

MATH TALENT HUNT EXAMINATION – 2020
Organised by : The Pi (π) Group of Mathematics (TPGM)

Class – X (TEN)
F.M – 100

Time – 2 Hour

Instructions:

1. There are 50 questions of marks 2 each.
2. Put tick mark on the correct alternative against each question in your answer sheet.
3. There is no Negative Marking.

1. n^2 is divisible by 8, if n is
(a) an integer (b) a natural number (c) an odd integer (d) an even integer
2. The product of a non-zero rational and an irrational number is
(a) always irrational (b) always rational (c) rational or irrational (d) one
3. If one of the zeros of the quadratic polynomial $f(x) = (k - 1)x^2 + kx + 1$ is -3 then the value of k is-
(a) $\frac{4}{3}$ (b) $-\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $-\frac{2}{3}$
4. If the zeros of the quadratic polynomial $ax^2 + bx + c, c \neq 0$ are equal, then
(a) c and a have opposite signs (b) c and b have opposite signs
(c) c and a have same signs (d) c and b have same signs
5. Graphically, the pair of equations
$$6x - 3y + 10 = 0$$
$$2x - y + 9 = 0$$
Represents two lines which are
(a) Intersecting at exactly one point (b) intersecting at exactly two points
(c) coincident (d) parallel
6. The pair of equations $x + 2y + 5 = 0$ and $3x - 6y + 1 = 0$ have
(a) Unique solutions (b) exactly two solutions
(c) Infinitely many solutions (d) no solutions
7. The length of the diagonals of rhombus are 16 cm and 12 cm. Then the length of the sides of the rhombus is –
(a) 9cm (b) 10 Cm (c) 8cm (d) 20 cm
8. If $\Delta ABC \sim \Delta QRP$ and $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{9}{4}$, $AB = 18cm$ and $BC = 15$ cm, then PR is equal to
(a) 10 cm (b) 12 Cm (c) $\frac{20}{3}$ cm (d) 8 cm
9. If $\sin A = \frac{1}{2}$, then the value of $\cot A$ is:
(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{\sqrt{3}}{2}$ (d) 1
10. The value of the expression $(\frac{\sin^2 22^\circ + \sin^2 68^\circ}{\cos^2 22^\circ + \cos^2 68^\circ} + \sin^2 63^\circ + \cos 63^\circ \sin 27^\circ)$ is
(a) 3 (b) 2 (c) 1 (d) 0
11. If $\sin \theta - \cos \theta = 0$, then the value of $(\sin^4 \theta + \cos^4 \theta)$ is
(a) 1 (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

12. Consider the following frequency distribution, find the upper limit of the Median Class

Class	0 - 5	6 - 11	12 - 17	18 - 23	24 - 29
Frequency	13	10	15	8	11

- (a) 17 (b) 17.5 (c) 18 (d) 18.5

13. Find the median of the following sets of data

13, 22, 25, 8, 11, 19, 17, 31, 16, 10

- (a) 17 (b) 17.5 (c) 18 (d) 18.5

14. If the common difference of an A.P is 5, then what is $a_{18} - a_{13}$

- (a) 5 (b) 20 (c) 25 (d) 30

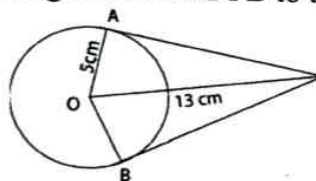
15. If 7 times the 7th term of an A.P is equal to 11 times its 11th term, then its 18th term will be :

- (a) 7 (b) 11 (c) 18 (d) 0

16. If radii of two concentric circles are 4cm and 5 cm, then the length of each chord of circle which tangent to the other circle is

- (a) 3cm (b) 6cm (c) 9cm (d) 1cm

17. From a point P which is at a distance of 13 cm from the centre O of a circle of radius 5cm, the pair of tangents PA and PB to the circle are drawn. Then, the area of the quadrilateral PAOB is



