GEOMETRY

The Complete Course

Lesson Thirty

Cylinders, Cones, Spheres

KA8430

Worksheet

Instructors may duplicate the worksheets as needed

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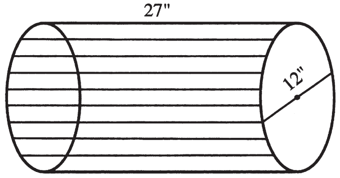
ANSWERS

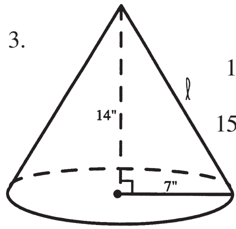
1.



$T.A. = L.A. + 2B = 2\pi rh + 2\pi r^2$
$= 2\pi \bullet 6" \bullet 27" + 2\pi \bullet (6")^2$
$= 1017.876\text{sq.in.} + 226.195\text{sq.in}$
$T.A. = 1244.1\text{sq.in.}$

2. $V = Bh$
$= \pi r^2 h$
$= \pi(6")^2 (27")$
$V = 3053.6\text{cu.in.}$

3.



$14^2 + 7^2 = \ell^2$
$245 = \ell^2$
$15.6525" = \ell$

$T.A. = L.A. + B$
$= \pi rl + \pi r^2$
$= \pi(7)(15.6525) + \pi(7)^2$
$= 344.216 + 153.938$
$T.A. = 498.2\text{sq.in.}$

4. $V = \frac{1}{3} Bh$
$= \frac{1}{3} \pi r^2 h$
$= \frac{1}{3} \pi (7)^2 (14)$
$V = 718.4\text{cu.in.}$

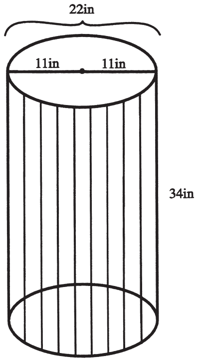
5. $A = 4\pi r^2$
$= 4\pi(8\text{in})^2$
$A = 804.2\text{sq.in.}$

6. $V = \frac{4}{3} \pi r^2$
$= \frac{4}{3} \pi(8\text{in})^3$
$V = 2144.7\text{cu.in.}$

7. $\frac{r_1}{r_2} = \frac{6}{10} = \frac{3}{5}$
$\frac{V_1}{V_2} = \frac{3^3}{5^3} = \frac{27}{125}$ or 27 : 125 (T30-9c)

8. $\frac{V_1}{V_2} = \frac{8}{27}$
$\frac{P_1}{P_2} = \frac{\sqrt[3]{8}}{\sqrt[3]{27}} = \frac{2}{3}$
$\frac{A_1}{A_2} = \frac{2^2}{3^2} = \frac{4}{9}$ OR 4 : 9

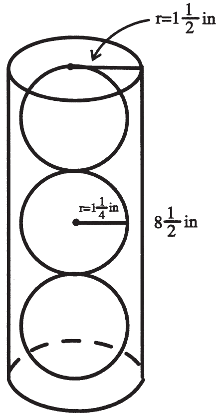
9.



$V = Bh$
$= \pi r^2 h$
$= \pi(11)^2 (34)$
$V = 12{,}924.5122\text{cu.in.}$

$1\text{cu.ft.} = 1728\text{cu.in}$
$\frac{1\text{cu.ft.}}{1728\text{cu.in.}} = \frac{x\text{ cu.ft.}}{12924.5122}$
$x = 7.5\text{cu.ft.}$

10.



Volume of Cylinder $= \pi r^2 h$
$= \pi(1\frac{1}{2})^2 (8\frac{1}{2})$
$V = 60.083\text{cu.in.}$

Volume of Tennis Ball $= \frac{4}{3} \pi r^3$
$= \frac{4}{3} \pi(1\frac{1}{4})^3$
$V = 8.181\text{cu.in.}$

Volume of air = Volume of cylinder - 3(Volume of ball)
= 60.083cu.in - 3(8.181cu.in.)
V = 35.5cu.in.

