O. P. JINDAL SCHOOL, SAVITRI NAGAR
Half Yearly Examination (2023-2024)

Class : X   **MM : 80**

Subject : Mathematics   **Time : 3 Hrs.**

Name: _____   Class / Section: _____   Roll No.:_____

Fifteen Minutes Extra will be for reading the Question Paper.

General Instructions:
1. This Question paper contains - five sections A, B, C, D and E.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION A

(This section comprises of very multiple choice questions (MCQ) of 1 mark each)

1. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$, where a & b are prime numbers, then LCM (p, q) is:
   (a) ab
   (b) a^2b^2
   (c) a^3b^2
   (d) a^3b^3

2. Two tankers contain 500 litres and 380 litres of petrol respectively. Then the maximum capacity of a container that can be used to measure the petrol of both tankers is:

   (a) 10 L
   (b) 20 L
   (c) 40 L
   (d) 880 L

   OR

   HCF of two consecutive numbers is equal to :
   (a)   1
   (b)   their products
   (c)   0
   (d)   none of these

3. Form a quadratic polynomial, whose zeros are -3 and 5.
   (a) $x^2 – 2x – 15$
   (b) $3x^2 + 5$
   (c) $x^2 – 3x – 14$
   (d) $x^2 + 2x + 15$

4. Graphically, the pair of equations given by $6x – 3y + 10 = 0$ & $2x – y + 9 = 0$ represents two lines which are:
   (a) intersecting at exactly one point
   (b) parallel
   (c) coincident
   (d) intersecting at exactly two points

5. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is:
   (a) 10
   (b) – 10
   (c) 5
   (d) – 5

OR

If α and β are the zeros of polynomial $x^2 + 2x + 1$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$ is:

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

6. 2 books and 5 pens together cost Rs. 150, whereas 3 books and 5 pens together cost Rs. 200, then the total cost of 1 book and 2 pens is:
   (a) Rs. 120
   (b) Rs. 70
   (c) Rs. 170
   (d) Can not be calculated

7. The pair of equations $x = 0$ and $x = 4$ has
   (a) One solution
   (b) Two solutions
   (c) Infinitely many solutions
   (d) No solution

8. If the quadratic equation $x^2 + 4x + k = 0$ has real and equal roots, then
   (a) k < 4
   (b) k > 4
   (c) k = 4
   (d) k = 4 & k = - 4

OR

The roots of the equation $x^2 - 8x + 12 = 0$ are:
   (a) Real and irrational
   (b) Real and rational
   (c) Real and equal
   (d) Not Real.

9. Which of the following is an A.P. ?
   (a) $3, \frac{7}{2}, 4, \frac{9}{2}, ...$
   (b) -1,-2,-4,-7.............
   (c) -3, 0, 1, 3 ....
   (d) $\sqrt{4}, \sqrt{16}, \sqrt{25}, \sqrt{36}............$

10. If the first term of an A.P is 5 and its 100th term is –292, then its 51st term is ....

   (a)   −142
   (b)   −149
   (c)   155
   (d)   −145

OR

If 7 times the 7th term of an A.P. is equal to 11 times its 11th term, then 18th term is
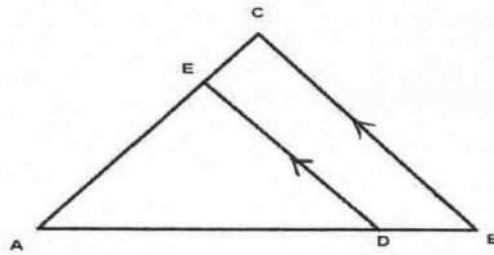   (a) 18
   (b) 9
   (c) 77
   (d) 0

11. If the sequence $a_n = 2n + 1$ is an A.P, then a and d are respectively

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

12. $\triangle$ ABC & $\triangle$ DEF are similar triangles. $\angle A = 40°$ & $\angle F = 68°$ then $\angle B$ is
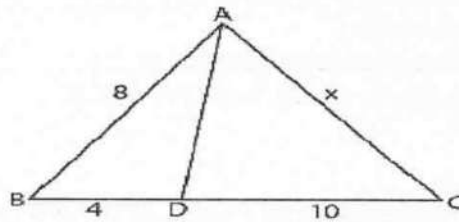
   (a)   83°
   (b)   72°
   (c)   65°
   (d)   97°