(a) 60 cm² (b) 65 cm² (c) 30 cm² (d) 32.5 cm²

18. A pole 6m high casts a shadow $2\sqrt{3}$ metre long on the ground, then the sun's elevation is

- (a) 60° (b) 45° (c) 30° (d) 90°

19. Let T_r be the r^{th} term of an A.P. whose first term is a and common difference is d . If for some positive integer m, n ; $T_m = \frac{1}{n}$, $T_n = \frac{1}{m}$, then $(a - d)$ equals

- (a) $\frac{1}{mn}$ (b) 1 (c) 0 (d) $\frac{1}{m} + \frac{1}{n}$

20. A ladder 25 metre long just reaches the top of a building 24 metre high from the ground. What is the distance of the foot of the ladder from the building?

- (a) 7m (b) 14m (c) 21m (d) 24.5m

21. If $\tan \theta = \frac{1}{\sqrt{7}}$, then $\frac{(\operatorname{cosec}^2 \theta - \sec^2 \theta)}{(\operatorname{cosec}^2 \theta + \sec^2 \theta)} = ?$

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

22. If $7 \tan \theta = 4$, then $\frac{(7 \sin \theta - 3 \cos \theta)}{(7 \sin \theta + 3 \cos \theta)} = ?$

- (a) $\frac{1}{7}$ (b) $\frac{5}{7}$ (c) $\frac{3}{7}$ (d) $\frac{5}{14}$

23. Which of the following is a quadratic equation?

- (a) $x^2 - 3\sqrt{x} + 2 = 0$ (a) $x + \frac{1}{x} = x^2$ (c) $x^2 + \frac{1}{x^2} = 5$ (d) $2x^2 - 5x = (x - 1)^2$

24. If the equation $x^2 + 5kx + 16 = 0$ has no real roots, then

- (a) $k > \frac{8}{5}$ (b) $k > -\frac{8}{5}$ (c) $-\frac{8}{5} < k < \frac{8}{5}$ (d) none of these

25. the hypotenuse of a right triangle is 25 cm. The other two sides are such that one is 5 cm. longer than the other. The lengths of these sides are

- (a) 10cm., 15cm. (b) 15cm., 20cm. (c) 12cm., 17cm. (d) 13cm., 18cm.

26. If the sum of the areas of two circles with radius R_1 and R_2 is equal to the area of the circle with radius R , then

- (a) $R_1 + R_2 = R$ (b) $R_1^2 + R_2^2 = R^2$
(c) $R_1 + R_2 < R$ (d) $R_1^2 + R_2^2 < R^2$

27. The area of the circle that can be inscribed in a square of side 6cm. is

- (a) $36\pi \text{ cm}^2$ (b) $18\pi \text{ cm}^2$ (c) $12\pi \text{ cm}^2$ (d) $9\pi \text{ cm}^2$

28. A cylindrical pencil sharpened at one edge is the combination of

- (a) a cone and a cylinder (b) frustum of a cone and a cylinder
(c) a hemisphere and a cylinder (d) two cylinders

29. A shuttlecock used for playing badminton has the shape of the combination of

- (a) a cylinder and a sphere (b) a cylinder and a hemisphere
(c) a sphere and a cone (d) frustum of a cone and a hemisphere

30. The volumes of two spheres are in the ratio 64: 27. The ratio of their surface areas is

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

31. The perimeter of a triangle with vertices (0,4), (0,0) and (3,0) is

- (a) 5 (b) 12 (c) 11 (d) $7 + \sqrt{5}$

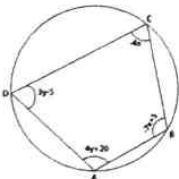
32. AOBC is a rectangle whose three vertices are A(0,3) , O(0,0) and B(5,0). The length of its diagonal is

- (a) 5 (b) 3 (c) $\sqrt{34}$ (d) 4

33. If $2^x = 3^y = 6^{-z}$ then $(\frac{1}{x} + \frac{1}{y} + \frac{1}{z})$ is equal to

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

34.



ABCD is a cyclic quadrilateral. Find the angles of the cyclic quadrilateral.