I. VIDEOTAPE FOLLOW-UP QUESTIONS

I. Introduction.
  A. Definition of a cylinder
  B. Definition of a cone
  C. Definition of a sphere

II. Cylinders.
  A. Definitions
    1. Right cylinder
      a) circular
      b) elliptical
    2. Oblique cylinder
      a) circular
      b) elliptical
    3. Parts of cylinder
      a) base
      b) altitude
      c) radius
      d) axis
    4. Lateral area
    5. Total area
  B. Theorems related to cylinder
    1. The lateral area L.A. of a right circular cylinder equals the product of the circumference C of the base and the height h of the cylinder. [$L.A. = C \times h = 2\pi rh$] (T30-1)
      a) Derivation
      b) Applied example
    2. The total area T.A. of a right circular cylinder equals the sum of the lateral area L.A. and the area of the two bases 2B.
    [$T.A. = L.A. + 2B = 2\pi rh + 2\pi r^2 = 2\pi r(h + r)$] (T30-2)
    3. The volume V of a cylinder equals the product of the area of the base B and the height of the cylinder.
    [$V = B \times h = \pi r^2 h$] (T30-3)

III. Cones.
  A. Definitions
    1. Right
      a) circular
      b) elliptical
    2. Oblique
      a) circular
      b) elliptical
    3. Parts of a cone
      a) base
      b) height
      c) slant height
      d) axis
    4. Lateral area
    5. Total area
  B. Theorems related to cones
    1. The lateral area L.A. of a right circular cone having slant height 1 and circumference $C = 2\pi r$, where r is the radius of the base, is one-half the product of the circumference and the slant height.

$$\left[L.A. = \frac{1}{2}(2\pi r)1 = \pi r1\right] \quad \text{(T30-4)}$$

      a) Derivation
      b) Applied example
    2. The total area T.A. of a right circular cone is the sum of the lateral area L.A. and the area of the base B.
    [$TA. = L.A. + B = \pi rl + \pi r^2 = \pi r(l + r)$] (T30-5)
      a) Derivation
      b) Applied example
    3. The volume V of a cone is one-third the product of the area of the base B and the height h.

$$\left[V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h\right] \quad \text{(T30-6)}$$

      a) Derivation
      b) Applied example

IV. Spheres.
  A. Definitions
    1. Radius
    2. Lateral area = total area
  B. Theorems related to spheres
    1. The area A of a sphere of radius r is four times the area of a great circle. [$A = 4\pi r^2$] (T30-7)
    2. The volume V of a sphere of radius r is

$$\frac{4}{3}\pi r^3 \quad \left[V = \frac{4}{3}\pi r^3\right] \quad \text{(T30-8)}$$

V. If the scale factor of two similar solids is a:b, then
  a) the ratio of corresponding perimeters or circumferences is a:b
  b) the ratios of base areas, lateral areas, and total areas are a^2 b^2
  c) the ratio of volumes is a^3:b^3. (T30-9)

VI. **Cavalieri's Principle:** If two solids have equal heights, and if the cross sections formed by any plane parallel to the bases of both solids have equal areas, then the volumes of the solids are equal. (P30-10)

II. SUPPLEMENTARY EXERCISES

1. A right circular cylinder 27 inches long has a diameter of 12 inches. What is the total surface area of the cylinder?

2. What is the volume of the cylinder in problem number 1?

3. A right circular cone is 14 inches tall and the diameter of the base is also 14 inches. What is the total surface area of the cone?

4. What is the volume of the cone in problem in number 3?

5. What is the surface area of a sphere whose radius is 8 inches.

6. What is the volume of the sphere in problem number 5?

7. Two spheres have radii of 6 and 10. What is the ratio of their volumes?

8. The ratio of the volumes of two similar pyramids is 8:27. What is the ratio of their total surface areas?

9. An oil barrel has a diameter of 22 inches and a height of 34 inches. How many cubic feet of oil will it hold?

10. Three tennis balls are placed in their cylindrical container. The diameter of a tennis ball is 2 1/2 inches. The diameter of the container is 3 inches and its height is 8 1/2 inches. What is the volume of air between the tennis balls and the inside surface of the container?