PAPER – II

MATHEMATICS

1. The centre of the circle passing through the points (8, 12), (11, 3) and (0, 14) is

(1) (2, 5) (2) (–2, 5) (3) (3, 5) (4) (4, 6)

2. The co-ordinates of a point R which divides the line joining $A(-3, 3)$ and $B(2, -7)$ internally in the ratio 2 : 3 are

(1) (1, 1) (2) (–1, –1) (3) (2, –2) (4) (3, 3)

3. The co-ordinates of A and B are $(-3, a)$ and $(1, a+4)$ respectively. The mid point of AB is $(-1, 1)$ then the value of a is

(1) –2 (2) 2 (3) 1 (4) –1

4. If the value of $\sin\theta = \frac{3}{5}$, then the value of $\text{cosec}\,\theta + \tan\theta$ is

(1) $\frac{13}{5}$ (2) $\frac{1}{5}$ (3) $\frac{5}{3}$ (4) none of the above

5. If $\cos(40^\circ + x) = \sin 30^\circ$ then the value of x is

(1) $\frac{12}{5}$ (2) $\frac{12}{13}$ (3) $\frac{5}{12}$ (4) $\frac{5}{13}$

6. If $\text{cosec}\,\alpha = \frac{13}{12}$, then the value of $\tan\alpha$ is

(1) $\frac{12}{5}$ (2) $\frac{12}{13}$ (3) $\frac{5}{12}$ (4) $\frac{5}{13}$

7. If $\sin\alpha = \frac{1-x^2}{1+x^2}$, then the value of $\tan\alpha$ is equal to :

(1) $\frac{2x}{1-x^2}$ (2) $\frac{1-x^2}{2x}$ (3) $\frac{1}{1+x^2}$ (4) $\frac{1}{1-x^2}$

8. The value of $x^2 - 6x + 13$ can never be less than

(1) 5 (2) 4 (3) 6 (4) 13

9. If $y = x - x^2 + x^3 - x^4 + \cdots$ upto infinity, the value of x is

(1) $\frac{y}{1+y}$ (2) $\frac{y}{1-y}$ (3) $y - \frac{1}{y}$ (4) $y + \frac{1}{y}$

10. The solution of the equation $7^{1+x} + 7^{1-x} = 50$ is

(1) 0 (2) 2 (3) ± 1 (4) none of these

11. What must be subtracted from $\frac{x}{y}$ to make it $\frac{y}{x}$?

(1) $\frac{x^2 - y^2}{xy}$ (2) $\frac{x - y}{xy}$ (3) $\frac{y^2 - x^2}{xy}$ (4) $\frac{y - x}{xy}$

12. The sum of the roots of $\frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$ is zero. The product of the roots is

(1) $\frac{1}{2}(a^2 + b^2)$ (2) 0 (3) $\frac{1}{2}(a + b)$ (4) $2(a^2 + b^2)$

13. The value of x in the equation $\sqrt{2x + \sqrt{2x + 4}} = 4$ is

(1) 6 (2) 7 (3) 8 (4) none of the above

14. If α, β are the roots of equation $ax^2 - bx + b = 0$ then the valuc of $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} - \sqrt{\frac{b}{a}}$ is always equal to

(1) 2 (2) –1 (3) 0 (4) 1

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15. If the radius of a circle is increased by 100% then the area is increased by

(1) 100% (2) 200% (3) 300% (4) 400%

16. A rectangular garden has an area of 200 m^2 and its length and breadth are in the ratio 5 : 4. A road of uniform width runs inside the garden around the perimeter and has an area 344 m^2, then the width of the road is

(1) 4 m (2) 3.5 m (3) 3 m (4) 2 m

17. If the circumference of a circle is reduced by 50%, then the area will be reduced by

(1) 50% (2) 25% (3) 75% (4) 12.5%

18. The perimeter of one face of a cube is 20 m, then its volume is

(1) 800 m^3 (2) 1000 m^3 (3) 125 m^3 (4) 400 m^3

19. The volume of a circular cylinder, whose diameter is 10 cms and height 4 cms is

(1) 40 π cm^3 (2) 20 π cm^3 (3) 100 π cm^3 (4) 80 π cm^3

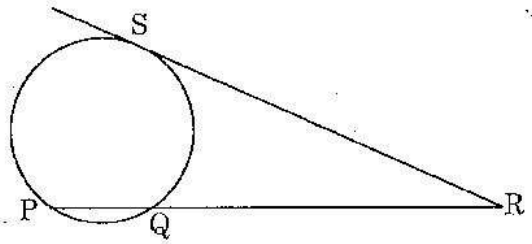
20. A closed box made of steel of uniform thickness has length, breadth and height 12 dm, 10 dm and 8 dm respectively. If the thickness of the steel sheet is 1 dm, then the inner surface area is