13. In the figure given below DE $\parallel$ BC. If AD = x, DB = x – 2, AE = x + 2 and EC = x – 1, the value of x is:
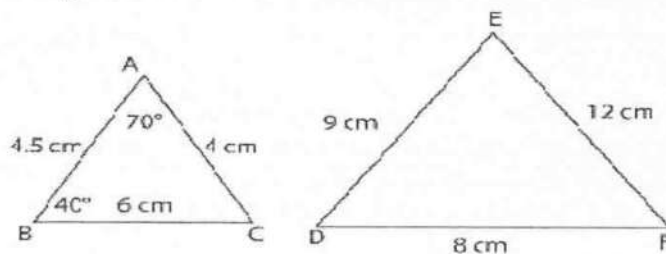

(a) 4

(b) 8

(c) 16

(d) 32

OR

If AD is the bisector of $\angle A$, then AC is

(a) 16

(b) 20

(c) 12

(d) 18

14. From the given figure find $\angle EDF$

   (a)   83°
   (b)   70°
   (c)   65°
   (d)   97°

15. The distance between the points (0, 5) and (-5, 0) is:

   (a) $5\sqrt{2}$

   (b) $3\sqrt{2}$

   (c) $2\sqrt{5}$

   (d) 5

16. In which ratio does the point (3, -5) divides the line segment joining the points (5, – 6) and (-1, -3)?

   (a) 1:5

   (b) 5:1

   (c) 1:1

   (d) 1:2

<div align="center">OR</div>

The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is

   (a) 5 units

   (b) 12 units

   (c) 11 units

   (d) $(7 + \sqrt{5})$ units

17. If cosec A – cot A = 13, then the value of cosec A + cot A is:

   (a) 1/12

   (b) 2/13

   (c) 1/14

   (d) 1/13

18. If $x \tan 60°\cos 60° = \sin60°\cot 60°$, then x =

   (a) cos 30°

   (b) tan 30°

   (c) sin 30°

   (d) cot 30°

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

   (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.

19. **Assertion (A)** : The pair of equations given by $9x – 12y + 15 = 0$ & $3x – 4y + 6 = 0$ represents two lines which are coinciding.

   Reason (R) : The pair of equations given by $a_1 x + b_1 y + c_1 = 0$ & $a_2 x + b_2 y + c_2 = 0$ represents two lines which are coinciding if

   $$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

   (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.

20. **Assertion (A)** : The roots of the equation $2x^2 – 5x + 8 = 0$ are not real.

   Reason (R) : The roots of the equation $ax^2 + bx + c = 0$ are not real if $b^2 – 4ac < 0$

   (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

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SECTION B

(This section comprises of very short answer type-questions (VSA) of 2 marks each)

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21. For what value of k, the quadratic equation $5x^2 – kx + 4$ has equal roots.

22. Three bells rings at an intervals of 4, 6 & 10 minutes. All the three bells rings at 7 a.m. When will then ring together again?

OR

Prove that $2 + 5\sqrt{3}$ is an irrational number.

23. If α and β are the zeroes of quadratic polynomial $x^2 + 2x - 3$, find $\frac{1}{\alpha} + \frac{1}{\beta}$

24. Find the 12th term from the last of the A.P. 10, 12,...124.

OR

The 7th term of an A.P. is 24 and 13th term is 52 find the A.P.

25. For what value of k, the system of equations has no solution.
$2x + 3y = 7$
$(k + 1)x + (2k - 1)y = 3k + 5$

SECTION C
**(This section comprises of short answer type questions (SA) of 3 marks each)**

26. Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$ and verify the relationship between the zeroes and its coefficients.

27. A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance if its speed were 5 km/hour more. Find the original speed of the train.

