PEARSON EDEXCEL · INTERNATIONAL GCSE · MATHEMATICS A • EXERCISE SHEET

3.2 Coordinates and straight lines

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS gradient • perpendicular lines

Coordinates and straight lines

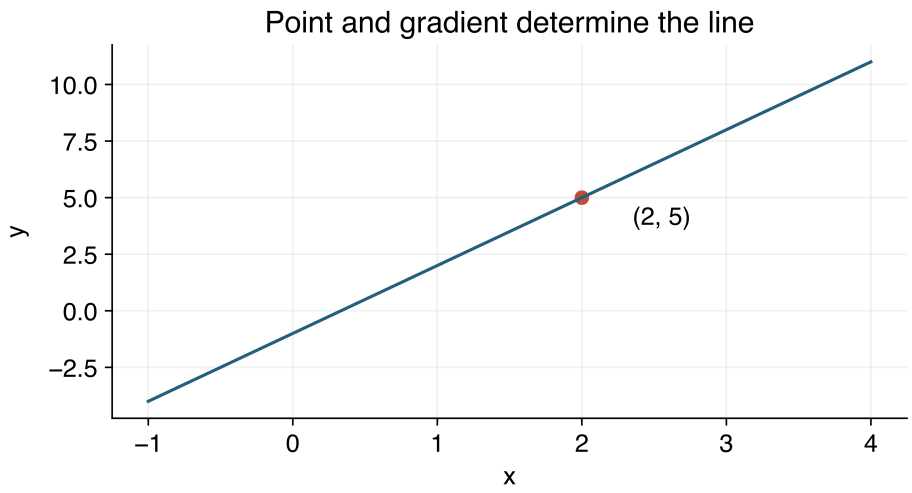
Objective

Plot and read coordinates in all four quadrants, find midpoints and gradients from two points, use $y = mx + c$, and write equations of parallel and perpendicular lines (objectives Foundation 3.3 A–I and Higher 3.3 F–G).

1 Key knowledge and worked examples

Coordinates, midpoints, gradients. 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 between the same points is $m = \frac{y_2-y_1}{x_2-x_1}$: through $(1, 7)$ and $(2, 9)$ the gradient is 2. A line $y = mx + c$ has gradient m and y-intercept $(0, c)$: $y = 3x+5$ has gradient 3, intercept $(0, 5)$. Vertical lines $x = k$ have no finite gradient; horizontal lines $y = c$ have gradient 0.

Parallel and perpendicular. Parallel lines share a gradient. Perpendicular gradients multiply to -1: perpendicular to m is $-1/m$, so perpendicular to $\frac{3}{8}$ is $-\frac{8}{3}$. The line of gradient m through (x_1, y_1) is $y - y_1 = m(x - x_1)$. When an answer is wanted as $ax + by + c = 0$, multiply out so a, b, c are integers.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 Find the midpoint of $(-5, 2)$ and $(3, 5)$. [2]

2.2 Find the gradient of the line through $(1, 7)$ and $(2, 9)$. [2]

2.3 Write down the equation of the line with gradient 6 through the point $(0, 2)$. [2]

2.4 For $y = 3x + 5$, write down the gradient and the coordinates of the y-intercept. [2]

2.5 A line has gradient $\frac{3}{8}$. Write down the gradient of any perpendicular line. [2]

2.6 Find the equation of the line through $(2, 5)$ with gradient 3. [2]

3 Exam-style questions

3.1 *(Edexcel 4MA1 2HR June 2024 Q21, adapted.)* $ABCD$ is a square. A has coordinates $(-5, 2)$ and B has coordinates $(3, 5)$. Find an equation of the line that passes through B and C, giving your answer in the form $ax + by + c = 0$ where a, b and c are integers. [4]

3.2 *(Original.)* A is $(-2, 3)$ and B is $(4, -1)$. Find the equation of the perpendicular bisector of AB, in the form $ax + by + c = 0$. [4]

3.3 *(Original.)* Line L passes through $(0, 4)$ and is parallel to $y = 5 - 2x$. (a) Write down the equation of L. (b) Determine whether the point $(3, -2)$ lies on L, justifying your answer. [4]