श्री Venkateshwar International School

Sector-18, Dwarka, New Delhi-75

MID -TERM EXAMINATION (2026-2027)

MATHEMATICS – X (041)

Time: 3 Hours **Max. Marks: 80**

GENERAL INSTRUCTIONS:

1. *This question paper consists of 6 pages with 38 questions in 5 Sections A-E.*
2. *Section A has 20 MCQs carrying 01 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 1, 2 and 1 mark each respectively.*
7. *All questions are compulsory. However, an internal choice in 2 questions of 5 marks, 2 questions of 3 marks and 2 questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.*
8. *Draw neat figures wherever required.*

SECTION - A

Section A consists of 20 multiple choice questions of 1 mark each. Choose the most appropriate option.

1. The roots of the equation $3x^2 - 7x + 4 = 0$ are **(1)**
   (a) rational. (b) irrational. (c) positive integers. (d) negative integers.

2. The quadratic polynomial with sum and product of its zeroes as $\frac{-1}{4}$ and $\frac{1}{4}$ respectively, is **(1)**
   (a) $4x^2 + x + 1$ (b) $x^2 - 3x + 2$ (c) $x^2 + 3x - 2$ (d) $4x^2 - x - 1$

3. Point (4, 3) lies on the line **(1)**
   (a) $3x + 7y = 27$ (b) $7x + 2y = 47$
   (c) $3x + 4y = 24$ (d) $5x - 4y = 1$

4. The sum of the 6th and the 7th terms of an A.P. is 39 and the common difference is 3, then the first term of the AP is **(1)**
   (a) -3 (b) 2 (c) 3 (d) 4

5. The graph of a polynomial p(x) intersects the x-axis at 2 distinct points and the y-axis at one point, the number of zeroes of p(x) is **(1)**
   (a) 0 (b) 1 (c) 2 (d) 3

6. The two end points of a line segment are (a, b) and (–a, –b), then the length of the line segment is **(1)**
   (a) $\sqrt{a^2 + b^2}$ (b) $2\sqrt{a^2 + b^2}$ (c) $\frac{2}{3}\sqrt{a^2 + b^2}$ (d) $\sqrt{a^2 - b^2}$

OR

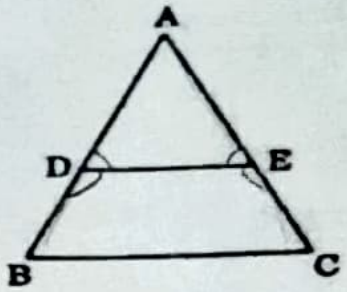
Solve the quadratic equation $x^2 - 3x - m(m+3) = 0$, m is a constant. (2)

SECTION - C

Section C consists of 6 questions of 3 marks each

26. If $\sin(A+B) = 1$ and $2\cos(A-B) = \sqrt{3}, 0° < A, B < 90°$, find the measure of A and B. (3)

27. In the given figure, $\frac{AD}{BD} = \frac{AE}{EC}$ and $\angle BDE = \angle CED$, prove that ΔABC is an isosceles triangle. (3)



28. In an AP, the 15th term exceeds the 8th term by 21. If the sum of the first 10 terms is 55, then find the AP. (3)

29. Solve the pair of linear equations $2x + y = 6$ and $2x - y = -2$ graphically. (3)

30. The coordinates of the centre of a circle are $(x-7, 2x)$. Find the value(s) of x if the circle passes through the point $(-9, 11)$ and has diameter $10\sqrt{2}$ units. (3)

OR

Find the ratio in which the x-axis divides the line segment joining the points $(-6, 5)$ and $(-4, -1)$. Also, find the point of intersection. (3)

31. Prove that $(3 + 2\sqrt{5})^2$ is an irrational number, given that $\sqrt{5}$ is irrational. (3)

OR

A fruit vendor has 990 apples and 945 oranges. He packs them into baskets. Each basket contains only one of the two fruits but in equal numbers. Find the number of fruits to be put in each basket in order to have minimum number of baskets. Also, find the number of baskets of each fruit. (3)

