



MATHEMATICS TALENT HUNT 2024

Organised by
The Pi Group of Mathematics (TPGM), Coochbehar
Registration No - SO031696 of 2022-2023

Class - X

Full Marks - 100

Time : 1 hr 30 min

INSTRUCTIONS

1. Candidates must write their Name, Class, Roll No. allotted for the exam and Name of their School correctly in the specific places of the answer sheet.
2. There are 50 questions of 2 marks each. Four possible options of answer are given for each question.
3. Candidates should choose the correct option and completely darken the circle with that option written in it in the answer sheet (OMR). For example, say the correct option for Question Number 10 is (c), then the candidate should darken the circle completely with 'c' written in it against the number 10 of the answer sheet. Use black ball pen or pencil for darkening.
4. There is no negative marking.

- 1) The number of real roots of the equation .

$$x^2 - 3|x| + 2 = 0$$

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

- 2) If common difference of an A . P is 7 , then $a_{25} - a_{21}$ is equal to

- (a) 14 (b) 7 (c) 28 (d) 35

- 3) The area of the largest triangle that can be inscribe in a semi circle of radius r is

- (a) r (b) 2r (c) r^2 (d) $\sqrt{r}$

- 4) If the perimeters of the base of two right circular cones are in the ratio 3 : 4 and their volumes are in the ratio 9 : 32 . Then the ratio of their heights is

- (a) 1 : 3 (b) 1 : 2 (c) 2 : 1 (d) 3 : 1

- 5) The probability of guessing the correct answer to a certain test questions is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$. Then x =

- (a) 2 (b) 3 (c) 4 (d) 6

- 6) If n is an even positive integer and $x > 0$, $x \neq 1$, then the median of the data

a , ax , ax^3 , ... , ax^n is [given $t_n = ax^{n-1}$]

- (a) ax^{n-1} (b) $ax^{n/2-1}$ (c) $ax^{n/2+1}$ (d) $ax^{n/2}$

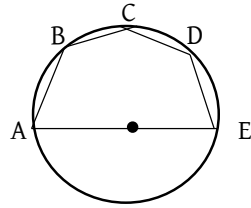
- 7) If the hight and base radius of a cone , each is increased by 50% , then the ratio between the volume of the given cone and the new cone is

- (a) 8 : 27 (b) 27 : 8 (c) 4 : 9 (d) 2 : 3

- 8) If two tangent inclined at an angle of 60° are drawn to a circle of radius 3 cm. Then length of each tangcet is equal to

- (a) $\frac{3\sqrt{3}}{2}$ cm (b) 6 cm (c) 3 cm (d) $3\sqrt{3}$ cm

- 9) In the given figure , AE is the diameter of the circle. Then the numerical value of $\angle ABC + \angle CDE$ is



