

Math 10

Lesson 6–5 Volumes of Pyramids and Cones

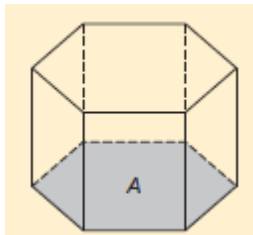
I. Lesson Objectives:

- 1) Solve problems involving the volumes of right pyramids and right cones.

II. Volume equations

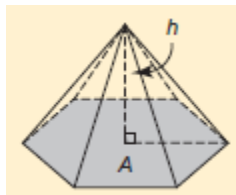
The volume of a right prism is:

$$V = Ah$$



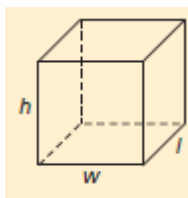
The volume of a right pyramid is:

$$V = \frac{1}{3}Ah = \frac{Ah}{3}$$



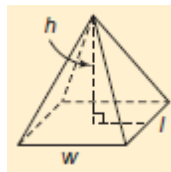
A right rectangular prism with length l , width w , and height h , has volume:

$$V = lwh$$



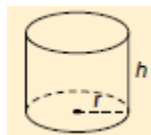
A right rectangular pyramid with base length l , base width w , and height h , has volume:

$$V = \frac{1}{3}lwh = \frac{lwh}{3}$$



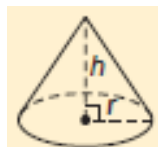
A right cylinder with base radius r and height h has volume:

$$V = \pi r^2 h$$



A right cone with base radius r and height h has volume:

$$V = \frac{1}{3}\pi r^2 h = \frac{\pi r^2 h}{3}$$



Question 1

Calculate the volume of a right square pyramid with a base length of 4 ft. and a slant height of 7 ft. to the nearest cubic foot.

Question 2

Determine the volume of a right rectangular pyramid with base dimensions 3.6 m by 4.7 m and height 6.9 m. Answer to the nearest tenth of a cubic metre.

Question 3

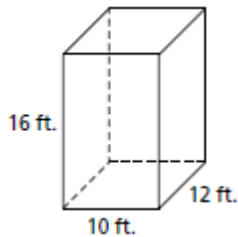
Determine the volume of a cone with a diameter of 8 mm and a height of 13 mm to the nearest cubic millimetre.

Question 4

A cone has a height of 8 m and a volume of 300 m^3 . Determine the radius of the base of the cone to the nearest metre.

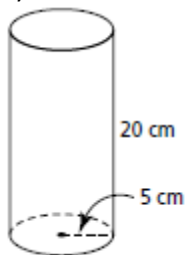
III. Assignment

1. Calculate the volume of the right prism.

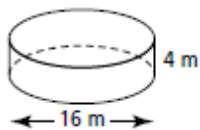


2. Calculate the volume of each right cylinder to the nearest cubic unit.

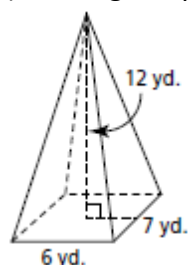
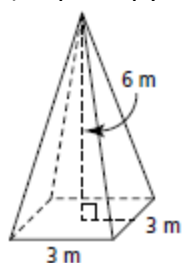
a)



b)

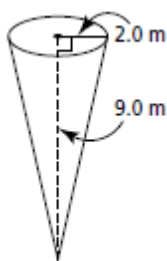


3. Calculate the volume of each right pyramid.
 a) square pyramid b) rectangular pyramid

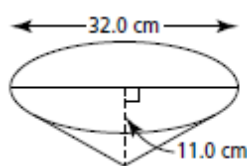


4. Calculate the volume of each right cone. Write the answer to the nearest tenth of a cubic unit.

a)



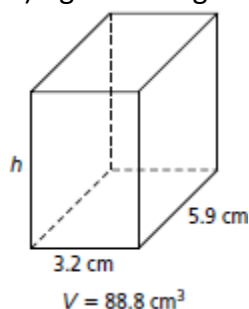
b)



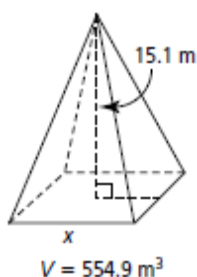
5. A regular tetrahedron has base area 68.0 m^2 and height 10.2 m .
 a) Sketch the tetrahedron.
 b) Determine its volume to the nearest tenth of a cubic metre.
6. A right cone has slant height 12 yd. and base diameter 4 yd.
 a) Sketch the cone.
 b) Determine its volume to the nearest cubic yard.
7. A stone monument has the shape of a square pyramid. Its slant height is 1.6 m and the side length of its base is 0.8 m . Determine the volume of the monument to the nearest tenth of a cubic metre.
8. An ice cream shop in Bellevue, Alberta, created a new dessert. It is a waffle cone with a height of 5 in. and a base diameter of 2 in. , filled with ice cream. Then whipped topping and sprinkles are added.
 a) The ice cream is level with the top of the cone. How much ice cream can the cone hold? Write the answer to the nearest cubic inch.
 b) One cubic inch of soft ice cream costs 55¢ , the waffle cone costs 35¢ , and the whipped topping and sprinkles cost 10¢ per dessert. How much will this dessert cost to produce?
 c) Suppose the cone had the shape of a right square pyramid with base side length 2 in. and height 5 in. How much ice cream would it hold?

9. For each object, its volume, V , and some dimensions are given. Calculate the dimension indicated by the variable. Write each answer to the nearest tenth of a unit.

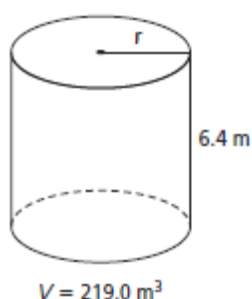
a) right rectangular prism



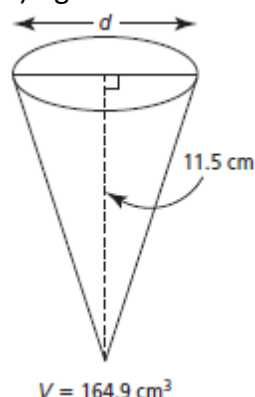
b) right square pyramid



c) right cylinder



d) right cone



10. Sunil immersed a right plastic cone in a measuring cylinder containing water and determined that the volume of the cone was 33.5 cm^3 . He measured the diameter of the base of the cone as 4.0 cm. What is the height of the cone to the nearest tenth of a centimetre?
11. An underground tank has the shape of a right cone, supported with its apex beneath its base. The tank collects the water run-off for a three-storey parking garage. The cone has a base diameter of 5.0 m and a height of 3.5 m. ($1 \text{ m}^3 = 1 \text{ kL}$)
- What is the capacity of this tank to the nearest tenth of a kilolitre?
 - How much water is in the tank when the water level is 1 m below the top of the tank?
12. A right rectangular pyramid has base dimensions 5 m by 3 m, and a height of 10 m. A horizontal cut is made through the pyramid 2 m from its apex and this smaller right rectangular pyramid is removed. What is the volume of the remaining piece?