Chapter 1: Use of Coordinates
Mathematics Notes

Question 1

Solution:
The point will be: $(0, 0)$.

Hints:
x and y axis meet at origin.

Question 2

Solution:
Coordinate of $H = (-5, y)$.
If $y > 0$, H lies in Quadrant II $(-, +)$.
If $y < 0$, H lies in Quadrant III $(-, -)$.
If $y = 0$, H lies on the negative x-axis.

Hints:
Points on a line parallel to the y-axis have a constant x-coordinate.

Question 3

Solution:
(i) Sides AM and MP.
(ii) Side MP is parallel to the y-axis and side AM is parallel to the x-axis.
(iii) Points $M(-5, -2)$ and $P(-5, 2)$; mirror image axis is the x-axis.

Formula:
$(x, y) \to (x, -y)$

Question 4

Solution:
Let $Z = (5, -6)$, $I = (5, 0)$, and $N = (0, -6)$.
Length of $IZ = |0 - (-6)| = 6$ units.
Length of $NZ = |5 - 0| = 5$ units.
Length of $IN = \sqrt{(0-5)^2 + (-6-0)^2} = \sqrt{61}$ units.

Formula:
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Question 5

Solution:
The system would contain only Quadrant I. No, it will not allow us to locate all points because points with negative values cannot be represented.

Hints:
Plane split requires negative components for QII, QIII, and QIV.

Question 6*

Solution:
Slope of $MA = \frac{0-(-4)}{0-(-3)} = \frac{4}{3}$
Slope of $AG = \frac{8-0}{6-0} = \frac{4}{3}$
Since the slopes match, the points are on the same straight line.

Formula:
$m = \frac{y_2-y_1}{x_2-x_1}$

Question 7*

Solution:
Slope of $RB = \frac{-5-(-1)}{-2-(-5)} = \frac{-4}{3}$
Slope of $BC = \frac{-12-(-5)}{4-(-2)} = \frac{-7}{6}$
Since the slopes are not equal, the points are not on the same straight line.

Formula:
$m = \frac{y_2-y_1}{x_2-x_1}$

Question 8*

Solution:
(i) Vertices: $O(0,0)$, $A(4,0)$, $B(0,4)$.
(ii) Vertices: $O(0,0)$, $C(-4,-3)$ in Quadrant III, $D(4,-3)$ in Quadrant IV.

Formula:
$d = \sqrt{x^2 + y^2}$

Question 9*

Solution:
Row 1: **Yes**. $\frac{-3+3}{2} = 0$ and $\frac{0+0}{2} = 0$.
Row 2: **Yes**. $\frac{2+4}{2} = 3$ and $\frac{3+5}{2} = 4$.
Row 3: **No**. $\frac{0+0}{2} = 0$ but $\frac{0+(-10)}{2} = -5 \neq 5$.
Row 4: **No**. $\frac{-8+6}{2} = -1 \neq 0$.

Formula:
$x_m = \frac{x_1+x_2}{2}, y_m = \frac{y_1+y_2}{2}$

Question 10*

Solution:
$x_{\text{value}} : -7 = \frac{3+x}{2} \implies x = -17$
$y_{\text{value}} : 1 = \frac{-4+y}{2} \implies y = 6$
Coordinate of $B = (-17, 6)$.

Formula:
$x_2 = 2x_m - x_1, y_2 = 2y_m - y_1$

Question 11*

Solution:
Point P ratio $1:2$:
$x_P = \frac{1(16)+2(4)}{1+2} = \frac{24}{3} = 8$
$y_P = \frac{1(-2)+2(7)}{1+2} = \frac{12}{3} = 4 \implies P(8, 4)$
Point Q midpoint of PB:
$x_Q = \frac{8+16}{2} = 12$
$y_Q = \frac{4+(-2)}{2} = 1 \implies Q(12, 1)$

Formula:
$x = \frac{mx_2+nx_1}{m+n}$
$y = \frac{my_2+ny_1}{m+n}$
$x_m = \frac{x_1+x_2}{2}, y_m = \frac{y_1+y_2}{2}$

Question 12*

Solution:
(i) $OA = \sqrt{1^2 + (-8)^2} = \sqrt{65}$
$OB = \sqrt{(-4)^2 + 7^2} = \sqrt{65}$
$OC = \sqrt{(-7)^2 + (-4)^2} = \sqrt{65}$
Radius $= \sqrt{65}$ units.
(ii) $OD = \sqrt{(-5)^2 + 6^2} = \sqrt{61} < \sqrt{65} \implies$ Inside.
$OE = \sqrt{0^2 + 9^2} = \sqrt{81} > \sqrt{65} \implies$ Outside.

Formula:
$d = \sqrt{x^2 + y^2}$
Hints:
Inside if $d < r$, Outside if $d > r$.

Question 13*

Solution:
$x_1 + x_2 = 10, x_2 + x_3 = 12, x_1 + x_3 = 0$
Adding: $2(x_1 + x_2 + x_3) = 22 \implies \sum x = 11$
$x_1 = -1, x_2 = 11, x_3 = 1$
$y_1 + y_2 = 2, y_2 + y_3 = 10, y_1 + y_3 = 6$
Adding: $2(y_1 + y_2 + y_3) = 18 \implies \sum y = 9$
$y_1 = -1, y_2 = 3, y_3 = 7$
Vertices: $A(-1, -1), B(11, 3), C(1, 7)$.

Formula:
$x_a + x_b = 2x_{\text{mid}}$
$y_a + y_b = 2y_{\text{mid}}$

Question 14

Solution:
(a) **1** unique street intersection.
(b) **1** unique street intersection.

Hints:
Each unique coordinate pair maps out one intersection grid crossover.

Question 15

Solution:
(i) **No**. Circle A limits $[20, 180]$ and $[70, 230]$. Circle B limits $[150, 350]$ and $[130, 330]$. Both fit inside screen bounds.
(ii) **Yes**. Center distance $d = \sqrt{(250-100)^2 + (230-150)^2} = \sqrt{150^2 + 80^2} = 170$. Since $170 < (80 + 100)$, they intersect.

Formula:
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Hints:
Intersect if $d < r_1 + r_2$.

Question 16

Solution:
$AB = \sqrt{(-3)^2 + 1^2} = \sqrt{10}$
$BC = \sqrt{(-1)^2 + (-3)^2} = \sqrt{10}$
$CD = \sqrt{3^2 + (-1)^2} = \sqrt{10}$
$DA = \sqrt{1^2 + 3^2} = \sqrt{10}$
Diagonals: $AC = \sqrt{(-4)^2 + (-2)^2} = \sqrt{20}$
$BD = \sqrt{2^2 + (-4)^2} = \sqrt{20}$
Equal sides & diagonals $\implies$ Square.
Area $= (\sqrt{10})^2 = 10$ sq. units.

Formula:
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Area $= s^2$
