**Answer Key to PRACTICE QUESTIONS SET – 3 (2024-25)**

**MATHEMATICS**

**CLASS – X**

**Section A**

**Answer ALL the following Questions. Each question carries 2 marks.**

1. **Determine if the points $(1, 5)$, $(2, 3)$ and $(-2, -11)$ are collinear.**

**Answer:**

$AB = \sqrt{(2-1)^2 + (3-5)^2} = \sqrt{5}$ units

$BC = \sqrt{(-2-2)^2 + (-11-3)^2} = \sqrt{212} = 2\sqrt{53}$ units

$AC = \sqrt{(-2-1)^2 + (-11-5)^2} = \sqrt{265} = \sqrt{5 \times 53}$ units

$AB + BC \neq AC$

Hence, the given points are not collinear.

2. **Find the sum of $1 + (-2) + (-5) + (-8) + \cdots + (-236)$**

**Answer:**

Here, $a = 1$ and $d = (-2) - 1 = -3$

$-236 = 1 + (n-1)(-3) \Rightarrow n = 80$

$S_n = \frac{80}{2}[2 \times 1 + (80-1)(-3)] = \frac{80}{2}[-235] = -9400$

3. **Find the values of y for which the distance between the points $P(2, -3)$ and $Q(10, y)$ is 10 units.**

**Answer:**

By the problem, $\sqrt{(10-2)^2 + (y+3)^2} = 10$

$\Rightarrow 64 + y^2 + 9 + 6y = 100$

$\Rightarrow y^2 + 6y - 27 = 0$

$\Rightarrow (y-3)(y+9) = 0$

$\Rightarrow y = 3 \text{ or } -9$

4. **In an AP, if $S_n = 3n^2 + 5n$ and $a_k = 164$, then find the value of k.**

**Answer:**

$a_n = S_n - S_{n-1} = (3n^2 + 5n) - [3(n-1)^2 + 5(n-1)] = 6n + 2$

$a_k = 164 \Rightarrow 6k + 2 = 164 \Rightarrow k = 27$

5. **How many numbers lie between 10 and 300, which divided by 4 leave a remainder 3?**

**Answer:**

The last term before 300 is 299, which divided by 4 leaves remainder 3.

$\therefore 11, 15, 19, 23, \dots \dots, 299$

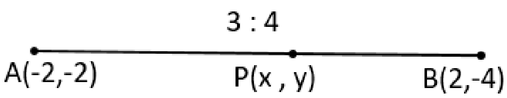
$\Rightarrow 299 = 11 + (n-1)4 \Rightarrow n = 73$

## Section B

**Answer ALL the following Questions. Each question carries 3 marks.**

6. **If A and B are $(-2, -2)$ and $(2, -4)$ respectively, find the coordinates of P such that $AP = \frac{3}{7}AB$ and P lies on the line segment AB.**

**Answer:**




$AP = \frac{3}{7}AB$ and $BP = AB - AP = AB - \frac{3}{7}AB = \frac{4}{7}AB$

$\frac{AP}{BP} = \frac{\frac{3}{7}AB}{\frac{4}{7}AB} = 3:4$

$x = \frac{[3(2)+4(-2)]}{3+4} = -\frac{2}{7}$

$y = \frac{[3(-4)+4(-2)]}{3+4} = -\frac{20}{7}$

Hence, the coordinates of P are $\left(-\frac{2}{7}, -\frac{20}{7}\right)$

7. **If there are $2n + 1$ terms in A.P, prove that the ratio of the sum of odd terms and the sum of even terms is $(n+1):n$.**

**Answer:**

Let sum of odd terms be $S_1$ and sum of even terms be $S_2$.

