Distance and midpoints

Wednesday, 16 January 2019 7:53 am

By the end of the lesson I would hope that you have an understanding of the concepts below which you can apply to a number of complex questions:

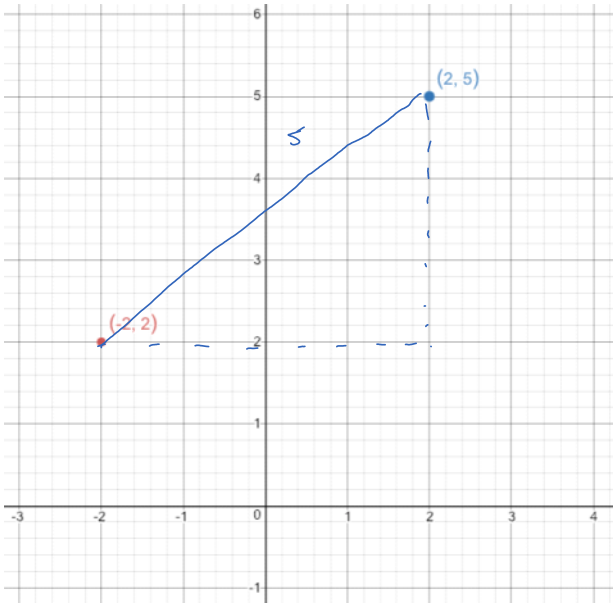
- Know what it means by the term midpoint
- Know how to find the midpoint of line segments which are
  - Parallel to an axis
  - Not parallel to an axis
- Know how to find the distance between two points

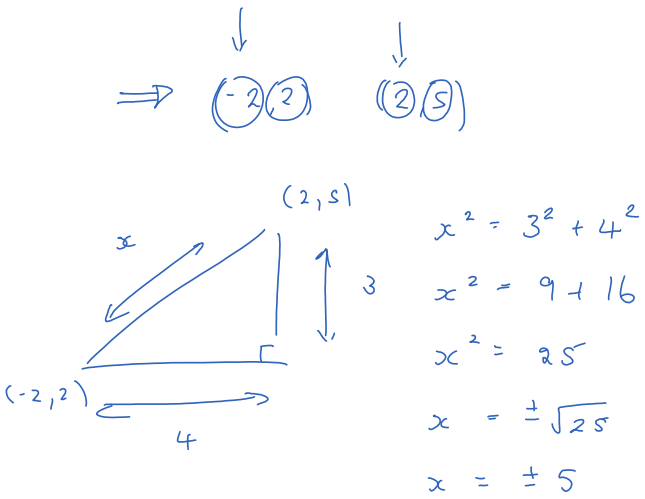
RECAP

Not really too much to recap as this is the start of a new chapter.
The good news is … we already know some of the theory from Year 9 Mathematics.
I'm going to start the lesson backwards!

Two points on a cartesian plane

Look at the following two points:



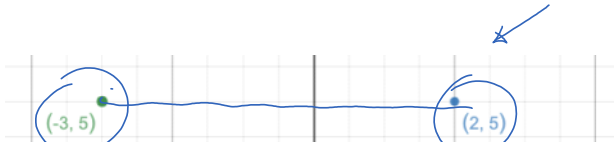


You can draw a line between any two point.

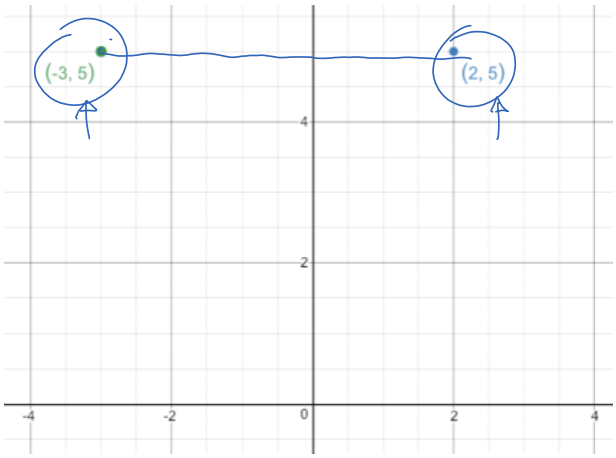
Where I see a diagonal line then I know that I can turn this into a right angled triangle.
As soon as I have a right angled triangle I know I can use Pythagoras' Theorem to find the **length of the line segment** which will join the two points.

