INTSO EDUCATION

MATHEMATICS TALENT SEARCH OLYMPIAD(MTSO) 2016 - 2017

STAGE - 1 **TIME : 60 min.**

CLASS : X **Max. Marks : 50**

Instructions:

- ➪ *Fill the OMR sheet completely and carefully.*
- ➪ *Each question carries one mark and has only one correct answer. No negative marks.*
- ➪ *The question paper contains 50 questions to be answered in 60 minutes.*

1. The exponent of 2 in the prime factorisation of 144 is [ ]
   1) 4 2) 5 3) 6 4) 3

2. If p_1 and p_2 are two odd prime numbers such that $p_1 > p_2$, then $p_1^2 - p_2^2$ is [ ]
   1) an even number 2) an odd number
   3) an odd prime number 4) a prime number

3. If $\frac{x}{2} = \frac{y}{3}$, then $\left(\frac{4}{5} + \frac{y-x}{y+x}\right)$ equals to [ ]
   1) $\frac{3}{5}$ 2) $\frac{4}{5}$ 3) 1 4) $\frac{6}{5}$

4. If n is a positive integer, then $\sqrt[n]{9} \times \sqrt[n]{9^2} \times \sqrt[n]{9^3} \times \ldots\ldots\ldots \times \sqrt[n]{9^n}$ is equals to [ ]
   1) $9^{n(n+1)}$ 2) $\sqrt{9^{n+1}}$ 3) 3^{n+1} 4) $\sqrt{81^{n(n+1)}}$

5. If 3a = 4b = 6c and a + b + c = $27\sqrt{29}$, then $\sqrt{a^2+b^2+c^2}$ is [ ]
   1) $3\sqrt{29}$ 2) 81 3) 87 4) 97

6. If x = 7 + $4\sqrt{3}$, then the value of $x^2 + \frac{1}{x^2}$ is [ ]
   1) 193 2) 194 3) 195 4) 196

7. If L.C.M of x and 18 is 36 and H.C.F of x and 18 is 2, then the value of x is [ ]
   1) 1 2) 2 3) 3 4) 4

8. If a, b, c,d are natural numbers such that a = bc, b = cd, c = da and d = ab, then (a + b) (b + c) (c + d) (a + d) is equals to [ ]
   1) $(a + b + c + d)^2$ 2) $(a + b)^2 + (c + d)^2$ 3) $(a + b)^2 + (b + c)^2$ 4) $(a + c)^2 + (b + d)^2$

9. What is the greatest positive integer 'n' which makes $n^3 + 100$ is divisible by n + 10 [ ]
   1) 120 2) 290 3) 890 4) 790

10. If the average of 20 different positive integers is 20, then the greatest possible number among these 20 numbers can be [ ]
    1) 210 2) 200 3) 190 4) 180

11. The number of primes less than 100 which have 7 as the unit digit is [ ]
    1) 6 2) 7 3) 8 4) 9

12. The years of 20th century and 21st century are of 4 digits. The number of years which are divisible by the product of the 4 digits of the year is [ ]
1) 7 2) 8 3) 9 4) 10

13. If a, b, c, d, e are five integers such that a + b = b + c = c + d = d + e = 2012, a + b + c + d + e = 5024. Then the value of (d – a) is [ ]
1) 8 2) 12 3) 10 4)4

14. In a polynomial in x, the indices of x must be [ ]
1) integers 2) positive integers
3) non negative integers 4) real numbers

15. If a + b + c = 0, then $\left(\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}\right)$ is [ ]
1) 1 2) 0 3) – 1 4) 3

16. Consider the equation $x^2 + y^2 = 2007$ given x is a real number and y is a natural number. The number of solutions of the equation is [ ]
1) 0 2) 2006 3) 88 4) 44

17. If a, b are natural numbers such that a + b = 2008, then $(-1)^a + (-1)^b$ is [ ]
1) 1 2) – 1 3) 2 4) 2 (or) – 2

18. If $a^2 - b^2 = 2011$ where a, b are integers then the most negative value of (a + b) is [ ]
1) – 101 2) – 2003 3) –2011 4) – 1

