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மதிப் பெண்கள் Marks

Compulsory Questions :-

1) A solid sphere and a solid hemisphere have equal total surface area. Prove that the ratio of their volume is $3\sqrt{3} : 4$

Sol :

r_1 and r_2 be the radius of sphere and hemisphere

T.S.A of sphere = T.S.A of solid hemisphere

$$4\pi r_1^2 = 3\pi r_2^2$$

$$\frac{r_1^2}{r_2^2} = \frac{3}{4}$$

$$\frac{r_1}{r_2} = \frac{\sqrt{3}}{\sqrt{4}}$$

$$\frac{r_1}{r_2} = \frac{\sqrt{3}}{2}$$

Ratio of volumes $= \frac{\text{volume of sphere}}{\text{volume of hemisphere}}$

$$= \frac{\frac{4}{3}\pi \times r_1^3}{\frac{2}{3}\pi \times r_2^3}$$

$$= \frac{4r_1^3}{2r_2^3} = 2\left[\frac{r_1}{r_2}\right]^3$$

$$= 2\left[\frac{\sqrt{3}}{2}\right]^3$$

$$= \frac{2 \times \sqrt{3} \times \sqrt{3} \times \sqrt{3}}{2 \times 2 \times 2}$$

$$= \frac{3\sqrt{3}}{4} = 3\sqrt{3} : 4$$

Ratio of volumes $= 3\sqrt{3} : 4$

2) If $1^3 + 2^3 + 3^3 + \ldots + k^3 = 44100$, then find $1 + 2 + 3 + \ldots + k$.

$$1^3 + 2^3 + 3^3 + \ldots + k^3 = 44100$$

$$\left[\frac{k(k+1)}{2}\right]^2 = 44100$$

$$\frac{k(k+1)}{2} = \sqrt{44100}$$

$$\frac{k(k+1)}{2} = 210.$$

$\therefore 1 + 2 + 3 + \ldots + k = 210$

3) What is the Probability that a leap year selected at random will contain 53 saturdays ?

A leap has 366 days, it has 52 full weeks and 2 days.

Sample space for two days.

$S = \{$Sun-mon, mon-Tue, Tue-wed, wed-Thu, Thu-Fri, Fri-sat, sat-Sun$\}$

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$n(S) = 7$.

Let A be the Event of 53rd Saturday.

$A = \{$Fri-Sat, Sat-Sun$\}$;

$n(A) = 2$.

53 Saturdays in a leap year is $P(A) = \frac{n(A)}{n(S)}$

$P(A) = \frac{2}{7}$

④ Find the Equation of a straight line Passing through (5,7) and is

i) Parallel to x axis

Sol:

x axis is $y = b$

(5,7), $b = 7$.

The required Equation of the line is $y = 7$.

(ii) Parallel to y axis

$x = c$.

(5,7), $c = 5$.

The required Equation of the line is $x = 5$.

⑤ The hill in the form of a right triangle has its foot at (19,3). The inclination of the hill to the Ground is 45°. Find the Equation of the hill joining the foot and top.

Sol:

$\tan\theta = m$

$\tan 45^\circ = m$.

one point slope form Equation is

$y - y_1 = m(x - x_1)$

$y - 3 = 1(x - 19)$

$y - 3 = x - 19$

$x - 19 - y + 3 = 0$

$x - 16 - y = 0$

$x - y - 16 = 0$

⑥ The radius of a spherical balloon increases from 12 cm to 16 cm as air being pumped into it. Find the ratio of the surface area of the balloons in two cases.

r_1 and r_2 is the Radius of the two balloons.

Given,

$\frac{r_1}{r_2} = \frac{12}{16} = \frac{3}{4}$

C.S.A of balloons $= \frac{4\pi r_1^2}{4\pi r_2^2}$

$= \frac{r_1^2}{r_2^2} = \left[\frac{r_1}{r_2}\right]^2$

$= \left[\frac{3}{4}\right]^2 = \left[\frac{9}{16}\right]$

The ratio of the surface

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(7) If $P(A) = \frac{2}{3}$, $P(B) = \frac{2}{5}$, $P(A \cup B) = \frac{1}{3}$. then find $P(A \cap B)$.

Sol:

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$= \frac{2}{3} + \frac{2}{5} - \frac{1}{3}$

$= \frac{10 + 6 - 5}{15}$

$= \frac{11}{15}$

$P(A \cap B) = \frac{11}{15}$

(8) Find the value of 'a', if the line through (-2,3) and (8,5) is perpendicular to $y = ax + 2$.

$(-2,3)$ $y = ax + 2$

Let m_1 be the slope of line joining $(-2,3)$, $(8,5)$.

m_2 be slope of $y = ax + 2 \Rightarrow ax - y + 2 = 0$

$m_1 = \frac{5-3}{8-(-2)} = \frac{2}{10} = \frac{1}{5}$

$m_2 = a$

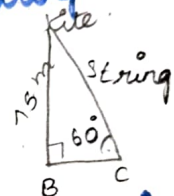
$m_1 \times m_2 = -1$

$\frac{1}{5} \times a = -1$

$a = -5$.

(9) A kite is flying at a height of 75 m above the ground. The string to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

Sol:



ΔABC, $\angle ACB = 60°$

$\sin\theta = \frac{AB}{AC}$

$\sin 60° = \frac{75}{AC}$

$\frac{\sqrt{3}}{2} = \frac{75}{AC}$

$AC = \frac{150}{\sqrt{3}}$

$AC = 50\sqrt{3}$ m

The length of the string = $50\sqrt{3}$.

(10) Form the quadratic Equation whose roots are $1+\sqrt{3}$ and $1-\sqrt{3}$.

(10) sum of roots = 1, product of roots = -2

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Sol:

$x^2 - (\alpha+\beta)x + (\alpha\beta)$.

$x^2 - (7+\sqrt{3})x + (7-\sqrt{3})$

$x^2 - 7x - \sqrt{3}x + 7\sqrt{3}$

$x^2 - \sqrt{3}x - \sqrt{3} = 0$.

Whose roots are.

$7+\sqrt{3}$, $7-\sqrt{3}$.

$\alpha+\beta = 7+\sqrt{3}+7-\sqrt{3}$

$\alpha+\beta = 14$

$\alpha\beta = (7+\sqrt{3})(7-\sqrt{3})$

$= 7^2 - (\sqrt{3})^2 = 49-3$

$\alpha\beta = 46$.

∴ The Q.F of equation are

$x^2 - (\alpha+\beta)x + \alpha\beta = 0$

∴ $x^2 - 14x + 46 = 0$.

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