INDIAN SCHOOL AL WADI AL KABIR

Mid Term Examination 2024-25

SUB: Mathematics - Set 2

Date: 19/09/2024 Time Allowed :3 hours

Class: X Maximum Marks: 80

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions.

2. This Question Paper is divided into 5 Sections A, B, C, D and E.

3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion- Reason based questions of 1 mark each.

4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.

5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.

6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.

7. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each.

8. All Questions are compulsory. However, an internal choice in 2 Question of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.

9. Draw neat and clean figures wherever required.

10. Use of calculators is not allowed.

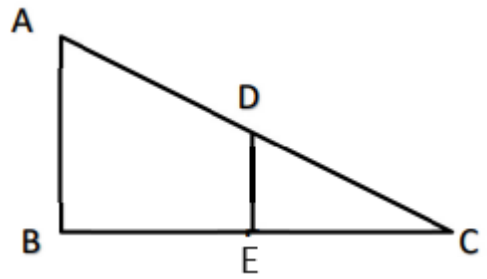
SECTION A

Section A consists of 20 questions of 1 mark each.

1 If the discriminant of the quadratic equation $3x^2 - 2x + c = 0$ is 16, then the value of c is:

(A) 1 **(B)** 0 **(C)** -1 **(D)** $\sqrt{2}$

2 In Δ ABC, DE $\parallel$ AB. If AB = a, DE = x, BE = b and EC = c. Then x expressed in terms of a, b and c is:



(A) $\frac{ac}{b}$ **(B)** $\frac{ac}{b+c}$

(C) $\frac{ab}{c}$ **(D)** $\frac{ab}{b+c}$

3 Consider the following frequency distribution:

Class	0-6	6-12	12-18	18-24	24-30
Frequency	12	10	15	8	11

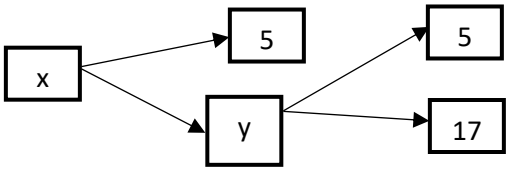
The median class is:

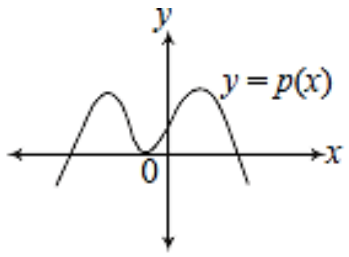
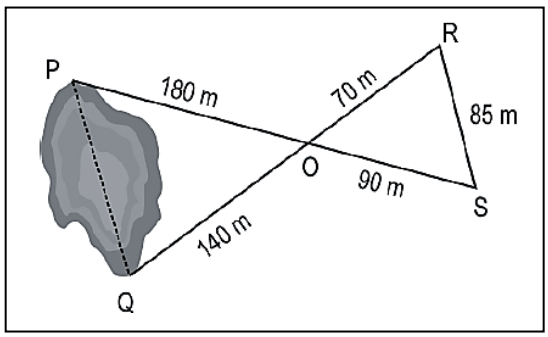
(A) 6-12 **(B)** 12-18 **(C)** 18-24 **(D)** 24-30

4 If P($\frac{a}{3}$, 4) is the mid-point of the line segment joining the points Q(-6, 5) and R(-2, 3),

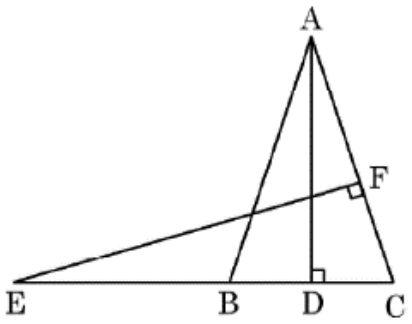
then the value of a is:

