



MATHEMATICS TALENT HUNT 2023

Organized by : The Pi Group of Mathematics (TPGM), Cooch Behar

Registration No. – S0031696 of 2022-23

Class – X

Full Mark : 100

Time : 2 Hours.

Instructions

1. There are 50 question of 2 marks each.
2. Put tick mark ($\sqrt{}$) only on the correct alternative against each question in your answer sheet.
3. There is no negative marking.

39. If ABC is a triangle right angled at B and M, N are the mid points of AB and BC respectively then, $4(AN^2 + CM^2) = ?$

- (a) $4AC^2$ (b) $5AC^2$ (c) $\frac{5}{4}AC^2$ (d) $6AC^2$

40. In a circle of radius 10 cm, two chords $AB = AC = 12$ cm. The length of the chord BC is –

- (a) 12 cm (b) 9.6 cm (c) 19.2 cm (d) 7.2 cm

41. Let a and b be two positive integers such that $a = p^3q^4$ and $b = p^2q^3$, where p and q are prime numbers. If $HCF(a, b) = p^m q^n$ and $LCM(a, b) = p^r q^s$ then $(m + n)(r + s) = ?$

- (a) 15 (b) 30 (c) 35 (d) 72

42. If p is a prime number, the quadratic equation having its roots as a factor of p is –

- (a) $x^2 - px + p = 0$ (b) $x^2 - (p + 1)x + p = 0$ (c) $x^2 + (p + 1)x + p = 0$
(d) $x^2 - px + p + 1 = 0$

43. If α and β are the zeros of a polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$ then p is –

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

44. If the system of equation $3x + y = 1$ and $(2k - 1)x + (k - 1)y = 2k + 1$ is inconsistent then, $k = ?$

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

45. If the vertices of a parallelogram PQRS taken in order are $P(3,4)$, $Q(2,-3)$ and $R(-3,-2)$ then the co-ordinates of the fourth vertex S is –

- (a) $(-2,-1)$ (b) $(-2,-3)$ (c) $(2,-1)$ (d) $(1,2)$

46. $\triangle ABC \sim \triangle PQR$. If AM and PN are the altitude of $\triangle ABC$ and $\triangle PQR$ respectively and $AB^2 : PQ^2 = 4 : 9$, then $AM : PN = ?$

- (a) 3:2 (b) 16:81 (c) 4:9 (d) 2:3

47. If $x \tan 60^\circ \cos 60^\circ = \sin 60^\circ \cot 60^\circ$, then $x = ?$

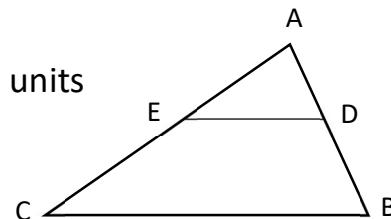
- (a) $\cos 30^\circ$ (b) $\tan 30^\circ$ (c) $\sin 30^\circ$ (d) $\cot 30^\circ$

48. If $\sin \theta + \cos \theta = \sqrt{2}$, then $\tan \theta + \cot \theta = ?$

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

49. In the figure $DE \parallel BC$, $AE = a$ units, $EC = b$ units, $DE = x$ units and $BC = y$ units. Which of the following is true?

- (a) $x = \frac{a+b}{ay}$ (b) $y = \frac{ax}{a+b}$ (c) $x = \frac{ay}{a+b}$ (d) $\frac{x}{y} = \frac{a}{b}$