OR

A two digit number is such that the product of its digits is 12. When 36 is added to this number, the digits are interchanged. Find the number.

28. In figure PQ || CD and PR || CB. Prove that :

$$\frac{AQ}{QD} = \frac{AR}{RB}$$
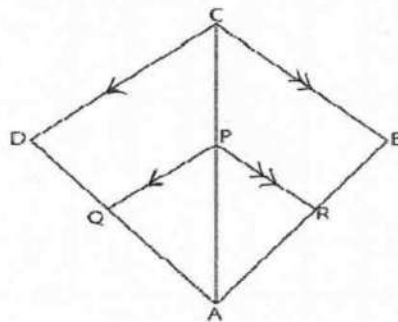
29. Prove that : $(\sin\theta + \text{cosec }\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

OR

Evaluate :

$$\frac{\cot^2 30° + 3\cos^2 45° + 2\text{cos ec}^2 60° + 3\sin^2 30°}{\sec^2 60° + \text{cosec}30° - \tan^2 60°}$$

30. Find the ratio in which the line segment joining the points $(2, -3)$ and $(-5, 6)$ is divided by y-axis.

31. Two persons are standing on the opposite sides of a tower. They observe the angles of elevation of the top of the tower to be 30° and 60°. Find the distance between them if the height of tower is 60 m.

SECTION D
(This section comprises of long answer-type questions (LA) of 5 marks each)

32. Prove that:

$$\sqrt{\frac{1+Sin\theta}{1-Sin\theta}} + \sqrt{\frac{1-Sin\theta}{1+Sin\theta}} = 2 \text{ Sec }\theta$$

33. The taxi charges is a city comprise of a fixed charge together with the charge for the distance covered. For a journey of 20 km the charge paid is Rs. 170 and for a journey of 30 km the charge paid is Rs. 250. Form the linear equation in two variables and then solve them graphically to find the fixed charge and the charge per Km.

34. Sum of n terms of an AP is given by $S_n = 2n^2 - 2n$, then find :

    (i)   its first term
    (ii)   the common differenc
    (iii)   first three terms of the AP.
    (iv)   its 20th term.
   (v)   Sum of first 20 terms of the AP

OR

The sum of first six terms of an A.P is 42. The ratio of its 10th term & 30th is 1:3. Calculate the first & 13th term of the A.P. Also find the sum of its 51 terms.

35. State and prove basic proportionality theorem.

SECTION E

(This section comprises of 3 case based questions of 4 marks each. Attempt any 4 questions in each case study)

36. **CASE STUDY 1:** In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs 1/4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th distance AD on the eighth line and posts a red flag.
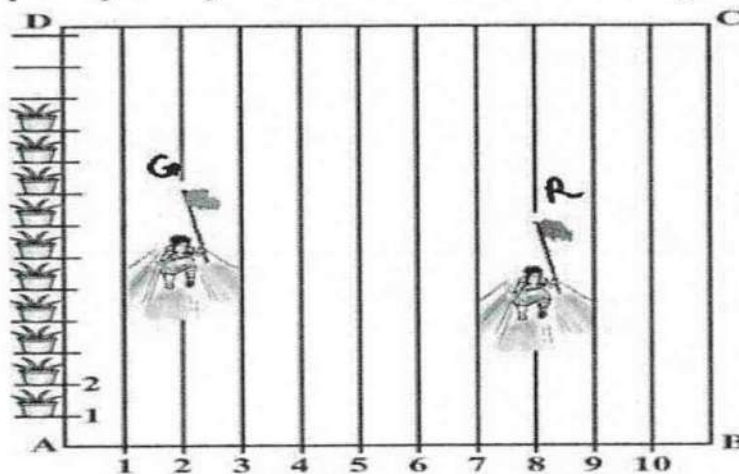
1. Find the position of green flag
a) (2, 25)
b) (2, 0.25)
c) (25, 2)
d) (0, -25)

2. Find the position of red flag
a) (8, 0)
b) (20, 8)
c) (8, 20)
d) (8, 0.2)

3. What is the distance between both the flags?
a) √41
b) √11
c) √61
d) √51

4. If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?

a) (5, 22.5)

b) (10, 22)

c) (2, 8.5)

d) (2.5, 20)

5. If Virat runs distance exactly equal to Rashmi on sixth line and posts Yellow flag. What is the position of Yellow flag.

a) (6, 0)

b) (22, 6)

c) (6, 22.5)

d) (22.5, 6)

37. CASE STUDY 2:

Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles.The height of Vijay's house if 20m when Vijay's house casts a shadow 10m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Ajay casts 20m shadow on the ground.

