SHAPING FUTURES, BUILDING LEGACIES

ST KABIR PUBLIC SCHOOL

SECTOR 26, CHANDIGARH, 160019

MID TERM EXAMINATION (2025-26)

Class: X
Subject: Mathematics (041)

Duration: 3 hours
Max. Marks: 80

General Instructions:

1. *This Question Paper contains **38** questions. **All** Questions are **compulsory.***
2. *This question paper is divided into **five** Sections – A, B, C, D and E.*
3. *In **Section A**, Questions no. **1** to **18** are multiple choice questions (MCQs) and questions number **19** and **20** are Assertion-Reason based questions of 1 mark each.*
4. *In **Section B**, Questions no. **21** to **25** are very short answer (VSA) types questions of **2** marks each.*
5. *In **Section C**, Questions no. **26** to **31** are short answer (SA) type questions of **3** marks each.*
6. *In **Section D**, Questions no. **32** to **35** are long answer (LA) type questions of **5** marks each.*
7. *In **Section E**, Questions no. **36** to **38** are case study-based questions of **4** marks each. Internal choice is provided in **2** marks questions in each case-study.*
8. *There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.*
9. *Draw neat diagrams wherever required. Take π =22/7 wherever required, if not stated.*
10. *Use of calculators is **not** allowed.*

1)

SECTION A

This section comprises multiple choice questions (MCQs) of 1 mark each.

Q 1. If α and β are zeroes of the polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then the value of p is **(1)**

(A) $\frac{-2}{3}$ (B) $\frac{2}{3}$
(C) $\frac{1}{3}$ (D) $\frac{-1}{3}$

Q 2. The value of $\left(\frac{11}{\cot^2\theta} - \frac{11}{\cos^2\theta}\right)$ is **(1)**

(A) 11 (B) -11
(C) $\frac{1}{11}$ (D)0

Q 3. Given that HCF (2520, 6600) = 40 and LCM (2520, 6600) = 252 × k, then the value of k is **(1)**

(A) 1650 (B)1600
(C)165 (D)1625

Q 4. If a zero of the polynomial $f(x) = (k^2 + 4)x^2 + 13x + 4k$ is reciprocal of the other, then k is **(1)**

(A) 2 (B)-2
(C)1 (D) -1

Q 5. If 2 and $\frac{1}{2}$ are zeroes of $px^2 + 5x + r$, then **(1)**

(A) p = r = 2 (B)p = r = -2
(C)p = -2, r = 2 (D)p = 2, r = -2

Q 6. The LCM of the smallest two-digit composite number and the smallest composite number is **(1)**

(A) 12 (B) 20
(C) 4 (D) 44

Q 7. The distance between the points P (2, tan α) and Q (3, 0) is **(1)**

(A) sec α (B) cosec α
(C) sin α (D) cos α

Q 8. Δ ABC is a right-angled triangle at B and $\tan A = \frac{4}{3}$. If AC= 10 cm, the length of AB is **(1)**

(A) 6 cm (B) 4 cm
(C) 3 cm (D) 8 cm

Q 9. The 7^{th} term from the end of the AP 7, 11, 15, ... ,107, is **(1)**

(A) 79 (B) 81
(C) 83 (D) 87

Q10. If the common difference of an AP is 7, then $a_{25} - a_{21}$ is equal to **(1)**

(A) 14 (B) 20
(C) 28 (D) 35

Q 11. The smallest number divisible by all natural numbers between 1 and 10(both inclusive) is **(1)**

(A) 2020 (B) 1010
(C) 2520 (D) 5040

Q 12. If the nth term of an AP is 7n + 12, then its common difference is **(1)**

(A) 12 (B) 5
(C) 7 (D) 19

Q 13. The discriminant of the quadratic equation $(x + 2)^2 = 0$ **(1)**

(A) -2 (B) 2
(C) 4 (D) 0

Q 14. If the equation $x^2 + 4x + k = 0$ has real and distinct roots, then **(1)**

(A) $k < 4$ (B) $k > 4$
(C) $k \geq 4$ (D) $k \leq 4$

Q 15. If A (5, p), B (1, 5), C (2, 1) and D (6, 2) taken in order are the vertices of a square, then the value of p is **(1)**

