MODEL TEST PAPER

FIRST TERM (SA-I)

MATHEMATICS

(With Answers)

CLASS X

Time Allowed : 3 to 3½ Hours] [*Maximum Marks* : 80

General Instructions :

(*i*) *All questions are compulsory.*

(*ii*) *The question paper consists of 34 questions divided into four sections A, B, C and D. Section A comprises of 10 questions of 1 mark each, Section B comprises of 8 questions of 2 marks each, Section C comprises of 10 questions of 3 marks each and Section D comprises of 6 questions of 4 marks each.*

(*iii*) *Question numbers 1 to 10 in Section A are multiple choice questions where you are to select one correct option out of the given four.*

(*iv*) *There is no overall choice. However, internal choice has been provided in 1 question of two marks, 3 questions of three marks each and 2 questions of four marks each. You have to attempt only one of the alternatives in all such questions.*

(*v*) *Use of calculators is not permitted.*

Section 'A'

Question numbers 1 to 10 are of one mark each.

1. The value of $\frac{\cos 70^\circ}{\sin 20^\circ} + \cos 57^\circ \operatorname{cosec} 33^\circ - 2 \cos 60^\circ$ is

(*a*) 0 (*b*) 1

(*c*) 2 (*d*) – 2

2. If θ is an acute angle such that $\tan^2 \theta = \frac{8}{7}$, then the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$ is

(*a*) $\frac{7}{8}$ (*b*) $\frac{8}{7}$

(*c*) $\frac{7}{4}$ (*d*) $\frac{64}{49}$

3. The pair $x + 2y = 140$ and $360 - 4y = 3x$ of linear equations represents two lines which are

(*a*) parallel (*b*) intersecting

(*c*) coincident (*d*) either intersecting or parallel

4. π is

(*a*) a natural number (*b*) a rational number

(*c*) an irrational number (*d*) not a real number

5. The decimal expansion of the rational number $\frac{14587}{250}$ will terminate after how many decimals ?

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

6. If $5 \tan \theta = 4$, then the value of $\frac{5 \sin \theta - 3 \cos \theta}{5 \sin \theta + 3 \cos \theta}$ is

(*a*) 0 (*b*) 1

(*c*) $\frac{1}{7}$ (*d*) $\frac{2}{7}$

7. The value of $\cos 1° \cos 2° \cos 3° \ldots\ldots \cos 180°$ is

(*a*) 0 (*b*) 1

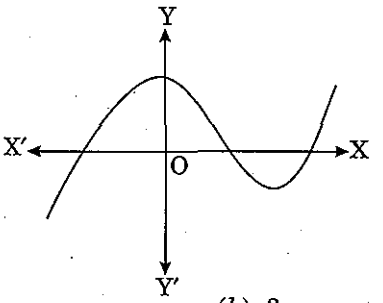
(*c*) -1 (*d*) None of these

8. If $\Delta ABC \sim \Delta DEF$, $BC = 3$ cm, $EF = 4$ cm and ar $(\Delta ABC) = 54$ cm^2, then the ar (ΔDEF) is

(*a*) 72 cm^2 (*b*) $\frac{81}{4}$ cm^2

(*c*) 108 cm^2 (*d*) 96 cm^2

9. In figure, the graph of a polynomial $p(x)$ is shown. The number of zeroes of $p(x)$ is



(*a*) 4 (*b*) 3

(*c*) 2 (*d*) 1

10. For the frequency distribution

Class-interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	11	16	13	22	6

The sum of lower limits of median class and modal class is

(*a*) 30 (*b*) 40

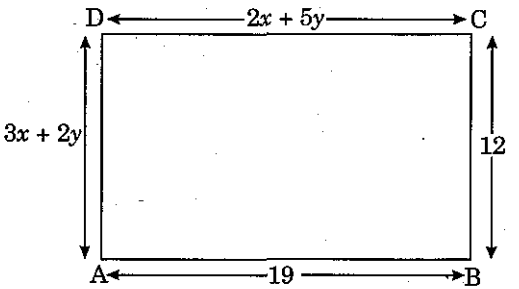
(*c*) 50 (*d*) 60

Section 'B'

Question numbers 11 to 18 carry 2 marks each.

11. Is $7 \times 5 \times 3 \times 2 + 3$ a composite number ? Justify your answer.

12. In figure, *ABCD* is a rectangle. Find the values of x and y.



13. Find the zeroes of the quadratic polynomial $5x^2 - 4 - 8x$ and verify the relationship between the zeroes and the coefficients of the polynomial.

14. If $\sec \alpha = \frac{5}{4}$, evaluate $\frac{\tan \alpha}{1 + \tan^2 \alpha}$.

Or

If $A + B = 90°$, prove that

$$\sqrt{\frac{\tan A \tan B + \tan A \cot B}{\sin A \sec B} - \frac{\sin^2 B}{\cos^2 A}} = \tan A$$

15. ABC is a triangle and PQ is a straight line meeting AB in P and AC in Q. If $AP = 1$ cm, $PB = 5$ cm, $AQ = 1.5$ cm, $QC = 4.5$ cm, prove that area of ΔAPQ is one-sixteenth of the area of ΔABC.

16. The perpendicular from vertex A on the side BC of triangle ABC intersects BC at point D such that $DB = 3CD$. Prove that : $2AB^2 = 2AC^2 + BC^2$.

17. The length of 42 leaves of a plant are measured correct up to the nearest millimetre and the data is as under :

Length (in mm)	118 – 126	126 – 134	134 – 142	142 – 150	150 – 158	158 – 166
Number of leaves	4	5	10	14	4	5

Find the mode length of the leaves.