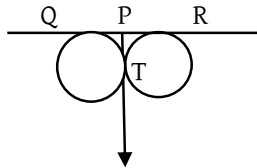
- (a) 90° (b) 180° (c) 270° (d) 135°
- 10) If the coordinates of one end of a diameter of a circle are $(2, 3)$ and the coordinates of its centre are $(-2, 5)$, then co-ordinates of the other end of the diameter are
 (a) $(-6, 7)$ (b) $(6, -7)$ (c) $(6, 7)$ (d) $(-6, -7)$
- 11) The 4th term from the end of the A . P
 $-11, -8, -5, \dots, 49$ is
 (a) 37 (b) 40 (c) 43 (d) 58
- 12) If $\sin \theta + \cos \theta = \sqrt{2}$, then $\tan \theta + \cot \theta = ?$
 (a) 1 (b) 2 (c) 3 (d) 4
- 13) If $\tan \alpha + \cot \alpha = 2$, then $\tan^{2020} \alpha + \cot^{2020} \alpha = ?$
 (a) 0 (b) 2 (c) 2020 (d) 2^{2020}
- 14) Five times a certain whole number is equal to threeless than twice the square of the number . Then the number is
 (a) -2 (b) -3 (c) 2 (d) 3
- 15) The co ordinates of the fourth vertex of the rectangle formed by the points $O(0, 0)$, A $(2, 0)$, B $(0, 3)$ are
 (a) $(3, 0)$ (b) $(0, 2)$ (c) $(2, 3)$ (d) $(3, 2)$
- 16) If the area of triangle formed by the points $O(0, 0)$, A $(a^{x^2}, 0)$ and B $(0, a^{6x})$ is $\frac{1}{2a^5}$ square units , then $x =$
 (a) 1 , 5 (b) -1 , 5 (c) 1 , -5 (d) -1 , -5
- 17) Which of the following relation will be true in the triangle ?
 (a) $\sin \frac{A+C}{2} = \cos \frac{B}{2}$ (b) $\sin \frac{A+B}{2} = \sin \frac{C}{2}$ (c) $\cos \frac{A+B}{2} = \cos \frac{C}{2}$ (d) $\cos \frac{A-B}{2} = \cos \frac{C}{2}$
- 18) If a digit is chosen at random from the digits 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 then the probability that it is odd , is
 (a) $\frac{4}{9}$ (b) $\frac{5}{9}$ (c) $\frac{1}{9}$ (d) $\frac{2}{3}$
- 19) The length of the tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm is
 (a) $\sqrt{7}$ cm (b) $2\sqrt{7}$ cm (c) 10 cm (d) 5 cm
- 20) If $(x, 2)$, $(-3, -4)$ and $(7, -5)$ are collinear , then $x =$
 (a) 60 (b) 63 (c) -63 (d) -60
- 21) The value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$ is
 (a) 4 (b) 3 (c) -2 (d) 3.5
- 22) $\left(3 - \frac{1}{n}\right) + \left(3 - \frac{2}{n}\right) + \left(3 - \frac{3}{n}\right) + \dots$ upto n terms is

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

23) If A (2, 2), B (-4, -4) and C (5, -8) are the vertices of a triangle, then the length of the median through vertex C is

- (a) $\sqrt{65}$ (b) $\sqrt{117}$ (c) $\sqrt{85}$ (d) $\sqrt{113}$

24) Two equal circles touch each other at T, if QP = 4.5 cm, then QR = ?



- (a) 9 cm (b) 18 cm (c) 15 cm (d) 13.5 cm

25) If A is an acute angle in a right triangle ABC, right angled at B then the value of $\sin A + \cos A$ is

- (a) equal to 1 (b) greater than 1 (c) less than 1 (d) 2

26) A bag contains 5 red balls and n green balls. If the probability of drawing a green ball is three times that of a red ball, then the value of n is

- (a) 18 (b) 15 (c) 10 (d) 20

27) If $\tan \theta = \frac{4}{5}$ then the value of $\frac{5 \sin \theta - 2 \cos \theta}{5 \sin \theta + 2 \cos \theta}$ is

- (a) $\frac{1}{3}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) 6

28) The volume of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1 cm and height 5 cm is

- (a) $\frac{4}{3} \pi$ (b) $\frac{10}{3} \pi$ (c) 5π (d) $\frac{20}{3} \pi$

29) If $u_i = \frac{x_i - 25}{10}$, $\sum f_i u_i = 20$, $\sum f_i = 100$, then $\bar{x} =$

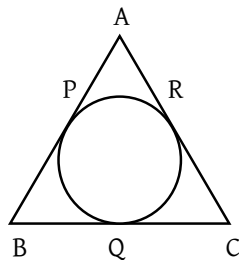
- (a) 23 (b) 24 (c) 27 (d) 25

30) If origin is centroid of a triangle where vertices are A (a, b), B (b, c) and C (c, a) then the value of $a^3 + b^3 + c^3$ is

- (a) 3bc (b) 3ab (c) 3abc (d) 3ca

31) In the Fig, the side AB, BC and CA of triangle ABC, touch a circle at P, Q and R respectively. If PA = 4 cm, BP = 3 cm and AC = 11 cm then length of BC is

- (a) 11 cm (b) 10 cm (c) 14 cm (d) 15 cm



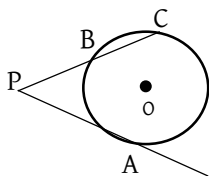
32) Quadratic equation where roots are the reciprocal of the roots of the equation $ax^2 + bx + c = 0$ is

- (a) $ax^2 + cx + b = 0$ (b) $cx^2 + bx + a = 0$ (c) $cx^2 - bx + a = 0$ (d) $cx^2 + bx - a = 0$

