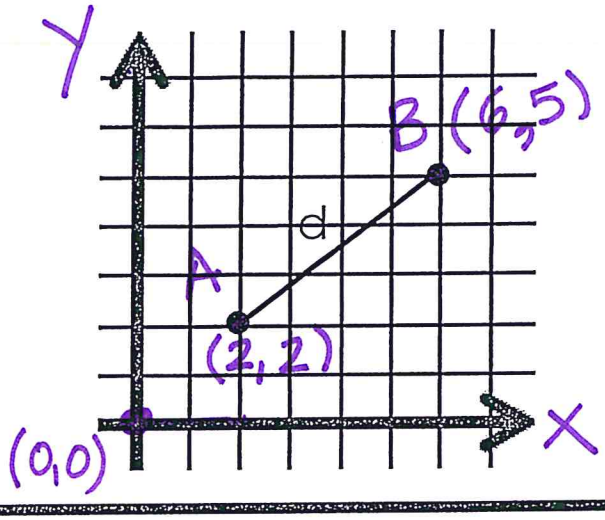
The Distance Formula

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

Used to find the distance between two points on the coordinate plane.



Example 1: Find the distance between (-3,1) and (2,3).

x_1, y_1 x_2, y_2

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

$d = \sqrt{(2-(-3))^2+(3-1)^2}$

$d = \sqrt{(2+3)^2+2^2}$

$d = \sqrt{5^2+2^2}$

$d = \sqrt{25+4} = \sqrt{29} = d$

Example 2: Find the distance between (-2,1) and (2,5).

x_1, y_1 x_2, y_2

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

$d = \sqrt{(2-(-2))^2+(5-1)^2}$

$d = \sqrt{4^2+4^2}$

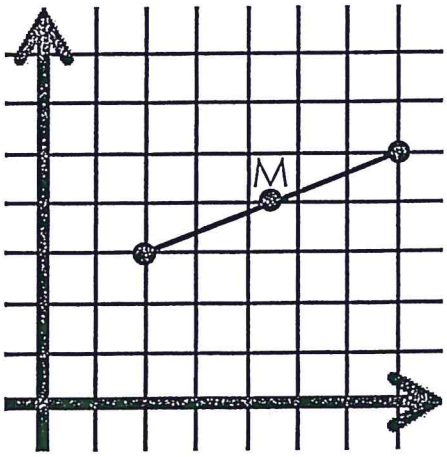
$d = \sqrt{16+16} = \sqrt{32} = \sqrt{16 \cdot 2}$

$d = 4\sqrt{2}$

The Midpoint Formula

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

The midpoint of a line segment is the point on the segment that is equidistant from the endpoints.



Example 3: Find the midpoint of the line segment with endpoints (-3, -1) and (7, -5).

x_1, y_1 x_2, y_2

$M\left(\frac{-3+7}{2}, \frac{-1+(-5)}{2}\right)$

$M(2, -3)$

Example 4: Find the midpoint of the line segment with endpoints (6, -3) and (4, -7).

x_1, y_1 x_2, y_2

$M\left(\frac{6+4}{2}, \frac{-3+(-7)}{2}\right)$

$M(5, -5)$

Midpoint Examples

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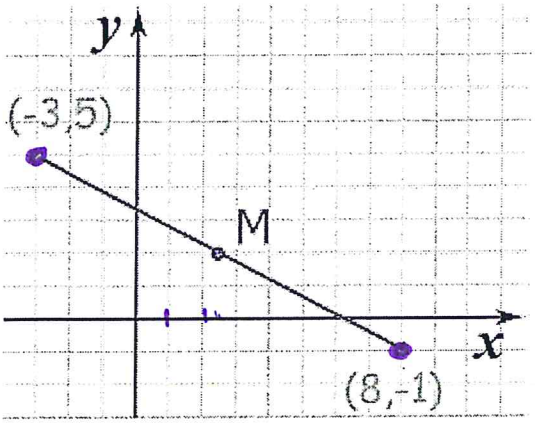
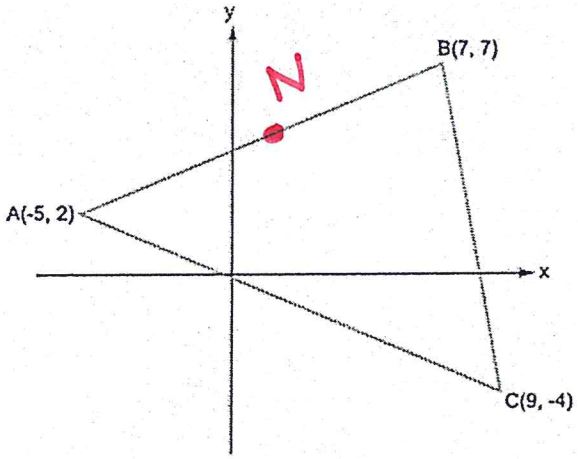


M= $(5/2, 2)$

$(-3,5)$ $(8,-1)$
$x_1\ y_1$ $x_2\ y_2$

$M\left(\frac{-3+8}{2}, \frac{5+(-1)}{2}\right)$

$M\left(\frac{5}{2}, 2\right)$

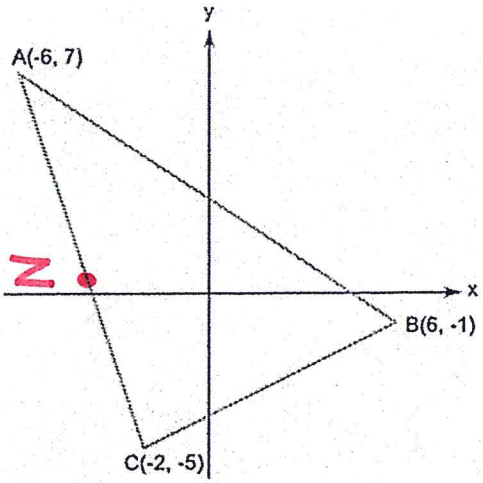


What is the midpoint of AB?

N= $(1, 9/2)$

$A(-5,2)$ $B(7,7)$
$x_1\ y_1$ $x_2\ y_2$

$N\left(\frac{-5+7}{2}, \frac{2+7}{2}\right)$



What is the midpoint of AC?

Z= $(-4, 1)$

$A(-6,7)$ $C(-2,5)$
$x_1\ y_1$ $x_2\ y_2$

$Z\left(\frac{-6+(-2)}{2}, \frac{7+5}{2}\right)$