SECTION - D

Section D consists of 4 questions of 5 marks each

32. If α and β are the zeroes of a quadratic polynomial $x^2 - ax - b$. Obtain a quadratic polynomial whose zeroes are $3\alpha + 1$ and $3\beta + 1$. (5)

33. Sides AB and AC and median AD of ΔABC are respectively proportional to sides PQ and PR and median PM of another ΔPQR. Show that $\Delta ABC \sim \Delta PQR$. (5)

OR

In the given figure, PA, QB and RC are each perpendicular to AC. If AP = x, BQ = y and CR = z, then prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$. (5)

$\frac{1}{x} + \frac{1}{2} = \frac{1}{y}$.

18. A peacock sitting on the top of a tree of height 10 m observes a snake moving on the ground. If the snake is $10\sqrt{3}$ m away from the base of the tree, then the angle of depression of the snake from the eye of the peacock is (1)

(a) 30° (b) 45° (c) 60° (d) 90°

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

19. **Assertion (A)** : If two triangles are similar, their corresponding medians are in the same ratio as their corresponding sides. (1)

Reason (R) : Similar triangles have corresponding sides that are proportional.

(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 and 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.

20. **Assertion (A)** : Value of $\sin\theta$ can never be $\frac{21}{22}$. (1)

Reason (R) : The maximum value of $\sin\theta$ is 1.

(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 and 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.

SECTION - B

Section B consists of 5 questions of 2 marks each

21. If A(3, 0), B(6, 4) and C(−1, 3) are the vertices of a ΔABC, then find the length of median BE. (2)

22. If $\cot\theta = \frac{7}{8}$, then find the value of $\sin\theta$ and $\cos\theta$ and hence find the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$. (2)

23. If one zero of the quadratic polynomial $p(x) = 6x^2 + 37x - (k-2)$ is the reciprocal of the other, find the value of k. (2)

24. Find the value(s) of k so that the pair of equations $x + 2y = 5$ and $3x + ky + 15 = 0$ has a unique solution. (2)

OR

Two straight paths are represented by the equations $x - 3y = 2$ and $-2x + 6y = 5$. Check whether the paths cross each other or not. (2)