(A) -4 **(B)** 12 **(C)** -12 **(D)** -6

5	The value of k for which the lines 5x+7y=3 and 15x + 21y = k coincide is: **(A)** 9 **(B)** 5 **(C)** 7 **(D)** 18
6	If the distance between the points (4, *p*) and (1, 0) is 5, then the value of *p* is: **(A)** 4 only **(B)** ± 4 **(C)** -4 only **(D)** 0
7	The lines represented by the equations x - 2y = 0 and 4*x*+3*y* = 20 are: **(A)** intersecting exactly at one point **(B)** intersecting exactly at two points **(C)** coincident **(D)** parallel
8	The values of x and y respectively are:  **(A)** 25, 500 **(B)** 425, 85 **(C)** 85, 425 **(D)** 500, 20
9	The HCF and LCM of two numbers is 9 and 459 respectively. If one of the numbers is 27, then the other number is: **(A)** 459 **(B)** 153 **(C)** 135 **(D)** 150
10	If the zeroes of the polynomial $5x^2 - 26x + k$ are reciprocal of each other, then the value of k is: **(A)** 5 **(B)** 4 **(C)** 6 **(D)** 8
11	If $a = 2^2 \times 3^2$, $b = 2^2 \times 3 \times 5$, $c = 2^2 \times 3 \times 7$, the LCM (a, b, c) is equal to: **(A)** 210 **(B)** 420 **(C)** 1260 **(D)** 120
12	If $2\cos^2\left(\frac{A}{2}\right) = 1$, then A is: **(A)** 90^0 **(B)** 45^0 **(C)** 30^0 **(D)** 60^0

13	The graph of $y=f(x)$ is given in the figure. The number of zeroes of $f(x)$ is:  **(A)** 0 **(B)** 2 **(C)** 3 **(D)** 4
14	If $\sum f_i = 18$, $\sum f_i x_i = 2p + 24$ and mean of the distribution is 2, then p is equal to: **(A)** **3** **(B)** 4 **(C)** 8 **(D)** 6
15	If $\frac{1}{2}$ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then the value of k is: **(A)** 2 **(B)** $\frac{1}{2}$ **(C)** -2 **(D)** $\frac{1}{4}$
16	If $\sin\theta = \cos\theta$, then the value of $2\tan\theta + \cos^2\theta$ is: **(A)** 1 **(B)** $\frac{1}{2}$ **(C)** $\frac{5}{2}$ **(D)** $\frac{2}{5}$
17	A geologist asked his assistant Annie to find the length of the lake(denoted as PQ) and Annie gave the correct answer. The answer given by Annie is:  **(A)** 100 m **(B)** 90 m **(C)** 170 m **(D)** 120 m
18	The mean and median of a data are 24 and 26 respectively. The mode of the data is: **(A)** 126 **(B)** 20 **(C)** 2 **(D)** 30
	Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

	(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A) (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.
19	**Assertion(A)**: If P and Q are the points on the sides DE and DF of a triangle DEF such that DP = 5 cm, DE = 15 cm, DQ= 6 cm and QF = 18 cm, then PQ is not parallel to EF. **Reason(R)**: If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.
20	**Assertion (A):** Point P(0, -7) is the point of intersection of *y*-axis and perpendicular bisector of line segment joining the points A (–1, 0) and B (7, –6). **Reason (R):** The point P(0, -7) lies on Y axis and is equidistant from A and B.
	SECTION B
	Section B consists of 5 questions of 2 marks each.
21	(a)If cos (A - B) = $\frac{\sqrt{3}}{2}$ and sin (A + B) = $\frac{\sqrt{3}}{2}$; find A and B where (A+ B) and (A – B) are acute angles. **OR** (b)If $4\cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + p = \frac{3}{4}$, then find the value of p.
22	The points A(1,-2) , B(2,3), C (k,2) and D(-4,-3) are the vertices of a parallelogram. Find the value of k.

