IB Math Studies/Algebra 2

13.3.6 Midpoint of a line segment

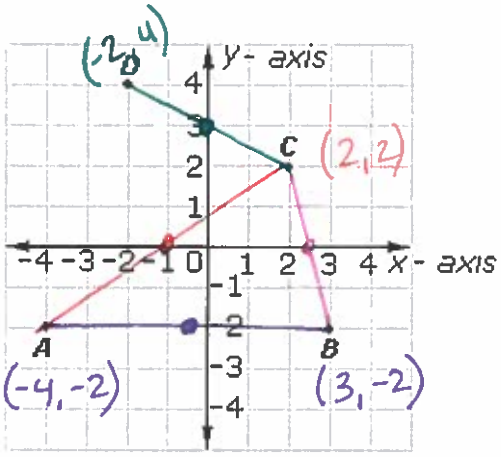
The midpoint of a line segment divides the line in half.

It is the average of the x & y coordinates of its endpoints.

Formula:

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

Find the midpoint of



AB $\left(\frac{-4+3}{2}, \frac{-2+-2}{2}\right)$

$\left(-\frac{1}{2}, -2\right)$

AC $\left(\frac{-4+2}{2}, \frac{-2+2}{2}\right)$

$(-1, 0)$

BC $\left(\frac{2+3}{2}, \frac{2+-2}{2}\right)$

$\left(\frac{5}{2}, 0\right)$

CD $\left(\frac{-2+2}{2}, \frac{4+2}{2}\right)$

$(0, 3)$

Find the coordinates of B, given that A is (4 , 5) and the midpoint of [AB] is M(1 , 3).

B: (x, y)

$$(1, 3) = \left(\frac{4+x}{2}, \frac{5+y}{2}\right)$$

$2 \cdot 1 = \frac{4+x}{2} \cdot 2$ $\quad 2 \cdot 3 = \frac{5+y}{2} \cdot 2$

$2 = 4 + x$ $\quad 6 = 5 + y$

$-2 = x$ $\quad 1 = y$

B: $(-2, 1)$

$a^2 + b^2 = c^2$

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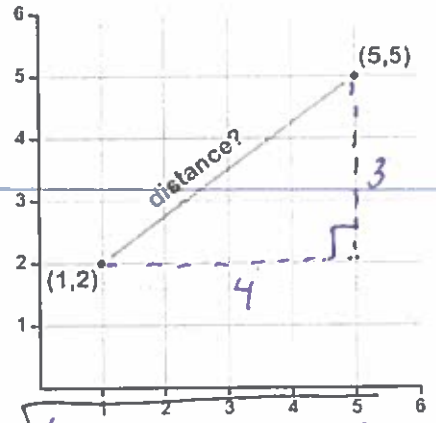
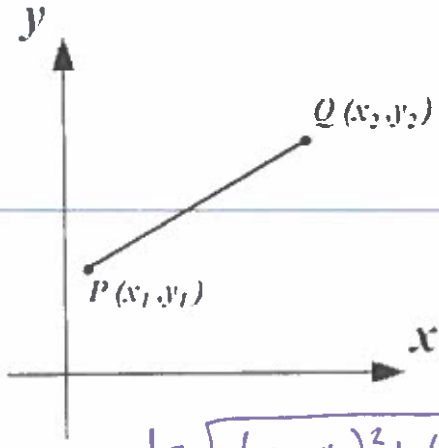
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

13.3.6 Distance between two points

The distance between two points comes from the Pythagorean Thm.

