The Slope (Gradient)

(1) $m = \dfrac{\text{vertical rise}}{\text{horizontal run}}$

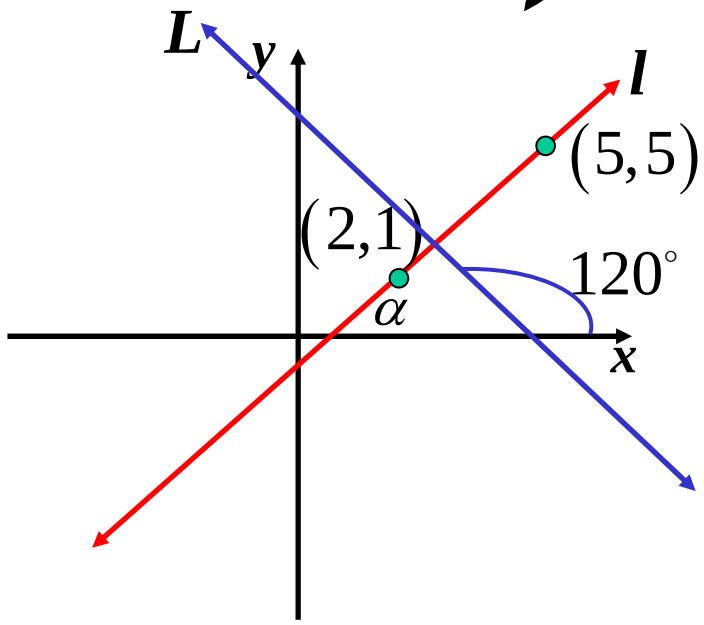
(2) $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$$m_l = \frac{5-1}{5-2}$$

$$= \frac{4}{3}$$

(3) $m = \tan\theta$

θ is the angle of inclination with the positive x axis



$$m_L = \tan 120^\circ$$

$$= -\sqrt{3}$$

$$m_l = \tan\alpha$$

$$\tan\alpha = \frac{4}{3}$$

$$\alpha = 53^\circ$$

Two lines are parallel iff they have the same slope

i.e. $m_1 = m_2$

Two lines are perpendicular iff their slopes are the negative inverse of each other

i.e. $m_1 \times m_2 = -1$

e.g. A, B, C and D are the points (1,1), (2,3), (3,2) and (a,4)

Find a such that;

(a) $AB \parallel CD$

$$m_{AB} = \frac{3-1}{2-1}$$
$$= 2$$
$$m_{CD} = \frac{4-2}{a-3}$$
$$= \frac{2}{a-3}$$

If $AB \parallel CD$ then

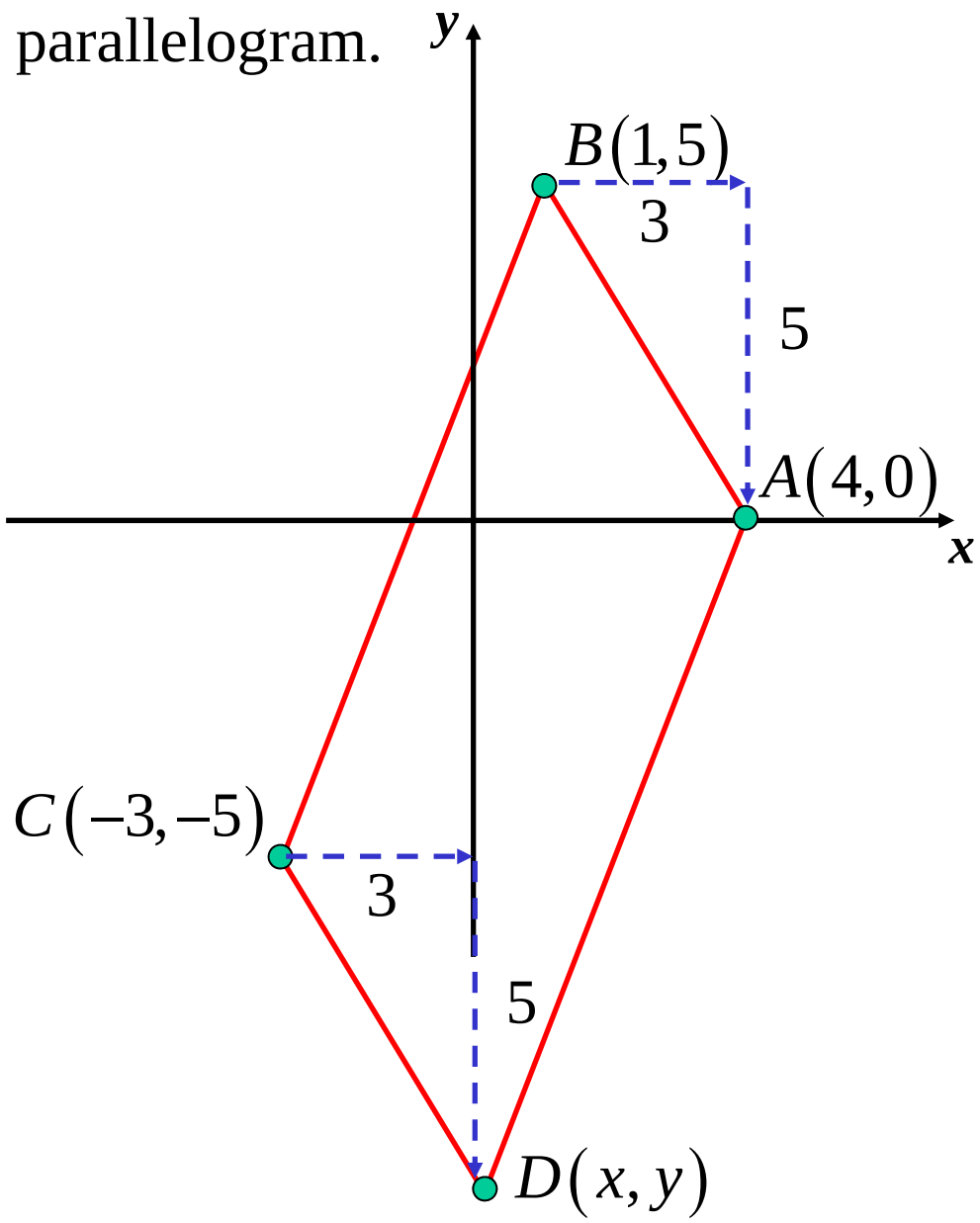
$$m_{AB} = m_{CD}$$
$$2 = \frac{2}{a-3}$$
$$a - 3 = 1$$
$$\underline{a = 4}$$

(b) $AB \perp CD$

If $AB \perp CD$ then

$$m_{AB} \times m_{CD} = -1$$
$$2 \times \frac{2}{a-3} = -1$$
$$4 = -a + 3$$
$$\underline{a = -1}$$

(ii) $A(4,0)$, $B(1,5)$ and $C(-3,-5)$ are three vertices of a parallelogram $ABCD$. Find the coordinates of D, the fourth vertex of the parallelogram.



$$D = (-3+3, -5-5)$$
$$= (0, -10)$$

To prove three points (A, B, C) are collinear;

(i) find m_{AB}

(ii) find m_{AC}

(iii) if $m_{AB} = m_{AC}$ then A, B, C are collinear

Exercise 7B; 2ace, 3bdf, 4, 6bd, 7bd, 8, 9ac, 10, 12, 14, 15ad, 16, 17, 18, 20, 22