

# MODEL TEST PAPER

## FIRST TERM (SA-I)

### MATHEMATICS

(With Answers)

CLASS X

Time Allowed : 3 to 3½ Hours

Maximum Marks : 80

#### General Instructions :

- All questions are compulsory.
- 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.
- 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.
- 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.
- Use of calculators is not permitted.

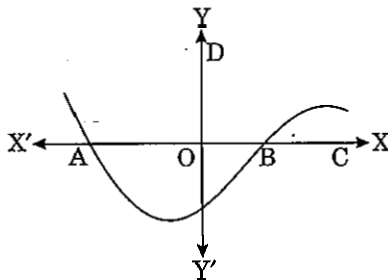
#### Section 'A'

Question numbers 1 to 10 are of one mark each.

1. The product of two consecutive natural numbers is always

- (a) prime number (b) odd number  
(c) even number (d) even or odd

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



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

3. Two isosceles triangles have equal angles and their areas are in the ratio 16 : 25. The ratio of their corresponding heights is

- (a) 5 : 4 (b) 4 : 5  
(c) 3 : 2 (d) 5 : 7

4.  $9 \sec^2 \theta - 9 \tan^2 \theta$  is equal to

- (a) 1 (b) 9  
(c) 8 (d) 0

5. The value of  $\frac{\cos(90^\circ - \theta) \cos \theta}{\cot \theta} - 1$  is

- (a)  $-\tan \theta$  (b)  $-\cos^2 \theta$   
(c)  $-\sin^2 \theta$  (d)  $-\sec^2 \theta$

6. If  $\tan \theta = \frac{1}{\sqrt{5}}$ , then the value of  $\frac{\operatorname{cosec}^2 \theta - \sec^2 \theta}{\operatorname{cosec}^2 \theta + \sec^2 \theta}$  is

- (a)  $\frac{1}{3}$  (b)  $\frac{2}{3}$   
(c)  $\frac{4}{3}$  (d) 1

7.  $(\sec \theta - \cos \theta)(\operatorname{cosec} \theta - \sin \theta)(\tan \theta + \cot \theta)$  is equal to

- (a)  $-1$  (b) 0  
(c) 1 (d) 2

8. Which of the following numbers has non-terminating repeating decimal expansion?

- (a)  $\frac{17}{320}$  (b)  $\frac{7}{80}$   
(c)  $\frac{93}{420}$  (d)  $\frac{84}{400}$

9. If the lines given by  $2x + ky = 1$  and  $3x - 5y = 7$  are parallel, then the value of  $k$  is

- (a)  $-7$  (b)  $-13$   
(c)  $-\frac{10}{3}$  (d)  $\frac{10}{3}$

10. The point of intersection of the ogives (more than and less than type) is given by (15, 30). What is the median and the total frequency?

- (a) 15, 30 (b) 30, 30  
(c) 15, 50 (d) 15, 60

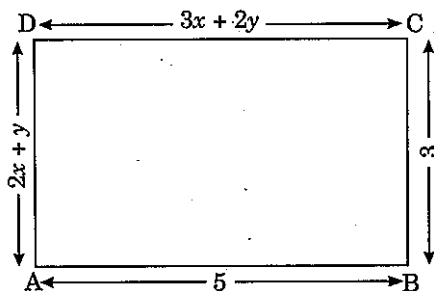
### Section 'B'

Question numbers 11 to 18 carry 2 marks each.

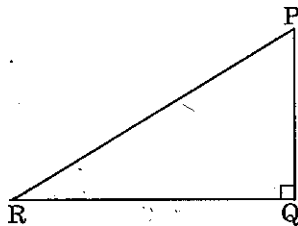
11. Is  $7 \times 5 \times 3 \times 2 \times 1 + 3$  a composite number? Justify your answer.

12. If the polynomial  $x^4 + 2x^3 + 8x^2 + 12x + 18$  is divided by another polynomial  $x^2 + 5$ , the remainder comes out to be  $ax + b$ . Find the values of  $a$  and  $b$ .

