SAMPLE QUESTION PAPER

MATHEMATICS (STANDARD)

Class X

Time: 3 Hours **Max. Marks: 80** Date: Roll No.:

General Instructions:

1. This question paper has 5 Sections — A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 Case-Based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.
7. All questions are compulsory. However, internal choice has been provided in 2 Qs of Section B, 2 Qs of Section C, 2 Qs of Section D and in all 3 case studies of Section E.
8. Draw neat and labelled figures wherever required.
9. Take π = 22/7 unless stated otherwise.
10. Use of calculators is NOT permitted.

SECTION – A | Multiple Choice Questions (MCQ) | 20 × 1 = 20 Marks

Each question carries 1 mark. Choose the most appropriate option.

Q1. The HCF of 96 and 404 is 4. Their LCM is: **[1 Mark]**

(a) 9696
(b) 4848
(c) 2424
(d) 404

Q2. If one zero of the polynomial $p(x) = 5x^2 + 13x + k$ is the reciprocal of the other, then k = **[1 Mark]**

(a) 0
(b) 5
(c) 1/6
(d) 6

Q3. The pair of equations x + 2y – 5 = 0 and 3x + 6y – 15 = 0 has: **[1 Mark]**

(a) a unique solution
(b) exactly two solutions
(c) infinitely many solutions
(d) no solution

Q4. The roots of the equation $2x^2 – 5x + 3 = 0$ are: **[1 Mark]**

(a) 1 and 3/2
(b) –1 and –3/2
(c) 3/2 and 1
(d) 3 and 1/2

Q5. The common difference of the AP: 1/3, 1 – 3b/3, 1 – 6b/3, ... is: **[1 Mark]**

(a) 1/3
(b) –b
(c) b
(d) –1/3

Q6. In △ABC, DE // BC. If AD = 3 cm, DB = 5 cm and AE = 2.4 cm, then EC = **[1 Mark]**

(a) 2 cm
(b) 3 cm
(c) 4 cm
(d) 5 cm

Q7. The distance between the points A(–3, 4) and B(5, –2) is: **[1 Mark]**

(a) √60
(b) 10
(c) √40
(d) 8

Q8. If tan θ = 5/12, then sec θ = **[1 Mark]**

(a) 13/12
(b) 12/5
(c) 13/5
(d) 5/13

Q9. The value of $(\sin^2 30° + \cos^2 60°) – (\tan^2 45° – \sin^2 90°)$ is: **[1 Mark]**

(a) –1
(b) 0
(c) 1
(d) 2

Q10. From the top of a cliff 60 m high, the angle of depression of a boat is 30°. The distance of the boat from the foot of the cliff is: **[1 Mark]**

(a) $30\sqrt{3}$ m
(b) $60\sqrt{3}$ m
(c) $60/\sqrt{3}$ m
(d) 30 m

Q11. A tangent PQ at point P of a circle of radius 5 cm meets line OQ at Q, where OQ = 13 cm. Length PQ = **[1 Mark]**

(a) 12 cm
(b) 8 cm
(c) $\sqrt{194}$ cm
(d) 6 cm

Q12. The area of a sector of a circle of radius 7 cm with central angle 90° is: **[1 Mark]**

(a) $154/4$ cm²
(b) 154 cm²
(c) $77/2$ cm²
(d) 77 cm²

Q13. A solid sphere of radius 3 cm is melted and recast into small spherical balls of radius 0.3 cm. The number of balls is: **[1 Mark]**

(a) 100
(b) 10
(c) 1000
(d) 300

Q14. The mean of 20 observations is 17. If each observation is increased by 3, the new mean is:**[1 Mark]**

(a) 20
(b) 17
(c) 51
(d) 14

Q15. For a distribution, Mean = 54.6 and Mode = 54. The Median is: **[1 Mark]**

(a) 54.4
(b) 54.2
(c) 54.6
(d) 55

Q16. One card is drawn from a well-shuffled deck of 52 cards. The probability of getting a red queen is: **[1 Mark]**

(a) 1/26
(b) 1/13
(c) 2/13
(d) 1/52

Q17. The graph of y = f(x) passes through (–2, 0), (0, 4), (2, 0) and (4, –12). The number of zeroes of f(x) is: **[1 Mark]**

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

Q18. If the sum of first n terms of an AP is $3n^2 + 5n$, the common difference is: **[1 Mark]**

(a) 6
(b) 5
(c) 3
(d) 8

Q19. Assertion (A): If two tangents drawn from an external point P to a circle are PA and PB, then PA = PB.Reason (R): The tangent to a circle is perpendicular to the radius through the point of contact.**[1 Mark]**

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

Q20. Assertion (A): $\sqrt{7}$ is an irrational number.Reason (R): Square root of every prime number is irrational. **[1 Mark]**

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

SECTION – B | Short Answer – I (SA-I) | 5 × 2 = 10 Marks

Each question carries 2 marks. Internal choice is provided in Q21 and Q22.

Q21. Find the largest number that divides 615 and 963 leaving the remainder 6 in each case. **[2 Marks]**

OR

Q21. Explain why 3 × 5 × 7 × 11 + 11 is a composite number. **[2 Marks]**

Q22. Find the sum of the first 20 terms of the AP: 1, 4, 7, 10, ... **[2 Marks]**

OR

Q22. The 7th term of an AP is –4 and its 13th term is –16. Find the AP. **[2 Marks]**

Q23. In △OAB, OA = OB and $AB^2 = 2OA^2$. Prove that △OAB is a right triangle. **[2 Marks]**

Q24. Find the ratio in which the line segment joining A(1, –5) and B(–4, 5) is divided by the x-axis. Also find the coordinates of the point of division. **[2 Marks]**

Q25. Two dice are thrown once. Find the probability of getting: (i) a doublet, (ii) a sum less than 5.

