INTSO EDUCATION

MATHEMATICS TALENT SEARCH OLYMPIAD(MTSO) 2015 - 2016

STAGE - 2 **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. ¼ (one fourth) marks will be deducted for indicating incorrect response of each question.*
- ⇨ *The question paper contains 50 questions to be answered in 60 minutes.*

1. Number of positive divisors of 163800 is [ ]
   1) 108 2) 110 3) 98 4) 112

2. If $xy = 2^2 \times 3^4 \times 5^7 (x + y)$, then the number of integral solutions is [ ]
   1) 575 2) 675 3) 550 4) 450

3. The simplest form of $2\log 3 + 3\log 5 - 5\log 2$ is [ ]
   1) $\log\frac{32}{1125}$ 2) $\log\frac{1125}{64}$ 3) $\log\frac{1125}{32}$ 4) $\log\frac{1025}{32}$

4. The H.C.F of 306 and 657 is [ ]
   1) 19 2) 9 3) 18 4) 27

5. $1^{1997} + 2^{1997} + 3^{1997} + \ldots\ldots + 1996^{1997}$ is always divisible by [ ]
   1) 1996 2) 1997 3) 1998 4) 1987

6. The largest integer n such that 33! is divisible by 2^n[! factorial notation] [ ]
   1) 32 2) 33 3) 29 4) 31

7. If n is positive integer then $n(n^2 - 1)$is always divisible by [ ]
   1) 5 2) 7 3) 11 4) 6

8. If $(2.3)^x = (0.23)^y = 1000$ then the value of $\frac{1}{x} - \frac{1}{y}$ is [ ]
   1) $\frac{1}{4}$ 2) $\frac{1}{3}$ 3) $\frac{1}{2}$ 4) $\frac{1}{5}$

9. If zeroes of $2x^4 - 3x^3 - 3x^2 + 6x - 2$ are $\sqrt{2}$ and $-\sqrt{2}$ then the remaining two roots are
   1) $1, \frac{1}{3}$ 2) $\frac{1}{3}, \frac{1}{4}$ 3) $\frac{1}{2}, \frac{1}{3}$ 4) $1, \frac{1}{2}$ [ ]

10. If $f(x, y) = 9x^2 - 26xy + 7y^2$ then $f(1, 2) - f(2, 1) =$ [ ]
    1) 6 2) 9 3) – 9 4) – 6

11. If α, β, γ are the roots of the equation $4x^4 + 32x^3 + 83x^2 + 76x + 21 = 0$ then the equation whose roots are $\alpha + 2, \beta + 2, \gamma + 2, \delta + 2$ is [ ]
    1) $4x^4 - 13x^2 + 9 = 0$ 2) $4x^4 + 13x^2 + 9 = 0$
    3) $4x^4 - 13x^2 - 9 = 0$ 4) $4x^4 + 13x^2 - 9 = 0$

12. If a + b + c = 1, $a^2 + b^2 + c^2 = 9$ and $a^3 + b^3 + c^3 = 1$ then $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}$ = [ ]

1) 9 2) 81 3) 27 4) 1

13. If $x+\frac{3x-5}{4}=2+\frac{6x-8}{5}$ then x = [ ]

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

14. If x = 2 then $x^9 + x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x + 1$ = [ ]

1) 1032 2) 1203 3) 1023 4) 2032

15. The 10^{th} term of the arithmetic progression 5, 1, – 3, – 7, ... [ ]

1) – 30 2) – 28 3) – 34 4) – 31

16. The number of two digit numbers are divisible by 3 [ ]

1) 25 2) 30 3) 33 4) 34

17. In a G.P the 3^{rd} term is 24 and 65^{th} term is 192, then 11^{th} term is [ ]

1) 6144 2) 5244 3) 3072 4) 4072

18. The number of terms in A.P is even, the sum of odd terms is 63 and that even terms is 72 and the last term exceeds the first term by 16.5, Then the number of terms is [ ]