19. If $\frac{x}{y}+\frac{y}{x}=-1$ where $x \neq 0, y \neq 0$, then the value of $x^3 - y^3$ is [ ]
1) 1 2) – 1 3) 0 4) $\frac{1}{2}$

20. If x + y + z = 9 and xy + yz + zx = 23, then the value of $x^3 + y^3 + z^3 - 3xyz$ is [ ]
1) 108 2) 207 3) 669 4) 729

21. If $(3x - 1)^7 = a_7x^7 + a_6x^6 + a_5x^5 + ... + a_1x + a_0$, then $a_7 + a_6 + a_5 + a_4 + a_3 + a_2 + a_1 + a_0$ is equals to [ ]
1) 0 2) 1 3) 128 4) 64

22. If x + 2 and x – 1 are the factors of $x^3 + 10x^2 + mx + n$, then the values of M and n are respectively
1) 5 and – 3 2) 17 and – 8 3) 7 and – 18 4) 23 and – 19 [ ]

23. Two points having same abscissa but different ordinates lie on [ ]
1) x - axis 2) y - axis
3) a line parallel to x - axis 4) a line parallel to Y - axis

24. The area of the triangle formed by the points P(0, 1), Q(0, 5) and R(3, 4) is [ ]
1) 16 squnits 2) 8 squnits 3) 4sq units 4) 6 sq units

25. The ratio in which the line segment joining the points $A(a_1,b_1)$ and $B(a_2, b_2)$ is divided by Y - axis is [ ]
1) $-a_1 : a_2$ 2) $a_1 : a_2$ 3) $b_1 : b_2$ 4) $-b_1 : b_2$

26. The circum centre of the triangle whose vertices are (– 2, –3) , (–1, 0) and (7, – 6) is[ ]
1) (3, 3) 2) (3, – 3) 3) (2, 4) 4) (4, 2)

27. The vertices of ΔABC are A(4, 6) B(1, 5) and C(7, 2). A line is drawn to intersect sides AB and AC at D and E respectively such that $\frac{AD}{AB}=\frac{AE}{AC}=\frac{1}{4}$. The ratio of area ΔADE to area of ΔABC is [ ]

1) 1 : 8 2) 16 : 1 3) 1 : 16 4) 8 : 1

28. If the mid point of the line joining (3, 4) and (k, 7) is (x, y) and 3x + 2y + 1 = 0, then the value of k is [ ]

1) 14 2) – 14 3) – 11 4) 15

29. If the line segment joining the points (3, – 4) and (1, 2) is trisected at P(a, – 2) and $Q\left(\frac{5}{3},b\right)$, then the values of a and b are [ ]

1) $\frac{2}{3},\frac{8}{3}$ 2) $\frac{7}{3},0$ 3) $\frac{1}{3},1$ 4) $\frac{2}{3},\frac{1}{3}$

30. Two adjascent vertices of a square are (1, 2) and (– 2, 6), then the other vertices are [ ]

1) (5, 5) (2, 9) 2) (5, 2) (5, 9) 3) (2, 5) (9, 5) 4) (5, 5), (9, 2)

31. The area of the parallellogram formed by the lines 4y – 3x – a = 0, 3y – 4x + a = 0, 4y – 3x – 3a = 0,and 3y – 4x + 2a = 0 is [ ]

1) a^2 sq units 2) $9a^2$ sq units 3) $\frac{2}{7}a^2$ sq units 4) $\frac{7}{2}a^2$ sq units

32. If the discriminant of the equation $6x^2 - bx + 2 = 0$ is '1' then the value of 'b' is [ ]

1) 7 2) – 7 3) ±7 4) $\pm\sqrt{7}$

33. The value of c for which the equation $ax^2 + 2bx + c = 0$ has equal roots is [ ]

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

34. If the roots of $px^2 + qx + 2 = 0$ are reciprocals of each other then P = [ ]

1) 1 2) 0 3) 2 4) 3

35. If the roots of the equation $3ax^2 + 2bx + c = 0$ are in the ratio 2 : 3, then $8b^2$ = [ ]

1) $25\frac{a}{c}$ 2) 25ac 3) $\frac{-25}{7}ac$ 4) 49ac

36. If the ratio of the roots of $ax^2 + 2bx + c$ is same as the ratio of the roots of $px^2 + 2qx + r = 0$, then

1) $\frac{b^2}{ac}=\frac{p^2}{qr}$ 2) $\frac{b}{ac}=\frac{q}{pr}$ 3) $\frac{b^2}{ac}=\frac{q^2}{pr}$ 4) $\frac{b}{ac}=\frac{q^2}{pr}$ [ ]

