

OCR Core Maths 2

Past paper questions Coordinate Geometry

Edited by K V Kumaran

Email: kvkumaran@gmail.com

Phone: 07961319548

Coordinates, Points and Lines

- Mid point of (x_1, y_1) , (x_2, y_2) is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$. Average the x -coordinates and average the y -coordinates.
- Distance from (x_1, y_1) to (x_2, y_2) is (by Pythagoras) $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$. Be careful about negatives! Remember $(2 - (-3))^2 = (2 + 3)^2$.
- Gradient is defined to be
$$\frac{\text{difference in } y}{\text{difference in } x} = \frac{y_2 - y_1}{x_2 - x_1}.$$

If you need the gradient between two points you should visualise them first to see if you should be getting a positive or negative answer. This should also give you an idea of whether to expect a big (steep) or small (shallow) gradient.

- Two lines with gradients m_1 and m_2 are at right angles (perpendicular) if $m_1 \times m_2 = -1$. So if a line has gradient -3 then the line perpendicular to it has gradient $\frac{1}{3}$.
- Lines can be written in many forms, the most common being $y = mx + c$ and $ax + by = c$. Any form can be converted to any other. For example write $3x - 2y = 4$ in the form $y = mx + c$.

$$3x - 2y = 4$$

$$2y = 3x - 4$$

$$y = \frac{3}{2}x - 2.$$

- Given one point (x_1, y_1) and a gradient m the line is given by $y - y_1 = m(x - x_1)$.

1.

(i) Find the gradient of the line l_1 which has equation $4x - 3y + 5 = 0$. [1]

(ii) Find an equation of the line l_2 , which passes through the point $(1, 2)$ and which is perpendicular to the line l_1 , giving your answer in the form $ax + by + c = 0$. [4]

The line l_1 crosses the x -axis at P and the line l_2 crosses the y -axis at Q .

(iii) Find the coordinates of the mid-point of PQ . [3]

(iv) Calculate the length of PQ , giving your answer in the form $\frac{\sqrt{a}}{b}$, where a and b are integers. [3]

Q9 June 2005

2.

The points A , B and C have coordinates $(5, 1)$, $(p, 7)$ and $(8, 2)$ respectively.

(i) Given that the distance between points A and B is twice the distance between points A and C , calculate the possible values of p . [7]

(ii) Given also that the line passing through A and B has equation $y = 3x - 14$, find the coordinates of the mid-point of AB . [4]

Q9 Jan 2006

3.

A is the point $(2, 7)$ and B is the point $(-1, -2)$.

(i) Find the equation of the line through A parallel to the line $y = 4x - 5$, giving your answer in the form $y = mx + c$. [3]

(ii) Calculate the length of AB , giving your answer in simplified surd form. [3]

(iii) Find the equation of the line which passes through the mid-point of AB and which is perpendicular to AB . Give your answer in the form $ax + by + c = 0$, where a , b and c are integers. [6]

Q9 Jan 2007

4.

The points A and B have coordinates $(-5, -2)$ and $(3, 1)$ respectively.

(i) Find the equation of the line AB , giving your answer in the form $ax + by + c = 0$. [3]

(ii) Find the coordinates of the mid-point of AB . [2]

The point C has coordinates $(-3, 4)$.

(iii) Calculate the length of AC , giving your answer in simplified surd form. [3]

(iv) Determine whether the line AC is perpendicular to the line BC , showing all your working. [4]

Q9 Jan 2008

5.

A is the point $(4, -3)$ and B is the point $(-1, 9)$.

- (i) Calculate the length of AB . [2]
- (ii) Find the coordinates of the mid-point of AB . [2]
- (iii) Find the equation of the line through $(1, 3)$ which is parallel to AB , giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [4]

Q9 June 2009

6.

The points A and B have coordinates $(6, 1)$ and $(-2, 7)$ respectively.

- (i) Find the length of AB . [2]
- (ii) Find the gradient of the line AB . [2]
- (iii) Determine whether the line $4x - 3y - 10 = 0$ is perpendicular to AB . [3]

Q1 Jan 2011

7.

The line l has gradient -2 and passes through the point $A(3, 5)$. B is a point on the line l such that the distance AB is $6\sqrt{5}$. Find the coordinates of each of the possible points B . [6]

Q8 Jan 2012

8.

- (i) Find the gradient of the line l which has equation $3x - 5y - 20 = 0$. [1]
- (ii) The line l crosses the x -axis at P and the y -axis at Q . Find the coordinates of the mid-point of PQ . [4]

Q3 June 2012

9.

- (i) The line joining the points $(-2, 7)$ and $(-4, p)$ has gradient 4. Find the value of p . [3]
- (ii) The line segment joining the points $(-2, 7)$ and $(6, q)$ has mid-point $(m, 5)$. Find m and q . [3]
- (iii) The line segment joining the points $(-2, 7)$ and $(d, 3)$ has length $2\sqrt{13}$. Find the two possible values of d . [4]

Q6 Jan 2013

10.

A is the point $(-2, 6)$ and B is the point $(3, -8)$. The line l is perpendicular to the line $x - 3y + 15 = 0$ and passes through the mid-point of AB . Find the equation of l , giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. [7]

Q8 June 2013

11.

A is the point $(5, 7)$ and B is the point $(-1, -5)$.

- (i) Find the coordinates of the mid-point of the line segment AB . [2]
- (ii) