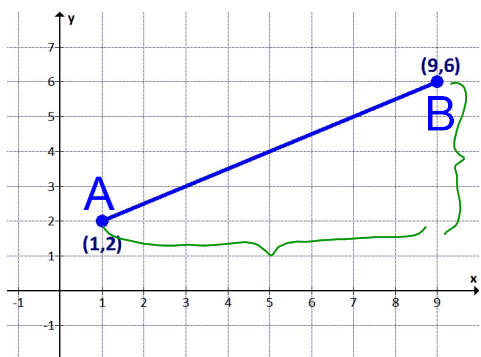


6.2 The Midpoint

Notation: M or M_{AB} is used for midpoint (between points A & B).
Remember m denotes slope.

What are the coordinates of the midpoint of segment AB?

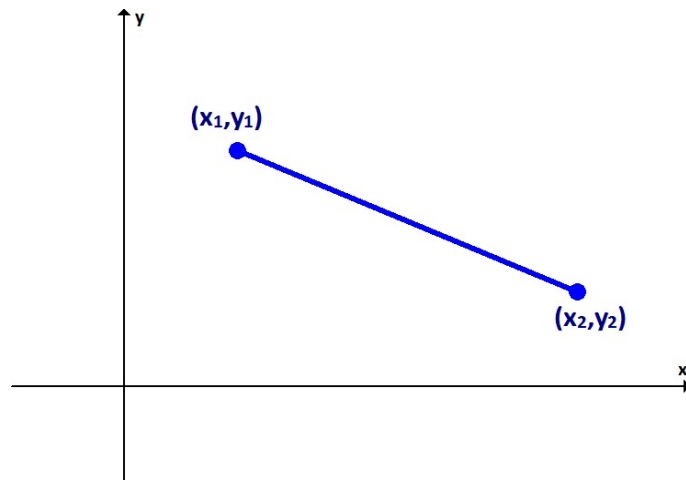


How can you determine the **MP** algebraically given the coordinates of the two endpoints?

$$M_{AB} \left(\frac{1+9}{2}, \frac{2+6}{2} \right) \\ = (5, 4)$$

The coordinates of the midpoint of a line segment are:

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



Ex 2: Find the midpoint of the line segment AB where A(2,-4) and B(-3,5).

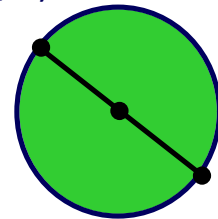
$$\begin{aligned} M_{AB} & \left(\frac{2+(-3)}{2}, \frac{-4+5}{2} \right) \\ & = \left(-\frac{1}{2}, \frac{1}{2} \right) \end{aligned}$$

Ex 3: The diameter of a circle has endpoints A(4, -3) and B (-3, 5).
Find the centre of the circle.

Find the midpoint!

$$M\left(\frac{4+(-3)}{2}, \frac{-3+5}{2}\right)$$

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



Ex 4: C(4, -3) is the midpoint of a line segment with endpoints A(7, 5) and B. Determine the coordinates of B. (x, y)

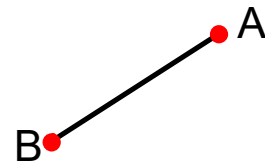
$$M_{AB}\left(\frac{7+x}{2}, \frac{5+y}{2}\right)$$

$$= (4, -3)$$

$$\frac{7+x}{2} = 4 \quad \frac{5+y}{2} = -3$$

$$7+x = 8 \quad 5+y = -6$$

$$x = 1 \quad y = -11$$



$$\therefore B(1, -11)$$

Ex 5: Given $\triangle ABC$ determine the equation of the line through the midpoint of AB and vertex C.

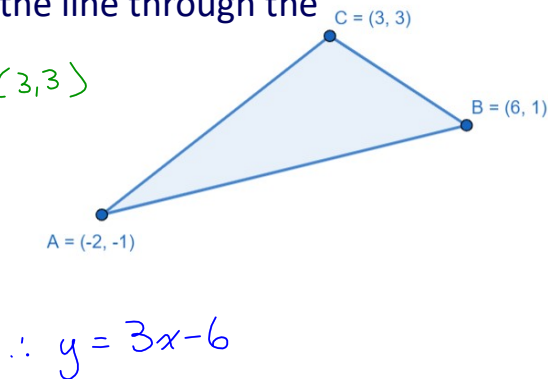
- ① M_{AB}
- ② Find slope between M_{AB} & C
- ③ New line using slope & either pt.

② slope between $(2,0)$ & $(3,3)$

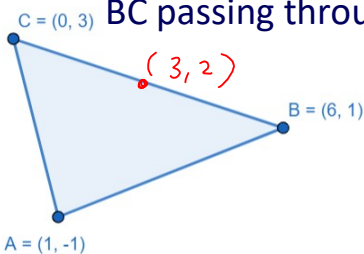
$$m = \frac{3-0}{3-2} = 3$$

① $M_{AB} \left(\frac{-2+6}{2}, \frac{-1+1}{2} \right) = (2,0)$

③ $y = 3x + b$
 Sub in $(2,0)$
 $0 = 3(2) + b$
 $b = -6$



Ex 6: Given $\triangle ABC$ determine the equation of the line perpendicular to BC passing through the midpoint of BC.



- ① Find M_{BC}
- ② Find slope of BC
- ③ Find perp slope
- ④ Make equation through M_{BC}

① $M_{BC} \left(\frac{0+6}{2}, \frac{3+1}{2} \right) = (3, 2)$

③ Perp slope $m = 3$

② $m = \frac{3-1}{0-6} = \frac{2}{-6} = -\frac{1}{3}$

④ $y = 3x + b$
 Sub $(3, 2)$
 $2 = 3(3) + b$
 $2 = 9 + b$
 $-7 = b$
 $\therefore y = 3x - 7$

Ex 7: Given $\triangle ABC$ determine the equation of the line through vertex A and perpendicular to line segment BC.

- ① slope of BC
- ② Find perp slope
- ③ Make new line

① $m = \frac{1 - (-3)}{6 - 7} = \frac{4}{-1} = -4$

③ $y = \frac{1}{4}x + b$
 Sub in $(3, -1)$
 $-1 = \frac{1}{4}(3) + b$
 $-1 = \frac{3}{4} + b$
 $-\frac{4}{4} - \frac{3}{4} = b$
 $-\frac{7}{4} = b$

② Perp slope $m = \frac{1}{4}$

$\therefore y = \frac{1}{4}x - \frac{7}{4}$

