MATHEMATICS
SAMPLE QUESTION PAPER-1
MARKING SCHEME
CLASS – X (2025-26)

Maximum Marks: 80 **Time: 3 hours**

General Instructions:

Read the following instructions carefully and follow them:

1. This question paper contains 38 questions. All Questions are compulsory.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Question numbers 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, Question numbers 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Question numbers 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Question numbers 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Question numbers 36-38 are case study-based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. There is no overall choice. However, an internal choice in 2 questions 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. Take π = 22/7 wherever required if not stated.
10. Use of calculators is not allowed.

SECTION – A
(Section A consists of 20 questions of 1 mark each)

Q.1 Find the value of k for which the system of equations $x + (k+1)y = 5$ and $(k+1)x + 9y = 8k - 1$ has infinitely many solutions **(1 Mark)**

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

Ans.1 (a) 2

Q.2 The quadratic equation $x^2 + 5x - 2 = 0$ has **(1 Mark)**

(a) two distinct real roots
(b) two equal real roots
(c) no real roots
(d) more than 2 real roots

Ans.2 (a) two distinct real roots

Q.3 $\Delta ABC \sim \Delta PQR$. If AM and PN are altitude of ΔABC and ΔPQR respectively and $AB^2 : PQ^2 = 25:36$, then AM: PN = **(1 Mark)**

(a) 2:5 (b) 5:6 (c) 25:36 (d) 2:3

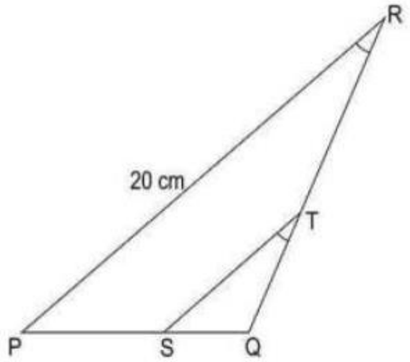
Ans.3 (b) 5:6

Q.4 The quadratic polynomial, the sum of whose zeroes is -5 and product is 6, is, **(1 Mark)**

(a) $x^2 + 5x + 6$
(b) $x^2 - 5x + 6$
(c) $x^2 - 5x - 6$
(d) $-x^2 + 5x + 6$

Ans.4 (a) $x^2 + 5x + 6$

Q.5 ΔPQR is shown below. ST is drawn such that $\angle PRQ = \angle STQ$ **(1 Mark)**



If ST divided QR in a ratio of $2:3$, then what is the length of ST?

(a) $\frac{10}{3}\ cm$

(b) $8\ cm$

(c) $12\ cm$

(d) $\frac{40}{3}$

Ans.5 (b) 8 cm

Q.6 P, (5,1), Q (1,4) and R (8,5) are the coordinates of the vertices of a triangle. Which of the following types of triangles will ΔPQR be **(1 Mark)**

(a) equilateral triangle (b) Scalene (c) Isosceles (d) None

Ans.6 (c) Isosceles

Q.7 If – 2 and 3 are the zeroes of quadratic polynomial $x^2 + (p+1)x + q$, then p and q are... respectively

(a) -7,3 (b) -6, -2 (c) 2,6 (d) -2,-6 **(1 Mark)**

Ans.7 (d) -2,-6

Q.8 A point (x y) is at a distance of 7 units from the origin. How many such points lie in the third quadrant?

(a) 0 (b) 1 (c) 2 (d) Infinitely many **(1 Mark)**

Ans.8 (d) Infinitely many

Q.9 The value of k for which the system of equation $x + y - 4 = 0$ and $2x + ky = 3$ has no. solution is

(a) -2 (b) ≠2 (c) 3 (d) 2 **(1 Mark)**

Ans.9 (d) 2

Q.10 The 11th term of an AP ; $-5, \frac{-5}{2}, 0, \frac{5}{2}, \ldots..$ **(1 Mark)**

(a) -20 (b) 30 (c) 20 (d) -30

Ans.10 (c) 20

Q.11 If $g - 1, g + 3$ and $3g - 1$ are in A.P, then find the value of g. **(1 Mark)**