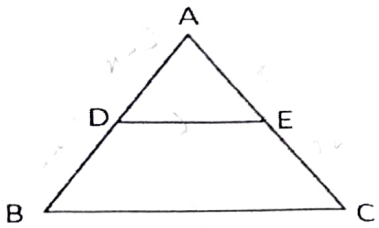
(A) 3 (B) 7
(C) 6 (D) 8

Q 16. If Δ ABC ~ Δ EDF and Δ ABC is not similar to Δ DEF, then which of the following is not true? **(1)**

(A) BC × EF = AC × FD (B) AB × EF = AC × DE
(C) BC × DE = AB × EF (D) BC × DE = AB × FD

Q 17. In the figure, DE ∥ BC, AD = x + 3, DB = 3x + 19, AE = x and EC = 3x + 4, find the value of x. (1)

(A) 4
(B) 1
(C) 3
(D) 2



Q 18. In triangles ABC and DEF, ∠ B = ∠ E, ∠ F = ∠ C and AB = 3 DE, then the two triangles are (1)

(A) congruent but not similar
(B) similar but not congruent
(C) neither congruent nor similar
(D) congruent as well as similar

Question number **19** and **20** are Assertion and Reason based questions carrying 1 mark each. Choose the correct option. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
(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.

Q 19. Assertion (A): A triangle with vertices at (4, 0), (-1, -1) and (3.5) is an isosceles right triangle. (1)
Reason (R): If ABC is an isosceles triangle, then it is right angled.

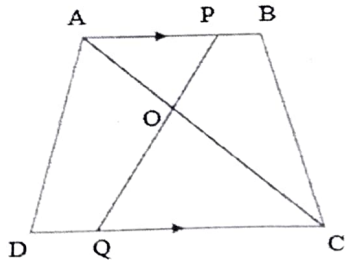
Q 20. Assertion (A): For any acute angle θ, the value of sin θ cannot be greater than 1. (1)
Reason (R): Hypotenuse is the longest side in any right-angled triangle.

SECTION B

This section comprises very short answer (VSA) types questions of **2** marks each.

Q 21. Prove that $\sqrt{7}$ is an irrational number. (2)

Q 22. In the figure, AB ∥ DC. If AC and PQ intersect each other at O, prove that (2)
AO × CQ = OC × AP



Q 23. Find the zeroes of the quadratic polynomial $p(x) = 6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficient of the polynomial. (2)

Q 24. (A) Prove that $\sec^2\theta - \cos^2\theta = \sin^2\theta(\sec^2\theta + 1)$. (2)

OR

(B) If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, $0° < (A + B) < 90°$ and $A > B$, find the value of A and B.

Q25. (A) Write the statements of Basic Proportionality theorem and converse of Basic proportionality theorem. (2)

OR

(B) In Δ PQR, S and T are points on PQ and PR respectively. $\frac{PS}{SQ} = \frac{PT}{TR}$ and ∠ PST =∠PRQ. Prove that PQR is an isosceles triangle.

SECTION C

This section comprises short answer (SA) types questions of **3** marks each.

Q 26. A circular track around a sports ground has circumference of 1080 m. Two cyclists Parush and Shreyan start together and cycled at constant speeds of 6 m/s and 9 m/s respectively around the circular track. After how many minutes will they meet again at the starting point. (3)

Q 27. (A) If α and β are zeroes of the polynomial $f(x) = 3x^2 - 5x - 2$, then evaluate $\alpha^3 + \beta^3$. (3)

OR

(B) If α and β are zeroes of the polynomial $f(x) = x^2 - 3x - 2$, then find a polynomial whose zeroes are $(2\alpha + 3\beta)$ and $(3\alpha + 2\beta)$,

Q 28. (A) Prove that $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = (7 + \tan^2 A + \cot^2 A)$ (3)

OR

(B) If $x = p\sec 0 \mid q\tan 0$ and $y = p\tan 0 \mid q\sec 0$, then prove that $x^2 - y^2 = p^2 - q^2$

Q 29. Solve for x: $2\left(\frac{2x-1}{x+3}\right) - 3\left(\frac{x+3}{2x-1}\right) = 5$, $x \neq -3, \frac{1}{2}$. (3)

Q 30. If the point C (-1,2) divides internally the line segment joining A (2, 5) and B (x, y) in the ratio 3: 4, then find the coordinates of B. (3)

Q 31. ABCD is a trapezium in which AB || DC and its diagonals intersect each other at the point O. Show that AO. DO = CO. BO. Using Basic Proportionality Theorem (3)

SECTION D

This section comprises long answer (LA) types questions of **5** marks each.

