MATHS

Lesson 10

Year 9

Topic: Linear and non-linear relationships

Calculating the distance between two points 2

Today you will:

- ► calculate the distance between two points.

Resources

Find and prepare

Sheet 8 — Map of Queensland

Key terms

For definitions and explanations of terms, please see the Glossary.

Lesson

Apply Pythagoras' theorem to find the distance between two points on a Cartesian plane



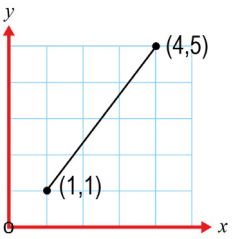
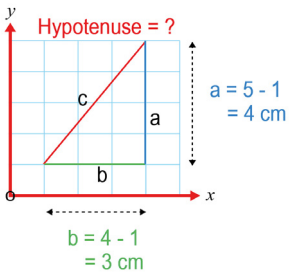
In this lesson, we will be building upon our knowledge of finding the distance between two points on a straight line.

Calculating distance from coordinates

Example:

Calculate the distance between the points and the gradient of the line between the following coordinate pairs: (1, 1) to (4, 5).

Calculating the distance

Think	Write
Mark the two points on the graph. Join the points with a line segment.	 Scale: 1 unit : 1 cm
Label the sides of the triangle a, b and c. Find the value of the rise and the run.	
Write Pythagoras' theorem.	$c^2 = a^2 + b^2$
Substitute in the values for a and b. Calculate for the unknown. Note the scale, which is, 1 unit is equal to 1 cm.	$= 4^2 + 3^2$ $= 16 + 9$ $= 25$ $c = \sqrt{25}$ $c = 5$ cm
Write a statement to communicate the final solution.	The length of the line is 5 cm.

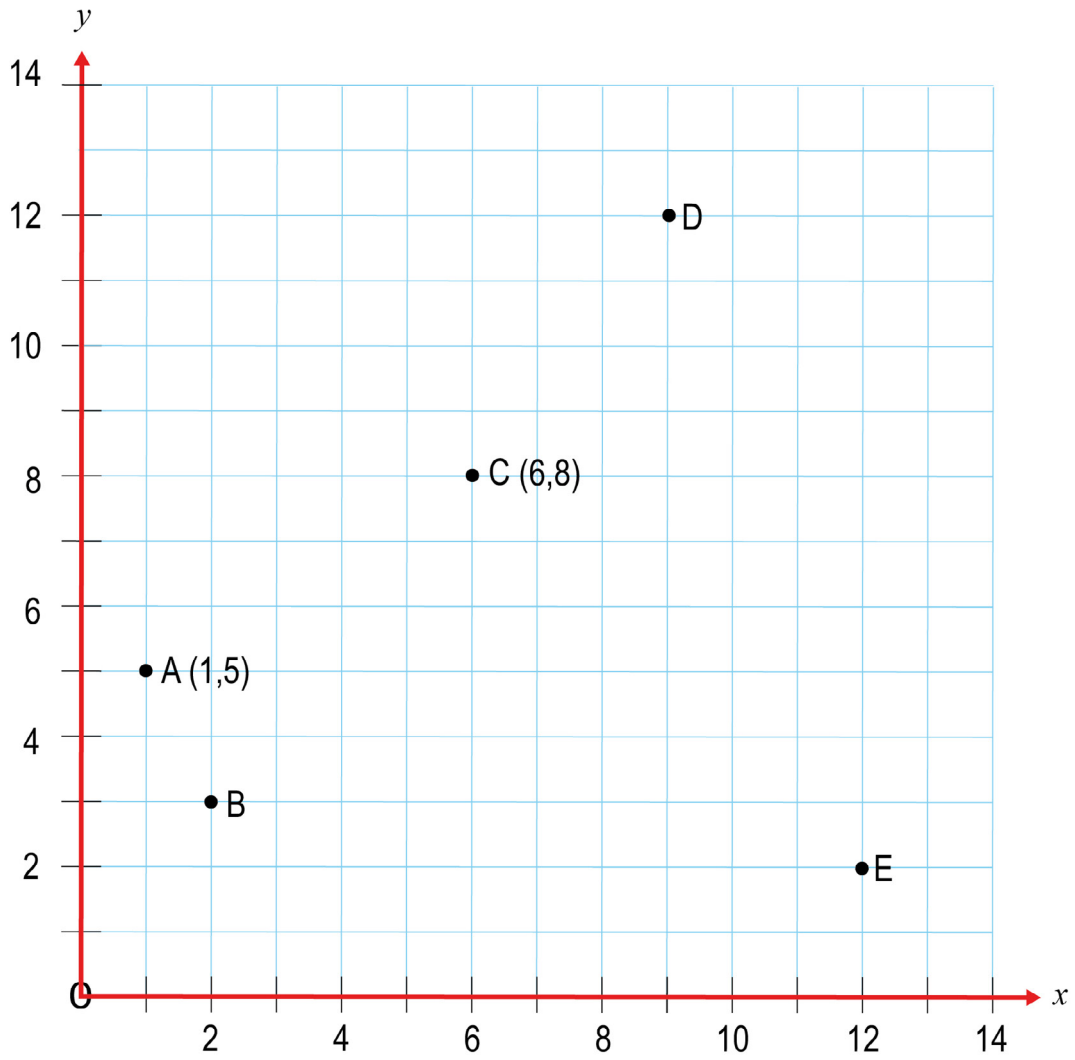
Calculating the gradient

Think	Write
Use the following formula (learned in Lesson 8) to calculate the gradient. Working from left to right the first point (1, 1) is (x_1, y_1) and the second point (4, 5) is (x_2, y_2). gradient $(m) = \frac{\text{rise}}{\text{run}}$ $= \frac{y_2 - y_1}{x_2 - x_1}$	$m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{5 - 1}{4 - 1}$ $m = 1.33 \ldots$

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1. Use Pythagoras' theorem to find the distances between the following points on the graph. Also calculate the gradients of the line formed.

   a. A and C b. B and D



Scale: 1 unit:1 cm

2. Calculate the distance between the following coordinate pairs (you could plot the points on the graph above).

   a. (4, 2) and (10, 6)

   b. (2, 14) and (14, 2)

   c. (9, 5) and (15, 11)

3. For each pair of the following points:
   i. Calculate the slope of the line that runs through the points. Remember, to find slope you can use the formula $\left(\frac{y_2 - y_1}{x_2 - x_1}\right)$
   ii. Calculate the distance between the two points. (Hint: It may help to draw a sketch of the line on a grid, draw in the horizontal and vertical lines to make a right-angled triangle and find the rise and run.)

   a. (3, 4) and (0, 0)

   b. (0, 0) and (2, 3)

   c. (−4, 3) and (0, −3)

4. Open **Sheet 8 —** Map of Queensland. Use Pythagoras' theorem to find an approximate distance between the following places.

   a. Cloncurry to Hughenden

   b. Cunnamulla to Charleville

   c. Emerald to Longreach

Note

Refer to the scale on the map to convert answers into kilometres. Note that one unit equals 250 kilometres.

5. If possible, research the distances in Question 4 in a book or on the internet to check the accuracy of your answers. You need to research the shortest distance between the two places, which forms a straight line (sometimes referred to 'as the crow flies') and is not the driving distance.

   a. Cloncurry to Hughenden =

   b. Cunnamulla to Charleville =

   c. Emerald to Longreach =

   d. How do your answers from Question 4 compare to the actual distances researched?

   e. If there is a difference in the comparison, what may be incorrect on **Sheet 8**?

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