(a) 3 (b) 4 (c) 5 (d) 7

Ans.11 (b) 4

Q.12 Which of the following is equal to the given expression? **(1 Mark)**

$\frac{\cot\theta \sec^2\theta}{cosec\ \theta}$

(a) $\sec\theta$

(b) $cosec\ \theta$

(c) $\cot^2\theta \sec\theta$

(d) $\cot^2\theta\ cosec\ \theta$

Ans.12 (a) sec θ

Q.13 If the n^{th} term of an AP is given by $a_n = 5n - 3$, then the sum of first 10 term is **(1 Mark)**

(a) 225
(b) 245
(c) 255
(d) 270

Ans.13 (b) 245

Q.14 Find the 11th term from the end of the given progression 10 , 7, 4..... -62. **(1 Mark)**

(a) -32 (b) -16 (c) -25 (d) 0

Ans.14 (a) -32

Q.15 Shown below is a solved trigonometric problem. **(1 Mark)**

$\frac{cosec\ \theta+\cot\theta-1}{coses\ \theta-\cot\theta+1}$

$= \frac{cosec\ \theta+\cot\theta-(\cot^2\theta-cosec^2\theta)}{cosec\ \theta-\cot\theta+1}$ (Step -1)

$= \frac{cosec\ \theta+\cot\theta-(\cot\theta+cosec\ \theta)(\cot\theta-cosec\ \theta)}{cosec\ \theta-\cot\theta+1}\ (Step-2)$

$= \frac{cosec\ \theta+\cot\theta(1-\cot\theta+cosec\ \theta)}{cosec\ \theta-\cot\theta+1}\ (Step-3)$

$= cosec\ \theta + \cot\theta$ (step-4)

In Which step is there an error in solving?

(a) Step 1 (b) Step 2 (c) Step 3 (d) There is no error

Ans.15 (a) Step 1

Q.16 In triangles ABC and DEF, $\angle B, \angle E, \angle F = \angle C$, and AB = 3DE. Then the two triangles are. **(1 Mark)**

(a) congruent but not similar. (b) similar but not congruent
(c) neither congruent nor similar (d) congruent as well as similar

Ans.16 (b) similar but not congruent

Q.17 What is the HCF of the least prime number and the least composite number **(1 Mark)**

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

Ans.17 (b) 2

Q.18 $\sqrt{n}$ is a natural number such that $n > 1$. Which of these can definitely be expressed as a product of primes? **(1 Mark)**

(i) $\sqrt{n}$ (ii) n (iii) $\frac{\sqrt{n}}{2}$

(a) only (i) (b) only (i) and (ii) (c) all (i), (ii) and (iii) (d) None of these

Ans.18 (c) all (i), (ii) and (iii)

DIRECTIONS: In the question number **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
(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.

Q.19 Statement A (Assertion): HCF of 26 and 91 is 13 and the LCM is 182. **(1 Mark)**

Statement R (Reasons) As HCF (a, b) X (a x b) = LCM (a, b)

Ans.19 (C) Assertion (A) is true but reason (R) is false.

Q.20 Assertion (A): The mid-point of a line segment divides it in ratio 1: 1. **(1 Mark)**

Reason (R): Three points are collinear if they lie on the same straight line.

Ans.20 (B) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

SECTION – B (Section B consists of 6 questions of 2 mark each)

Q.21 Solve for x and y $71x + 37y = 253$ **(2 Marks)**

$37x + 71y = 287$

Ans.21

Given equations:

$$71x + 37y = 253 \quad (1)$$
$$37x + 71y = 287 \quad (2)$$

Step 1: Multiply to Eliminate One Variable

Multiply (1) by 71 and (2) by 37:

Equation (1) × 71:

$$71 \times 71x + 71 \times 37y = 71 \times 253$$
$$5041x + 2627y = 17963$$

Equation (2) × 37:

$$37 \times 37x + 37 \times 71y = 37 \times 287$$
$$1369x + 2627y = 10619$$

Step 2: Subtract to Solve for x

Subtract the second equation from the first to eliminate y:

$$(5041x + 2627y) - (1369x + 2627y) = 17963 - 10619$$
$$3672x = 7344$$
$$x = \frac{7344}{3672} = 2$$

Step 3: Substitute to Solve for y

Substitute $x = 2$ in equation (1):

$$71(2) + 37y = 253$$
$$142 + 37y = 253$$
$$37y = 253 - 142 = 111$$
$$y = \frac{111}{37} = 3$$