(1) 456 dm^2 (2) 376 dm^2 (3) 264 dm^2 (4) 696 dm^2

21. If AB and CD are two chords of a circle intersecting at P inside the circle such that $AB = 12$ cms, $AP = 2$ cms and $PD = 4$ cms. Find PC.

(1) 3 cms (2) 4 cms (3) 5 cms (4) 6 cms

22. In the following figure, RS is a tangent, $PQ = 12$ cm and $QR = 4$ cm. Then RS is

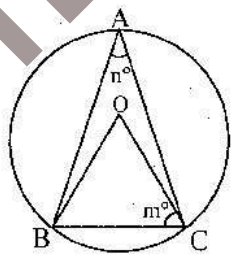


(1) 9 cm (2) 8 cm (3) 10 cm (4) 11 cm

23. If the bases of two similar triangles are in the ratio of 2 : 3, then their areas are in the ratio of

(1) 2 : 3 (2) 3 : 2 (3) 4 : 9 (4) 9 : 4

24. In the figure below, O is the centre of the circle and $\angle BAC = n^\circ$, $\angle OCB = m^\circ$, then



(1) $m + n = 90^\circ$ (2) $m + n = 180^\circ$ (3) $m + n = 120^\circ$ (4) $m + n = 150^\circ$

25. A circle has two equal chords AB and AC, chord AD bisects BC in E. If $AC = 12$ cm and $AE = 8$ cm, then the measure of AD is

(1) 24 cm (2) 18.5 cm (3) 18 cm (4) 19 cm

26. The value of $5\sqrt{3} - 3\sqrt{12} + 2\sqrt{75}$ on simplifying is

(1) $5\sqrt{3}$ (2) $6\sqrt{3}$ (3) $\sqrt{3}$ (4) $9\sqrt{3}$

27. Choose the wrong statement.

(1) There is no largest natural number

(2) There is no largest whole number

(3) Every natural number is a whole number

(4) All natural numbers together with zero are called integers

28. In an arithmetic progression, the 4th term is 11 and the 12th term is 35, then the first term of the series is

(1) 5 (2) 4 (3) 3 (4) 2

29. The first term of A.P. whose third term is 16 and the difference of 5th and 7th term is 12 is

(1) 7 (2) 6 (3) 5 (4) 4

30. If $a^x = b,\ b^y = c,\ c^z = a$, then the value of xyz is

(1) 0 (2) 1 (3) $\frac{1}{abc}$ (4) abc

31. Which one of the following is true?

(1) $\sin(90^\circ - \theta) = \sin\theta$ (2) $\cos(90^\circ - \theta) = \cos\theta$

(3) $\sin(90^\circ - \theta) = \cos\theta$ (4) $\tan(90^\circ + \theta) = \tan\theta$

32. α and β are angles in the first quadrant, $\tan\alpha = \frac{1}{7}$, $\sin\beta = \frac{1}{\sqrt{10}}$. Then using formula $\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$, the value of $\alpha + 2\beta$ is equal to

(1) 0° (2) 45° (3) 60° (4) 90°

33. In an acute angled triangle ΔABC, $a = 4$ cm, $b = 6$ cm. $\sin B = \frac{3}{4}$, then the value of angle A is

(1) 30° (2) 45° (3) 60° (4) none of these

34. The value of $\tan^2 30^\circ + 4\sin^2 45^\circ + \frac{1}{3}\cos^2 30^\circ$ is

(1) $2\frac{7}{12}$ (2) $1\frac{5}{12}$ (3) $-2\frac{5}{12}$ (4) $-1\frac{5}{12}$

35. Which of the following relation is true?

(1) $\cos^2\theta - \sin^2\theta = 1$ (2) $\text{cosec}^2\theta - \sec^2\theta = 1$