- (a) -15° and 25° (b) 15° and -25°
(c) -15° and -25° (d) 15° and 25°

35. The simplest value of $\frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \frac{1}{\sqrt{4}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{6}}$ is

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

36. 1 year ago, a man was 7 times as old as his son. Now, his age is equal to the square of his son's age. The present age of the man will be

- (a) 7 years (b) 36 years (c) 49 years (d) 64 years

37. 15 litre of a mixture contains alcohol and water in the ratio 1:4. If 3 litre of water is mixed in it, the percentage of alcohol in the new mixture will be

- (a) 15 (b) $16\frac{2}{3}$ (c) 17 (d) $18\frac{1}{2}$

38. If $\frac{a}{lm-n^2} = \frac{b}{mn-l^2} = \frac{c}{nl-m^2}$ then find the value of $lm + bm + cn$

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

39. If $x + 2\sqrt{6} = 5$ find the value of $x^2 + \frac{1}{x^2} + 2$
 (a) 25 (b) 49 (c) 100 (d) 51
40. Two circles of radius 12 cm and 13 cm touches internally then the distance between their centre is
 (a) 5cm (b) 25cm (c) 1cm (d) 13cm
41. The sum of length, breadth and height of a rectangular parallelepiped is P, total surface area is s and diagonal is d; then which of the following is correct?
 (a) $d = \sqrt{p^2 + s}$ (b) $d = \sqrt{p^2 - s}$ (c) $d = \sqrt{p^2 + s^2}$ (d) $d = \sqrt{p^2 - s^2}$
42. If $A = \begin{bmatrix} 2 & 0 & -4 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ is expressed as the sum of a symmetric and a skew-symmetric matrix is
 (a) $\begin{bmatrix} 2 & 2 & -4 \\ 2 & 3 & 4 \\ -4 & 4 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 4 & -5 \\ 0 & 3 & 7 \\ 3 & 1 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & 4 & -8 \\ 4 & 6 & 8 \\ -8 & 8 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
43. In $\triangle ABC$, $AB = 6\sqrt{3}cm$, $AC = 12 cm$, and $BC = 6cm$. The angle B is
 (a) 120° (b) 60° (c) 90° (d) 45°
44. ABCD is a parallelogram. P is any point on CD. If $\text{area}(\triangle DPA) = 15cm^2$ and $\text{area}(\triangle APC) = 20cm^2$, then, $\text{area}(\triangle APB) = ?$
 (a) $15 cm^2$ (b) $20 cm^2$ (c) $35 cm^2$ (d) $30 cm^2$
45. If $a + b = \sqrt{5}$ and $a - b = \sqrt{3}$ then the value of $(a^2 + b^2) = ?$
 (a) 8 (b) 4 (c) 2 (d) 1
46. Which of the following cannot be the probability of an event?
 (a) $\frac{2}{3}$ (b) -1.5 (c) 15% (d) 0.7
47. Area of a sector of angle p(in degree) of a circle with radius R is
 (a) $\frac{p}{180} \times 2\pi R$ (b) $\frac{p}{180} \times \pi R^2$ (c) $\frac{p}{360} \times 2\pi R$ (d) $\frac{p}{720} \times 2\pi R^2$
48. A square and an equilateral triangle have equal perimeters. If the diagonal of the square is $12\sqrt{2}cm$, then the area of the triangle is
 (a) $24\sqrt{2}cm^2$ (b) $24\sqrt{3}cm^2$ (c) $48\sqrt{3}cm^2$ (d) $64\sqrt{3}cm^2$
49. If the circumference of a circle and the perimeter of a square are equal, then
 (a) Area of the circle = Area of the square
 (b) Area of the circle > Area of the square
 (c) Area of the circle < Area of the square
 (d) Nothing definite can be said about the relation between the areas of the circle and the square
50. Area of the largest triangle that can be inscribed in a semi-circle of radius r unit is
 (a) $r^2 sq. units$ (b) $\frac{1}{2}r^2 sq. units$ (c) $2r^2 sq. units$ (d) $\sqrt{2}r^2 sq. units$