Q.22 A line intersects the y-axis and x-axis at the points P and Q respectively. If (2, -5) is the mid-point of PQ then find the coordinates of P and Q. **(2 Marks)**

Ans.22

Step 1: Midpoint Formula

The midpoint M of two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is:

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Using our points:

$$\left(\frac{0 + x_2}{2}, \frac{y_1 + 0}{2}\right) = (2, -5)$$

Step 2: Solve for x_2 and y_1

From the x-coordinate:

$$\frac{x_2}{2} = 2 \implies x_2 = 4$$

From the y-coordinate:

$$\frac{y_1}{2} = -5 \implies y_1 = -10$$

Final Coordinates

- $P = (0, -10)$ (on y-axis)
- $Q = (4, 0)$ (on x-axis)

Q.23 Using fundamental theorem of Arithmetic, final HCF and LCM of 6, 72 and 120. **(2 Marks)**
Ans.23

Step 1: Prime factorization

- $6 = 2 \times 3$
- $72 = 2^3 \times 3^2$
- $120 = 2^3 \times 3 \times 5$

- Take highest powers of all prime factors appearing:
  - 2^3 from 72 or 120
  - 3^2 from 72
  - 5^1 from 120

So,

$$LCM = 2^3 \times 3^2 \times 5 = 8 \times 9 \times 5 = 360$$

Q.24 Find the ratio in which the point (-3, p) divides the line segment joining the point (-5, -4) and (-2, -3). Also find the value of p. **(2 Marks)**

Ans.24

Step 1: Use section formula for coordinate x

$$x = \frac{k \cdot x_2 + x_1}{k+1}$$

Here:

$$-3 = \frac{k \times (-2) + (-5)}{k+1}$$

Multiply both sides by $k+1$:

$$-3(k+1) = -2k - 5$$

$$-3k - 3 = -2k - 5$$

$$-3k + 2k = -5 + 3$$

$$-k = -2$$

$$k = 2$$

Step 2: Use section formula for coordinate y

$$p = \frac{k \cdot y_2 + y_1}{k+1} = \frac{2 \times (-3) + (-4)}{2+1} = \frac{-6-4}{3} = \frac{-10}{3} = -\frac{10}{3}$$

Final answer

- The point divides the segment in the ratio $2:1$
- The value of $p = -\frac{10}{3}$

Q.25 Find a quadratic polynomial whose zeros are $(3+\sqrt{3})$ and $(3-\sqrt{3})$ **(2 Marks)**

Ans.25 Let $\alpha = 3 + \sqrt{3}$

$\beta = 3 - \sqrt{3}$

$\therefore \alpha + \beta = (3+\sqrt{3}) + (3-\sqrt{3})$

$\boxed{\alpha + \beta = 6}$

$\alpha \cdot \beta = (3+\sqrt{3}) \times (3-\sqrt{3})$

$\Rightarrow (a-b)(a+b) = a^2 - b^2$

$= (3)^2 - (\sqrt{3})^2 \Rightarrow 9 - 3 = 6$

$\boxed{\alpha \cdot \beta = 6}$

$\therefore$ Quadratic polynomials

$$= x^2 - (\alpha+\beta)x + \alpha \cdot \beta$$

$= x^2 - 6x + 6$ Ans.

SECTION – C (Section C consists of 6 questions of 3 mark each)

Q.26 If sum of three consecutive terms of A.P. is 39 and their product is 2080. Find three terms. **(3 Marks)**

Ans.26

Let the three consecutive terms of the A.P. be:

$a-d, a, a+d$

Step 1: Sum of three terms is 39

$$(a-d)+a+(a+d)=39$$

$$3a=39$$

$$a=13$$

Step 2: Product of three terms is 2080

$$(a-d)\times a\times(a+d)=2080$$

Substitute $a=13$:

$$(13-d)(13)(13+d)=2080$$

Use the identity:

$$(13-d)(13+d)=13^2-d^2=169-d^2$$

So:

$$13\times(169-d^2)=2080$$

$$2197-13d^2=2080$$

$$2197-2080=13d^2$$

$$117=13d^2$$

$$d^2=\frac{117}{13}=9$$

$$d=\pm 3$$

Step 3: Find the three terms

For $d=3$:

$$13-3=10,\quad 13,\quad 13+3=16$$

For $d=-3$:

$$13-(-3)=16,\quad 13,\quad 13+(-3)=10$$

Final answer

The three consecutive terms are $10, 13, 16$.

