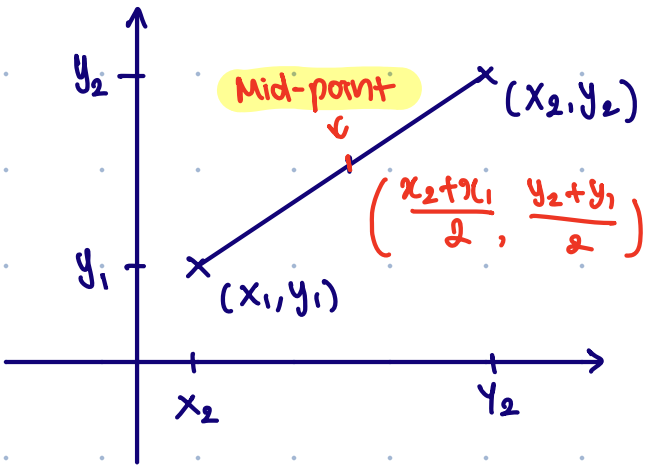
Chapter 7 : Coordinate Geometry

① Mid-point theorem



② Gradient

↳ Parallel lines : $m_1 = m_2$

↳ Perpendicular : $m_1 \times m_2 = -1$.

③ Equation of straight line

↳ Gradient-intercept formula :

$y = mx + c$ ← sub m m, & a set of (x,y) to find 'c'.

$m = \frac{y_2 - y_1}{x_2 - x_1}$

↳ Eqn of non-vertical line w gradient m passing through point (x_1, y_1) :

to find gradient (m)

$y - y_1 = m(x - x_1)$ $\quad \frac{y_2 - y_1}{x_2 - x_1} \not= \frac{m}{1}$

↳ E.g. Find an equation of a straight line that is perpendicular to $3y + 5x = \frac{2}{3}$ and passes through (3,3).

$3y + 5x = \frac{2}{3}$ ↓ write in gradient-intercept formula

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

$y = -\frac{5}{3}x + \frac{2}{9}$

Method 1 :

$\therefore 3y + 5x = \frac{2}{3}$ ↓ rearrange

$y = -\frac{5}{3}x + \frac{2}{9}$ M1

$M_2 \times (-\frac{5}{3}) = -1$

$M_2 = \frac{3}{5}$ M1

$y = \frac{3}{5}x + c$

Sub in (3,3) : $3 = \frac{3}{5}(3) + c$

$c = \frac{6}{5}$ M1

$\therefore y = \frac{3}{5}x + \frac{6}{5}$ * A1

Applying Gradient - intercept formula

Method 2 :

$\therefore y = -\frac{5}{3}x + \frac{2}{9}$ M1

$\therefore M_2 = \frac{3}{5}$ M1

$y - 3 = \frac{3}{5}(x - 3)$

$y = \frac{3}{5}x - \frac{9}{5} + 3$

$y = \frac{3}{5}x + \frac{6}{5}$ * B2

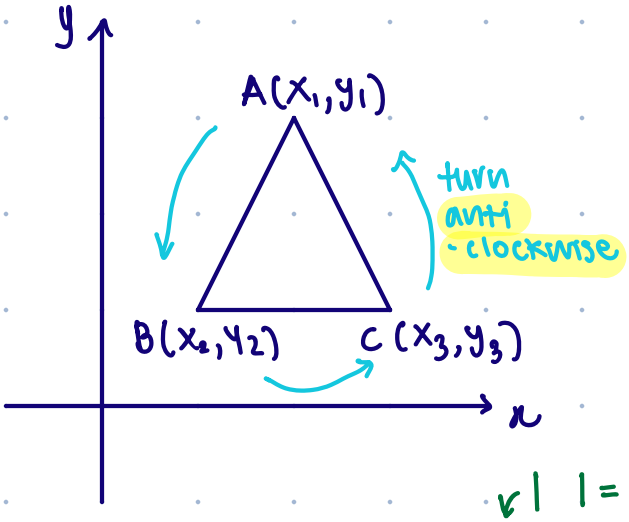
← applying the other formula, faster

> because don't need to find 'c'.

