Coordinate Geometry

① Midpoint of a line

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

(x_1, y_1) M (x_2, y_2)

② Length of a line

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

③ Equation of line

$y = mx + c$

m: gradient, c: y-intercept

④ Gradient

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

⇒ If two lines are parallel

→ $m_1 = m_2$

⇒ If two lines are colinear

→ $m_1 = m_2$

⇒ If two lines are perpendicular

$m_1 \times m_2 = -1$

⇒ m of a curve @ a point = m of the tangent @ the same point

⑤ Equation of a circle

⇒ $(x-a)^2 + (y-b)^2 = r^2$

→ Centre = (a, b)

→ radius = r

⇒ $x^2 + y^2 + 2gx + 2fy + c = 0$

→ Centre = $(-g, -f)$

→ radius = $\sqrt{g^2 + f^2 - c}$

⑥ Intersections of circles and lines

i] $b^2 - 4ac > 0$

→ 2 pts of intersection

ii] $b^2 - 4ac = 0$

→ 1 pt of intersection

iii] $b^2 - 4ac < 0$

→ No intersection

⑦ Types of eq of line

i] $y = mx + c$

ii] $y - y_1 = m(x - x_1)$

iii] $\frac{x}{a} + \frac{y}{b} = 1$

a = x-intercept

b = y-intercept

⑧ When the form $3y + 2x = 33$ is given use $ax + by = c$

where $-\frac{a}{b}$ = gradient