CENTRE FOR PEDAGOGICAL STUDIES IN MATHEMATICS (CPSM)
ACHIEVEMENT-CUM-DIAGNOSTIC TEST IN MATHEMATICS-2022

INSTRUCTION: Write your Name, Class, Roll No. etc. in the answersheet. Select the correct answer out of (a), (b), (c) and (d) of particular item and blaken the specific rectangle ■ with H.B. pencil denoting the correct answer. For example, if (c) is the correct answer to Q. No. X: blacken like this: Q. No. X: □ □ ■ □ Rough work is to be done on separate paper. Marks will be deducted for wrong answer. Don't waste time for answering a question which appears difficult to you, better try the next question.

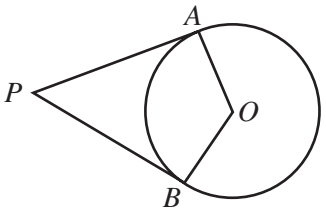
1. The diameter BC intersects the chord AD at P and $\angle ACB = 70°$. The complement of $\angle ADC$ is

   (a) 20° (b) 70° (c) 30° (d) 35°

2. $ABCD$ is a cyclic quadrilateral, then $\tan\frac{A}{2}\tan\frac{C}{2} + \tan\frac{B}{2}\tan\frac{D}{2} =$

   (a) 0 (b) 1 (c) 2 (d) 4

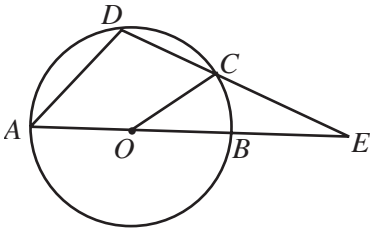
3. In the adjoining figure O is the centre of the circle, PA and PB are two tangents from an external point P, if $\angle AOB = 130°$, find $\angle APB$.



   (a) 40° (b) 55°

   (c) 50° (d) 60°

4. In the adjoining figure O is the centre of a circle, AB is a diameter and DC is a chord. AB and DC when produced meet at E, $\angle AOC = 150°$ and $\angle BAD = 40°$. Find $\angle BEC$.



   (a) 25° (b) 30°

   (c) 40° (d) 35°

5. O is the circumcentre of the obtuse angled triangle ABC in which $\angle BAC$ is obtuse and $\angle OCB = \theta$; find $\angle BAC$.

   (a) $180° - 2\theta$ (b) $180° - \theta$ (c) $90° - \theta$ (d) $90° + \theta$

6. In $\triangle PQR$, $PQ = PR$, The circle drawn with PQ as diameter intersects QR at S. If $QS = 4$ cm, find RS

   (a) 3.5 cm (b) 4 cm

   (c) 2 cm (d) none of these

7. In the cyclic quadrilateral $ABCD$, $AB = AD$, $\angle DAC = 60°$ and $\angle BDC = 50°$. The measure of $\angle ACD$ is

   (a) 35° (b) 45° (c) 50° (d) 65°

8. O is the centre of a circle, QR is a chord, $OM \perp QR$, if $OM = 4$ cm, find PR.

   (a) 4 cm (b) 8 cm (c) 6 cm (d) none of these

9. O is the centre of a circle with radius 5 cm, LM is a diameter of the circle, P is a point on the plane of the circle such that $LP = 6$ cm and $MP = 8$ cm, then P lies

   (a) on LM (b) outside the circle

   (c) inside the circle (d) on the circle

10. Given a circle with centre O. The smallest chord PQ is of length 4 cm, largest chord AB is of lengh 10 cm and the chord EF is of length 7 cm, then the radius of the circle is

    (a) 3 cm (b) 3.5 cm (c) $7\frac{1}{3}$ cm (d) 5 cm

11. Which one of the following statements is wrong?

    (a) There is one and only one circle passing through three points.

    (b) An isosceles trapezium is cyclic.

    (c) The tangents are equally inclined to the line joining the external point (from where te tangents are drawn) and the centre of the circle.

    (d) The angle between two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segments joining the points of contact at the centre.