1) 8 2) 12 3) 9 4) 10

19. If x, y, z are in G.P and $a^x = b^y = c^z$ then [ ]

1) $\log_b a = \log_c b$ 2) $\log_b a = \log_a c$ 3) $\log_c b = \log_a c$ 4) None

20. The sum of first 100 natural numbers is [ ]

1) 505 2) 5050 3) 5060 4) 6050

21. Number of terms of the A.P 1, 4, 7, ... needed to give the sum 925 [ ]

1) 20 2) 22 3) 24 4) 25

22. If D, E, F are the mid points of sides BC, CA, AB of ΔABC, then the ratio of areas of ΔDEF and ΔABC is [ ]

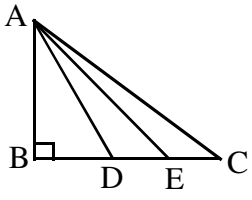
1) 1 : 2 2) 2 : 1 3) 1 : 4 4) 4 : 1

23. A ladder 25 m long reaches a window of building 20m above the ground then the distance of the foot of the ladder from building [ ]

1) 22 m 2) 10 m 3) 35 m 4) 15m

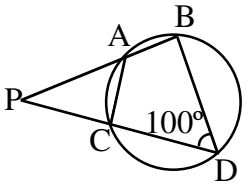
24. In the given figure ABC is triangle rightangled at B and D and E are points on BC trisect it then $3AC^2 + 5AD^2$ = [ ]

1) $5AE^2$
2) $8AE^2$
3) $6AE^2$
4) $7AE^2$



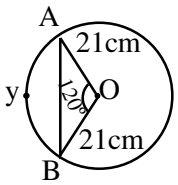
25. In given figure PAB and PCD are two secant lines to a circle from an external point P. If $\angle PDB = 100°$ then $\angle PAC$ = [ ]

1) 100°
2) 80°
3) 90°
4) 70°



26. The angle between a tangent to a circle and the radius drawn at point of contact is [ ]
1) 60º 2) 30º 3) 45º 4) 90º

27. The area of the segment AYB showing in the adjascent figure if radius of circle is 21 cm and $\angle AOB = 120º$ [ ]



1) 272 cm^2
2) 271.047 cm^2
3) 371 cm^2
4) 371.047cm^2

28. The name of the polygon with 6 sides is called [ ]
1) pentagon 2) heptagon 3) hexagon 4) octagon

29. The name of the figure formed by the internal angular bisectors of a parallogram is [ ]
1) parallelogram 2) Rectangle 3) Rhombus 4) square

30. If 3 + 4i is a root of the equation $x^2 + px + q = 0$ then [ ]
1) p = 6, q = 25 2) p = 6, q = 1 3) p = – 6, q = – 7 4) p = – 6, q = 25

31. The solution of the inequality $(x + 3)(3x – 2)^5(7 – x)^3(5x + 8)^2 \geq 0$ is [ ]

1) $(-\infty,-3]\cup\left[\frac{2}{3},7\right]\cup\left[\frac{-8}{5}\right]$ 2) $(-\infty,3]\cup\left[\frac{-2}{3},7\right]\cup\left[\frac{8}{5}\right]$

3) $(-\infty,-3)\cup\left[\frac{-2}{3},7\right]$ 4) $(-\infty,-3)\cup\left[\frac{-2}{3},7\right]\cup\left[\frac{8}{5}\right]$

32. The number of zeroes of a polynomial of degree 'n' is [ ]
1) n – 1 2) n + 1 3) n 4) n^2

33. The sum of the present ages of Ramu and Somu is 60 years. If the ratio of their present ages is 7 : 8 then the present age of Ramu is [ ]
1) 28 years 2) 32 years 3) 30 years 4) 24 years

34. If $ax^3 + bx^2y + cxy^2 + dy^3$ is a symmetric expression then [ ]
1) a = b and c = d 2) a = c and b = d 3) a = d and b = c 4) $a \neq d$ and $c \neq d$

35. If a > 1, the roots of the equation $(1 – a)x^2 + 3ax – 1 = 0$ are [ ]
1) one positive and one negative 2) both negative
3) both positive 4) both non real complex

