COORDINATES, POINTS AND LINES | KEY FACTS

- The ***distance between*** the points (x_1, y_1) and (x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- The ***midpoint*** of (x_1, y_1) and (x_2, y_2) is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.
- The ***gradient*** of a straight line through two points (x_1, y_1) and (x_2, y_2) is $m = \frac{y_2 - y_1}{x_2 - x_1}$

DISTANCES AND MIDPOINTS | EXAMPLE-PROBLEM PAIR 1

The points A and B have coordinates $(-2, 4)$ and $(5, 2)$.

(a) Find the exact distance AB.

(b) Find the midpoint, M of A and B.

(c) Find the gradient of AB.

C and D are the points $(2, 5)$ and (6,3) respectively.

(a) Find the exact distance CD.

(b) Find the midpoint, M of C and D.

(c) Find the gradient of CD.

DISTANCES AND MIDPOINTS | EXAMPLE-PROBLEM PAIR 2

Find all points of the form (a, a) which are a distance of 5 away from the point $(0, 1)$.

(a) The points P and Q *have* coordinates $(1, 4)$ and $(-2, r)$ respectively.
Given that $PQ = 7$, find the possible values of r.

EQUATION OF A STRAIGHT LINE | KEY FACTS

- The line with gradient m through point (x_1, y_1) has ***equation*** $y - y_1 = m(x - x_1)$.
- Two lines are ***parallel*** if they have the ***same gradient***.
- If a line has gradient m, the gradient of any line ***perpendicular*** to it is $m_\perp = -\frac{1}{m}$.

EQUATION OF A STRAIGHT LINE | EXAMPLE PROBLEM PAIR 1

Find the equation of the line with gradient $\frac{2}{3}$ that passes through the point $(-3,1)$. Give your answer in the form $y = mx + c$.

Find the equation of the line with gradient -5 that passes through the point $(2,3)$. Give your answer in the form $y = mx + c$.

EQUATION OF A STRAIGHT LINE | EXAMPLE PROBLEM PAIR 2

Line l passes through the point $(-2,2)$ and is parallel to the line with equation $3x + 5y = 7$.

Find the equation of l in the form $ax + by + c = 0$, where a, b and c are integers.

Find the equation of the line that is parallel to $3x - y + 7 = 0$ and passes through the point $(1,8)$.

Write the equation in the form $ax + by + c = 0$, where a, b and c are integers.

EQUATION OF A STRAIGHT LINE | EXAMPLE PROBLEM PAIR 3

Find the perpendicular bisector of the line segment joining the points $(4,-3)$ and $(1,5)$.
Give your answer in the form $ax + by = c$.

Find the equation of the line perpendicular to $4y + x = 12$ which passes through the point $P(2,-5)$.
Give your answer in the form $ax + by = c$.