



VELAMMAL BODHI CAMPUS

(A CBSE – IIT/NEET Integrated Sr. Sec. School)

GRADE: X - Batch I

GRAND TEST– 2

SUB: MATHS

DATE: 19.12.2023

MARKS:80(3 HOURS)

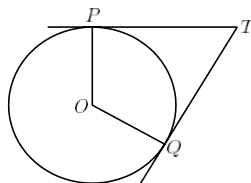
General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1,1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required, Take $\pi=22/7$ wherever required if not stated.

SECTION-A

Section A consists of 20 questions of 1 mark each.

1. The quadratic equation $x^2 - 4x - 3\sqrt{2} = 0$ has
 - (a) two distinct real roots
 - (b) two equal real roots
 - (c) no real roots
 - (d) more than 2 real roots
2. If the square of difference of the zeroes of the quadratic polynomial $x^2+px+45$ is equal to 144, then the value of p is
 - (a) ± 9
 - (b) ± 12
 - (c) ± 15
 - (d) ± 18
3. In the adjoining figure, TP and TQ are the two tangents to a circle with centre O . If $\angle POQ=110^\circ$, then $\angle PTQ$ is



- (a) 60°
 - (b) 70°
 - (c) 80°
 - (d) 90°
4. The pair of equations $x = a$ and $y = b$ graphically represents lines which are
 - (a) parallel
 - (b) intersecting at (b, a)
 - (c) coincident
 - (d) intersecting at (a, b)
 5. A set of numbers consists of three 4's, five 5's, six 6's, eight 8's and seven 10's. The mode of this set of numbers is
 - (a) 6
 - (b) 7
 - (c) 8
 - (d) 10
 6. If $x^2+y^2=25$, $xy=12$, then x is
 - (a) (3,4)
 - (b) (3, -3)
 - (c) (3,4,-3,-4)
 - (d) (3,-3)
 7. Triangle ABC is an equilateral triangle with each side of length $2p$. If AD is perpendicular to BC. Then the value of AD is
 - (a) $\sqrt{3}$
 - (b) $\sqrt{3p}$
 - (c) $2p$
 - (d) $4p$

8. In triangle ABC and BDE are two equilateral triangle such that D is the mid-point of BC . Ratio of the areas of triangles ABC and BDE is.....
 (a) 1:4 (b) 4:1 (c) 1:3 (d) 3:1
9. From an external point P, tangents PA and PB are drawn to a circle with centre O. If CD is the tangent to the circle at a point E and $PA = 14\text{cm}$. The perimeter of triangle PCD is
 (a) 14cm (b) 21cm (c) 28cm (d) 35cm
10. $(\cos^4 A - \sin^4 A)$ is equal to -----
 (a) $1 - 2\cos^2 A$ (b) $2\sin^2 A - 1$ (c) $\sin^2 A - \cos^2 A$ (d) $2\cos^2 A - 1$
11. An observer, 1.5m tall is 20.5 away from a tower 22m high, then the angle of elevation of the top of the tower from the eye of observer is
 (a) 30° (b) 45° (c) 60° (d) 90°
12. A tree casts a shadow 15m long on the level of ground, when the angle of elevation of the sun is 45° . The height of a tree is
 (a) 10m (b) 14m (c) 8m (d) 15m
13. From a solid circular cylinder with height 10cm and radius of the base 6cm, a right circular cone of the same height and same base is removed, then the volume of remaining solid is
 (a) $280\pi\text{cm}^3$ (b) $330\pi\text{cm}^3$ (c) $240\pi\text{cm}^3$ (d) $440\pi\text{cm}^3$
14. If median is 137 and mean is 137.05, then the value of mode is
 (a) 156.90 (b) 136.90 (c) 186.90 (d) 206.90
15. If a number x is chosen at random from the numbers -2, -1, 0, 1, 2. Then, the probability that $x^2 < 2$ is
 (a) $\frac{2}{5}$ (b) $\frac{4}{5}$ (c) $\frac{1}{5}$ (d) $\frac{3}{5}$
16. If the circumference of a circle increases from 4π to 8π , then its area is
 (a) Halved (b) doubled (c) tripled (d) quadrupled
17. Which of the following relationship is the correct?—
 (a) $P(E) + P(\bar{E}) = 1$ (b) $P(E) - P(\bar{E}) = 1$ (c) $P(\bar{E}) = 1 + P(E)$ (d) None
18. A chord of a circle of radius 10cm, subtends a right angle at its centre. The length of the chord (in cm) is
 (a) $\frac{5}{\sqrt{2}}$ (b) $5\sqrt{2}$ (c) $10\sqrt{2}$ (d) $10\sqrt{3}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