12. The radius of a circle is 6 cm. The perpendicular distance from the centre of the circle to the chord which is 8 cm in length is

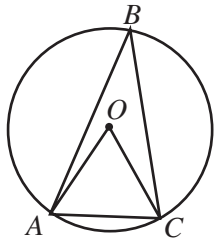
(a) $\sqrt{5}$ cm (b) $2\sqrt{5}$ cm (c) $2\sqrt{7}$ cm (d) 5 cm

13. AC is the diameter of the circumcircle of the cyclic quadrilateral $ABCD$. If $\angle BDC = 42°$, find $\angle ACB$.

(a) 42° (b) 48°

(c) 58° (d) none of these

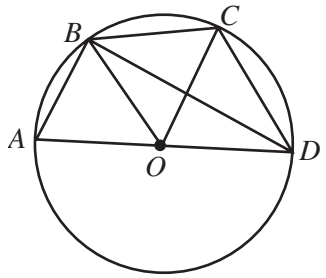
14. In the adjoining figure O is the centre of a circle and chord AC = radius of the circle, find the measure of the angle ABC.



(a) 60° (b) 45°

(c) 25° (d) 30°

15. In the adjoining figure AOD is a diameter of the circle with centre O. Given that $\angle ADB = 18°$, find the mesure of $\angle BCD$.



(a) 120° (b) 108°

(c) 110° (d) 100°

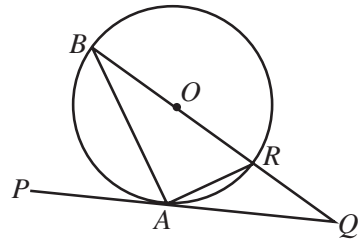
16. If two tangents are drawn from an external point to a circle of radius 4 cm and the length of each tangent is $4\sqrt{3}$ cm, then the distance of the point from the centre is

(a) $4\sqrt{3}$ cm (b) 4 cm (c) 8 cn (d) $4\sqrt{2}$ cm

17. Two circles of radii 25 cm and 9 cm touch each other externally. Find the length of the direct common tangent.

(a) 34 cm (b) 36 cm (c) 30 cm (d) 27 cm

18. In the adjoining figure, O is the centre of a circle, PQ is the tangent to the circle at A. If $\angle PAB = 58°$ then $\angle AQB =$



(a) 32° (b) 26°
(c) 44° (d) 52°

19. Two circles intersect each other at O and P. AB is a common tangent to the circles. Then the sum of angles subtended by the line segment AB at O and P is equal to

(a) 90° (b) 150° (c) 270° (d) 180°

20. What is the distance between two parallel chords of lengths 32 cm and 24 cm in a circle of radius 20 cm?

(a) 4 cm (b) 28 cm

(c) 4 cm or 28 cm (d) 4 cm or 14 cm

21. The nature of the roots of $x^2 - 5x - 2 = 0$ is

(a) real and rational (b) imaginary

(c) real and irrational (d) real and equal

22. If $x = 3 + 2\sqrt{2}$ then $\frac{x^2+1}{x} =$

(a) $6\sqrt{2}$ (b) 12 (c) 3 (d) 6

23. For what value of k the difference of the roots of the equation $x^2 - kx + 8 = 0$ is 1.

(a) $\pm\sqrt{33}$ (b) 8 (c) 33 (d) $4\sqrt{2}$

24. If $x^2 + y^2 = 2\sqrt{2}x + 4\sqrt{2}y - 10$, then $\frac{x}{y} =$

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) 2 (d) None of these

25. Find the quadratic equation whose one root is $\frac{4+\sqrt{5}}{2}$.

(a) $6x^2 - 16x - 9 = 0$ (b) $4x^2 - 17x - 9 = 0$

(c) $x^2 - 5x + 8 = 0$ (d) $4x^2 - 16x + 11 = 0$

26. If the roots of the equation $2kx^2 + 5kx + 2 = 0$ be equal then k =

(a) 0 (b) $\frac{16}{25}$ (c) $\frac{5}{4}$ (d) $\frac{4}{5}$

27. If $(p + q) : \sqrt{pq} = 2 : 1$, then $p : q$ will be

(a) 2 : 1 (b) 1 : 2 (c) 1 : 1 (d) 1 : 4

28. If $x \propto \frac{1}{y}$ and $y \propto \frac{1}{z}$ then

(a) $x \propto yz$ (b) $x \propto z$ (c) $x \propto \frac{1}{z}$ (d) $x \propto z^2$