37. If α,β are the roots of $x^2 + px + 1 = 0$ and γ,δ are the roots of $x^2 + qx + 1 = 0$, then $(\alpha-\gamma)(\beta-\gamma)(\alpha+\delta)(\beta+\delta)=$ [ ]

1) $p^2 - q^2$ 2) $p^2 + q^2$ 3) $q^2 - p^2$ 4) $-q^2 - p^2$

38. If α, β are the roots of $ax^2 + 2bx + c = 0$, then $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is [ ]

1) $\frac{2\left(2b^2 - ac\right)}{ac}$ 2) $\frac{4\left(b^2 - ac\right)}{ac}$ 3) $\frac{4\left(b^2 - ac\right)}{a^2c^2}$ 4) $\frac{4\left(b^2 - ac\right)}{a}$

39. If $ax^2 + bx + c = 0$ is statisfied by every value of x, then [ ]
1) b = 0, c = 0 2) c = 0 3) b = 0 4) a = b = c = 0

40. If α, β are the roots of $4x^2 + 3x + 7 = 0$, then the value of $\frac{1}{\beta} + \frac{1}{\alpha}$ is [ ]

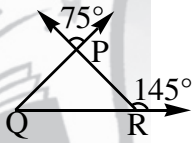
1) $\frac{3}{7}$ 2) $\frac{-3}{7}$ 3) $\frac{4}{7}$ 4) $\frac{-4}{7}$

41. $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0$, then b^2 = [ ]
1) $a^2 - 2ac$ 2) $a^2 + 2ac$ 3) $a^2 - ac$ 4) $a^2 + ac$

42. In ΔABC, AB = AC, D is the mid point of BC, if AB = 5cm, BC = 6cm, then AD = [ ]
1) 7cm 2) 4cm 3) 5cm 4) 6cm

43. Among the following can be the measure of sides of a triangle. [ ]
1) 5cm, 7cm, 13cm 2) 6cm, 7cm, 13cm 3) 9cm, 12cm, 13cm 4) 5cm, 9cm, 4cm

44. In the given figure $\angle PQR$ = [ ]
1) 40° 2) 50°
3) 30° 4) 70°



45. In ΔABC $\angle A = \frac{\angle B}{2} = \frac{\angle C}{2}$, then the measure of $\angle A$ is [ ]

1) 60° 2) 30° 3) 40° 4) 36°

46. From a point 'O' with in an equilateral triangle perpendiculars are drawn to the three sides are 5, 7 and 9 cms in length the perimeter of the triangle is [ ]

1) $42\sqrt{3}cm$ 2) $36\sqrt{3}cm$ 3) $126\sqrt{3}cm$ 4) $54\sqrt{3}cm$

47. The perimeter of an isosceles rightangled triangle is 2012. Its area is [ ]

1) $2012\left(3 - \sqrt{2}\right)$ 2) $(1006)^2\left(3 - \sqrt{2}\right)$ 3) $(2012)^2$ 4) $(1006)^2$

48. If TP and TQ are two tangents to a circle with centre 'O' so that $\angle POQ = 120°$, then $\angle PTQ$ is
1) 90° 2) 80° 3) 70° 4) 60° [ ]

49. If the sum of the greatest and lowest angles of a triangle is 120° and their diffrence is 60°, then the triangle formed is [ ]
1) scalene 2) isosceles 3) right angled 4) an equilateral

50. ABCD is a cyclic quadrilateral such that AB is a diameter of the cirle circumscribing it and $\angle ADC = 140°$, then $\angle BAC$ = [ ]
1) 30° 2) 50° 3) 40° 4) 60°