[2 Marks]

SECTION – C | Short Answer – II (SA-II) | 6 × 3 = 18 Marks

Each question carries 3 marks. Internal choice is provided in Q26 and Q29.

Q26. Prove that $\sqrt{3}$ is irrational. **[3 Marks]**

OR

Q26. Check whether 12^n can end with digit 0 for any natural number n. **[3 Marks]**

Q27. Find all zeroes of $x^4 – 3x^3 – 5x^2 + 21x – 14$ if two of its zeroes are $\sqrt{7}$ and $–\sqrt{7}$. **[3 Marks]**

Q28. Solve graphically: 2x + y = 8 and x – y = 1. Find the vertices of the triangle formed by these lines and the y-axis. **[3 Marks]**

Q29. 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. Find the speed of the train. **[3 Marks]**

OR

Q29. The sum of a two-digit number and the number obtained by reversing its digits is 66. If the digits of the number differ by 2, find the number. **[3 Marks]**

Q30. Prove that the lengths of tangents drawn from an external point to a circle are equal. **[3 Marks]**

Q31. Find the area of the shaded region in a figure where a circle of radius 14 cm has two equal chords, each subtending 60° at the centre. (Use π = 22/7) **[3 Marks]**

SECTION – D | Long Answer (LA) | 4 × 5 = 20 Marks

Each question carries 5 marks. Internal choice is provided in Q32 and Q33.

Q32. State and prove the Basic Proportionality Theorem (Thales' Theorem). Use it to find AE if in △ABC, DE // BC, AD = 4.5 cm, DB = 3 cm, BC = 7.5 cm. **[5 Marks]**

OR

Q32. State and prove the Pythagoras Theorem. Use it to find the length of the altitude from vertex A to side BC of △ABC where AB = 7 cm, BC = 14 cm, CA = 7√3 cm. **[5 Marks]**

Q33. The following distribution shows the daily pocket allowance of 25 children of a locality. Find the mean daily pocket allowance using the step-deviation method.Pocket Allowance (Rs): 11–13 | 13–15 | 15–17 | 17–19 | 19–21 | 21–23 | 23–25

No. of children: 3 | 6 | 9 | 13 | 5 | 4 | 1 **[5 Marks]**

OR

Q33. The following table gives the production yield per hectare of wheat for 100 farms in a village. Convert it into a 'more than type' ogive and hence find the median.Production (kg/ha): 50–55 | 55–60 | 60–65 | 65–70 | 70–75 | 75–80

No. of farms: 2 | 8 | 12 | 24 | 38 | 16 **[5 Marks]**

Q34. A wooden article was made by scooping out a hemisphere of radius 7 cm from each end of a solid cylinder of height 10 cm and radius 7 cm. Find the total surface area and the volume of the article.

[5 Marks]

Q35. The angles of elevation of the top of a tower from two points at distances a and b from the base and in the same straight line with it are complementary. Prove that the height of the tower is √(ab). Also find the height if a = 16 m and b = 25 m. **[5 Marks]**

SECTION – E | Case-Based Integrated Questions | 3 × 4 = 12 Marks

Each case study carries 4 marks — sub-parts (i) = 1 Mark, (ii) = 1 Mark, (iii) = 2 Marks. Internal choice in sub-part (iii).

Q36. Case Study 1 — Arithmetic Progressions: The Grand Staircase

The Qutub Minar in Delhi has a spiral staircase. Suppose a new amphitheatre in a school is designed with a staircase where the 1st step is built using 3 bricks, the 2nd step uses 5 bricks, the 3rd step uses 7 bricks, and so on. Each step uses 2 more bricks than the previous one. The architect needs to plan the total bricks required.

(i) How many bricks are used in the 10th step? **[1 Mark]**

(ii) How many bricks are used in the 25th step? **[1 Mark]**

(iii) Find the total number of bricks used in building 30 steps. **[2 Marks]**

OR

(iii) In which step will exactly 101 bricks be used? **[2 Marks]**

Q37. Case Study 2 — Coordinate Geometry: Smart City Planning

A town planner is designing a new smart city. On a coordinate grid (scale: 1 unit = 100 m), the positions of key locations are: Hospital H(1, 4), School S(5, 2), Market M(3, 6) and Park P(7, 8). The planner needs to calculate distances and midpoints to design roads efficiently.

(i) Find the distance between the Hospital H(1, 4) and the School S(5, 2). **[1 Mark]**

(ii) Find the midpoint of the road connecting Market M(3, 6) and Park P(7, 8). **[1 Mark]**

(iii) Find the point that divides the line segment joining H(1, 4) and P(7, 8) in the ratio 1:2 internally. **[2 Marks]**

OR

(iii) Find the coordinates of the centroid of the triangle formed by H(1, 4), S(5, 2) and M(3, 6). **[2 Marks]**

Q38. Case Study 3 — Heights & Distances: The Lighthouse

During a school excursion to a coastal area, students observed a lighthouse standing on a cliff. From a boat at sea, the angle of elevation of the top of the lighthouse (height h_1 above the cliff) is 60°, and the angle of elevation of the base of the lighthouse (top of the cliff, height h_2 from sea level) is 30°. The horizontal distance from the boat to the base of the cliff is 80 m. Students are asked to find the heights using trigonometric ratios.

(i) Find the height of the cliff (h_2) above sea level. **[1 Mark]**

(ii) Find the total height ($h_1 + h_2$) of the top of the lighthouse above sea level. **[1 Mark]**

(iii) Find the height h_1 of the lighthouse above the cliff. **[2 Marks]**

OR

(iii) If the angle of elevation of the top of the lighthouse from a second boat is 45°, find the horizontal distance of this second boat from the cliff. **[2 Marks]**