29. If $4a = 5b$ and $8b = 9c$, then $a : b : c$ =

(a) 45 : 36 : 32 (b) 45 : 27 : 32

(c) 5 : 4 : 3 (d) 4 : 10 : 9

30. If the sum of the roots of the equation $5x^2 + (p + q + r)x + pqr = 0$ is equal to zero, then the value of $p^3 + q^3 + r^3$ is

(a) 0 (b) 3 (c) pqr (d) $3pqr$

31. If $x = \frac{\sqrt{7}+\sqrt{3}}{\sqrt{7}-\sqrt{3}}$ and $xy = 1$ then $\frac{x^2+xy+y^2}{x^2-xy+y^2} =$

(a) $\frac{11}{12}$ (b) 1 (c) $\frac{12}{11}$ (d) $\frac{10}{11}$

32. If α and β be the roots of the equatin $x^2 - ax + b = 0$ and $A_n = \alpha^n + \beta^n$ then $A_{n+1} - aA_n + bA_{n-1} =$

(a) $a + b$ (b) a

(c) $-b$ (d) 0

33. If α and β be the roots of the equation $x^2 - 6x + 6 = 0$, then $\alpha^3 + \beta^3 + \alpha^2 + \beta^2 + \alpha + \beta =$

(a) 150 (b) 138 (c) 128 (d) 124

34. Two students A and B solve an equation of the form $x^2 + px + q = 0$, A starts with a wrong value of p and obtains the roots as 2 and 6, B starts with a wrong value of q and gets the roots as 2 and -9. What are the correct roots of the equation.

(a) 3, –4 (b) –3, 4 (c) –3, –4 (d) 3, 4

35. If $\log_4\log_4\log_4\log_4 x = 0$, then x =

(a) 4^{16} (b) 256^4 (c) 512 (d) 2^{512}

36. If $\sin\theta$ and $\cos\theta$ be the roots of the equation $ax^2 + bx + c = 0$, then the correct relation among a, b and c is—

(a) $(a + c)^2 = b^2 - c^2$ (b) $(a + c)^2 = b^2 + c^2$

(c) $(a - c)^2 = b^2 + c^2$ (d) $(a - c)^2 = b^2 - c^2$

37. If x varies directly as y and inversely as z, and $x = \frac{1}{6}$ when $y = 5$ and z = 9. Find the value of x when $y = 6$ and $z = \frac{1}{5}$.

(a) 3 (b) 81 (c) $\frac{1}{9}$ (d) 9

38. If $\frac{by+cz}{b^2+c^2} = \frac{cz+ax}{c^2+a^2} = \frac{ax+by}{a^2+b^2}$ then

(a) $x = y = z$ (b) $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$

(c) $\frac{x}{a^2} = \frac{y}{b^2} = \frac{z}{c^2}$ (d) $x + y + z = 1$

39. A positive integer is such that when its square added to its cube we get the next integer. The integer is

(a) 2 (b) 0

(c) 1 (d) none of these

40. A two digit number is less than twice the product of its digits by 8, if the digit in the ten's place is greater than the digit in the unit's place by 1; the number is

(a) 76 (b) 87

(c) 65 (d) none of these

41. The compound interest on Rs. 20480 at $6\frac{1}{4}\%$ per annum for 2 years 73 days is

(a) Rs. 3000 (b) Rs. 3131 (c) Rs. 2929 (d) Rs. 3636

42. The difference between simple and compound interest, compounded annually, on a sum of money for 2 years at 10% per annum is Rs. 65. The sum is

(a) Rs. 6500 (b) Rs. 65650

(c) Rs. 6565 (d) Rs. 65000

43. *A* and *B* started a business with initial investments in the ratio 12 : 11 and their annual profits were in the ratio 4 : 1. If *A* invested his money for 11 months, *B* invested his money for