33) Sum of n term of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \dots$ is

- (a) $\frac{n(n+1)}{2}$ (b) $2n(n+1)$ (c) $\frac{n(n+1)}{\sqrt{2}}$ (d) 1

- 34) If the centroid of the triangle formed by the points $(3, -5)$, $(-7, 4)$, $(10, -k)$ is at the point $(k, -1)$ then $k =$
 (a) 3 (b) 1 (c) 2 (d) 4
- 35) The line through $A(-2, 3)$ and $B(4, b)$ perpendicular to the line $2x - 4y = 5$. then the value of b is
 (a) $b = -9$ (b) $b = 9$ (c) $b = 0$ (d) $b = \frac{3}{4}$
- 36) In the given fig. AB is the diameter of the circle, with centre O , and AT is the tangent. then the numerical value of x is
 (a) 20° (b) 58° (c) 68° (d) 78°
- 37) Three identical coins are tossed together what is the probability of obtaining at least one head.
 (a) $\frac{3}{8}$ (b) $\frac{1}{8}$ (c) $\frac{1}{2}$ (d) $\frac{7}{8}$
- 38) If θ and $(2\theta - 45^\circ)$ are acute angles such that $\sin \theta = \cos(2\theta - 45^\circ)$, then $\tan \theta$ is equal to
 (a) 1 (b) -1 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$
- 39) The mean of 1, 3, 4, 5, 7, 4 is m . the numbers 3, 2, 2, 4, 3, 3, p have mean $m-1$ and median q then $p+q =$
 (a) 4 (b) 5 (c) 6 (d) 7
- 40) If the sum and product of the roots of the equation $kx^2 + 6x + 4k = 0$ are equal, then the value of k is
 (a) $-\frac{3}{2}$ (b) $\frac{3}{2}$ (c) $\frac{2}{3}$ (d) $-\frac{2}{3}$
- 41) If mode of a series exceeds its mean by 12, then mode exceeds the median by
 (a) 4 (b) 8 (c) 6 (d) 10
- 42) If $\cos(81^\circ + \theta) = \sin\left(\frac{k}{3} - \theta\right)$ then k is equal to
 (a) $43\frac{1}{2}^\circ$ (b) 54° (c) 27° (d) $13\frac{1}{2}^\circ$
- 43) A man is climbing a ladder which is inclined to the wall at an angle of 30° . If he ascends at the rate 2m/sec then approaches the wall at the rate of
 (a) 2m/sec (b) 2.5m/sec (c) 1m/sec (d) 1.5m/sec
- 44) In the given figure if $PA = 20\text{cm}$ $PB = 16\text{cm}$ and $BC = x$ cm then the value of x is



- (a) 4 cm (b) 256 cm (c) 400 cm (d) 9 cm
- 45) The co ordinates of the circum centre of the triangle formed by the points $O(0, 0)$ $A(a, 0)$ and $B(0, b)$ are
 (a) (a, b) (b) $\left(\frac{a}{2}, \frac{b}{2}\right)$ (c) $\left(\frac{b}{2}, \frac{a}{2}\right)$ (d) (b, a)

46) The angles of a polygon are in A.P with common differences 5° . If the smallest angle is 120° , find the number of sides of the polygon.

- (a) 5 (b) 8 (c) 16 (d) 9 or 16

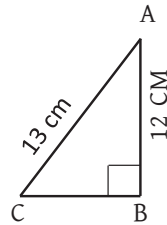
47) If the mean of the following frequency distribution is 2.6, then the value of p is ?

Variate (X) : 1 2 3 4 5

Frequency (f) : 4 5 y 1 2

- (a) 3 (b) 8 (c) 13 (d) 24

48) In the given fig. $\tan A - \cot C$ is equal to



- (a) 0 (b) $\frac{5}{12}$ (c) $\frac{7}{13}$ (d) $-\frac{7}{13}$

49) If the height of a vertical pole is $\sqrt{3}$ times the length of its shadow on the ground, then the angle of elevation of the sun at that time is

- (a) 30° (b) 60° (c) 45° (d) 75°

50) The probability that a leap year selected at random will contain 53 Sunday is

- (a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) $\frac{5}{7}$