



Name: _____ () Class: _____ Date: _____

MA303.1.2 – Perpendicular Lines

At the end of this unit, you should be able to

- obtain gradient of perpendicular lines
- find the equation of perpendicular bisector of two points

E1. Using Pythagoras' Theorem, show that the three points $A(2, -1)$, $B(5, 4)$ and $C(15, -2)$ forms a right-angled triangle. Name the vertex with the right angle.

(a) Find the equations of the lines AB and BC .

(b) If m_1 is the gradient of the line AB and m_2 is the gradient of the line BC , show that $m_1 m_2 = -1$.

E2. If $m_1 m_2 = -1$, where m_1 and m_2 are the gradients of two lines, then the two lines are perpendicular. Is the converse true? If not, state a condition whereby the converse will always be true.

P1. Show that the lines formed by AB and BC where $A = (t, 1)$ and $B = (3, 4)$ and $C = (6, t + 1)$ are perpendicular for all values of t .

E3. Let $A(-2, 3)$ and $B(3, -4)$ be two points on the Cartesian plane.

(a) Find the coordinates of the midpoint C .

(b) Find the gradient of AB , and hence deduce the gradient of a perpendicular line to AB .

(c) Find the equation of the perpendicular line to AB , passing through the point C . This line is called the **perpendicular bisector** to the line AB .

To find the perpendicular bisector of the line joining $A(x_1, y_1)$ and $B(x_2, y_2)$:

- Find the midpoint C .
- Find the gradient of AB .
- Deduce the gradient of the perpendicular.
- Obtain the equation using the gradient of the perpendicular with the midpoint C .

P2. Find the equation of the perpendicular bisector to the following pairs of points:

(a) $(-5, -2)$ and $(3, 14)$

(b) (p, q) and $(3p, q)$

P3. Given the equation of a line $3y + 2x - 5 = 0$.

(a) Show that $A(1, 1)$ and $B(4, -1)$ lie on the line.

(b) The perpendicular bisector of AB cuts another line whose equation is given by $2y + 5x + 3 = 0$ at C . Find the coordinates of C .

P4. Given two lines whose equations are $5y = 2x + 8$ and $4y = 10 - px$ where p is a real number.

(a) What is the value of p if the two lines are

i. parallel?

ii. perpendicular?

(b) Find the distance between the two lines if they are parallel.