(a) 7 months (b) 5 months (c) 4 months (d) 3 months

44. *A* is a working and *B* a sleeping partner in a business. *A* puts in Rs. 12000 and *B* Rs. 20000. *A* receives 10% of the profits for managing, the rest being divided in proportion of their capitals. Out of the total profit of Rs. 18000, the money received by *A* is

(a) Rs. 6480 (b) Rs. 8400

(c) Rs. 7875 (d) Rs. 8325

45. The difference between the interests received from two different banks on Rs. 5000 for 2 years is Rs. 25. The difference between their rates is

(a) 1% (b) 2.5%

(c) 0.5% (d) 0.25%

46. $\sum_{i=1}^{n}(x_i - \bar{x}) =$

(a) $n\bar{x}$ (b) $\bar{x}$

(c) 1 (d) none of these

47. If the median of a distribution is 28 and mean is 27.5, then the mode is

(a) 29.5 (b) 28.5 (c) 29 (d) 27

48. If $\Sigma f_i x_i = 216$ and $\Sigma f_i = 16$ and the mean of the distribution is $A + 13.5$, then $A =$

(a) 1 (b) 0 (c) $\frac{1}{16}$ (d) $\frac{1}{6}$

49. The mode of the distribution

wt. in kg	40	43	46	49	52	55
No. of boys	5	8	16	9	7	3

(a) 40 (b) 46 (c) 47 (d) 47.5

50. The mean of 100 observations is 45. It was later found that two obsevations 19 and 31 were incorrectly recorded as 91 and 13. The correct mean is—

(a) 45 (b) 44 (c) 45.54 (d) 44.46

51. In an isosceles right angled triangle the length of the median on the hypotenuse is 3 cm. The area of the triangle is

(a) 12 cm^2 (b) 9 cm^2 (c) 6 cm^2 (d) 18 cm^2

52. A square whose one side is 4 m has its corners cut away so as to form a octagon with all sides equal. Find the length of each side of the octagon.

(a) $2\sqrt{2}\left(\sqrt{2}-1\right)$ m (b) $2\sqrt{2}\left(\sqrt{2}+1\right)$ m

(c) $2\left(\sqrt{2}-1\right)$ m (d) $2\left(\sqrt{2}+1\right)$ m

53. In a cuboid the length of a diagonal is p, the total surface area is q and the sum of the length, breadth and height is r, then which one of the following relations is true?

(a) $r = \sqrt[4]{p^2 - q}$ (b) $r^2 = 4(p^2 + q^2)$

(c) $r^2 = 4(p^2 + q)$ (d) $r = \sqrt{p^2 - q}$

54. A cube has surface area S and volume V, then the volume of the cube whose surface area is $2S$ will be

(a) 2 V (b) 4 V (c) $\sqrt{2}$ V (d) $2\sqrt{2}V$

55. A metalic spherical shell of internal and external radii 2 cm and 4 cm respectively is melted and recast into the form of a cone of base radius 4 cm. The height of the cone is

(a) 15 cm (b) 14 cm (c) 12 cm (d) 18 cm

56. A tent is of the shape of a right circular cylinder upto a height of 3 metres then becomes a right circular cone with a maximum height of 13.5 metres above the ground. The radius of the base is 14 metres, the cost of painting the inner surface of the tent at the rate of Rs. 2 per square metre is

(a) Rs. 1034 (b) Rs. 2068 (c) Rs. 3102 (d) Rs. 1540

57. If h, c, V are respectively the height, the curved surface area and volume of a right circular cone, then $3\pi Vh^3 - c^2h^2 + 9V^2 =$

(a) 3 (b) 1 (c) 0 (d) 2

58. A container in the form of a right circular cylinder surmounted by a hemisphere of the same radius 15 cm as the cylinder. If the volume of the container is $32400\,\pi/\text{cm}^3$ then the height h cm of the container satisfies which one of the following?

