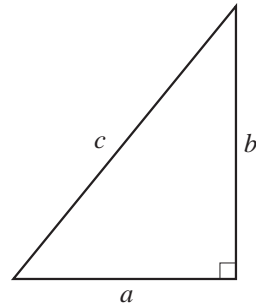


13 Graphs

13.2D Lengths of Line Segments

In a right-angled triangle the length of the hypotenuse may be calculated using Pythagoras' Theorem.

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



Worked Example 1

Determine the length of the line segment joining the points A (4, 1) and B (10, 9).



Solution

- (a) The diagram shows the two points and the line segment that joins them.

A right-angled triangle has been drawn under the line segment. The length of the line segment AB (the hypotenuse) may be found by using Pythagoras' Theorem.

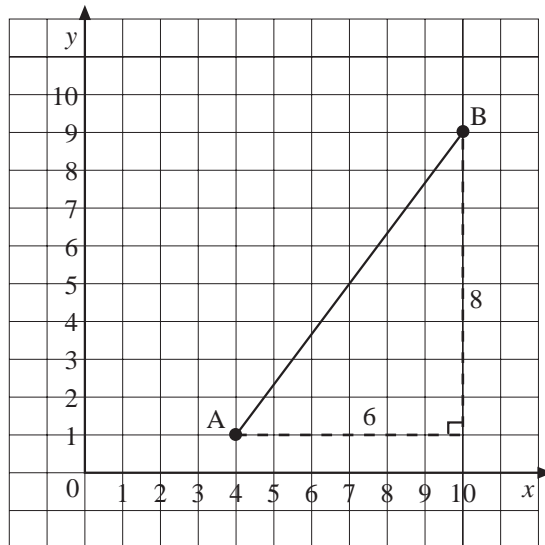
$$AB^2 = 6^2 + 8^2$$

$$AB^2 = 36 + 64$$

$$AB^2 = 100$$

$$AB = \sqrt{100}$$

$$AB = 10$$



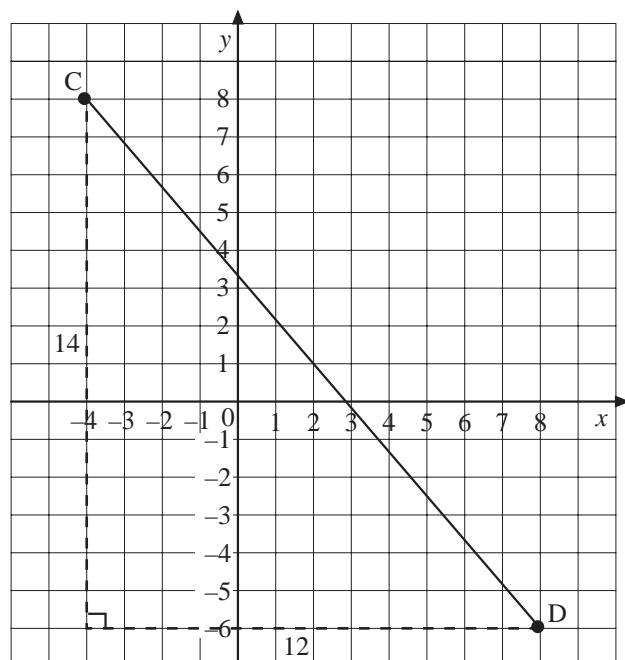
Worked Example 2

Determine the length of the line joining the points C (-4, 8) and D (8, -6).



Solution

The diagram shows the two points and a right-angled triangle that can be used to determine the length of the line segment CD.



Using Pythagoras' Theorem,

$$CD^2 = 14^2 + 12^2$$

$$CD^2 = 196 + 144$$

$$CD^2 = 340$$

$$CD = \sqrt{340}$$

$$CD = 18.43908891$$

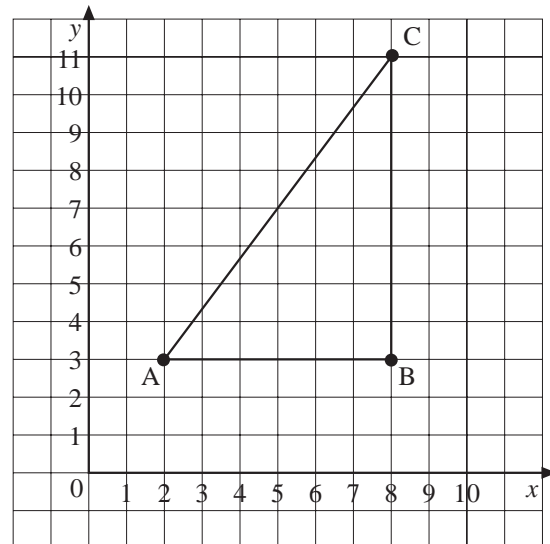
$$CD = 18.4 \quad (\text{to 3 significant figures})$$



Exercises

1. The diagram shows the three points A, B and C which are the vertices of a triangle.

- State the length of the line segment AB.
- State the length of the line segment BC.
- Calculate the length of AC.