50. If the difference of Mode and Median of a data is 24, then the difference of Median and Mean is –

- (a) 8 (b) 12 (c) 24 (d) 36

← x →

1. The ratio of LCM and HCF of the least composite and the least prime number is –

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

2. The length of the diagonals of a rhombus are 24 cm and 32 cm. Then the length of the altitude of the rhombus is –

- (a) 12 cm (b) 12.8 cm (c) 19 cm (d) 19.2 cm

3. Two fair coins are tossed. What is the probability of getting at most one head?

- (a) $\frac{3}{4}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{3}{8}$

4. If $2 \sin^2 A - \cos^2 A = 2$, then A is – (a) 0° (b) 90° (c) 45° (d) 30°

5. The distance of the point $A(-5,6)$ from the origin is –

- (a) 11 units (b) 61 units (c) $\sqrt{11}$ units (d) $\sqrt{61}$ units

6. If $217x + 131y = 913$ and $131x + 217y = 827$, then $x + y =$ –

- (a) 5 (b) 6 (c) 7 (d) 8

7. The smallest number by which $\frac{1}{13}$ should be multiplied so that its decimal expansion terminates after two decimal places is –

- (a) $\frac{13}{100}$ (b) $\frac{13}{10}$ (c) $\frac{100}{13}$ (d) $\frac{10}{13}$

8. The circumference of a circle is 100 cm. The side of the square inscribed in the circle is –

- (a) $50\sqrt{2}$ cm (b) $\frac{100}{\pi}$ cm (c) $\frac{50\sqrt{2}}{\pi}$ cm (d) $\frac{100\sqrt{2}}{\pi}$ cm

9. If the sum of zeros of the quadratic polynomial $5x^2 - px + 8$ is 4, then the value of 'p' is

- (a) 10 (b) 20 (c) 30 (d) 40

10. If in two triangle $\triangle DEF$ and $\triangle PQR$, $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is not true?

- (a) $\frac{EF}{PR} = \frac{DF}{PQ}$ (b) $\frac{DE}{PQ} = \frac{FE}{RP}$ (c) $\frac{DE}{QR} = \frac{DF}{PQ}$ (d) $\frac{EF}{RP} = \frac{DE}{QR}$

11. If n is a natural number, then $9^{2n} - 4^{2n}$ is always divisible by –

- (a) 5 (b) 13 (c) both 5 and 13 (d) none of these

12. If the system of equations $2x + 3y = 7$ and $(a + b)x + (2a - b)y = 21$ has infinitely many solutions then
 (a) $a = 1, b = 5$ (b) $a = 5, b = 1$ (c) $a = -1, b = 5$ (d) $a = 5, b = -1$
13. If $\tan \theta = \frac{1}{\sqrt{7}}$, then $\frac{\operatorname{cosec}^2 \theta - \sec^2 \theta}{\operatorname{cosec}^2 \theta + \sec^2 \theta} = ?$
 (a) $\frac{5}{7}$ (b) $\frac{3}{7}$ (c) $\frac{1}{12}$ (d) $\frac{3}{4}$
14. If $\sec \theta + \tan \theta = x$, then $\tan \theta = ?$
 (a) $\frac{x^2+1}{x}$ (b) $\frac{x^2-1}{x}$ (c) $\frac{x^2+1}{2x}$ (d) $\frac{x^2-1}{2x}$
15. One of the methods to determining mode is –
 (a) Mode = 2 Median – 3 mean (b) Mode = 2 Median + 3 Mean (c) Mode = 3 Median – 2 Mean (d) Mode = 3 Median + 2 Mean
16. If $x^2 + k(4x + k - 1) + 2 = 0$ has equal roots, then k is –
 (a) $-\frac{2}{3}, 1$ (b) $\frac{2}{3}, -1$ (c) $-\frac{3}{2}, \frac{1}{3}$ (d) $-\frac{3}{2}, -\frac{1}{3}$
17. The next term of the AP $\sqrt{7}, \sqrt{28}, \sqrt{63}, \dots$ is –
 (a) $\sqrt{70}$ (b) $\sqrt{84}$ (c) $\sqrt{97}$ (d) $\sqrt{112}$
18. 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
19. A ladder makes an angle of 60° with the ground when placed against a wall. If the foot of the ladder is 2 m away from the wall, then the length of the ladder is –
 (a) $\frac{4}{\sqrt{3}}$ m (b) $4\sqrt{3}$ m (c) $2\sqrt{2}$ m (d) 4 m
20. A box contains 90 discs numbered from 1 to 90. If one disc is drawn randomly from the box, the probability that it bears a prime number less than 23 is –
 (a) $\frac{7}{90}$ (b) $\frac{1}{9}$ (c) $\frac{4}{45}$ (d) $\frac{9}{89}$
21. The perimeter of a triangle with vertices (0,4), (0,0) and (3,0) is –
 (a) $7+\sqrt{5}$ units (b) 5 units (c) 10 units (d) 12 units
22. The area of a circle whose area and circumference are numerically equal is –
 (a) 2π sq units (b) 4π sq units (c) 6π sq units (d) 8π sq units
23. The number of solid spheres, each of diameter 6 cm that can be made by melting a solid metal cylinder of height 45 cm and diameter 4 cm is –
 (a) 3 (b) 5 (c) 4 (d) 6