(a) 135 cm < h < 150 cm (b) 140 cm < h < 147 cm

(c) 145 cm < h < 148 cm (d) 139 cm < h < 145 cm

59. A hemispherical bowl has its external diameter 10 cm and thickness 1 cm. The whole surface area of the bowl is

(a) 82 π cm^2 (b) $28\frac{2}{7}$ cm^2 (c) 276 cm^2 (d) 286 cm^2

60. The sum of the radii of two spheres is 10 cm and the sum of their volumes is 880 cm^3. The numerical value of the product of their radii is

(a) 21 (b) $33\frac{1}{3}$ (c) $26\frac{1}{3}$ (d) 27

61. If $\sin(\theta - 30°) = \frac{\sqrt{3}}{2}$, find $\sec\frac{\theta}{2}$.

(a) 1 (b) $\frac{2}{\sqrt{3}}$ (c) 2 (d) $\sqrt{2}$

62. If $x\cos\theta = y\cot\theta = 1$, then the relation between x and y is

(a) $x^2 + y^2 = 1$ (b) $x^2 - y^2 = 1$

(c) $xy = 1$ (d) none of these

63. The relation obtained by eliminating θ from $x = a\sec^n\theta$ and $y = b\tan^n\theta$ is

(a) $\left(\frac{x}{a}\right)^{\frac{1}{n}} + \left(\frac{y}{b}\right)^{\frac{1}{n}} = 1$ (b) $\left(\frac{x}{a}\right)^{\frac{2}{n}} + \left(\frac{y}{b}\right)^{\frac{2}{n}} = 1$

(c) $\left(\frac{x}{a}\right)^{\frac{2}{n}} + \left(\frac{y}{b}\right)^{\frac{2}{n}} = 1$ (d) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

64. If $\left(1 + 4x^2\right)\cos\theta = 4x$ then $\frac{1+2x}{1-2x} =$

(a) $\text{cosec}\,\theta + \cot\theta$ (b) $\text{cosec}\,\theta - \cot\theta$

(c) $\sec\theta + \tan\theta$ (d) $\sec\theta - \tan\theta$

65. The angles of triangle are $\alpha - \beta$, α and $\alpha + \beta$. If the largest angle is twice the smallest angle then the circular measure of the largest angle is

(a) $\frac{4\pi}{7}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{4\pi}{9}$

66. If $\sin\theta = \frac{5}{12}$, find $\tan\theta + \sec\theta$.

(a) $\frac{3}{2}$ (b) $\frac{1}{2}$ (c) 3 (d) $\frac{5}{2}$

67. The ratio of the angles of a triangle is 2 : 3 : 4. The circular measure of the greatest angle of the triangle is

(a) $\frac{8\pi}{9}$ (b) $\frac{4\pi}{9}$

(c) $\frac{2\pi}{9}$ (d) none of these

68. In a triangle the length of the sides are 1. $\sin\theta$ and $\cos\theta$ units; the sine of the greatest angle of the triangle is

(a) 1 (b) 0 (c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

69. The angle of elevations of the top of a tower from two points in the same hrizontal line with the foot of the tower are complementary angles. If the distance of those two points from the foot of the tower be *a* metre and *b* metre respectively, then the height of the tower is

(a) $\frac{a+b}{2}$ m (b) $\frac{ab}{2}$ m (c) $\sqrt{ab}$ m (d) $\frac{1}{3}(a+b)$ m

70. The angles of elevation of the top and the bottom of a flag kept on a flagpost from a point 30 m away from the bottom of the flagpost are 45° and 30° respectively. What is the height of the flag? (take $\sqrt{3} = 1.732$)

