THE ASSOCIATION OF MATHEMATICS TEACHERS OF INDIA

Screening Test – Bhaskara Contest

NMTC at JUNIOR LEVEL – IX & X Standards

Saturday, 1st September, 2018

Note:

1. Fill in the response sheet with your Name, Class and the institution through which you appear in the specified places.
2. Diagrams are only visual aids; they are NOT drawn to scale.
3. You are free to do rough work on separate sheets.
4. Duration of the test: 2 pm to 4 pm – 2 hours.

PART – A

Note

- Only one of the choices A, B, C, D is correct for each question. Shade the alphabet of your choice in the response sheet. If you have any doubt in the method of answering, seek the guidance of the supervisor.
- For each correct response you get 1 mark. **For each incorrect response you lose $\frac{1}{2}$ mark.**

1. The value of $\dfrac{3+\sqrt{6}}{8\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}-\sqrt{27}}$ is

   A. $\sqrt{2}$ B. $\sqrt{3}$ C. $\sqrt{6}$ D. $\sqrt{18}$

2. A train moving with a constant speed crosses a stationary pole in 4 seconds and a platform 75 m long in 9 seconds. The length of the train is (in meters)

   A. 56 B. 58 C. 60 D. 62

3. One of the factors of $9x^2 - 4z^2 - 24xy + 16y^2 + 20y - 15x + 10$ is

   A. $3x-4y-2z$ B. $3x+4y-2z$ C. $3x+4y+2z$ D. $3x-4y+2z$

4. The natural number which is subtracted from each of the four numbers 17, 31, 25, 47 to give four numbers in proportion is

   A. 1 B. 2 C. 3 D. 4

5. The solution to the equation $5\,(3^x) + 3\,(5^x) = 510$ is

   A. 2 B. 4 C. 5 D. No solution

6. If $(x+1)^2 = x$, the value of $11x^3 + 8x^2 + 8x - 2$ is

   A. 1 B. 2 C. 3 D. 4

7. There are two values of m for which the equation $4x^2 + mx + 8x + 9 = 0$ has only one solution for x. The sum of these two values of m is

   A. 1 B. 2 C. 3 D. 4

8. The number of zeros in the product of the first 100 natural numbers is

   A. 12 B. 15 C. 18 D. 24

9. The length of each side of a triangle is increased by 20% then the percentage increase of area is

   A. 60% B. 120% C. 80% D. 44%

10. The number of pairs of relatively prime positive integers (a, b) such that $\dfrac{a}{b} + \dfrac{15b}{4a}$ is an integer is

    A. 1 B. 2 C. 3 D. 4

11. The four digit number $8ab9$ is a perfect square. The value of $a^2 + b^2$ is

    A. 52 B. 62 C. 54 D. 68

12. a, b are positive real numbers such that $\dfrac{1}{a} + \dfrac{9}{b} = 1$. The smallest value of $a + b$ is

    A. 15 B. 16 C. 17 D. 18

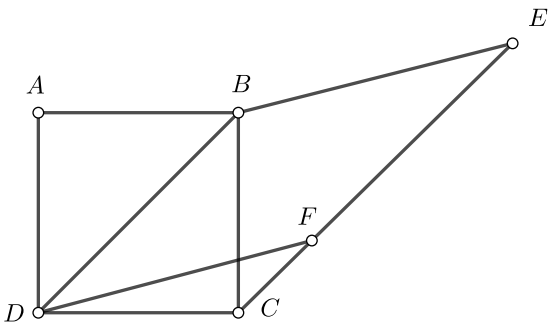
13. a, b are real numbers. The least value of $a^2 + ab + b^2 - a - 2b$ is

    A. 1 B. 0 C. -1 D. 2

14. I is the incenter of a triangle ABC in which $\angle A = 80^\circ$. $\angle BIC =$

    A. 120° B. 110° C. 125° D. 130°

15. In the adjoining figure, $ABCD$ is a square and $DFEB$ is a rhombus. $\angle CDF =$



    A. 15° B. 18° C. 20° D. 30°

PART – B

Note

- Write the correct answer in the space provided in the response sheet.
- For each correct response you get 1 mark. **For each incorrect response you lose $\frac{1}{4}$ mark.**

16. $ABCD$ is a square. E, F are points on BC, CD respectively and $\angle EAF = 45°$. The value of $\frac{EF}{BE + DF}$ is ———

17. The average of 5 consecutive natural numbers is 10. The sum of the second and fourth of these numbers is ———

18. The number of natural numbers n for which $n^2 + 96$ is a perfect square is ———

19. n is an integer and $\sqrt{\frac{3n-5}{n+1}}$ is also an integer. The sum of all such n is ———

20. $\frac{a}{b}$ is a fraction where a, b have no common factors other than 1. b exceeds a by 3. If the numerator is increased by 7, the fraction is increased by unity. The value of $a + b$ ———

21. if $x = \sqrt[3]{2} + \frac{1}{\sqrt[3]{2}}$, then the value of $2x^3 - 6x$ is ———

22. The angles of a heptagon are $160°, 135°, 185°, 140°, 125°, x°, x°$. The value of x is ———

23. ABC is a triangle and AD is its altitude. If $BD = 5DC$, then the value of $\frac{3(AB^2 - AC^2)}{BC^2}$ is ———

24. A sphere is inscribed in a cube that has a surface area of 24 cm^2. A second cube is then inscribed within the sphere. The surface area of the inner cube (in cm^2) is ———

25. A positive integer n is a multiple of 7. If $\sqrt{n}$ lies between 15 and 16, the number of possible value(s) of n is ———

26. The value of x which satisfies the equation $\frac{\sqrt{x+5} + \sqrt{x-16}}{\sqrt{x+5} - \sqrt{x-16}} = \frac{7}{3}$ is ———

27. M man do a work in m days. If there had been N men more, the work would have been finished n days earlier, then the value of $\frac{m}{n} - \frac{M}{N}$ is ———

28. The sum of the digits of a two number is 15. If the digits of the given number are reversed, the number is increased by the square of 3. The original number is ———

29. When expanded the units place of $(3127)^{173}$ is ———

30. If $a : (b + c) = 1 : 3$ and $c : (a + b) = 5 : 7$, then $b : (c + a)$ is ———