Q 32. (A) Prove that $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = \sec A\,\text{cosec}\,A + 1$ (5)

OR

(B) Verify the following trigonometric equations

(i) $\text{cosec}^3 30^0 \times \cos 60^0 \times \tan^3 45^0 \times \sin^2 90^0 \times \sec^2 45^0 \times \cot 30^0 = 8\sqrt{3}$

(ii) $\tan^2 30^0 + \frac{1}{2}\sin^2 45^0 + \frac{1}{3}\cos^2 30^0 + \cot^2 60^0 = \frac{7}{6}$

Q 33. (A) For what values of a and b will the following system of linear equations have infinitely many solutions? (5)

$2x - 3y = 7$

$(a + b)x - (a + b - 3)y = 4a + b$

OR

(B) For what values of p and q will the following system of linear equations have infinitely many solutions?

$4x + 5y = 2$

$(2p + 7q)\, x + (p + 8q)\, y = 2q - p + 1$

Q 34. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$. **(5)**

Q 35. John and Jolly together have 45 marbles. Both of them lost 5 marbles each and the product of the number of marbles they now have, is 124. Find out how many marbles they had to start with? **(5)**

SECTION E

This section comprises 3 case-based questions of **4** marks each.

Q 36. A model rocket is a small rocket designed to reach low altitudes and can be recovered by a variety of means. Flying a model rocket is a relatively safe and inexpensive way for a person to learn the basics of forces and how a vehicle responds to external forces. Like an airplane, a model rocket is subjected to the forces of weight, thrust and aerodynamics during its flight. Shalvi is a member of India's first rocket club, named the STAR Club. She launches her latest rocket from a large field. At the moment its fuel is exhausted, the rocket has a velocity of 240 ft/sec and an altitude of 544 ft. After t sec, its height h(t) above the ground is given by

$h(t) = -16\, t^2 + 240\, t + 544$

(i) What will be the path of the rocket? **(1)**

(ii) At what time is the minimum height attained by the rocket? Find the answer in seconds. **(1)**

(iii) **(A)** How high is the rocket 5 seconds after the fuel is exhausted?

OR

(B) How high is the rocket 10 seconds after the fuel is exhausted? **(2)**

Q 37. Bus fare for two people to station A and three people to station B from Jalandhar is ₹ 385. If the fare for three people to station A and 5 people to station B from Jalandhar is ₹ 620. Consider the bus fares from Jalandhar to station A and that to station B as ₹ x and ₹ y respectively. Use this information to answer the following questions

(i) What is the equation for the first situation? **(1)**

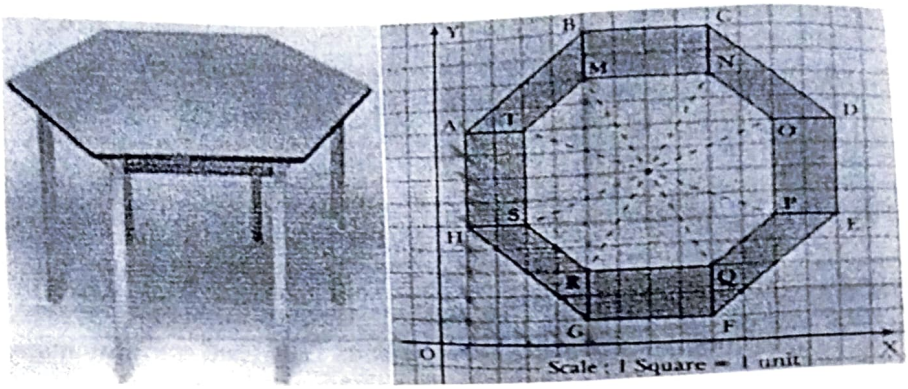
(ii) What is the equation for the second situation? **(1)**

(iii) (A) Find the bus fare from Jalandhar to station A. **(2)**

OR

(B) Find the bus fare from Jalandhar to station B.

Q 38. The top of a table is shown in the figure. On the basis of above information answer the following questions



(i) Find the distance between points A and B. **(1)**

(ii) Write the coordinates of the mid-point of the line segment joining points M and Q. **(1)**

(iii) (A) If G is taken as the origin and x, y axes put along GF and GB, then find the points denoted by coordinate (4, 2) and (8, 4). **(2)**

OR

(B) Find the coordinates of H, G and also find the distance between them.