(a) 17.32 m (b) 12.68 m (c) 6.34 m (d) 8.66 m

71. Find the missing term of the series 1, 2, 6, 24, …, 720.

(a) 120 (b) 100 (c) 104 (d) 108

72. If ÷ means +, – means ÷, × means –, and + means × then $32 \div 8 - 4 \times 12 + 4 =$

(a) – 41 (b) – 14 (c) 21 (d) 12

73. How many terms are there in the series 4, 7, 10, 13, … 148

(a) 25 (b) 51 (c) 37 (d) 49

74. The missing term of the series 3, 8, 18, ?, 53, 78 is

(a) 30 (b) 35 (c) 33 (d) 32

75. If $\sin(10 + 2x)^\circ = \cos(x - 40)^\circ$ then $\tan\frac{3x}{2} =$

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) 1 (d) 0

76. If $b \propto a^3$ and a increases by 10%, then by what percent b will increase?

(a) 33.1 % (b) 30 %

(c) 33 % (d) none of these

77. When $x^{40} + 2$ is divided by $x^4 + 1$, what is the remainder?

(a) 1 (b) 2 (c) 3 (d) 4

78. The positive integral values of m satisfying the inequations $8m + 35 > 75$ and $5m + 18 < 53$ is

(a) 5, 7 (b) 6 (c) 5, 6, 7 (d) 12

79. If $\cos^4\theta - \sin^4\theta = \frac{1}{3}$, then $\tan\theta =$

(a) $\frac{2}{3}$ (b) $\frac{1}{2}$ (c) $\sqrt{\frac{2}{3}}$ (d) $\frac{1}{\sqrt{2}}$

80. If $\sin^4\theta + \sin^2\theta = 1$, then $\cot^4\theta + \cot^2\theta =$

(a) 0 (b) 1 (c) 2 (d) 4

Alternative Questions for ICSE and CBSE candidates:

71. The 503th term of the sequence 9, 13, 17, 21, …, … is

(a) 2017 (b) 2008 (c) 2021 (d) 2013

72. If $2\cos 3\theta = 1$ and $0 < \theta < 90°$ then the value of θ is—

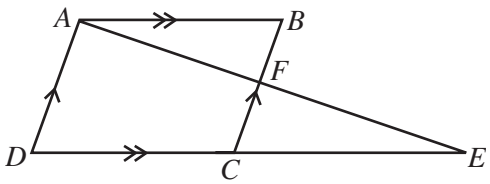
(a) 60° (b) 20° (c) 30° (d) 15°

73. If $A = \begin{bmatrix} 0 & a \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & -b \end{bmatrix}$, $M = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$ and $BA = M^2$ then the values of a and b are

(a) $a = -1$, $b = 2$ (b) $a = 1$, $b = -2$
(c) $a = -1$, $b = -2$ (d) $a = 2$, $b = 1$

74. Sailo has with her 'x' notes of Rs. 10 and the number of Rs. 20 notes with her two less than twice the number of Rs. 10 notes. If in all she has with her Rs. 1010, the number of Rs. 20 notes with her is

(a) 20 (b) 21 (c) 40 (d) 38

75. 

In the above figure $AB \parallel DE$ and $AD \parallel BC$ and AE intersects BC at F. If $AB = 3$ cm, $AF = 9$ cm and $CE = 5$ cm then $AE =$

(a) 24 cm (b) 18 cm (c) 15 cm (d) 12 cm

76. For the polynomial $x^2 + mx + n$, if $(x - 2)$ is its factor and $m + n = 1$, then find the values of m and n

(a) $m = -5$, $n = 6$ (b) $m = 6$, $n = -5$
(c) $m = 5$, $n = 6$ (d) $m = -5$, $n = -6$

77. How much CGST is charged when a buyer purchases goods worth Rs. 10,000 and GST rate is 18%?

(a) Rs. 1800 (b) Rs. 450
(c) Rs. 900 (d) None of these

78. If mean proportion of a and 54 is 18 then $a =$

(a) 9 (b) 6 (c) 3 (d) 2

79. Write the next two terms of the A.P. $-4, -\frac{1}{2}, 3, \frac{13}{2}, \ldots, \ldots, \ldots$

(a) $13\frac{1}{2}, 16\frac{1}{2}$ (b) 6, 9
(c) $\frac{11}{2}, 9$ (d) $10, 13\frac{1}{2}$

80. If $2x - 8 \geq 4$, $x \in \{1, 2, 3, \ldots \ldots 9, 10\}$ then the solution set has

(a) 6 elements (b) 4 elements
(c) 3 elements (d) 5 elements