

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 $\tan \theta = \frac{3}{4}$, then $\cos^2 \theta - \sin^2 \theta$ is equal to
 - (a) $\frac{7}{25}$
 - (b) $-\frac{7}{25}$
 - (c) $\frac{4}{25}$
 - (d) 1
2. If $\text{HCF}(105, 120) = 15$, then $\text{LCM}(105, 120)$ is
 - (a) 210
 - (b) 420
 - (c) 840
 - (d) 1680
3. $\frac{1 - \tan^2 45^\circ}{1 + \tan^2 45^\circ}$ is equal to
 - (a) $\tan 90^\circ$
 - (b) 1
 - (c) $\sin 45^\circ$
 - (d) $\sin 0^\circ$
4. The mean of first six prime numbers is equal to
 - (a) $\frac{41}{6}$
 - (b) $\frac{31}{6}$
 - (c) $\frac{51}{6}$
 - (d) $\frac{61}{6}$

5. $\sec^4 \theta - \sec^2 \theta$ is equal to

(a) $\tan^2 \theta - \tan^4 \theta$

(b) $\tan^4 \theta - \tan^2 \theta$

(c) $\tan^4 \theta + \tan^2 \theta$

(d) $\tan^2 \theta + \tan^4 \theta$

6. If $\sin \theta + \sin^2 \theta = 1$, then $\cos^2 \theta + \cos^4 \theta$ is equal to

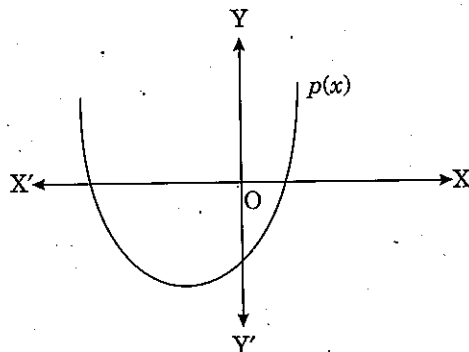
(a) -1

(b) 1

(c) 0

(d) None of these

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



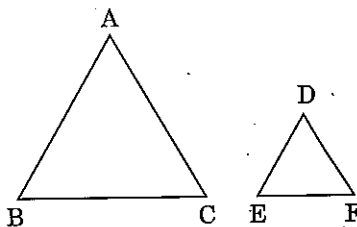
(a) 0

(b) 1

(c) 2

(d) 3

8. In figure, $\triangle ABC \sim \triangle DEF$. If $AB = 2DE$ and $\text{ar}(\triangle ABC) = 56 \text{ cm}^2$, then $\text{ar}(\triangle DEF)$ is



(a) 14 cm^2

(b) 28 cm^2

(c) 112 cm^2

(d) 224 cm^2

9. The pair of linear equations

$$2x + 3y = 7$$

and

$$6x + 9y = 24$$

(a) one solution

(b) two solutions

(c) many solutions

(d) no solution

10. The decimal expansion of $\frac{1357}{2^2 \times 5^3}$ will terminate after how many places of decimals?

(a) 1

(b) 2

(c) 3

(d) 4

Section 'B'

Question numbers 11 to 18 carry 2 marks each.

11. Write 21975 as a product of its prime factors.

12. If 2 is a zero of both the polynomials $3x^2 + mx - 14$ and $2x^3 + nx^2 + x - 2$, find the value of $m - 2n$.

13. For what value of k , the following system of equations have a unique solution :

$$\begin{aligned} kx + 2y &= 5 \\ 3x - 4y &= 10 \end{aligned}$$

14. If $\tan \theta = \frac{a}{b}$, show that

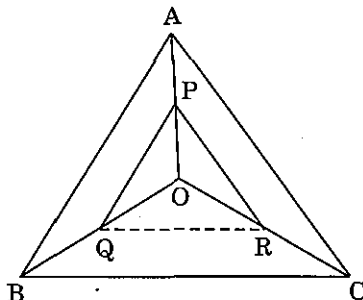
$$\frac{a \sin \theta - b \cos \theta}{a \sin \theta + b \cos \theta} = \frac{a^2 - b^2}{a^2 + b^2}$$

Or

Determine the acute angle θ satisfying the equation

$$\sec^2 \theta + \tan^2 \theta = \frac{5}{3}$$

15. In figure, $PQ \parallel AB$ and $PR \parallel AC$. Prove that $QR \parallel BC$.



16. In $\triangle ABC$, $\angle A$ is acute. BD and CE are perpendiculars on AC and AB respectively. Prove that

$$AB \times AE = AC \times AD.$$

17. Find the mode of the following distribution of marks obtained by 100 students :

Marks obtained	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of students	10	14	16	26	24

18. The following cumulative frequency distribution is given :

Less than 20	Less than 30	Less than 40	Less than 50	Less than 60	Less than 70	Less than 80	Less than 90	Less than 100
0	4	16	30	46	66	82	92	100

Write the ordinary frequency distribution.

Section 'C'

Question numbers 19 to 28 carry 3 marks each.