18. The following is the cumulative frequency distribution of marks obtained by 85 students.

Marks	*Number of Students*
Below 10	5
Below 20	9
Below 30	17
Below 40	29
Below 50	43
Below 60	60
Below 70	70
Below 80	78
Below 90	83
Below 100	85

Write the above cumulative frequency distribution as frequency distribution.

Section 'C'

Question numbers 19 to 28 carry 3 marks each.

19. Show that $n^2 - 1$ is divisible by 8, if n is an odd positive integer.

20. Find the HCF of 65 and 117 and express in the form $65m + 117n$.

Or

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

21. If three times the larger of the two numbers is divided by the smaller one, we get 4 as quotient and 3 as remainder. Also, if seven times the smaller is divided by the larger one, we get 5 as quotient and 1 as remainder. Find the numbers.

Or

If twice the son's age in years is added to the father's age, the sum is 70. But if twice the father's age is added to the son's age the sum is 95. Find the age of father and son.

22. If α and β are the zeroes of the quadratic polynomial : $p(x) = x^2 - 1$, find a quadratic polynomial whose zeroes are $\frac{2\alpha}{\beta}$ and $\frac{2\beta}{\alpha}$.

23. Prove that :

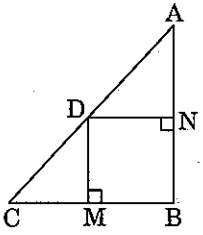
$$\frac{(1 + \cot\theta + \tan\theta)(\sin\theta - \cos\theta)}{\sec^3\theta - \text{cosec}^3\theta} = \sin^2\theta\cos^2\theta$$

24. If $m = p\sec\theta + q\tan\theta$ and $n = p\tan\theta + q\sec\theta$, prove that : $m^2 - n^2 = p^2 - q^2$.

25. In figure, D is a point on hypotenuse AC of ΔABC, $DM \perp BC$ and $DN \perp AB$. Prove that

(*i*) $DM^2 = DN.MC$

(*ii*) $DN^2 = DM.AN$.



26. ABC is an isosceles triangle with $AC = BC$. If $AB^2 = 2AC^2$, prove that ΔABC is a right triangle.

27. Find the median of the following data :

Classes	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100
Frequency	5	3	4	3	3	4	7	9	7	8

28. Find the mean of the following distribution, using step deviation method :

Classes	*Number of students*
4 – 8	2
8 – 12	12
12 – 16	15
16 – 20	25
20 – 24	18
24 – 28	12
28 – 32	13
32 – 36	3

Or

If the mean of the following distribution is 27, find the value of p.

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	8	p	12	13	10

Section 'D'

Question numbers 29 to 34 carry 4 marks each.

29. Find the zeroes of the polynomial $p(x) = x^3 - 5x^2 - 2x + 24$, if it is given that the product of its two zeroes is 12.

30. Solve the following system of linear equations graphically :

$$2x + y = 8$$
$$3x - 2y = 12$$

Also find the coordinates of the points where the lines meet the x-axis.

31. The following table gives the production yield per hectare of wheat of 100 farms of a village :

Production yield in kg/hectare	50 – 55	55 – 60	60 – 65	65 – 70	70 – 75	75 – 80
Number of farms	2	8	12	24	38	16

Change the above distribution to more than type distribution and draw its ogive.

32. Prove that the ratio of the areas of two similar triangles is equal to the ratio of squares of their corresponding sides.

Or

Prove that in a right triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides.

33. If $x = \cot A + \cos A$ and $y = \cot A - \cos A$, show that $x^2 - y^2 = 4\sqrt{xy}$.

Or

Evaluate :

$\cot 11° \cot 37° \cot 53° \cot 60° \cot 79° + \tan (65° - \theta) - \cot (25° + \theta) + \cos (38° + \theta) - \sin (52° - \theta)$

34. If $\operatorname{cosec} \theta + \cot \theta = p$, prove that : $\cos \theta = \dfrac{p^2 - 1}{p^2 + 1}$.

ANSWERS

Section 'A'

1. (*b*) **2.** (*a*) **3.** (*b*)
4. (*c*) **5.** (*c*) **6.** (*c*)
7. (*a*) **8.** (*d*) **9.** (*b*)
10. (*c*)

Section 'B'

11. Yes, $7 \times 5 \times 3 \times 2 + 3 = 213 = 71 \times 3$ is a composite number.

12. $x = 2$ and $y = 3$

13. The zeroes of $5x^2 - 4 - 8x$ are 2 and – 2/5.

14. $\dfrac{12}{25}$

17. Mode = 144.29 mm

18.

Marks	*Frequency*
0 – 10	5
10 – 20	4
20 – 30	8
30 – 40	12
40 – 50	14
50 – 60	17
60 – 70	10
70 – 80	8
80 – 90	5
90 – 100	2

Section 'C'

20. $13 = 65m + 117n$, where $m = 2$ and $n = -1$.

21. Numbers are 25 and 18 *Or* **Father's age** = 40 years, Son's age = 15 years

22. $p(x) = k(x^2 + 4x + 4)$, where k is a non-zero constant.

27. Median = 66.43

28. Mean = 19.92 *Or* $p = 7$

Section 'D'

29. The zeroes of the given polynomial $p(x)$ are 3, 4 and – 2.

30. $x = 4, y = 0$; (0, 8) and (0, – 6)

31.

Production field (in kg/hectare)	*Cumulative Frequency (more than type)*
More than or equal to 50	100
More than or equal to 55	8
More than or equal to 60	90
More than or equal to 65	78
More than or equal to 70	54
More than or equal to 75	16

33. *Or* $\frac{1}{\sqrt{3}}$