KENDRIYA VIDYALAYA SANGATHAN ERNAKULAM REGION
PRE BOARD QUESTION PAPER – CLASS X[2026-27]
MATHEMATICS (STANDARD) – Subject Code 041

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.

2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each (Q.1–Q.18 MCQs and Q.19–Q.20 Assertion–Reason type).

3. Section B has 5 Very Short Answer (VSA) type questions carrying 2 marks each.

4. Section C has 6 Short Answer (SA) type questions carrying 3 marks each.

5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.

6. Section E has 3 Case Study-based integrated units of assessment (4 marks each) with sub-parts of 1, 1 and 2 marks.

7. All questions are compulsory. However, an internal choice has been provided in 2 questions of Section B, 2 questions of Section C, 2 questions of Section D and in the 2-mark sub-part of each case study in Section E.

8. Draw neat diagrams wherever required. Take $\pi = 22/7$ wherever required, if not stated.

9. Use of calculators is not allowed.

SECTION A

(Q.1 to Q.20 are Multiple Choice Questions of 1 mark each)

1. Two traffic lights at a junction change after every 48 seconds and 72 seconds respectively. If they change simultaneously at 8:00 a.m., after how much time will they change simultaneously again?

(A) 2 min 24 s (B) 3 min (C) 4 min 48 s (D) 2 min

2. If one zero of the polynomial $p(x) = (k^2 + 4)x^2 + 13x + 4k$ is the reciprocal of the other, then the value of k is

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

3. The pair of linear equations $2x + 3y = 7$ and $(k - 1)x + (k + 2)y = 3k$ has infinitely many solutions for k =

(A) 5 (B) 6 (C) 7 (D) 8

4. The roots of the quadratic equation $x^2 - 6x + k = 0$ are real and equal. The value of k is

(A) 3 (B) 6 (C) 9 (D) 12

5. The sum of the first n terms of an AP is $3n^2 + 5n$. The common difference of the AP is

(A) 3 (B) 5 (C) 6 (D) 8

6. The sum of the digits of a two-digit number is 9. If the digits are interchanged, the number increases by 27. The original number is

(A) 36 (B) 63 (C) 27 (D) 45

7. A 6 m tall pole casts a shadow of 4 m on level ground. At the same time, a tree casts a shadow of 14 m. The height of the tree is

(A) 18 m (B) 21 m (C) 24 m (D) 28 m

8. If $\Delta ABC, DE \parallel BC$ such that AD=3cm, DB=4.5cm and AE=4cm,find length of EC?

(A) 5 cm (B) 8 cm (C) 6 cm (D) 7.5 cm

9. A 15 m long ladder placed in a street reaches a window 12 m high on one side. Keeping its foot at the same point, it is turned to the other side and reaches a window 9 m high. The width of the street is

(A) 15 m (B) 18 m (C) 21 m (D) 24 m

10. Tangents PA and PB are drawn from an external point P to a circle with centre O, such that $\angle APB = 80°$. Then $\angle OAB$ is equal to

(A) 40° (B) 50° (C) 80° (D) 100°

11. The tangent PQ at a point P of a circle of radius 5 cm meets the line through the centre O at a point Q such that OQ = 13 cm. The length of PQ is

(A) 8 cm (B) 10 cm (C) 12 cm (D) $\sqrt{194}$ cm

12. If $\sin A = 3/5$, where A is an acute angle, then the value of $(\tan A + \sec A)$ is

(A) 1 (B) 2 (C) 5/2 (D) 7/4

13. The value of $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta)$ is

(A) 0 (B) 1 (C) $\sec^2\theta$ (D) $\tan^2\theta$

14. The area of a sector of a circle of radius 6 cm and central angle 60° is

(A) 6π cm² (B) 12π cm² (C) 3π cm² (D) 36π cm²

15. A solid toy is in the form of a hemisphere surmounted by a right circular cone of the same base radius r. If the height of the cone is equal to the radius of its base, what is the ratio of the volume of the cylindrical container that precisely circumscribes this toy to the total volume of the toy?

(A) 2:1 (B) 3:1 (C) 9:5 (D) 4:3

16. A school has 134 mathematics notebooks and 188 science notebooks. The largest number of equal-sized bundles that can be made so that 4 mathematics notebooks and 6 science notebooks are left over is:

(A) 13 (B) 26 (C) 39 (D) 65

17. If two positive integers 'a' and 'b' are written as $a = x^3y^2$ and $b = xy^3$, where x and y are prime numbers, then HCF(a, b) is:

(A) xy (B) xy^2 (C) x^3y^3 (D) x^2y^2

18. The ratio in which the x-axis divides the line segment joining the points A(1, -5) and B(-4, 5) is:

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

Directions (Q.19 and Q.20): In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

19. **Assertion (A):** The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has no solution.

Reason (R): A pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has no solution if $a_1/a_2 = b_1/b_2 \neq c_1/c_2$.

(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.

20. **Assertion (A):** The value of tan θ is less than 1 for every acute angle θ.

Reason (R): tan 45° = 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 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.

SECTION B

(Q.21 to Q.25 are Very Short Answer type questions of 2 marks each)

21. A florist has 36 roses and 60 lilies. She wants to make identical bouquets using all the flowers, with each bouquet having the same number of roses and the same number of lilies, and no flower left over. Find the maximum number of bouquets she can make and the number of roses and lilies in each bouquet.