24. $81^{2.5} \times 9^{4.5} \div 3^{4.8} = 9^?$
 (a) 7.1 (b) 9.4 (c) 4.7 (d) 4.5
25. If $1^3 + 2^3 + 3^3 + \dots + 10^3 = 3025$ then $4 + 32 + 108 + \dots + 4000$ is equal to –
 (a) 12000 (b) 12100 (c) 12200 (d) 12400
26. $1 + 2 + 3 + \dots + 48 + 49 + 50 + 49 + 48 + \dots + 3 + 2 + 1$ is –
 (a) 2525 (b) 2500 (c) 1250 (d) 5000
27. The positive square root of $\sqrt{48} - \sqrt{45}$ is –
 (a) $\frac{\sqrt[4]{3}}{\sqrt{2}}(\sqrt{5} - \sqrt{3})$ (b) $\frac{\sqrt[4]{3}}{2}(\sqrt{5} - \sqrt{3})$ (c) $\frac{\sqrt{2}}{\sqrt[4]{3}}(\sqrt{5} - \sqrt{3})$ (d) $\frac{\sqrt{2}}{\sqrt[4]{3}}(\sqrt{5} + \sqrt{3})$
28. Find out the missing term in the series 122, 145, 170, 197, _____, 257
 (a) 230 (b) 240 (c) 226 (d) 224
29. If $a : b : c = (y-z) : (z-x) : (x-y)$, then the value of $ax+by+cz$ is –
 (a) 1 (b) 3 (c) 0 (d) -1
30. A single discount equal to three consecutive discount of 10%, 12% and 5% is –
 (a) 26.27% (b) 24.76% (c) 9% (d) 11%
31. If $x = r \sin \theta \cos \phi$, $y = r \sin \theta \sin \phi$ and $z = r \cos \theta$, then $x^2 + y^2 + z^2$ is independent of –
 (a) θ, ϕ (b) r, θ (c) r, ϕ (d) r
32. The number of terms common to the two A.P's 3, 7, 11, ..., 407 and 2, 9, 16, ..., 709 is –
 (a) 0 (b) 14 (c) 25 (d) none of these
33. A coin is tossed thrice. The probability of obtaining a head and a tail alternately is –
 (a) $\frac{1}{14}$ (b) $\frac{1}{8}$ (c) $\frac{3}{7}$ (d) none of these
34. The sum of all values of integer n for which $\frac{n^2-9}{n-1}$ is also a integer is –
 (a) 0 (b) 7 (c) 8 (d) 9
35. If the points $(a, 0)$, $(at_1^2, 2at_1)$ and $(at_2^2, 2at_2)$ are collinear then the value of $t_1 t_2$ is –
 (a) 0 (b) 1 (c) -1 (d) none of these
36. If the roots of $x^2 - bx + c = 0$ are two consecutive integers then, $b^2 - 4c$ is –
 (a) 0 (b) 1 (c) 2 (d) none of these
37. When my father was 31, I was 8. Now he is twice as old as I am. How old am I?
 (a) 23 years (b) 46 years (c) 22 years (d) 24 years
38. The radius and height of a cone are each increased by 20%. Then the volume of the cone is increased by –
 (a) 20% (b) 40% (c) 60% (d) 72.8%