$S_1 = a_1 + a_3 + a_5 + \cdots + a_{2n+1}$

$= \frac{n+1}{2}[a_1 + a_{2n+1}]$

$= \frac{n+1}{2}(a + a + 2nd)$

$= (n + 1)(a + nd)$

$S_2 = a_2 + a_4 + a_6 + \cdots + a_{2n}$

$= \frac{n}{2}[a_2 + a_{2n}]$

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

$= n(a + nd)$

$S_1 : S_2 = (n + 1)(a + nd) : n(a + nd) = (n + 1) : n$

8. **The centre of a circle is $(2a, a - 7)$. Find the values of a, if the circle passes through the point $(11, -9)$ and has diameter $10\sqrt{2}$ units.**

**Answer:**

Radius $= \sqrt{(11 - 2a)^2 + (-9 - a + 7)^2}$

$\Rightarrow \frac{10\sqrt{2}}{2} = \sqrt{(11 - 2a)^2 + (-2 - a)^2}$

$\Rightarrow \left(\frac{10\sqrt{2}}{2}\right)^2 = \left(\sqrt{(11 - 2a)^2 + (-2 - a)^2}\right)^2$

$\Rightarrow 5a^2 - 40a + 75 = 0$

$\Rightarrow a^2 - 8a + 15 = 0$

$\Rightarrow (a - 5)(a - 3) = 0 \Rightarrow a = 5, 3$

Therefore, the values of a are 5 and 3.

9. **How many terms of AP: 9, 17, 25,…. must be taken to give a sum of 636?**

**Answer:**

Here, $a = 9, d = 17 - 9 = 8, S_n = 636$

$636 = \frac{n}{2}[2 \times 9 + (n - 1)8]$

$\Rightarrow 4n^2 + 5n - 636 = 0$

$\Rightarrow 4n^2 + 53n - 48n - 636 = 0$

$\Rightarrow (4n - 48)(n + 53) = 0$

$\Rightarrow n = \frac{48}{4} = 12 \text{ or } n = -53 \text{ (not possible)}$

$\text{Hence}, n = 12$

10. **Which term of the AP: $-7, -12, -17, -22$, .... will be – 82?**

**Is – 100 any term of the A.P? Give reasons for your answer.**

**Answer:**

Let nth term be $-82$ i.e, $a_n = -82$

Here, $a = -7$ , $d = -12 + 7 = -5$

$a + (n-1)d = -82$

$\Rightarrow -7 + (n-1)(-5) = -82$

$\Rightarrow n = 16$

$\Rightarrow$ 16th term is $-82$

For $-100$: $a + (n-1)d = -100$

$\Rightarrow -7 + (n-1)(-5) = -100$

$\Rightarrow n = \frac{98}{5} = 19\frac{3}{5}$ which is not an integral number.

Hence, $-100$ is not a term in AP.

## Section C

**Answer ALL the following Questions. Each question carries 5 marks.**

11. **Find the ratio in which the line $2x + 3y - 5 = 0$ divides the line segment joining the points $(1, -9)$ and $(2, 1)$. Also, find the coordinates of the point of division.**

**Answer:**

Let the line $2x + 3y - 5 = 0$ divide the line segment joining the points $(1, -9)$ and $(2,1)$ in the ratio k:1 at point P.

Coordinates of P $= \left(\frac{2k+1}{k+1}, \frac{k-9}{k+1}\right)$

But P lies on $2x + 3y - 5 = 0$

$\therefore 2\left(\frac{2k+1}{k+1}\right) + 3\left(\frac{k-9}{k+1}\right) - 5 = 0$

$\Rightarrow 2(2k+1) + 3(k-9) - 5(k+1) = 0$

$\Rightarrow 2k - 30 = 0$

$\Rightarrow k = 15$

$\Rightarrow k : 1 = 15 : 1$

So, the point P divides the line in the ratio 15 : 1.

Point of division P $= \left(\frac{2\times15+1}{15+1}, \frac{15-9}{15+1}\right) = \left(\frac{31}{16}, \frac{3}{8}\right)$

12. **$10^{th}$ term from the end of an A.P is $11^{th}$ term from the beginning. Its value is 55. If its first term be 5, find the common difference, the number of terms and the last term.**

**Answer:**

Let common difference be $d$.

By the problem, $a_{11} = 55 \Rightarrow 5 + 10d = 55 \Rightarrow d = 5$

$10^{th}$ term from the end $= (n - 10 + 1)^{th}$ term from the beginning.