Q.27 Given that $\sqrt{3}$ is irrational. Prove that $1-2\sqrt{3}$ is irrational. **(3 Marks)**

Ans.27 Let $(1-2\sqrt{3})$ is a rational number.

$\therefore 1-2\sqrt{3}=\frac{p}{q}$ [where p, q is a coprime number and $q\neq 0$]

$-2\sqrt{3} = \frac{p}{q} - \frac{1}{1}$

$-2\sqrt{3} = \frac{p-q}{q}$

$\sqrt{3} = \frac{p-q}{-2}$

$\therefore \sqrt{3}$ is an irrational number (Given)

and $\frac{p-q}{-2}$ is a rational number.

$\therefore IR \neq R$

∴ our assumption would be wrong.

Hence, $(1 - 2\sqrt{3})$ is an irrational number.

Q.28 Prove that **(3 Marks)**

$\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$

Ans.28

$$\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$$

L.H.S.

$\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$

$\Rightarrow \frac{\sqrt{1+\sin\theta}}{\sqrt{1-\sin\theta}} + \frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}}$

$\Rightarrow \frac{(\sqrt{1+\sin\theta})^2 + (\sqrt{1-\sin\theta})^2}{\sqrt{(1-\sin\theta)(1+\sin\theta)}}$

$\Rightarrow \frac{(1+\sin\theta)+(1-\sin\theta)}{\sqrt{[1-\sin^2\theta]}}$

$\Rightarrow \frac{2}{\sqrt{\cos^2\theta}} \quad \Rightarrow \quad \frac{2}{\cos\theta} \quad \Rightarrow \quad 2\sec\theta$

Q.29 If α and β are the zeroes of the polynomial $6y^2 - 7y + 2$, find a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$. **(3 Marks)**

Ans.29

Step 1: Find sum and product of original zeroes

By comparing $ay^2 + by + c$:

- Sum of zeroes: $\alpha + \beta = \frac{7}{6}$
- Product of zeroes: $\alpha\beta = \frac{2}{6} = \frac{1}{3}$

Step 2: Find sum and product of new zeroes

- Sum: $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{7}{6}}{\frac{1}{3}} = \frac{7}{6} \times \frac{3}{1} = \frac{7\times3}{6} = \frac{21}{6} = \frac{7}{2}$
- Product: $\frac{1}{\alpha} \times \frac{1}{\beta} = \frac{1}{\alpha\beta} = \frac{1}{\frac{1}{3}} = 3$

Step 3: Form the required quadratic polynomial

General form:

$$x^2 - (\text{sum})x + (\text{product})$$

So, the polynomial is:

$$x^2 - \left(\frac{7}{2}\right)x + 3$$

If required in standard integer coefficients, multiply all terms by 2:

$$2x^2 - 7x + 6$$

Q.30 The numerator of a fraction is 4 less than the denominator. If the numerator is decreased by two and the denominator is increased by one, then the denominator is 8 times the numerator. Find the fraction. **(3 Marks)**

Ans.30

Let the denominator be x.

Then numerator = $x - 4$ (since it is 4 less than the denominator).

Step 1: Use the given condition

If numerator is decreased by 2 and denominator is increased by 1, then:

$$\frac{(x-4)-2}{x+1} = \frac{x-6}{x+1}$$

According to the problem:

$$x + 1 = 8 \times (x - 6)$$

Step 2: Solve the equation

$$x + 1 = 8x - 48$$

$$1 + 48 = 8x - x$$

$$49 = 7x$$

$$x = 7$$

Step 3: Find numerator

$$\text{Numerator} = x - 4 = 7 - 4 = 3$$

Q.31 Sumit is 3 times as old as his son. Five years later he shall be two and a half times as old as his son. How old is Sumit at present? **(3 Marks)**

Ans.31

Let Sumit's present age be x years, and his son's present age be y years.

