Useful Knowledge and Formulas

Chapter 2 Laws of Integral Indices

Suppose a and b are real numbers, and m and n are integers.

1. $a^m \times a^n = a^{m+n}$
2. $a^m \div a^n = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $(ab)^m = a^m b^m$
5. $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

Chapter 4 Percentages (II)

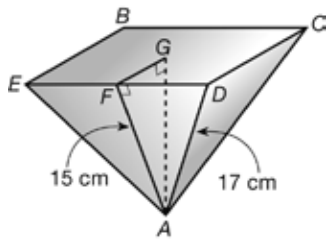
1. Let P be the principal, $r\%$ be the interest rate per period,
   n be the number of periods, I be the interest and A be the total amount.
   (a) Simple interest
   (i) $I = P \times r\% \times n$ (ii) $A = P + I$
   (b) Compound interest
   (i) $A = P \times (1 + r\%)^n$ (ii) $I = P \times (1 + r\%)^n - P$
2. Let n be the number of periods.
   (a) Growth
   New value = Original value × (1 + Growth rate)^n
   (b) Depreciation
   New value = Original value × (1 − Depreciation rate)^n

Chapter 7
Areas and Volumes (III)

In this chapter, unless otherwise specified, give the answers correct to 3 significant figures if necessary.

Warm Up Zone

1. The figure shows a right pyramid with a square base. Find the volume of the pyramid. (Leave the answer in surd form.)

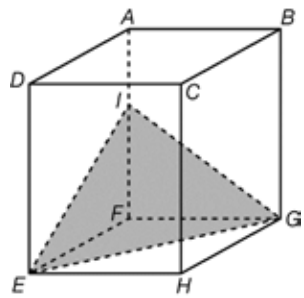


Try Elite Zone Q.3

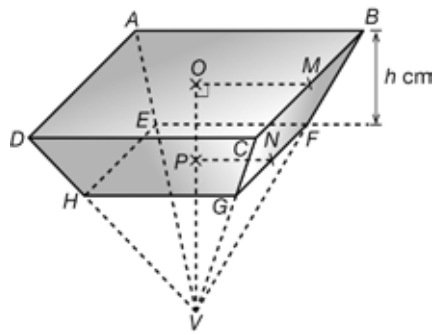
Elite Zone

Level Up Questions

1. In the figure, $ABCDEFGH$ is a cuboid of volume $960\ \text{cm}^3$. If I is a point on AF such that $AF = 4AI$. Find the volume of tetrahedron $IEGF$.



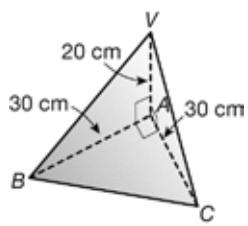
2. In the figure, M and N are the mid-points of BC and GF respectively. The upper base and lower base of the frustum $ABCDHEFG$ are squares. Suppose $AB = 12$ cm, $EF = 8$ cm and the height of the frustum is h cm.



(a) Find VO in terms of h.

(b) Express the volume of the frustum $ABCDHEFG$ in terms of h.

3. In the figure, $VABC$ is a tetrahedron. ΔABC is a right-angled isosceles triangle with $AB = AC = 30$ cm. The height VA of the pyramid is 20 cm. Find the total surface area of the pyramid.



Special Scenario

19. Two identical spheres of radius 6 cm intersect such that the distance between their centres is 10 cm. The points of intersection of two spheres form a circle. Find the area of this circle in terms of π.

Challenging Questions

20. In Figure (a), the test tube consists of a hollow cylindrical tube joined to a hemispherical bowl of the same radius. The capacity of the test tube is $\frac{64\pi}{3}$ cm^3 and the capacity of the hemispherical bowl is $\frac{1}{32}$ of the whole test tube.

Figure (a)

Figure (b)

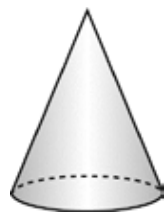


Figure (c)

(a) (i) Find the radius of the cylinder and height of the test tube.

(ii) The test tube is then filled with a liquid until the liquid level is 6 cm beneath the top end of the test tube. Find, in terms of π, the volume of the liquid.

(b) The liquid in the test tube in (a) is now poured into an inverted right circular cone shown in Figure (b). Suppose the depth of the liquid is one-third of the height of the cone. Find the capacity of the circular cone in terms of π.

(c) Now the top of the cone in Figure (b) is covered and it is turned upside down as shown in Figure (c). It is given that the height of the cone is 3 times its base radius. Find the height of the liquid in Figure (c).