Length of a Line Segment

Recall:

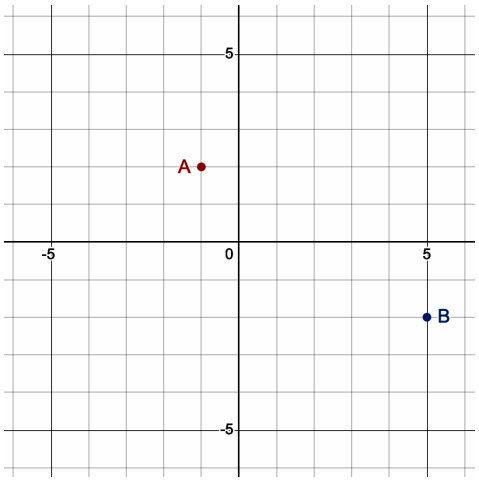
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

1. A line segment connects points $A\ (-1,\ 2)$ and $B\ (5,\ -2)$.

   a) Estimate the length by sketching the right triangle formed by the horizontal and vertical changes.

   b) Calculate the exact length using the formula.

   c) Calculate the approximate length accurate to one decimal place.



Estimate is about 7 units.

$$\Delta x = 5 - (-1) = 6$$
$$\Delta y = -2 - 2 = -4$$

Exact length:

$$d = \sqrt{6^2 + (-4)^2} = \sqrt{36 + 16} = \sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13}$$

Approximation: 7.2

2. Calculate the length of the line segment with endpoints $C\ (-7,\ 4)$ and $D\ (2,\ 16)$.

$$\Delta x = 2 - (-7) = 9,\ \Delta y = 16 - 4 = 12$$

$$d = \sqrt{9^2 + 12^2} = \sqrt{81 + 144} = \sqrt{225} = 15$$

3. A drone flies in a straight line from point $P\,(1.8,\ -3.4)$ to point $Q\,(-4.2,\ 2.6)$ on a coordinate grid (units are kilometres).

   a) Determine the distance travelled (exact value under a square root is fine).

   b) Give the real-world distance travelled to the nearest tenth of a kilometre.

a)

$$\Delta x = -4.2 - 1.8 = -6.0,\ \Delta y = 2.6 - (-3.4) = 6.0$$

$$d = \sqrt{(-6.0)^2 + (6.0)^2} = \sqrt{36 + 36} = \sqrt{72} = \sqrt{36 \cdot 2} = 6\sqrt{2}$$

b)

$$6\sqrt{2} \approx 6(1.4142) \approx 8.5$$

The drone travels about 8.5 km.