Given:

- $x = 3y$ (Sumit is 3 times as old as his son)
- Five years later:
  - Sumit: $x + 5$
  - Son: $y + 5$

After 5 years:

$$x + 5 = 2.5(y + 5)$$

Now substitute $x = 3y$:

$$3y + 5 = 2.5(y + 5)$$

$$3y + 5 = 2.5y + 12.5$$

$$3y - 2.5y = 12.5 - 5$$

$$0.5y = 7.5$$

$$y = \frac{7.5}{0.5} = 15$$

Sumit's present age:

$$x = 3y = 3 \times 15 = \boxed{45}$$

Sumit is 45 years old at present.

SECTION – D (Section D consists of 4 questions of 5 mark each)

Q.32 **(4 Marks)**

Prove that $\frac{1}{secsec\, A - tantan\, A} - \frac{1}{coscos\, A} = \frac{1}{coscos\, A} - \frac{1}{secsec\, A + tantan\, A}$

Ans.32

$$\frac{1}{\sec A - \tan A} - \frac{1}{\cos A} = \frac{1}{\cos A} - \frac{1}{\sec A + \tan A}$$

L.H.S

$\Rightarrow \frac{1}{\sec A - \tan A} \times \frac{\sec A + \tan A}{\sec A + \tan A} - \sec A$

$\Rightarrow \frac{\sec A + \tan A}{\sec^2 A - \tan^2 A} - \sec A$

$\Rightarrow \frac{\sec A + \tan A}{1} - \sec A$

$\Rightarrow \sec A + \tan A - \sec A$

$\Rightarrow \boxed{\tan A}$

R.H.S

$\frac{1}{\cos A} - \frac{1}{\sec A + \tan A}$

$\Rightarrow \sec A - \frac{1}{\sec A + \tan A} \times \frac{\sec A - \tan A}{\sec A - \tan A}$

$\Rightarrow \sec A - \frac{(\sec A - \tan A)}{\sec^2 A - \tan^2 A}$

$\Rightarrow \sec A - \frac{(\sec A - \tan A)}{1}$

$\Rightarrow \sec A - (\sec A - \tan A)$

$\Rightarrow sac\ A - \sec A + \tan A$

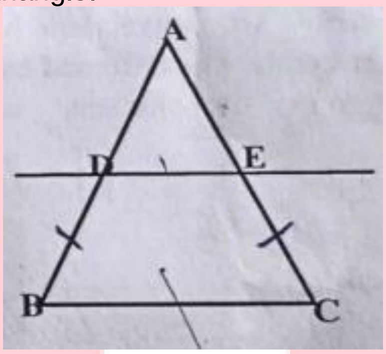
$\Rightarrow \boxed{\tan A}$

∴ L.H.S = R.H.S

Q.33 Prove that, if a line segment 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. Using the above result, prove the following. **(4 Marks)**

In the given figure, DE II BC and BC = CE.

Prove that ΔABC is an isosceles triangle.



Ans.33

Given: In the figure, DE || BC and $BD = CE$.

To Prove: $\triangle ABC$ is isosceles, i.e., $AB = AC$.

Proof:

From the theorem above:

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Given $BD = CE$, let $BD = CE = x$.

Let $AD = p$, $AE = q$.

So:

$$\frac{p}{x} = \frac{q}{x} \implies p = q$$

Therefore, $AD = AE$.

Now, $AB = AD - DB = p + x$

and $AC = AE + EC = p + x$

Thus,

$$AB = AC$$

So, triangle ABC is isosceles.

Q.34 A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the speed of the train. **(4 Marks)**

Ans.34

- Time taken at speed x:

$$\frac{480}{x} \quad \text{hours}$$

- Time taken at speed $x - 8$:

$$\frac{480}{x-8} \quad \text{hours}$$

Given:

$$\frac{480}{x-8} = \frac{480}{x} + 3$$

Multiply both sides by $x(x-8)$:

$$480x = 480(x-8) + 3x(x-8)$$

$$480x = 480x - 3840 + 3x^2 - 24x$$

$$0 = -3840 + 3x^2 - 24x$$

$$3x^2 - 24x - 3840 = 0$$

Divide entire equation by 3:

$$x^2 - 8x - 1280 = 0$$

Step 3: Use quadratic formula

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4 \times 1 \times (-1280)}}{2} = \frac{8 \pm \sqrt{64 + 5120}}{2} = \frac{8 \pm \sqrt{5184}}{2} = \frac{8 \pm 72}{2}$$

