

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.

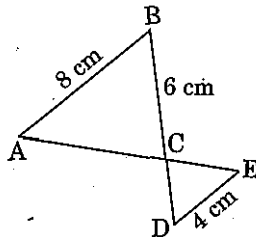
Section 'A'

Question numbers 1 to 10 are of one mark each.

1. If $\sec \theta + \tan \theta = p$, then the value of $\sec \theta - \tan \theta$ is

- (a) $p - 1$ (b) $\frac{1}{p} - 1$
(c) $\frac{1}{p}$ (d) $\frac{1}{p} + 1$

2. In figure, $AB \parallel DE$. The length of CD is

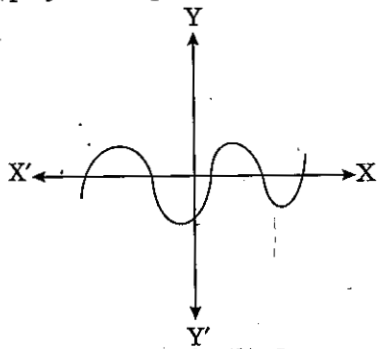


- (a) 3.5 cm (b) 3.7 cm
(c) 3 cm (d) 4.2 cm

3. If $\cos \theta = \frac{4}{5}$, then the value of $(\cot \theta + \operatorname{cosec} \theta)^2$ is

- (a) 3 (b) 6
(c) 9 (d) 8

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



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

5. If $\cot \theta = \sqrt{2} + 1$, then the value of $\operatorname{cosec}^2 \theta$ is

- (a) $2\sqrt{3}(\sqrt{2} + 1)$ (b) $2\sqrt{2}(\sqrt{2} + 1)$
(c) $3\sqrt{2}(\sqrt{2} + 1)$ (d) $5\sqrt{2}(\sqrt{2} + 1)$

6. If a rational number x is expressed as $x = \frac{p}{q}$, where p, q are integers, $q \neq 0$ and p, q have

no common factor (except 1), then the decimal expansion of x is terminating if and only if q has a prime factorization of the form :

- (a) $2^m \cdot 3^n$ (b) $2^m \cdot 5^n$
(c) $2^m \cdot 7^n$ (d) $5^m \cdot 3^n$

7. If $A = 45^\circ$ and $B = 30^\circ$, then the value of $\sin A \cos B - \cos A \sin B$ is

- (a) $\frac{\sqrt{3} + 1}{2\sqrt{2}}$ (b) $\frac{\sqrt{3} - 1}{2\sqrt{2}}$
(c) $\frac{\sqrt{3} + 1}{2\sqrt{3}}$ (d) $\frac{\sqrt{3} - 1}{2\sqrt{3}}$

8. If the HCF of 210 and 55 is expressible in the form $210 \times 5 + 55 \times n$, then the value of n is

- (a) -18 (b) -17
(c) -20 (d) -19

9. If the pair of linear equations $2x + 3y = 7$ and $2\alpha x + (\alpha + \beta)y = 28$ has infinitely many solutions, then the values of α and β are

- (a) 4 and 5 (b) 3 and 5
(c) 4 and 7 (d) 4 and 8

10. The mean of first 15 natural numbers is

- (a) 6 (b) 8
(c) 7 (d) 9

Section 'B'

Question numbers 11 to 18 carry 2 marks each.

11. If α and β are the zeroes of the quadratic polynomial $p(x) = 3x^2 - 5x + 7$, then find the value of $\alpha^2 + \beta^2$.

12. Explain why the number $7 \times 11 \times 13 + 13$ is composite.

13. For what values of a and b , the following pair of linear equations has an infinite number of solutions :

$$2x + 3y = 7$$

$$(a - b)x + (a + b)y = 3a + b - 2$$

14. Show that :

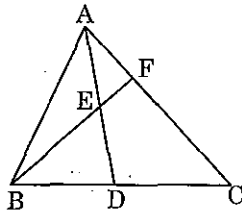
$$2 \sec^2 \theta - \sec^4 \theta - 2 \operatorname{cosec}^2 \theta + \operatorname{cosec}^4 \theta = \cot^4 \theta - \tan^4 \theta$$

Or

Prove that :

$$\frac{1 - \sin \theta}{1 + \sin \theta} = (\sec \theta - \tan \theta)^2$$

15. In $\triangle ABC$, AD is a median and E is the mid-point of AD . If BE produced meets AC at F , show that $AF = \frac{1}{3}AC$.



16. Prove that the sum of the squares on the sides of a rhombus is equal to the sum of squares on its diagonals.

17. The following distribution gives the marks of 50 students of a particular school :

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
No. of students	5	6	8	12	13	6

Write the above distribution as less than type cumulative frequency distribution.

18. For the following grouped frequency distribution find the mode :

Class	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 21	21 - 24
Frequency	2	5	10	23	21	12	3

Section 'C'

Question numbers 19 to 28 carry 3 marks each.

19. Use Euclid's division lemma to show that the cube of any positive integer is of the form $9m$, $9m + 1$ or $9m + 8$ for some integer m .