13. In figure,  $ABCD$  is a rectangle. Find the values of  $x$  and  $y$ .



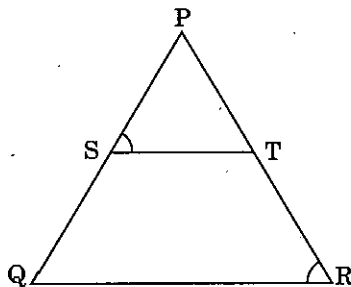
14. In  $\Delta PQR$ , right-angled at  $Q$ ,  $PR + QR = 25$  cm and  $PQ = 5$  cm. Determine the values of  $\sin P$ ,  $\cos P$  and  $\tan P$ .



Or

If  $3 \cot \theta = 4$ , check whether  $\frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} = \cos^2 \theta - \sin^2 \theta$  or not.

15. In figure,  $\frac{PS}{SQ} = \frac{PT}{TR}$  and  $\angle PST = \angle PRQ$ , prove that  $PQR$  is an isosceles triangle.



16. If  $ABC$  is an equilateral triangle with  $AD \perp BC$ , then prove that  $AD^2 = 3DC^2$ .

17. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality :

Monthly consumption (in units)	65 - 85	85 - 105	105 - 125	125 - 145	145 - 165	165 - 185	185 - 205
Number of consumers	4	5	13	20	14	8	4

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

18. In a continuous frequency distribution if lower limit of modal class = 125, frequency of modal class = 20, frequency of the class preceding the modal class = 13, frequency of the class succeeding the modal class = 14 and size of each class is 20. Find the mode of the distribution.

### Section 'C'

Question numbers 19 to 28 carry 3 marks each.

19. Show that any positive integer is of the form  $4q + 1$  or  $4q + 3$ , where  $q$  is a positive integer.

20. Prove that  $\sqrt{6}$  is an irrational.

Or

Show that  $2 - \sqrt{3}$  is an irrational.

21. A boat covers 32 km upstream and 36 km downstream in 7 hours. Also, it covers 40 km upstream and 48 km downstream in 9 hours. Find the speed of the boat in still water and that of the stream.

Or

Meena went to a bank to withdraw ₹ 2000. She asked the cashier to give her ₹ 50 and ₹ 100 notes only. Meena got 25 notes in all. Find how many notes ₹ 50 and ₹ 100 she received.

22. If  $\alpha$  and  $\beta$  are the zeroes of the quadratic polynomial :

$$p(x) = kx^2 + 4x + 4 \text{ such that } \alpha^2 + \beta^2 = 24, \text{ find the value of } k.$$

23. Prove that :

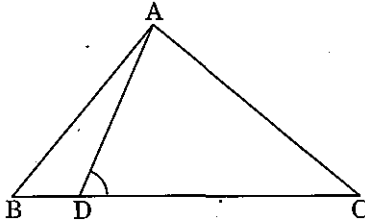
$$(1 + \cot \theta - \operatorname{cosec} \theta)(1 + \tan \theta + \sec \theta) = 2.$$

24. Prove that :

$$\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}.$$

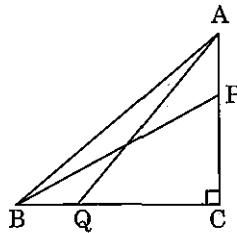
25.  $D$  is a point on the side  $BC$  of a  $\triangle ABC$  such that  $\angle ADC = \angle BAC$ . Prove that

$$\frac{CA}{CD} = \frac{CB}{CA} \text{ or } CA^2 = CB \times CD.$$



26. In right triangle  $ABC$  right angled at  $C$ ,  $P$  and  $Q$  are the points on the side  $CA$  and  $CB$  respectively, which divide these sides in the ratio 2 : 1. Prove that

$$9AQ^2 = 4BC^2 + 9AC^2$$



27. In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying numbers of mangoes. The following was the distribution of mangoes according to the number of boxes.