23	Find the HCF of 612 and 1314 using prime factorisation. **OR** Prove that $3 + \sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is an irrational number.
24	Solve the quadratic equation for x: $x^2 + 2\sqrt{2}\,x - 6 = 0$
25	If $2x + y = 13$ and $4x - y = 17$, find the value of $(x - y)$.
	SECTION C
	Section C consists of 6 questions of 3 marks each.
26	In the given figure, E is a point on the side CB produced of an isosceles triangle ABC with AB = AC. If AD ⊥ BC and EF ⊥ AC, then prove that Δ ABD ~ Δ ECF. 
27	In ΔABC right angled at A, if AB = 24 cm and AC = 7 cm, find sin B, sec B and tan B. Also verify the result $\sec^2 B - \tan^2 B = 1$.
28	(a)If α and β are the zeroes of a quadratic polynomial $5x^2 + 2x - 3$, find (i) $\frac{1}{\alpha} + \frac{1}{\beta}$ (ii) $\alpha^2 + \beta^2$ **OR** (b)If α and β are the zeroes of a quadratic polynomial such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$. Find the quadratic polynomial having α and β as its zeroes.

29

(a)A part of monthly hostel charges in a college hostel are fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 25 days, he has to pay ₹ 4,500, whereas a student B who takes food for 30 days has to pay ₹ 5,200. Find the fixed charges per month and the cost of food per day.

OR

(b)Using graphical method, solve the following system of equations:

$3x + y + 4 = 0$ and $3x – y + 2 = 0$

30

Heights of 50 students of class X of a school are recorded and the following data is obtained:

Heights (cm)	130-135	135-140	140-145	145-150	150-155	155-160
Number of students	4	11	12	7	10	6

Find the median height of the students.

31

Find the zeroes of the quadratic polynomial $3x^2 + 4x - 4$, and verify the relationship between the zeroes and the coefficients.

SECTION D

Section D consists of 4 questions of 5 marks each.

32

(i) Prove that $\left(\frac{1}{cos\,\theta} - cos\theta\right)\left(\frac{1}{sin\,\theta} - sin\theta\right) = \frac{1}{tan\,\theta + cot\,\theta}$

(ii) If $a \cos\theta + b \sin\theta = m$ and $a \sin\theta - b \cos\theta = n$, then prove that $a^2 + b^2 = m^2 + n^2$.

33

(a) Find the dimensions of a rectangular park whose perimeter is 60 m and area 200 m^2.

OR

(b)Find the value of ‘c’ for which the quadratic equation

$(c + 1)\,x^2 – 6\,(c + 1)\,x + 3\,(c + 9) = 0$; $c \neq –1$ has real and equal roots.

34 (a)Daily wages of 110 workers, obtained in a survey, are tabulated below:

Daily Wages(₹)	100-120	120-140	140-160	160-180	180-200	200-220	220-240
No. of workers	10	15	20	22	18	12	13

Compute the mean daily wages and modal daily wages of these workers.

OR

(b)If the median of the following frequency distribution is 32.5, find the values of f_1 and f_2.

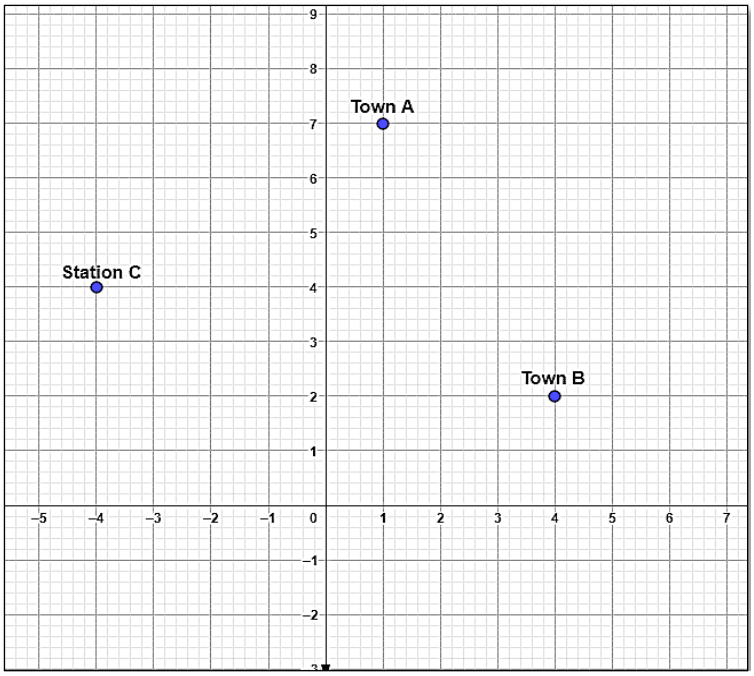
Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