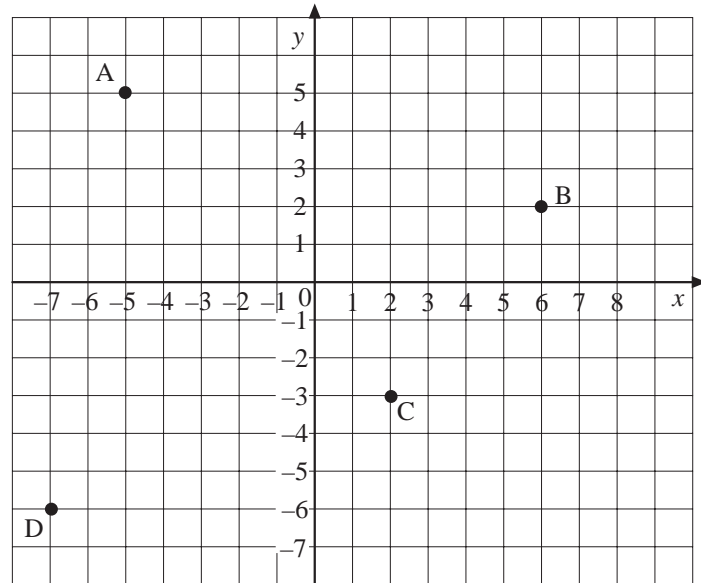


2. Determine the lengths of the line segments that have ends at the points with the following coordinates. Where appropriate, give your answer correct to 3 significant figures.
- | | |
|---------------------|---------------------|
| (a) (0, 0) (4, 3) | (b) (1, 2) (13, 7) |
| (c) (2, 6) (10, 12) | (d) (5, 7) (12, 19) |
| (e) (6, 1) (3, 4) | (f) (8, 2) (0, 5) |
| (g) (6, 3) (2, 9) | (h) (0, 10) (10, 0) |
3. The points A, B and C have coordinates (3, 2), (4, 7) and (10, 3) respectively. Giving your answers correct to 3 significant figures, determine the lengths of the following line segments.
- | | | |
|--------|--------|--------|
| (a) AB | (b) AC | (c) BC |
|--------|--------|--------|

4. The diagram shows the points A, B, C and D.

Giving your answers correct to 3 significant figures, calculate the lengths of

- (a) AB (b) AC
 (c) AD (d) BD
 (e) BC (f) CD



5. Giving your answers correct to 3 significant figures, calculate the lengths of the line segments that have the end-points listed below.
- (a) $(0, 0)$ $(-3, -6)$ (b) $(2, 7)$ $(-3, -4)$
 (c) $(-2, 4)$ $(8, -6)$ (d) $(3, -2)$ $(1, -8)$
 (e) $(-10, -2)$ $(2, -12)$ (f) $(3, -1)$ $(-4, 2)$
 (g) $(-6, -1)$ $(-8, -9)$ (h) $(-3, -2)$ $(-5, -9)$
6. The point A has coordinates $(2, 3)$ and the point B has coordinates $(10, y)$. The length of the line segment AB is 10. Determine the two possible values of y .
7. The points A and B have coordinates $(x, 4)$ and $(3, 7)$ respectively. The length of the line segment AB is $\sqrt{13}$. Determine the two possible values of x .
8. The length of the line segment AB is $\sqrt{40}$. The coordinates of A are $(2, -6)$ and the coordinates of B are $(-4, y)$. Determine the two possible values of y .

Answers

13.2D Lengths of Line Segments

1. (a) $AB = 6$ (b) $BC = 8$ (c) $AC = 10$
2. (a) 5 (b) 13 (c) 10 (d) 13.9
(e) 4.24 (f) 8.54 (g) 7.21 (h) 14.1
3. (a) $AB = 5.10$ (b) $AC = 7.07$ (c) $BC = 7.21$
4. (a) $AB = 11.4$ (b) $AC = 10.6$ (c) $AD = 11.2$
(d) $BD = 15.3$ (e) $BC = 6.40$ (f) $CD = 9.49$
5. (a) 6.71 (b) 12.1 (c) 14.1 (d) 6.32
(e) 15.6 (f) 7.62 (g) 8.25 (h) 7.28
6. $y = -3$ or 9
7. $x = 1$ or 5
8. $y = -4$ or -8