(3) $\cot^2\theta - \tan^2\theta = 1$ (4) $\sec^2\theta - \tan^2\theta = 1$

36. The value of x satisfying the equation $px^2 + (4p - 3q)x - 12pq = 0$ is

(1) $x = \frac{p}{3q}$ (2) $x = \frac{3p}{q}$ (3) $x = \frac{3q}{p}$ (4) $x = \frac{-3q}{p}$

37. The sum of two numbers is 20 and their product is 40. The sum of their reciprocals is

(1) $\frac{1}{10}$ (2) $\frac{1}{2}$ (3) 2 (4) 14

38. If D is any point on the side BC of ΔABC such that ΔADB and ΔADC are equal in area, then

(1) AD is the median (2) AD is the altitude

(3) AD is an angle bisector (4) AD is any line

39. The sides of a triangle are 5 cms, 6 cms and 7 cms. One more triangle is formed by joining the mid points of the sides. The perimeter of the second triangle is

(1) 18 cms (2) 12 cms (3) 9 cms (4) 6 cms

40. In a right angled triangle the square of the hypotenuse is twice the product of the square of the other sides. Then the triangle is

(1) equilateral (2) isosceles

(3) of $\angle$s 30°, 60°, 90° (4) of $\angle$s 40°, 50°, 90°

41. If the three altitudes of a triangle are equal, then the triangle is

(1) isosceles (2) right angled triangle

(3) equilateral (4) none of these

42. A rectangular paper of dimensions 6 cm and 3 cm is rolled to form a cylinder with height equal to the width of the paper, then its base radius is

(1) $\frac{6}{\pi}$ cm (2) $\frac{3}{2\pi}$ cm (3) $\frac{6}{2\pi}$ cm (4) $\frac{9}{2\pi}$ cm

43. The difference between the maximum and the minimum observations in the data is

(1) class interval (2) frequency

(3) cummulative frequency (4) range

44. For two events A and B, $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cup B) = 0.6$ then $P(A/B)$ is

(1) 0.75 (2) 0.60 (3) 0.80 (4) 0.30

45. A school has 20 teachers, one of them retires at the age of 60 years and a new teacher replaces him, this change reduces the average age of the staff by 2 years, the age of the new teacher is

(1) 28 years (2) 25 years (3) 20 years (4) 18 years

46. If A and B are two independent events such that the probability that both A and B occur is $\frac{1}{8}$, $P(B) = \frac{1}{2}$ and the probability that neither of them occurs is $\frac{3}{8}$ then the probability of the occurrence of A is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{4}$ (4) $\frac{1}{5}$.

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47. A circle is entirely in another circle. It is possible to draw

(1) only one common tangent (2) two common tangents

(3) no common tangent (4) infinite number of tangents

48. In an equiangular triangle incentre, circumcentre and orthocentre are

(1) collinear (2) concyclic (3) coincident (4) none of these

49. In ΔABC, AD is drawn such that ΔABD and ΔACD are equal in area then AD is

(1) any segment drawn from A to BC (2) the bisector of $\angle BAC$

(3) A median of ΔABC (4) none of these

50. What points on the X-axis are at a distance of 5 units from the point $(5, -4)$?

(1) (2, 0), (–8, 0) (2) (2, 1), (8, 1)

(3) (–2, 0), (–8, 0) (4) none of these

51. The centre of the circle passing through the points (5, 7), (6, 6) and (2, –2) is

(1) (2, –3) (2) (2, –1) (3) (2, 3) (4) none of these

52. The length of a line segment is of 10 units and the co-ordinates of one end point are (2, –3). If the abscissa of the other end is 10, then the ordinate of the other end is

(1) 3 or –9 (2) 3 or 9 (3) – 3 or 9 (4) – 3 or – 9

53. If x and y are positive with $x - y = 2$ and $xy = 24$ then $\frac{1}{x} + \frac{1}{y}$ is equal to

(1) $\frac{5}{12}$ (2) $\frac{1}{12}$ (3) $\frac{1}{6}$ (4) $\frac{25}{6}$

54. If one root of $x^2 - 4x + K = 0$ is 6, then the value of K is

(1) 12 (2) 2 (3) -2 (4) -12

55. The number of solutions of the equations $3x - 5y = 9$ and $24x - 72 = 42y$ is

(1) 1 (2) 2 (3) 3 (4) no solution

56. A man's age is six times that of his son's age. In six years the father's age will be three times of the son's age. The age of the father and the son are respectively