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

SECTION E (Case Study Based Questions)

36 **Case Study -1**

Two friends Seema and Aditya work in the same office at Delhi. In the Christmas vacations, both decided to go to their hometowns represented by Town A and Town B respectively in the figure given below. Town A and Town B are connected by trains from the same station C (in the given figure) in Delhi.



Based on the given situation, answer the following questions:

(i)	Find the coordinates of A and C.	1m
(ii)	Seema and Aditya planned to meet at a location D situated at a point D represented by the mid-point of the line joining the points represented by Town A and Town B. Find the coordinates of the point represented by the point D.	1m
(iii)	(a)Who will travel more distance, Seema or Aditya, to reach to their hometown? **OR** (b)Check whether the points A, B and C form vertices of an isosceles triangle.	2m

37 **Case Study – 2**

Education is a never-ending process; it doesn't stop after starting a career or earning a degree. Like a good student keeps on learning within the framework of information, teaching is an evolving skill because a good teacher needs to keep on upskilling himself/herself to be relevant in the class.

A school has invited 42 Mathematics teachers, 56 Physics teachers and 70 Chemistry teachers to attend a Science workshop.

Based on the above information, answer the following questions.

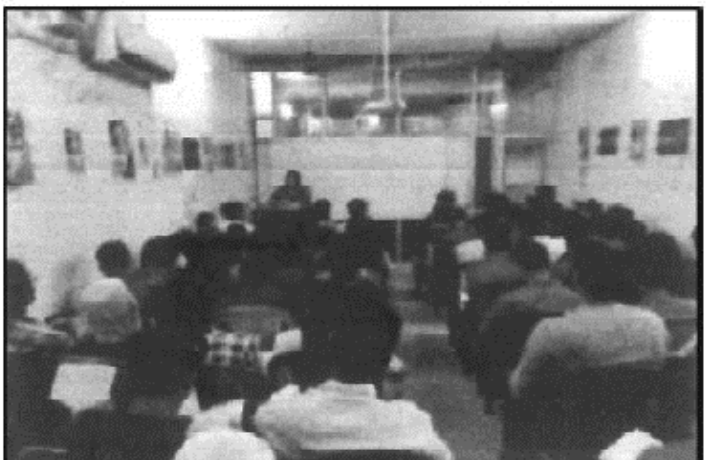
(i)	Express 70 and 56 as the product of their prime factors.	1m
(ii)	If the same number of teachers are to sit at a table and each table is occupied by the teachers of the same subject, find the number of teachers seated at a table.	1m
(iii)	(a) Find the minimum number of tables required, if the same number of teachers are to sit at a table and each table is occupied by the teachers of the same subject. OR (b)Find the largest number which divides 70 and 125, leaving remainders 5 and 8 respectively.	2m

38 **Case Study -3**

A coaching institute of Mathematics conducts classes in 2 batches I and II. Scholarships are given to students who performs exceptionally good in both batches and their fees structure is different.

In batch I, there are 20 students with scholarship and 5 children without scholarship, whereas in batch II there are 5 children with scholarship and 25 children without scholarship. The total monthly collection of fees from batch I is ₹ 9000 and from batch II is ₹ 26000.

Assume that each child with scholarship pays ₹ x per month and each child without scholarship pays ₹ y per month.



Based on the above information answer the following questions.

(i)	Represent the information algebraically in terms of x and y.	1m
(ii)	(a) Find the monthly fee paid by a child with scholarship. **OR** (b) Find the difference in the monthly fee paid by a child with scholarship and without scholarship.	2m
(iii)	If there are 10 children with scholarship and 20 children without scholarship in batch II, what is the total monthly collection of fees from batch II	1m

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