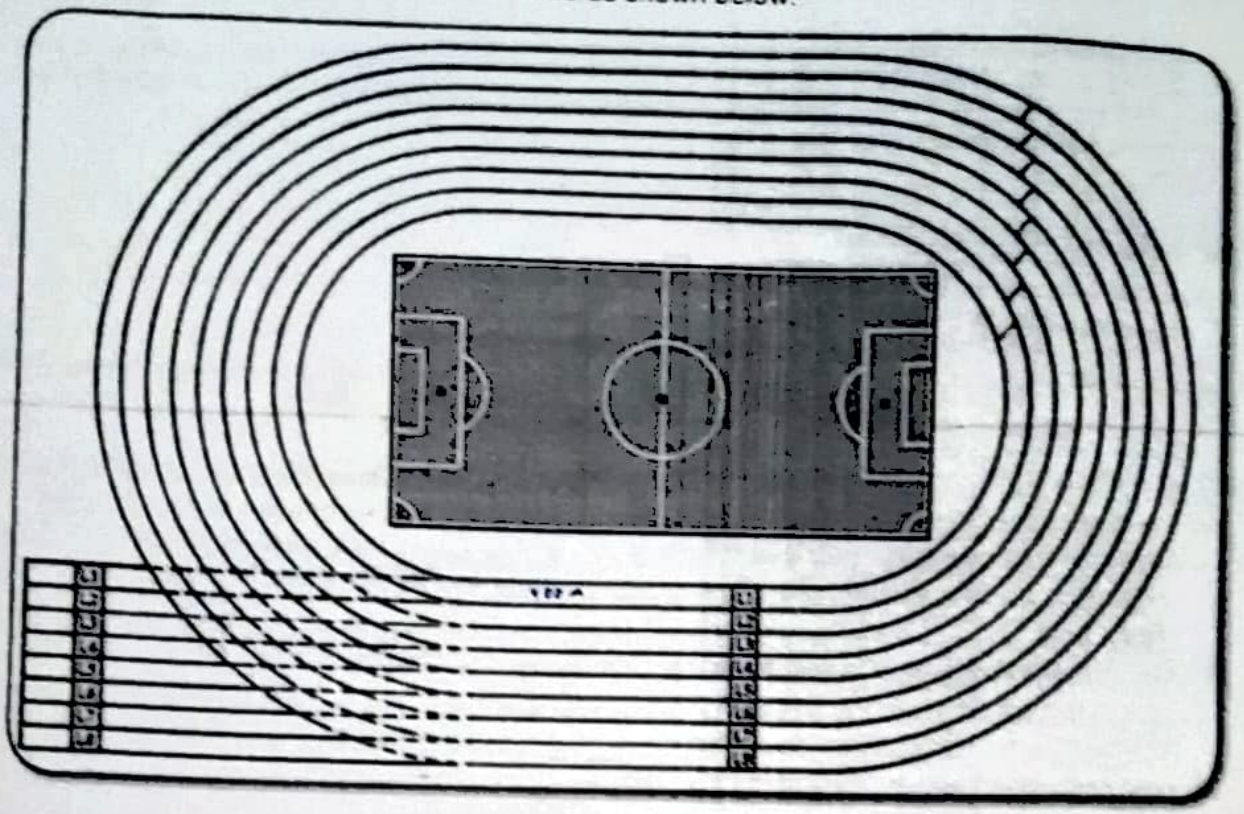
25. Find the value(s) of k so that the quadratic equation $(k+1)x^2 - 2(k-1)x + 1 = 0$ has real and equal roots. (2)

OR

(ii) (b) If Shreya moves to a point which is at a distance of $\frac{41}{\sqrt{3}}$ m from the India Gate, then find the angle of elevation made by her eye to the top of the India Gate. (2)

(iii) If Shreya observes the angle of elevation from her eye to the top of India Gate to be 60°, then how far is she standing from the base of the India Gate. (1)

38. In order to organise Annual Sports Day, a school prepared an eight lane running track with an integrated football field inside the track area as shown below.



The length of the innermost lane of the track is 400 m and each subsequent lane is 7.6 m longer than the preceding lane.

Answer the following questions based on the given information.

(i) Find the length of the 6th lane. (1)

(ii) (a) While practicing for a race, a student took one round each in the first six lanes. Find the total distance covered by the student. (2)

OR

(ii) (b) A student took one round each in lane 4 to lane 8. Find the distance covered by the student. (2)

(iii) Find the difference between the lengths of the 8th lane and the 4th lane. (1)

7. The graph of an equation $y = -5$ is a line which is (1)

(a) parallel to x-axis (b) parallel to y-axis

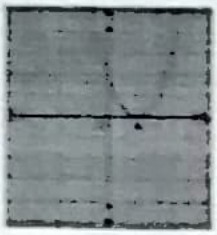
(c) passing through origin (d) coincident with x-axis

8. The distance between the lines $2x + 4 = 0$ and $x - 5 = 0$ is (1)

(a) 1 unit (b) 5 units (c) 7 units (d) 9 units

9. If in a quadratic polynomial $ax^2 + bx + c$, the relationship $b = \pm 2\sqrt{ac}$ holds true, then the graph of the polynomial can be (1)

(a)



(b)

(c)

(d)

10. How many natural numbers up to 300 are divisible by 17? (1)

(a) 13 (b) 15 (c) 17 (d) 19

11. If the HCF of 85 and 153 is expressible in the form of $85n - 153$, then the value of n is (1)

(a) 4 (b) 3 (c) 2 (d) 1

12. The three vertices of a rhombus PQRS are P (2, –3), Q (6, 5) and R (–2, 1). The coordinates of S are (1)

(a) (0, –1) (b) (–6, –7) (c) (4, 1) (d) (2, 3)

13. If $p^n = (a \times 5)^n$, for p^n to end with the digit zero 'a' can be _____ for any natural number n. (1)

(a) any natural number (b) an odd number

(c) any even number (d) None of these

14. If a and b are two co-prime numbers, then a^3 and b^3 are (1)

(a) co-primes (b) not co-primes. (c) even. (d) odd.