(4) Area of rectilinear figures

↳ Shoelace method

#1 Area of triangle



$$\text{Area of } \triangle = \frac{1}{2}\left| \begin{matrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{matrix} \right|$$

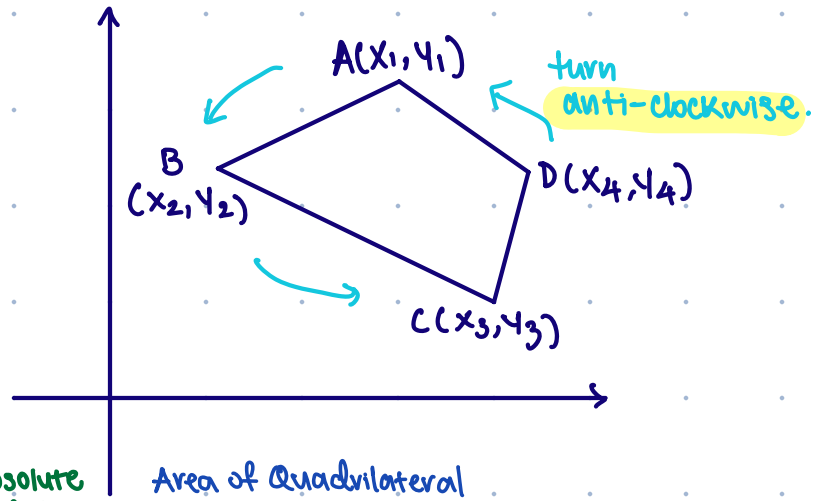
$$= \frac{1}{2}(x_1y_2 + x_2y_3 + x_3y_1 - x_2y_1 - x_3y_2 - x_1y_3)$$

✓ | | = absolute value

eg. $|7| = 7$

$|-7| = 7$

#2 Area of Quadrilateral

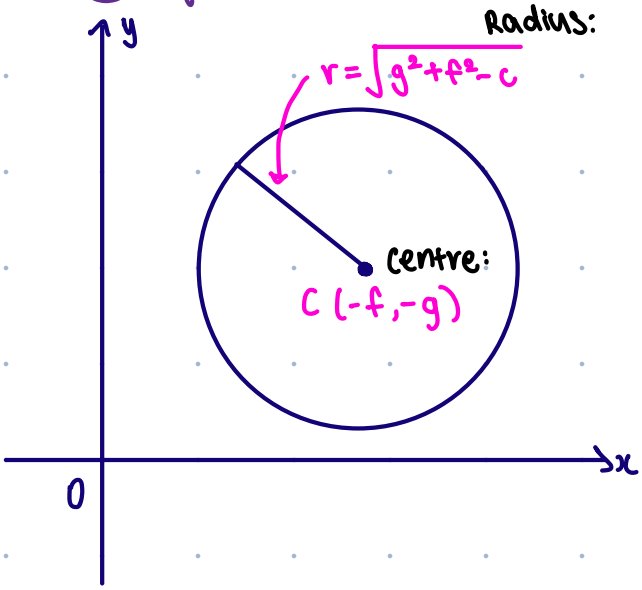


Area of Quadrilateral

$$= \frac{1}{2}\left| \begin{matrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{matrix} \right|$$

$$= \frac{1}{2}(x_1y_2 + x_2y_3 + x_3x_4 + x_4y_1 - x_2y_1 - x_3y_2 - x_4y_3 - x_1y_4$$

(5) Equations of Circles



① Standard form:

$$(x-a)^2 + (y-b)^2 = r^2$$

∴ centre: (a,b) & radius: r

② General form:

$$x^2 + y^2 + 2fx + 2gy + c = 0$$

∴ centre: $(-f,-g)$. & radius: $\sqrt{g^2+f^2-c}$