19. Prove that $n^2 - n$ is divisible by 2 for every positive integer n .

20. Prove that $\frac{8}{7}\sqrt{3}$ is an irrational number.

Or

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

21. The taxi charges in a city consist of a fixed charge together with the charge for the distance covered. For a distance of 10 km, the charge paid is ₹105 and for a journey of 15 km, the charge paid is ₹ 155. What are the fixed charges and the charge per km ? How much does a person have to pay for travelling a distance of 25 km ?

Or

Solve : $ax + by = a - b$
 $bx - ay = a + b$

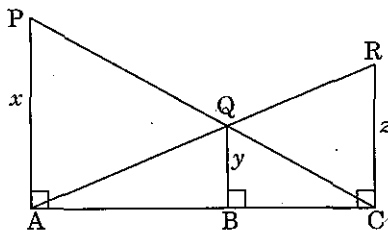
22. If the zeroes of the polynomial $p(x) = x^3 - 3x^2 + x + 1$ are $\alpha - \beta$, α and $\alpha + \beta$, find α and β .

23. If $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$, show that $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$.

24. If A and B are acute angles such that $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$ and

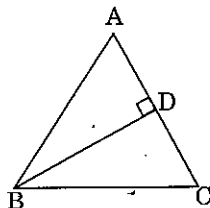
$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}, \text{ find } A + B.$$

25. In figure, PA , QB and RC are each perpendicular to AC . Prove that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$.



26. In an isosceles triangle ABC with $AB = AC$, BD is perpendicular from B to the side AC . Prove that

$$BD^2 - CD^2 = 2CD \cdot AD.$$



27. The table below gives the percentage distribution of female teachers in primary schools of rural areas of various states and union territories (U.T.) of India. Find the mean percentage of female teachers by using step-deviation method.

Percentage of female teachers	15 - 25	25 - 35	35 - 45	45 - 55	55 - 65	65 - 75	75 - 85
No. of States / U.T.	6	11	7	4	4	2	1

Or

The mean of the following distribution is 8.1. Find the value of p .

Classes	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14
Frequency	1	2	1	p	6	2	3

28. A survey regarding the height (in cm) of 51 girls of class X of a school was conducted and the following data was obtained :

Height (in cm)	Number of girls
Less than 140	4
Less than 145	11
Less than 150	29
Less than 155	40
Less than 160	46
Less than 165	51

Find the median height.

Section 'D'

Question numbers 29 to 34 carry 4 marks each.

29. If $\operatorname{cosec} \theta = x + \frac{1}{4x}$, prove that

$$\operatorname{cosec} \theta + \cot \theta = 2x \text{ or } \frac{1}{2x}.$$

30. The mean of the following data is 46.2. Find the missing frequencies f_1 and f_2 .

Classes	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	Total
Frequencies	6	f_1	16	13	f_2	2	50

31. Find all the zeroes of $x^4 + x^3 - 23x^2 - 3x + 60$, if it is given that two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$.

32. Solve the following system of linear equations graphically :

$$2x - y - 4 = 0$$

$$x + y + 1 = 0$$

Find the points where the lines meet y-axis.

33. Prove that :

$$2(\sin^6 A + \cos^6 A) - 3(\sin^4 A + \cos^4 A) + 1 = 0$$

Or

Evaluate : $\frac{2 \sin 68^\circ}{\cos 22^\circ} - \frac{2 \cot 15^\circ}{5 \tan 75^\circ}$

$$\frac{3 \tan 45^\circ \tan 20^\circ \tan 40^\circ \tan 50^\circ \tan 70^\circ}{5} + \frac{3 \tan 25^\circ \tan 35^\circ \tan 55^\circ \tan 65^\circ - \frac{1}{2} \tan^2 60^\circ}{4(\cos^2 29^\circ + \cos^2 61^\circ)}$$

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

Or

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

ANSWERS**Section 'A'**

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

Section 'B'

11. $21975 = 3 \times 5^2 \times 293$ 12. $m = 1, n = -4, m - 2n = 9$
13. $k = -\frac{3}{2}$ 14. Or $\theta = 30^\circ$
17. Mode = 38.33
18.

<i>Classes</i>	<i>Frequency</i>	<i>Cumulative frequency (of less than)</i>
20 - 30	4	4
30 - 40	$16 - 4 = 12$	16
40 - 50	$30 - 16 = 14$	30
50 - 60	$46 - 30 = 16$	46
60 - 70	$66 - 46 = 20$	66
70 - 80	$82 - 66 = 16$	82
80 - 90	$92 - 82 = 10$	92
90 - 100	$100 - 92 = 8$	100

Section 'C'

21. Fixed charges = ₹ 5, Charge per km = ₹ 10, ₹ 255 Or $x = 1$ and $y = -1$
22. $\alpha = 1, \beta = \pm \sqrt{2}$
24. 45°
27. Mean = 39.71 Or $p = 5$
28. Median height = 149.03 cm

Section 'D'

30. $f_1 = 9$ and $f_2 = 4$
31. The other zeroes are 4 and -5
32. $x = 1, y = -2; (0, -1)$ and $(0, -4)$
33. Or $\frac{11}{8}$