Finding the midpoint of a line segment

This is a lot simpler than you might think.
Look at the following examples:



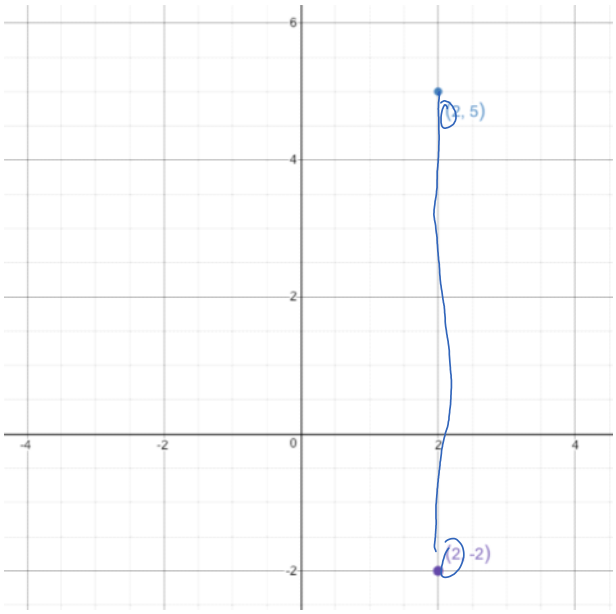
$\frac{1}{2}$ way $-3 + 2$



$\frac{1}{2}$ way -3 & 2

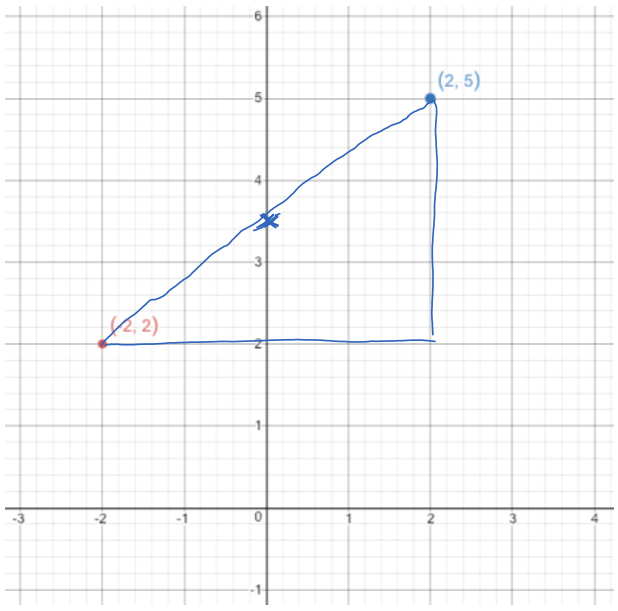
$\frac{-3+2}{2} = -\frac{1}{2}$

$\therefore$ midpt $= (-\frac{1}{2}, 5)$



$(2, \frac{3}{2})$

$\frac{5+(-2)}{2} = \frac{3}{2}$



$(-2, 2)$ $(2, 5)$

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

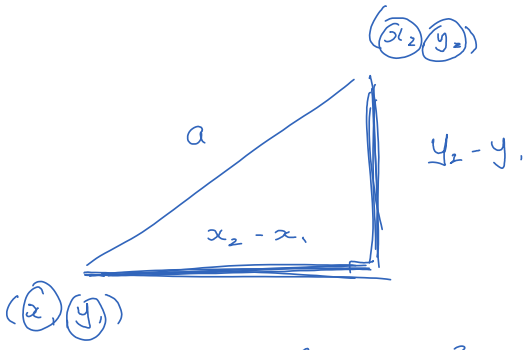
$= \left(0, \frac{7}{2}\right)$

Making things more challenging than they need to

As is normal, Barry makes things far more challenging than they need to.
There is this overwhelming need to have formulae for everything in Mathematics!
Methods 1 and 2 asks that you remember the following formulae:

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

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



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

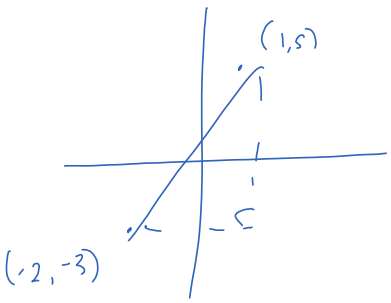
$$a = \sqrt{b^2 + c^2}$$

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

I prefer to work it using a quick sketch!

Final Example:

Find the midpoint and distance of the line segment joining the points $A(1,5)$ and $B(-2,-3)$

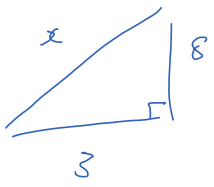


$(1, 5)$ $(-2, -3)$

x_1 y_1 x_2 y_2

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

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



$$x^2 = 8^2 + 3^2$$

$$x^2 = 64 + 9$$

$$x^2 = 73$$

$$x = \pm\sqrt{73}$$

$$x = \sqrt{73}$$