(1) 18, 3 (2) 30, 5 (3) 24, 4 (4) 42, 7

57. If sum of the roots is p and sum of their squares is q^2, the equation is

(1) $x^2 - px + p^2q^3 = 0$ (2) $x^2 - px + q^3 = 0$

(3) $x^2 - px + (p^2 - q^2)/2 = 0$ (4) none of these

58. If $f(x) = x^2 - 2x + 1$ and $x \subset R$, the minimum value of $f(x)$ is

(1) 0 (2) -10 (3) -1000 (4) not defined

59. If one root of the quadratic equation is $\sqrt{3} + 1$, the equation is

(1) $x^2 - 2x - \sqrt{3} = 0$ (2) $x^2 - 2\sqrt{3}x + 2 = 0$

(3) $x^2 - 2x - 2 = 0$ (4) $x^2 + 2\sqrt{3}x + 23 = 0$

60. If $\cos\theta = \frac{3}{5}$, then the value of $\frac{\sin\theta \cdot \tan\theta + 1}{2\tan^2\theta}$ is

(1) $\frac{88}{166}$ (2) $\frac{91}{160}$ (3) $\frac{92}{160}$ (4) $\frac{93}{160}$

61. On the level of ground, the angle of elevation of the top of a town is 30°, on moving 20 metres nearer to it the angle of elevation is 60°. The height of the tower is

(1) 10 mts (2) 15 mts (3) 20 mts (4) $10\sqrt{3}$ mts

62. What is the angle of elevation of the sun, when the length of the shadow of a pole is $\sqrt{3}$ times the height of the pole?

(1) 30° (2) 45° (3) 60° (4) 75°

63. One side of a parallelogram is 8 cm. If the corresponding altitude is 6 cm, then its area is given by

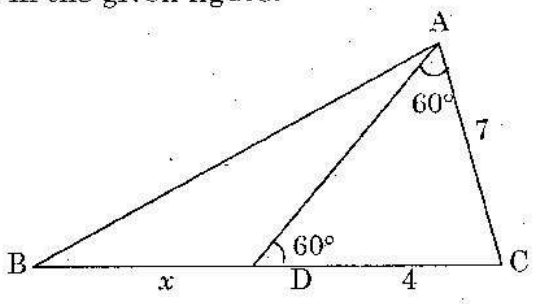
(1) 24 cm^2 (2) 36 cm^2 (3) 40 cm^2 (4) 48 cm^2

64. A rectangle is 8 cm longer than its width. A square of side x cm has been cut out of it. If x cm is half the width of the rectangle, then the remaining area is

(1) $(2x^2 + 8x)$ cm^2 (2) $(2x^2 + 16x)$ cm^2

(3) $(3x^2 + 8x)$ cm^2 (4) $(3x^2 + 16x)$ cm^2

65. Find the value of x in the given figure.



(1) 8 (2) 8.25 (3) 9.25 (4) 6.4

66. Sides of various triangles are given below. Which of them is not a right triangle?

(1) 3, 4, 5 (2) 8, 6, 10 (3) 6, 12, 16 (4) 15, 20, 25

67. If corresponding sides of two similar triangles are in the ratio of 5 : 6, then ratio of their areas will be

(1) 5 : 6 (2) 25 : 36 (3) 8 : 12 (4) none of these

68. If hypotenuse of an isosceles right triangle is $8\sqrt{2}$ cm, find its area

(1) 32 cm^2 (2) 64 cm^2 (3) $64\sqrt{2}$ cm^2 (4) none of these

69. In a ΔABC if $\angle B = 90°$ and D is the mid point of AC then BD = ?

(1) AD only (2) $AD = DC$ (3) $\sqrt{AD \times DC}$ (4) none of these

70. The distance between centres of two circles is 2.5 cm. The radii are 1 cm and 3.5 cm. Where do they touch?

(1) at a point externally
(2) at two distinct points
(3) at only one point
(4) they do not touch anywhere

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