15. If $\theta = 45°$, then $\sec\theta \cot\theta - \text{cosec}\theta \cot\theta$ is (1)

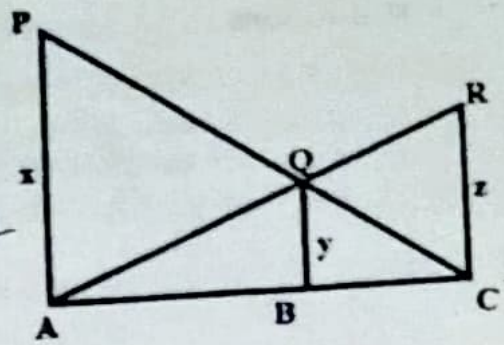
(a) 0 (b) 1 (c) $2\sqrt{2}$ (d) $\sqrt{2}$

16. The points A (9, 0), B (9, –6), C (–9, 0) and D (–9, 6) are the vertices of a (1)

(a) square. (b) rectangle. (c) parallelogram. (d) trapezium.

17. If two positive numbers p and q can be expressed as $p = 18a^2b^4c$ and $q = 20a^3b^2d$, where a, b, c and d are prime numbers, then HCF(p, q) is (1)

(a) $2a^2b^2$ (b) $2a^2b^2cd$ (c) $180a^2b^2$ (d) $180a^3b^4cd$



34. A train covers a distance of 480 km at a uniform speed. If its speed had been 8 km/h slower, it would have taken 3 hours longer to cover the same distance. Find the original speed of the train. **(5)**

35. Prove that $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + sec\theta.cosec\theta.$ **(5)**

OR

Prove that $\frac{\sin A - \cos A + 1}{\sin A + \cos A - 1} = \frac{1}{\sec A - \tan A}$ **(5)**

SECTION- E

Case study-based questions are compulsory

36. The total cost of Snowden Ice Cream Parlour is divided into fixed cost (x) and variable cost per unit (y). Fixed cost is the cost that the ice cream parlour has to incur even at zero level of production and the variable cost is the cost that will be directly proportional to each unit of ice cream sold.
The break-even point of a new flavour of ice cream is the number of units sold at which the total cost of the ice cream is the same as the total selling price.
The parlour launched a new flavour of ice cream and wanted to find the fixed and the variable cost associated with it. They found that their total cost for that flavour was ₹ 27,500 after selling 50 units and ₹ 32,500 after selling 250 units.
Answer the following questions based on the given information.
(i) Form a pair of linear equations in two variables to represent the given equation. **(1)**
(ii) (a) Find the fixed cost incurred by the ice cream parlour. **(2)**

OR

(ii) (b) Find the variable cost per unit incurred by the ice cream parlour. **(2)**
(iii) The parlour launches another new flavour with a fixed cost of ₹ 10,000, a variable cost of ₹ 40 per unit and the selling price of ₹ 60 per unit. Find the number of units at the break-even point of the other new flavour. **(1)**

37. India Gate is located near Karthavya path in New Delhi. It stands as a memorial to 74,187 soldiers of the Indian Army who lost their lives in the First World War. The monument is 42 m tall and was designed by Sir Edwin Lutyens in the style of Roman triumphal arches. A student Shreya with height 1 m visited India Gate as a part of her study tour.
Answer the following questions based on the given information.
(i) Find the angle of elevation from Shreya's eye to the top of India Gate if she is standing at a distance of 41 m away from the India Gate. **(1)**
(ii) (a) If the angle of elevation from Shreya's eye changes from 45° to 30°, when she moves some distance from the original position, find the distance she moves back. **(2)**