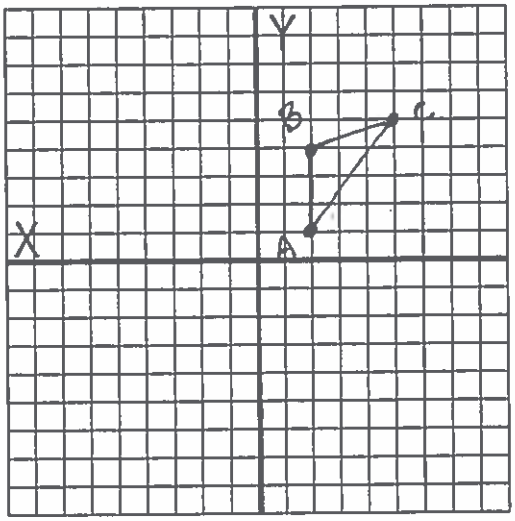


$d = \sqrt{(5-2)^2 + (5-1)^2} = 5$



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

1. Triangle ABC has vertices at A(2 , 1), B(2 , 4) and C(5 , 5).
Find the perimeter of the triangle.



$AB = 3$

$BC = \sqrt{(4-5)^2 + (2-5)^2}$

$= 3.16$

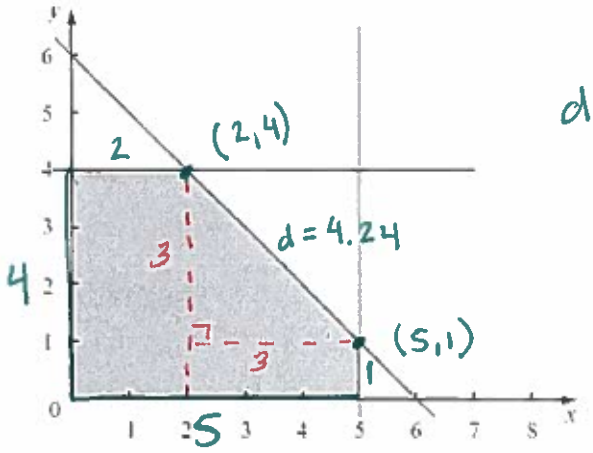
$AC = \sqrt{(5-1)^2 + (5-2)^2}$

$= 5$

$P_\Delta = 3 + 3.16 + 5$

$= 11.16$

2. Find the perimeter and area of the shaded region:



$d = \sqrt{(5-2)^2 + (1-4)^2} = 4.24$

$P = 4 + 2 + 5 + 1 + 4.24 = 16.24$ units

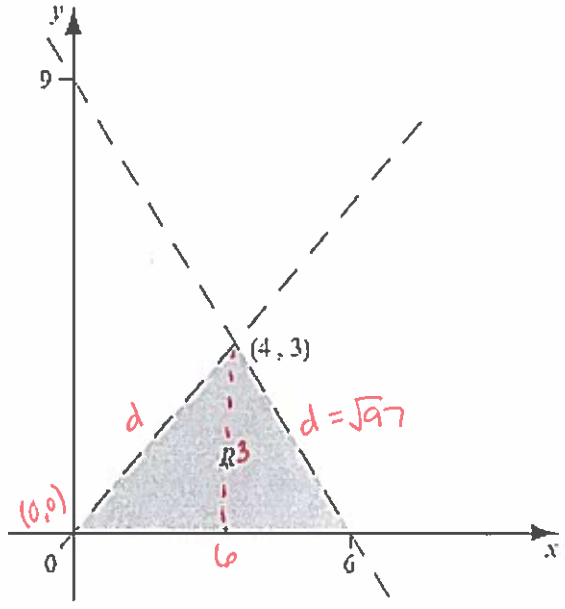
$A_\triangle = \frac{1}{2}(3)(3) = 4.5$

$A_\square = 2(4) = 8$

$A_{\text{rect}} = 1(3) = 3$

$A = 8 + 4.5 + 3 = 15.5$ units^2

3. Find the perimeter and area of the shaded region:



$d = \sqrt{(3-0)^2 + (4-0)^2} = \sqrt{97}$

$P = \sqrt{97} + \sqrt{97} + 6 = 25.7$ units

$A = \frac{1}{2}bh$

$= \frac{1}{2}(6)(3) = 9$ units^2