$\Rightarrow a + (n - 9 - 1) \times 5 = a + 10 \times 5$

$\Rightarrow n - 10 = 10$

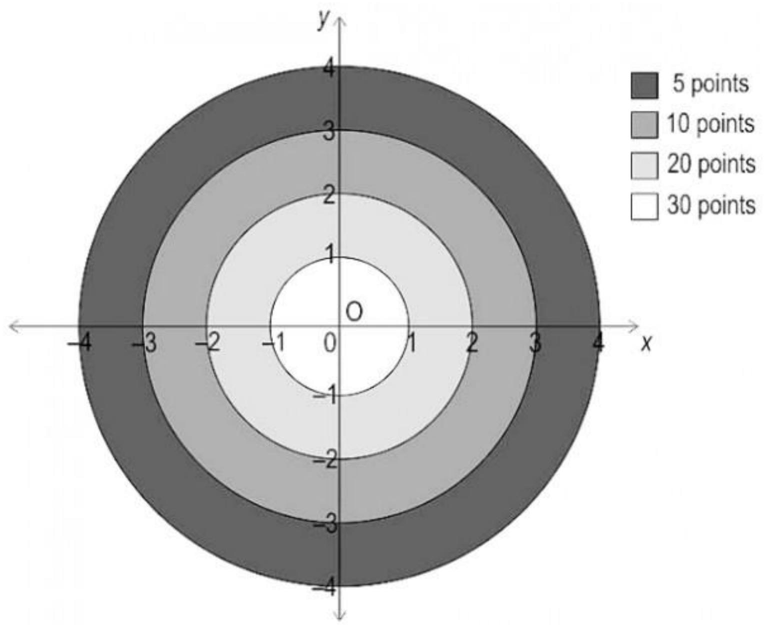
$\Rightarrow n = 20$

Therefore, last term $= a_{20} = 5 + 19 \times 5 = 100$

## Section – D : Case Study

13. **In a game of archery, a bow is used to shoot arrows at a target board. One such board, which is divided into 4 concentric circular sections, is drawn on a coordinate grid as shown. Each section carries different points. If an arrow lands on the boundary, the inner section points are awarded.**

**Answer the questions based on the given information.**




a) **After shooting two arrows, Rohan scored 25 points. Write one set of coordinates for each arrow that landed in the target**.

**Answer:** For example: $(1.5, 0)$ and $(3.5, 0)$

**b) If one player's arrow lands on $(\mathbf{2}, \mathbf{2.5})$, how many points will be awarded to the player?**

**Answer:**

The distance of $(2, 2.5)$ from $(0,0) = \sqrt{(\mathbf{2}-\mathbf{0})^2 + (\mathbf{2.5}-\mathbf{0})^2} = \sqrt{\mathbf{10.25}}$ **units**

Hence, 5 points will be awarded

**c) One of Rohan's arrows landed on $(\mathbf{1.2}, \mathbf{1.6})$. He wants his second arrow to land on the line joining the origin and first arrow such that he gets 10 points for it. Find one possible pair of coordinates of the second arrow's landing mark.**

**Answer:**

The distance of $(1.2, 1.6)$ from $(0,0) = \sqrt{(1.2-0)^2 + (1.6-0)^2} = 2$ units

Let's consider that the second arrow lands on the boundary mark. Then the ratio in which the first arrow divides the line joining origin and the second arrow's landing mark is the ratio of their radii i.e, 2 : 1.

Therefore, the coordinates of the second arrow's landing mark $(x, y)$ is given by

$\left(\frac{2x+0}{3}, \frac{2y+0}{3}\right) = (1.2, 1.6) \Rightarrow x = 1.8, y = 2.4$

Hence, $(1.8, 2.4)$ is one possible pair of coordinates of the second arrow's landing mark.

**OR**

**An arrow landed on the boundary and is worth 20 points. The coordinates of the landing mark were of the form $(\mathbf{m}, -\mathbf{m})$. Find all such coordinates.**

**Answer:**

The distance between the origin and the coordinate $(m, -m)$ is 2 units.

Using distance formula,

$m^2 + (-m)^2 = 2^2 \Rightarrow m = \pm\sqrt{2}$

Hence, the coordinates are $(\sqrt{2}, -\sqrt{2})$ and $(-\sqrt{2}, \sqrt{2})$

14. **ASSERTION REASON BASED 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 and (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

**Assertion(A)**: The point $(-1, 6)$ divides the line segment joining the points $(-3, 10)$ and $(6, -8)$ in the ratio 2:7 internally.

**Reason(R)**: Three points A, B and C are collinear if AB + BC = AC

**Answer: (b)**