36. If $\sec\theta + \tan\theta = \frac{1}{5}$ then the value of $\sin\theta$ is [ ]

1) $\frac{-13}{12}$ 2) $\frac{-12}{13}$ 3) $\frac{12}{13}$ 4) $\frac{13}{12}$

37. If $3\sin\theta + 4\cos\theta = 5$ then $4\sin\theta - 3\cos\theta$ = ? [ ]
1) 3 2) 4 3) 5 4) 0

38. The value of $\sin^2\frac{\pi}{10} + \sin^2\frac{4\pi}{10} + \sin^2\frac{6\pi}{10} + \sin^2\frac{9\pi}{10} =$ [ ]
1) 0 2) 1 3) 2 4) 4

39. The value of $3(\sin x – \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) =$ [ ]
1) 15 2) 10 3) 13 4) 0

40. $\cos^2 9^\circ + \cos^2 18^\circ + \cos^2 27^\circ + ... + \cos^2 81^\circ =$ [ ]

1) 4 2) $\frac{9}{2}$ 3) 5 4) $\frac{11}{2}$

41. In $\Delta^{le} ABC$ 5 cosA + 3 = 0 then the quadratic equation whose roots are sinA and tanA is
1) $15x^2 + 32x + 16 = 0$ 2) $15x^2 + 8x - 16 = 0$ [ ]
3) $15x^2 - 18x - 16 = 0$ 4) $15x^2 - 8x - 16 = 0$

42. If $a = x \sec\theta + y \tan\theta$, $b = x \tan\theta + y \sec\theta$ then $x^2 - y^2 =$ [ ]
1) $a^2 - b^2$ 2) $a^2 + b^2$ 3) $b^2 - a^2$ 4) a^2b^2

43. Let the vertices of a ΔABC be (4, 3), (7, – 1), (9, 3) then the triangle is [ ]
1) scalene triangle 2) isosceles triangle
3) Equilateral triangle 4) Rightangled triangle

44. The co - ordinates of the points which divides the join of the points (2, 4) and (6, 8) externally in the ratio 5 : 3 is [ ]
1) (5, 6) 2) (12, 14) 3) (3, 8) 4) (2, 7)

45. If (3, 2), (6, 3), (x, y) and (6, 5) are the vertices of a parallelogram in order then (x, y) =
1) (5, 6) 2) (6, 5) 3) (9, 6) 4) (9, 5) [ ]

46. The distance between the two parallel lines 5x + 12y – 30 = 0 and 5x + 12y – 4 = 0 is [ ]

1) 3 2) 7 3) $\frac{5}{2}$ 4) 2

47. The equation of the line which passes through the point of intersection of the lines 2x – y + 5 = 0 and 5x + 3y – 4 = 0 and is perpendicular to the line x – 3y + 21 = 0 is [ ]
1) 2x + y + 8 - 0 2) 3x + 4y – 7 = 0 3) 3x + y = 0 4) 3x + y + 5 = 0

48. The area of the triangle is 5units, two of its vertices are (2, 1) and (3, – 2) then third vertex lies on y = x + 3, then the third vertex is [ ]

1) $\left(\frac{2}{7}, \frac{13}{5}\right)$ 2) $\left(\frac{7}{2}, \frac{13}{2}\right)$ 3) $\left(\frac{9}{2}, \frac{13}{2}\right)$ 4) $\left(\frac{7}{2}, \frac{13}{2}\right)$ or $\left(\frac{-3}{2}, \frac{3}{2}\right)$

49. The equation of the line passing through the point (2, – 3) and having slope $\frac{5}{4}$ is [ ]

1) 4x – 5y = 20 2) 3x – 2y = 5 3) 5x – 4y = 22 4) 3x + 2y = 5

50. The intercepts made by the line 3x + 4y – 12 = 0 on the axes [ ]
1) 2 and 3 2) 4 and 3 3) 3 and 5 4) – 2 and – 3