Step 4: Find roots

1. $x = \frac{8+72}{2} = \frac{80}{2} = 40$
2. $x = \frac{8-72}{2} = \frac{-64}{2} = -32$ (not feasible)

Final answer

Speed of the train = 40 km/h

Q.35 The ratio of 11th term to the 18th term of an Arithmetic Progression (A.P) is 2: 3. Find the ratio of sum of its first five terms to sum of its first 21 terms. **(4 Marks)**

Ans.35

Let the first term be a and common difference be d.

Step 1: Write expressions for 11th and 18th terms

- $T_{11} = a + 10d$
- $T_{18} = a + 17d$

Given ratio:

$$\frac{a+10d}{a+17d} = \frac{2}{3}$$

Cross-multiply:

$$3(a+10d) = 2(a+17d)$$

$$3a + 30d = 2a + 34d$$

$$3a - 2a = 34d - 30d$$

$$a = 4d$$

Step 2: Find ratio of sums

Sum of first n terms of A.P.:

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

Sum of first 5 terms:

$$S_5 = \frac{5}{2}[2a + 4d] = \frac{5}{2}[2(4d) + 4d] = \frac{5}{2}[8d + 4d] = \frac{5}{2} \times 12d = 30d$$

Sum of first 21 terms:

$$S_{21} = \frac{21}{2}[2a + 20d] = \frac{21}{2}[2(4d) + 20d] = \frac{21}{2}[8d + 20d] = \frac{21}{2} \times 28d = 294d$$

Step 3: Compute the ratio

$$\frac{S_5}{S_{21}} = \frac{30d}{294d} = \frac{30}{294} = \frac{5}{49}$$

Final answer

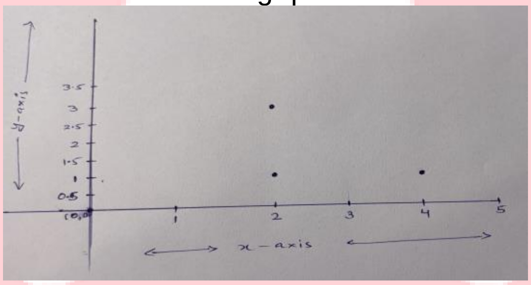
The ratio of the sum of first 5 terms to the first 21 terms is

$$\boxed{\frac{5}{49}}$$

SECTION – E (Section E consists of 3 case study-based questions of 4 marks each)

Q.36 The panchayat office (P) and School (s) are on the same street in a village. School and Library (L) building are also on a same street, but not the former street. The co – ordinates of the three buildings are marked on a graph paper, by taking 1 unit = 500 m, as shown below.

On the basis of given graph answer the following questions:



(i) What is the distance between Panchayat and school building?

(ii) How far is Library from the school?

(iii) What type of triangle is formed by joining positions of Panchayat, School and Library?

Ans.36

Here are the coordinates from the graph:

- Panchayat (P): (2, 3)
- School (S): (2, 1)
- Library (L): (4, 1)
- 1 unit = 500 m

(i) Distance between Panchayat and School

Coordinates: P (2, 3), S (2, 1)

Since x-coordinates are the same, it's a vertical distance:

$$\text{Distance} = |3 - 1| = 2 \text{ units}$$

$$2 \text{ units} \times 500 \text{ m/unit} = 1000 \text{ m}$$

So, the Panchayat and School are 1000 m apart. image.jpg

(ii) Distance between Library and School

Coordinates: L (4, 1), S (2, 1)

y-coordinates are the same, it's a horizontal distance:

$$\text{Distance} = |4 - 2| = 2 \text{ units}$$

$$2 \text{ units} \times 500 \text{ m/unit} = 1000 \text{ m}$$

(iii) Type of triangle formed by P, S, L

Calculate all sides:

- PS: Calculated above = 2 units
- SL: Calculated above = 2 units
- PL: $P(2,3), L(4,1)$

