust system pumps the air out at a rate of 10 m^3 per second, how long does it take to replace the stale air with fresh air in the entire tunnel? Give your answer in hours and minutes.





1 km = 1000 m

26. A trough made of concrete has the outside dimensions shown. It has no lid. The concrete is 8 cm thick. What is the maximum volume the trough can hold? What assumptions did you make?