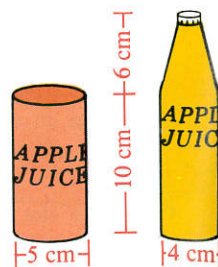




- B** 17. a. Guess which contains more, the can or the bottle. (Assume that the top part of the bottle is a complete cone.)  
 b. See if your guess is right by finding the volumes of both.



Ex. 17

18. A solid metal cylinder with radius 6 cm and height 18 cm is melted down and recast as a solid cone with radius 9. Find the height of the cone.



19. A pipe is 2 m long and has inside radius 5 cm and outside radius 6 cm. How many cubic centimeters of metal are in the pipe?

20. Two water pipes of the same length have diameters 6 cm and 8 cm. These two pipes are replaced by a single pipe of the same length, which has the same capacity as the smaller pipes combined. What should the diameter of the new pipe be?

21. If the radius and height of a cylinder are both multiplied by 3, the lateral area is multiplied by  $\underline{\quad}$  and the volume is multiplied by  $\underline{\quad}$ .

22. The total area of a cylinder is  $40\pi$ . If  $h = 8$ , find  $r$ .

23. The total area of a cylinder is  $90\pi$ . If  $h = 12$ , find  $r$ .

24. In rectangle  $ABCD$ ,  $AB = 10$  and  $AD = 6$ .

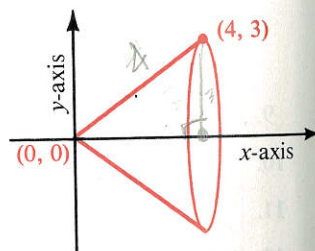
- a. If the rectangle is revolved in space about  $\overline{AB}$ , what is the volume of the space through which it moves?

- b. Answer part (a) if the rectangle is revolved about  $\overline{AD}$ .

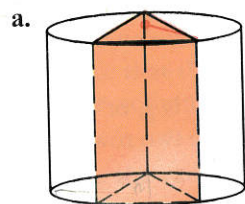
25. a. The segment joining  $(0, 0)$  and  $(4, 3)$  is rotated about the  $x$ -axis, forming the lateral surface of a cone. Find the lateral area and the volume of this cone.

- b. Make a sketch showing the cone that would be formed if the segment had been rotated about the  $y$ -axis. Find the lateral area and the volume of this cone.

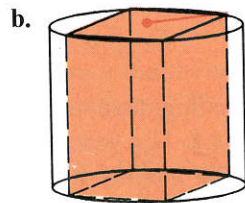
- c. Are your answers to parts (a) and (b) the same?



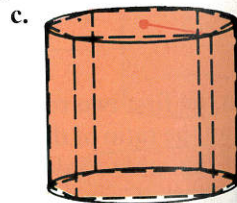
26. Each of the prisms shown below is inscribed in a cylinder with height 10 and radius 6. Find the volume and lateral area of each prism.



Base is an equilateral triangle.

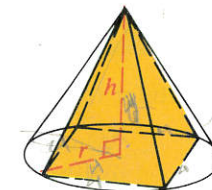


Base is a square.



Base is a regular hexagon.

27. A square pyramid with base edge 4 is inscribed in a cone with height 6. What is the volume of the cone?  
 28. A square pyramid is inscribed in a cone with radius 4 and height 4.  
 a. What is the volume of the pyramid?  
 b. Find the slant heights of the cone and the pyramid.



Exs. 27, 28

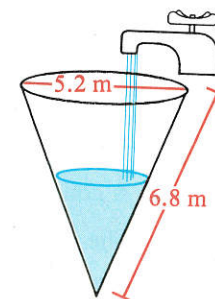
- C** 29. A regular hexagonal pyramid with base edge 6 and height 8 is inscribed in a cone. Show that the lateral area of the cone is  $60\pi$  and the lateral area of the pyramid is  $18\sqrt{91}$ .

30. In  $\triangle ABC$ ,  $AB = 15$ ,  $AC = 20$ , and  $BC = 25$ . If the triangle is rotated in space about  $\overline{BC}$ , what is the volume of the space through which it moves?

31. A  $120^\circ$  sector is cut out of a circular piece of tin with radius 6 and bent to form the lateral surface of a cone. What is the volume of the cone?

### CALCULATOR KEY-IN

1. Water is pouring into a conical reservoir at the rate of  $1.8 \text{ m}^3$  per minute. How long will it take to fill the reservoir?



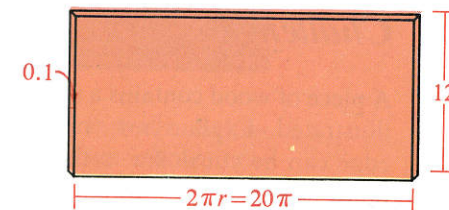
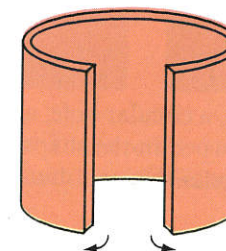
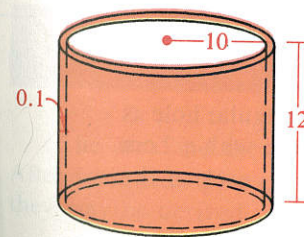
Ex. 1

2. Given a cylinder with radius 10 and height 12, suppose that the lateral surface of the cylinder is covered with a thin coat of paint having thickness 0.1. The volume of the paint can be calculated approximately or exactly.

- a. Use the diagrams below to explain the following formula.

Approximate volume = (lateral area of cylinder)  $\cdot$  (thickness of paint)

$$V \approx (2\pi rh) \cdot (t)$$



Why is this formula only an approximation of the volume?

- b. Use the formula above to find the approximate volume of the paint.  
 c. Find the exact volume of paint by subtracting the volume of the inner cylinder (the given cylinder) from the volume of the outer cylinder (the given cylinder plus paint).