- (a) Both assertion(A) and reason(R) are true and reason(R) is the correct explanation of assertion(A).
 (b) Both assertion(A) and reason(R) are true but reason(R) is not the correct explanation of assertion(A).
 (c) Assertion(A) is true but reason(R) is false.
 (d) Assertion(A) is false but reason(R) is true.

19. Assertion: $a_n - a_{n-1}$ is not independent of n then the given sequence is an AP.

Reason: Common difference $d = a_n - a_{n-1}$ is constant or independent of n .

20. Assertion: The value of $\sin \theta = 4/3$ is not possible.

Reason: Hypotenuse is the largest side in any right angled triangle.

Section-B

Section B consists of 5 questions of 2 marks each.

21. Find the sum of first 8 multiples of 3?

22. From an external point P , tangents PA and PB are drawn to a circle with centre O . If $\angle PAB = 50^\circ$, then find $\angle AOB$.

23. Find the ratio in which the point $(-3, k)$ divides the line segment joining the points $(-5, -4)$ and $(-2, 3)$. Also find the value of k .

24. Prove that $\sqrt{5}$ is an irrational.

OR

Explain why $(7 \times 13 \times 11) + 11$ and $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 3$ are composite numbers.

25. Find the 7th term from the end of AP 7, 10, 13,, 184.

OR

The fourth term of an AP is 11. The sum of the fifth and seventh terms of the AP is 34. Find the common difference.

SECTION-C

Section C consists of 6 questions of 3 marks each.

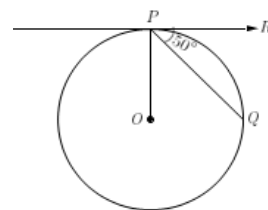
26. A fraction becomes $1/3$ when 2 is subtracted from the numerator and it becomes $1/2$ when 1 is subtracted from the denominator. Find the fraction.

27. Solve for x : $\frac{1}{x+4} - \frac{1}{x+7} = \frac{11}{30}$ $x \neq -4, -7$

28. Prove that the rectangle circumscribing a circle is a square.

OR

If O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ , find $\angle POQ$.



29. An electric pole is 10 m high. A steel wire tied to top of the pole is affixed at a point on the ground to keep the pole up right. If the wire makes an angle of 45° with the horizontal through the foot of the pole, find the length of the wire. [Use $\sqrt{2} = 1.414$]

30. From a solid right circular cylinder of height 14 cm and base radius 6 cm, a right circular cone of same height and same base removed. Find the volume of the remaining solid.

OR

A metallic cylinder has radius 3 cm and height 5 cm. To reduce its weights, a conical hole is drilled in the cylinder. The conical hole has a radius of $\frac{3}{2}$ cm and its depth $\frac{8}{9}$ cm. Calculate the ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape.

31. Two dice are tossed simultaneously. Find the probability of getting
(i) An even number on both dice. (ii) the sum of two numbers more than 9.

SECTION-D

Section D consists of 4 questions of 5 marks each.

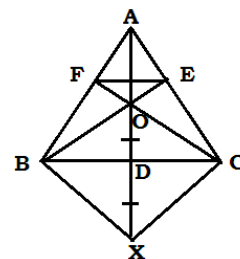
32. Solve the following quadratic equation $9x^2 - 9(a+b)x + (2a^2 + 5ab + 2b^2) = 0$

OR

i) Find the roots of the equation $x^2 - 3\sqrt{5}x + 10 = 0$

ii) Solve $\frac{x}{x+1} + \frac{x}{x+2} = \frac{x}{x+4}$, $x \neq -1, -2, -4$

33. In triangle ABC , AD is a median and O is any point on AD . BO and CO on producing meet AC and AB at E and F respectively. Now AD is produced to X such that $OD = DX$ as shown in figure. Prove that:



- (1) $EF \parallel BC$ (2) $AO : AX = AF : AB$

34. i) Prove that $\frac{\cos^2 \theta}{1 - \tan \theta} + \frac{\sin^2 \theta}{\sin \theta - \cos \theta} = 1 + \sin \theta \cos \theta$
ii) Prove that $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$

Or

Prove that $\sqrt{\frac{\sec A - \tan A}{\sec A + \tan A}} \times \sqrt{\frac{\operatorname{cosec} A - \cot A}{\operatorname{cosec} A + \cot A}} = (\sec A - 1)(\operatorname{cosec} A - 1).$

35. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle.

Section-E

Case study based questions are compulsory.

35. **Heart Rate:** The heart rate is one of the 'vital signs,' or the important indicators of health in the human body. It measures the number of times per minute that the heart contracts or beats. The speed of the heartbeat varies as a result of physical activity, threats to safety, and emotional responses. The resting heart rate refers to the heart

rate when a person is relaxed. While a normal heart rate does not guarantee that a person is free of health problems, it is a useful benchmark for identifying a range of health issues. After the age of 10 years, the heart rate of a person should be between 60 and 100 beats per minute while they are resting.

Thirty women were examined by doctors of AIIMS and the number of heartbeats per minute were recorded and summarised as follows.

Number of heart beats per minute	Number of women (f_i)
65-68	2
68-71	4
71-74	3
74-77	8
77-80	7
80-83	4
83-86	2

Based on the above information, answer the following questions.

- What is the mean heartbeats per minute for these women?
- What is the upper limit of median value of heartbeats per minute for these women?
- What is the lower limit of mode value of heart beats per minute for these women?

OR

How many women are having heartbeat in range 68-77?

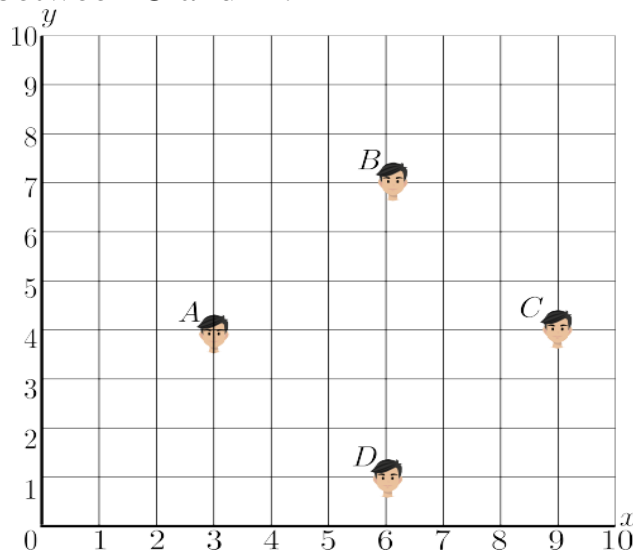
36. Morning assembly is an integral part of the school's schedule. Almost all the schools conduct morning assemblies which include prayers, information of latest happenings, inspiring thoughts, speech, national anthem, etc. A good school is always particular about their morning assembly schedule. Morning assembly is important for a child's development. It is essential to understand that morning assembly is not just about standing in long queues and singing prayers or national anthem, but it's something beyond just prayers. All the activities carried out in morning assembly by the school staff and students have a great influence in every point of life. The positive effects of attending school assemblies can be felt

throughout life.

Have you noticed that in school assembly you always stand in row and column and this make a coordinate system. Suppose a school have 100 students and they all assemble in prayer in 10 rows as given below.

Here A , B , C and D are four friend Amar, Bharat, Colin and Dravid.

- (i) What is the distance between A and B ?
- (ii) What is the distance between C and D ?



- (iii) What is the distance between A and C ?

OR

What is the distance between D and B ?

37. Volume of a Bird Cage. A company makes rectangular shaped bird cages with height b inches and square bottoms. The volume of these cages is given by the function $V = b^3 - 6b^2 + 9b$.

- (i) Find an expression for the length of each side of the square bottom.
- (ii) Use the function to find the volume of a cage with a height of 15 inches.
- (iii) Use the function to find the volume of a cage with a height of 18 inches