20. Prove that $\frac{11\sqrt{3}}{5}$ is an irrational.

Or

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

21. The class IX students of a certain public school wanted to give a farewell party to the outgoing students of class X. They decided to purchase two kinds of sweets, one costing ₹ 70 per kg and the other costing ₹ 84 per kg. They estimated that 36 kg of sweets were needed. If total money spent on sweets was ₹ 2800, find how many sweets of each kind they purchased.

Or

Ram tells his daughter, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be". Find their present ages.

22. If the sum of the zeroes of the quadratic polynomial $p(x) = kx^2 + 2x + 3k$ is equal to their product, find the value of k .

23. Prove that :

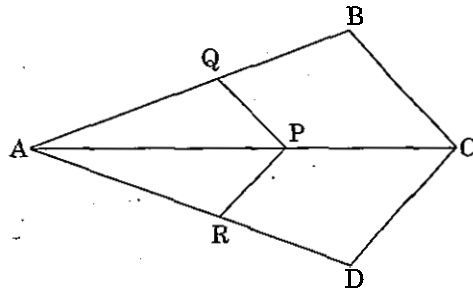
$$(\sin \theta + \sec \theta)^2 + (\cos \theta + \operatorname{cosec} \theta)^2 = (1 + \sec \theta \operatorname{cosec} \theta)^2$$

24. Prove that :

$$\frac{\sec \theta - \tan \theta}{\sec \theta + \tan \theta} = 1 - 2 \sec \theta \tan \theta + 2 \tan^2 \theta$$

25. In figure, if $PQ \parallel BC$ and $PR \parallel CD$, prove that

$$\frac{AR}{AD} = \frac{AQ}{AB}$$



26. Triangle ABC is right-angled at B and D is the mid-point of BC . Prove that $4AD^2 = 3AB^2$.

27. From the data given below, find the value of p , if the mean is 330.

Loss per-shop	0 - 100	100 - 200	200 - 300	300 - 400	400 - 500	500 - 600
No. of shops	10	15	30	p	25	20

Or

Calculate the mean from the following data, using step-deviation method :

Classes	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55
Frequency	10	12	8	20	11	4	5

28. Find the median of the following data :

Classes	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Frequency	13	11	16	30	14	6	7	3

Section 'D'

Question numbers 29 to 34 carry 4 marks each.

29. Prove that :

$$\frac{1}{\operatorname{cosec} \theta - \tan \theta} - \frac{1}{\sin \theta} = \frac{1}{\sin \theta} - \frac{1}{\operatorname{cosec} \theta + \cot \theta}$$

30. Prove that :

$$\frac{\cos \theta}{1 - \tan \theta} + \frac{\sin \theta}{1 - \cot \theta} = \cos \theta + \sin \theta$$

Or

Evaluate : $\frac{\sec 31^\circ}{\operatorname{cosec} 59^\circ} + \frac{\sec^2 (90^\circ - \theta) - \cot^2 \theta}{2 (\sin^2 35^\circ + \sin^2 55^\circ)} + \frac{2 \cos^2 60^\circ \tan^2 31^\circ \tan^2 59^\circ}{3 (\sec^2 39^\circ - \cot^2 51^\circ)}$
 $+ \frac{1}{\sqrt{3}} \tan 10^\circ \tan 30^\circ \tan 40^\circ \tan 45^\circ \tan 50^\circ \tan 80^\circ$

31. Obtain all the zeroes of the polynomial $f(x) : 3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.

32. Represent the following system of equations graphically :

$$\begin{aligned} x - y + 1 &= 0 \\ 4x + 3y &= 24 \end{aligned}$$

Find the points where the lines meet the x -axis.

33. The following distribution gives the daily income of 50 workers of a factory.

Daily income (in ₹)	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200
Numbers of workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive. Hence, obtain the median income from the graph and verify the result by using the formula.

34. In a triangle, if square of one side is equal to the sum of the squares of other two sides, then the angle opposite the first side is a right angle. Prove.

Or

If a line is drawn parallel to one side of a triangle, to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. Prove.

ANSWERS**Section 'A'**

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

Section 'B'

11. - 17/9

12. $7 \times 11 \times 13 + 13 = 2 \times 3 \times 13 \times 13 = 2 \times 3 \times 13^2$ is a composite number

13. $a = 5, b = 1$

17.

<i>Upper Limits</i>	<i>Frequency</i>	<i>Cumulative Frequency (cf)</i>
Less than 10	5	5
Less than 20	6	11
Less than 30	8	19
Less than 40	12	31
Less than 50	13	44
Less than 60	6	50

18. Mode = 14.6

Section 'C'

21. One kind of sweet = 16 kg and other kind of sweet = 20 kg Or Ram's present age = 42 years and Daughter's present age = 12 years.

22. $k = -\frac{2}{3}$

27. $p = 25$ Or Mean = 35.5

28. Median = 33.33

Section 'D'

30. Or 2

31. The zeroes of $f(x)$ are $-\sqrt{\frac{5}{3}}, \sqrt{\frac{5}{3}}, -1$ and -1 .

32. $(-1, 0), (6, 0)$

33.

<i>Daily income (in ₹)</i>	<i>Cumulative frequency</i>
Less than 120	12
Less than 140	26
Less than 160	34
Less than 180	40
Less than 200	50

Draw ogive by plotting the points (120, 12), (140, 26), (160, 34), (180, 40) and (200, 50).

Median income = ₹ 138.60