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Class X

Mathematics

Q. 1. What will be the probability that a vowel selected at random in English language is an "I"?

Q. 2. What will be the probability for a leap year to have 52 Mondays and 53 Sundays?

Q. 3. Two dice are thrown at a time. What will be the probability that the difference of the numbers shown on the dice is 1?

Q. 4. If a coin is tossed thrice, find the probability of getting at least one head.

Q. 5. What will be the probability that in a family of 3 children, there will be at least one boy?

Q. 6. Two friends were born in the year 2001.What is the probability that they have the same birthday?

Q. 7. Three dice are thrown simultaneously. What is the probability of obtaining the sum 17 or 18?

Q. 8. In a game, the entry fee is Rs 5. The game consists of tossing a coin 3 times. If one or two heads show, Shweta gets her entry fee back. If she throws 3 heads, she receives double the entry fees. Otherwise, she will lose. For tossing a coin three times, find the probability that she
(i) loses the entry (ii) gets double entry fee (iii) just gets her entry fee.

Q. 9. A bag contains 24 balls of which x are red,$2x$ are white and $3x$ are blue. A ball is selected at random. What is the probability that it is (a) not red (b) white

Q. 10. A natural number is chosen at random from amongst the first 30. What is the probability that the number chosen is divisible by 4 or 5?

Q. 11. When $0° < \theta < 90°$, solve the equation$cos^2\theta - 3cos\theta + 2 = sin^2\theta$.

Q. 12. If $4\sin\theta = 3$ and$\sqrt{\frac{cosec^2\theta - cot^2\theta}{sec^2\theta - 1}} + 2cot\theta = \frac{\sqrt{7}}{x} + cos\theta$, then find the value of x.

Q. 13. Eliminate θ between the equations: $x = asec^3\theta,\ y = btan^3\theta$.

Q. 14. If $xsin^3\theta + ycos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, prove that $x^2 + y^2 = 1$.

Q. 15. Prove that$\frac{1}{cosecA - cotA} - \frac{1}{sinA} = \frac{1}{sinA} - \frac{1}{cosecA + cotA}$.

Q. 16. Prove that $\frac{tanA}{1-cotA} - \frac{cotA}{1-tanA} = 1 + \tan A + \cot A$.

Q. 17. If $\frac{\cos\alpha}{\cos\beta} = m$ and $\frac{\cos\alpha}{\sin\beta} = n$, then prove that $(m^2 + n^2)cos^2\beta = n^2$.

Q. 18. If $(a+2)\sin A + (2a-1)\cos A = (2a+1)$, then find the value of $\tan A$.

Q. 19. If $cosec\theta - sin\theta = a^3$ and $sec\theta - cos\theta = b^3$, prove that $a^2b^2(a^2 + b^2) = 1$.

Q. 20. If α and β are roots of the equation $a\tan\theta + b\sec\theta = c$ and $\tan(\alpha+\beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$, then prove that $\tan(\alpha+\beta) = \frac{2ac}{a^2 - c^2}$.

Q. 21. An aeroplane flying horizontally at a height of 2500 m above the ground is observed at an elevation of 60°, and after 15 seconds, the elevation is observed to be 30°. Find the speed of the aeroplane in km/hr.

Q. 22. Two pillars of equal height are on either side of a road, which is 100 m wide. The angles of elevation of the top of the pillars are 60° and 30° at a point on the road between the pillars. Find the position of the point from the pillars. Also , find the height of each pillar.

Q. 23. From the top of a tower 50 m high the angles of depression of the top and bottom of a pole are observed to be 45° and 60° respectively. Find the height of the pole.

Q. 24. A bird is sitting on the top of a tree, which is 80m high. The angle of elevation of the bird, from a point on the ground is 45°.The bird flies away from the point of observation horizontally and remains at a constant height.After 2 seconds, the angle of elevation of the bird from the point of observation becomes 30°. Find the speed of flying of the bird.

Q. 25. From the top of a tower, the angles of depression of two objects on the same side of the tower are found to be A and B $(A > B)$. If the distance between the objects is 'p' metres, show that the height 'h' of the tower is given by

$$h = \frac{p\ tanA\ tanB}{tanA - tanB}$$

Q. 26. If the angle of elevation of a cloud from a point 'h' metres above a lake is A and the angle of depression of its reflection in the lake is B. Prove that the distance of the cloud from the point of observation is

$$\frac{2hsecA}{tanB - tanA}$$

Q. 27. A round balloon of radius 'a' subtends an angle θ at the eye of the observer while the angle of elevation of its centre is ϕ. Prove that the height of the centre of the balloon is $a\ sin\phi\ cosec\left(\frac{\theta}{2}\right)$.

Q. 28. A tower subtends an angle α at a point A in the plane of its base and the angle of depression of the foot of the tower at a point b metres just above A is β. Prove that the height of tower is b tan α cot β.

29. From the foot of a mountain, the elevation of its summit is 45^0after ascending 1000m towards the mountain up a slope of 30^0 inclination, the elevation is found to be 60^0. Find the height of the mountain.

Q. 30. If the angle of elevation of a cloud from a point h metres above the lake is α and the angle of depression of its reflection in the lake is β, prove that the height of cloud is
$h(\frac{tan\beta + tan\alpha}{tan\beta - tan\alpha})$.