Number of mangoes	Number of boxes
50 - 52	15
53 - 55	110
56 - 58	135
59 - 61	115
62 - 64	25

Find the mean number of mangoes kept in a packing box, using step-deviation method.

**Or**

The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is ₹ 18. Find the value of  $p$ .

Daily pocket Allowance (in ₹)	11 - 13	13 - 15	15 - 17	17 - 19	19 - 21	21 - 23	23 - 25
Number of children	7	6	9	13	$p$	5	4

28. Find the median of the following data :

Classes	Frequency
0 - 10	3
10 - 20	8
20 - 30	10
30 - 40	15
40 - 50	7
50 - 60	4
60 - 70	3

**Section 'D'**

Question numbers 29 to 34 carry 4 marks each.

29. Find the zeroes of the polynomial :  $p(x) = x^3 - 5x^2 - 16x + 80$ , if its two zeroes are equal in magnitude but opposite in sign.

30. 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 this theorem.

**Or**

State and prove the converse of the following theorem :

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

31. Prove that :

$$\sin^6 A + \cos^6 A = 1 - 3 \sin^2 A \cos^2 A.$$

**Or**

Evaluate :

$$\frac{\cos 20^\circ}{\sin 70^\circ} + \operatorname{cosec} (65^\circ + \theta) - \sec (25^\circ - \theta) - \tan (55^\circ - \theta) + \cot (35^\circ + \theta) + \cos (40^\circ + \theta) - \sin (50^\circ - \theta) + \frac{\cos 55^\circ \operatorname{cosec} 35^\circ}{\tan 5^\circ \tan 25^\circ \tan 45^\circ \tan 65^\circ \tan 85^\circ}$$

32. Prove that :

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

33. Solve the following system of equations graphically :

$$2x - 5y + 4 = 0$$

$$2x + y - 8 = 0$$

Find the points where the lines meet the  $y$ -axis.

34. Compute the missing frequencies,  $x$  and  $y$  in the following data if the mean is  $166\frac{9}{26}$  and the sum of the observations is 52.

<i>Classes</i>	<i>Frequency</i>
140 - 150	5
150 - 160	$x$
160 - 170	20
170 - 180	$y$
180 - 190	6
190 - 200	2
<i>Total</i>	52

Now, also calculate the median.

### ANSWERS

#### Section 'A'

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

#### Section 'B'

11. Yes,  $7 \times 5 \times 3 \times 2 \times 1 + 3 = 71 \times 3$  is a composite number.  
 12.  $a = 2$  and  $b = 3$       13.  $x = 1$  and  $y = 1$   
 14.  $\sin P = \frac{12}{13}$ ,  $\cos P = \frac{5}{13}$  and  $\tan P = \frac{12}{5}$  Or Yes.  
 17.

<i>Monthly consumption (in units)</i>	<i>Number of consumers [Frequency (f)]</i>	<i>Monthly consumption less than</i>	<i>Cumulative frequency (cf)</i>
65 - 85	4	85	4
85 - 105	5	105	9 (5 + 4)
105 - 125	13	125	22 (13 + 9)
125 - 145	20	145	42 (22 + 20)
145 - 165	14	165	56 (42 + 14)
165 - 185	8	185	64 (56 + 8)
185 - 205	4	205	68 (64 + 4)

18. 135.76.

#### Section 'C'

21. Speed of the boat in still water = 10 km/h, Speed of the stream = 2 km/h Or 10 and 15  
 22.  $k = -1$  or  $k = \frac{2}{3}$       27. Mean = 57.19 Or  $p = 20$   
 28. Median = 32.67

**Section 'D'**

29. Zeroes are 4, -4, 5

31. Or 2

33.  $x = 3$  and  $y = 2$ ;  $\left(0, \frac{4}{5}\right)$  and  $(0, 8)$

34.  $x = 10, y = 9$  and Median = 165.5