22. Find a quadratic polynomial whose sum and product of zeroes are −3 and 2 respectively. Hence find its zeroes.

OR

If α and β are the zeroes of the polynomial $x^2 - 8x + k$ such that $\alpha^2 + \beta^2 = 40$, find the value of k.

23. On a city map drawn on a coordinate grid (1 unit = 1 km), a hospital H is at (2, −3) and a school S is at (−4, 5). A bus stop is to be built at the midpoint of HS. Find the coordinates of the bus stop and its distance from the hospital.

24. Two straight paths PA and PB touch a circular pond with centre O and radius 6 m at A and B respectively, from an external point P. If PA = 8 m, find the distance OP and the perimeter of the quadrilateral OAPB.

OR

Two concentric circles have radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

25. A playground slide has its top 3 m above the ground and is inclined at 30° to the ground. Find the length of the slide and the horizontal distance it covers on the ground.

SECTION C

(Q.26 to Q.31 are Short Answer type questions of 3 marks each)

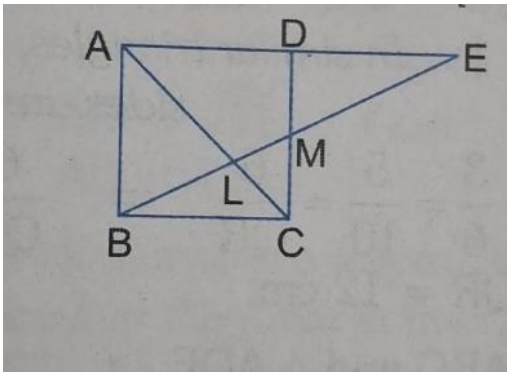
26. Prove that $\sqrt{5}$ is an irrational number.

OR

Prove that $3 + 2\sqrt{5}$ is an irrational number.

27. Solve the following pair of linear equations: 2x + 3y = 11 and 2x − 4y = −24. Hence find the value of 'm' for which y = mx + 3.

28. In figure, M is mid-point of side CD of a parallelogram ABCD. The line BM is drawn intersecting AC at L and AD produced at E. Prove that EL = 2 BL.



29. Prove that: $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

OR

Prove that: $(1 + \cot A - \text{cosec}\,A)(1 + \tan A + \sec A) = 2$.

30. Two friends, Aditi and Rohan, are sitting at positions A(2, 3) and B(8, 7) respectively on a grid mapped across a school playground. A third friend, Maya, wants to sit at a point P(x, y) along the straight line joining A and B such that her distance from Aditi is half of her distance from Rohan.

(a) In what ratio does point P divide the line segment AB internally? [1]

(b) **Find the exact coordinates of P(x, y) where Maya should sit.** [2]

31. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding minor segment. (Use $\pi = 3.14$)

SECTION D

(Q.32 to Q.35 are Long Answer type questions of 5 marks each)

32. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

OR

Two water taps together can fill a tank in 9⅜ hours (i.e. 75/8 hours). The tap with the larger diameter takes 10 hours less than the tap with the smaller diameter to fill the tank separately. Find the time in which each tap can separately fill the tank.

33. State and prove the Basic Proportionality Theorem (Thales Theorem).

34. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of the same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy and the cost of painting it at ₹10 per cm^2. (Use $\pi = 22/7$)

OR

A water tank consists of a cylinder of radius 3.5 m and height 8 m with a hemispherical roof of the same radius. Find the total curved surface area of the cylinder and hemisphere together. Also find the cost of painting this curved surface at ₹120 per m^2. .

35. A chord of a circle of radius **14cm** subtends a right angle at the centre.

Find:

1. The area of the minor segment.
2. The area of the major sector.
3. The perimeter of the minor sector.

SECTION E

(Q.36 to Q.38 are Case Study based questions of 4 marks each)

36. Case Study 1: Green Campus Drive

A school launches a 'Green Campus Drive'. On Day 1, the students plant 8 saplings. On each following day, they plant 4 more saplings than on the previous day. The numbers of saplings planted on successive days form an Arithmetic Progression (AP).

(i) Write the first four terms of this AP. **[1]**

(ii) How many saplings are planted on the 15th day? **[1]**

(iii) Find the total number of saplings planted in the first 20 days. **[2]**

OR

On which day will the students plant exactly 100 saplings?

37. Case Study 2: Planning a Town Layout

The town-planning map of a locality is drawn on a coordinate grid where 1 unit = 100 m. A school S is at (2, 3), a library L is at (6, 7) and a community park P is at (10, 3).

(i) Find the distance between the school and the library (in units). **[1]**

(ii) A bus stop is to be built exactly midway between the school and the park. Find its coordinates. **[1]**

(iii) Show that the school, library and park are the vertices of an isosceles right-angled triangle. **[2]**

OR

A café C lies on SL such that SC : CL = 1 : 3. Find the coordinates of C.

38. Case Study 3: The Lighthouse

A lighthouse 30 m tall stands on the shore. A boat at a point A on the sea level observes the top of the lighthouse at an angle of elevation of 30°. The boat sails straight towards the lighthouse and, after some time, at a point B observes the top of the lighthouse at an angle of elevation of 60°. (Use $\sqrt{3} = 1.73$ wherever required.)

(i) Find the distance of the boat from the foot of the lighthouse at A. **[1]**

(ii) Find the distance of the boat from the foot of the lighthouse at B. **[1]**

(iii) How far did the boat sail from A to B? **[2]**

OR

The boat took 4 minutes to sail from A to B. At the same speed, how much more time will it take to reach the foot of the lighthouse?

— End of Question Paper —