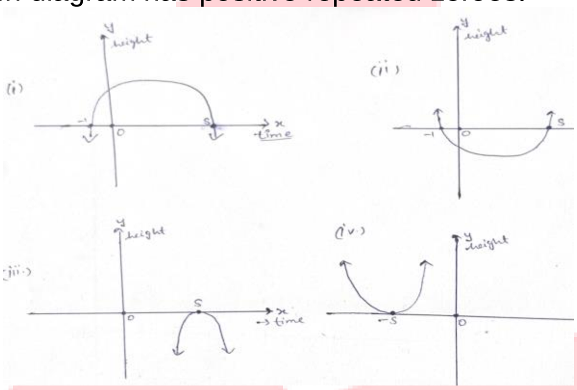
$$PL = \sqrt{(4-2)^2 + (1-3)^2} = \sqrt{2^2 + (-2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2} \text{ units}$$

So,

- PS = 2 units,
- SL = 2 units,
- PL = $2\sqrt{2}$ units (~2.83 units)

The triangle PSL has two equal sides (PS = SL) and the third side is different, so it is an isosceles triangle.

Q.37 (i) Which diagram has positive repeated zeroes.



(ii) Find zeroes of the polynomial $-4t^2 + 16t + 20$

(iii) Find the value of the polynomial $-4t^2 + 16t + 20$ at $t = 3$. Interpret the result.

Ans.37 (i) (iv)

(ii)

Set $-4t^2 + 16t + 20 = 0$:

Divide both sides by -4 to simplify:

$$t^2 - 4t - 5 = 0$$

Factor:

$$t^2 - 4t - 5 = (t-5)(t+1) = 0$$

So,

$$t = 5, \quad t = -1$$

(iii)

Substitute $t = 3$:

$$-4(3)^2 + 16 \times 3 + 20 = -4 \times 9 + 48 + 20 = -36 + 48 + 20 = 32$$

The value at $t = 3$ is 32.

Q.38 An interior designer, Sana, hired two painters, Manan and Bhima to make paintings for her buildings. Both painters were asked to make 50 different paintings each. The prices quoted by both the painters are given below:

Manan asked for Rs 6000 for the first painting, and an increment of Rs 200 for each following painting

Bhima asked for Rs 4000 for the first painting and an increment of Rs 400 for each following painting.

(a) How much money did Manan get for his 25th painting ? show your work. **(1 Mark)**

(b) How much money did Bhima get in all ? show your work. **(1 Mark)**

(c) If both Manan and Bhima make paintings at the same pace, find the first painting for which Bhima will get more money than Manan. Show your steps. **(2 Marks)**

Ans.38

(a) Money Manan got for his 25th painting

Manan's price pattern:
First painting: Rs 6000,
Increment per painting: Rs 200

This is an arithmetic progression (A.P.):
First term (a_1) = 6000
Common difference (d) = 200

Amount for the n^{th} painting:

$$a_n = a_1 + (n-1)d$$

For $n = 25$:

$$a_{25} = 6000 + (25-1) \times 200 = 6000 + 24 \times 200 = 6000 + 4800 = \boxed{10800}$$

(b) Amount Bhima got in all (total for 50 paintings)

Bhima's price pattern:
First painting: Rs 4000,
Increment per painting: Rs 400

This is an A.P.:
First term (a_1) = 4000,
Common difference (d) = 400
Number of paintings (n) = 50

Sum of n terms of A.P.:

$$S_n = \frac{n}{2}[2a_1 + (n-1)d]$$

For $n = 50$:

$$S_{50} = \frac{50}{2}[2 \times 4000 + 49 \times 400] = 25[8000 + 19600] = 25 \times 27600 = \boxed{690000}$$

(c) First painting for which Bhima gets more than Manan

Let number of the painting be n.

Money Manan gets: $M_n = 6000 + (n-1) \times 200$
Money Bhima gets: $B_n = 4000 + (n-1) \times 400$

Set $B_n > M_n$:

$$4000 + (n-1) \times 400 > 6000 + (n-1) \times 200$$

$$4000 + 400(n-1) > 6000 + 200(n-1)$$

$$400(n-1) - 200(n-1) > 6000 - 4000$$

$$200(n-1) > 2000$$

$$n - 1 > 10$$

$$n > 11$$

So, for painting number **11**, Bhima and Manan will be paid equally. For **painting number 12**, Bhima will begin to get more.