Vijay's House   Tower   Ajay's House
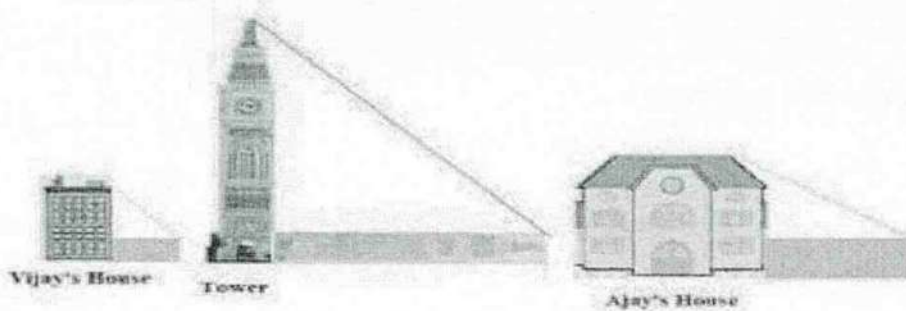
1. What is the height of the tower?

a) 20m

b) 50m

c) 100m

d) 200m

2. What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m?

a) 75m

b) 50m

c) 45m

d) 60m

3. What is the height of Ajay's house?

a) 30m

b) 40m

c) 50m

d) 20m

**4. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Ajay's house?**

a) 16m

b) 32m

c) 20m

d) 8m

5. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

a) 15m

b) 32m

c) 16m

d) 8m

38. CASE STUDY 3:

Your elder brother wants to buy a car and plans to take loan from a bank for his car. He repays his total loan of Rs 1,18,000 by paying every month starting with the first instalment of Rs 1000. If he increases the instalment by Rs 100 every month , answer the following:
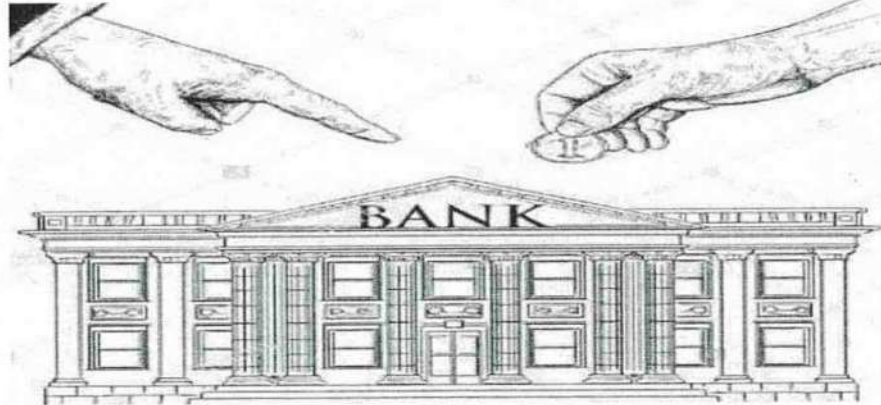
1. The amount paid by him in 30th installment is

a) 3900

b) 3500

c) 3700

d) 3600

2. The amount paid by him in the 30 installments is

a) 37000

b) 73500

c) 75300

d) 75000

3. What amount does he still have to pay offer 30th installment?

a) 45500

b) 49000

c) 44500

d) 54000

4. If total installments are 40 then amount paid in the last installment?

a) 4900

b) 3900

c) 5900

d) 9400

5. The ratio of the 1st installment to the last installment is

a) 1:49

b) 10:49

c) 10:39

d) 39:10