APPROXIMATIONS AND SMALL ERRORS

PREVIOUS EAMCET BITS

1. There is an error of ± 0.04 cm in the measurement of the diameter of a sphere. When the radius is 10 cm, the percentage error in the volume of the sphere is **[EAMCET 2009]**

   1) ± 1.2 2) ± 1.0 3) ± 0.8 4) ± 0.6

   Ans: 4

Sol. $r = 10\text{cm}; \delta r = 0.02$

$\therefore \frac{\delta r}{r} \times 100 = \pm 0.2$

$\therefore \frac{\delta V}{V} \times 100 = 3 \times (\pm 0.2) = \pm 0.6$

2. The circumference of a circle is measured as 56 cm with an error 0.02 cm. The percentage error in its area is **[EAMCET 2007]**

   1) $\frac{1}{7}$ 2) $\frac{1}{28}$ 3) $\frac{1}{14}$ 4) $\frac{1}{56}$

   Ans: 3

Sol. radius = r, circumference = x; Area = A

$\therefore x = 2\pi r \Rightarrow r = \frac{x}{2\pi}; \delta x = 0.02$

$A = \pi r^2 = \frac{x^2}{4\pi}$

$\delta A = \frac{x}{2\pi}.\delta x$

Percentage error in $A = \frac{\delta A}{A} \times 100$

$= \frac{\frac{x}{2\pi}.\delta x}{\left(\frac{x^2}{4\pi}\right)} \times 100 = \frac{1}{14}$

3. The radius of a circular plate is increasing at the rate of 0.01 cm/sec when the radius is 12 cm. Then the rate at which the area increases is **[EAMCET 2005]**

   1) 0.24 π sq.cm /sec 2) 60 π sq.cm /sec 3) 24 π sq.cm /sec 4) 1.2 π sq.cm /sec

   Ans: 1

Sol. $r = 12, \frac{dr}{dt} = 0.01/\sec$

$A = \pi r^2$

$\frac{dA}{dr} = 2\pi r \frac{dr}{dt} = 24\pi \times 0.01$

$= 0.24\pi \text{ sq.cm}/\sec$

4. The approximate value of $(1.0002)^{3000}$ is **[EAMCET 2002]**

   1) 1.2 2) 1.4 3) 1.6 4) 1.8

Ans: 3

Sol. Let $y = f(x) = x^{3000}$

here $x = 1, \delta = 0.0002$

$\delta y = f'(x)\delta x = 3000x^{2999}\delta x$

$= (3000)(0.0002)$

$= 0.6$

$\therefore\ f(x + \delta x) = y + \delta y = 1 + 0.6 = 1.6$

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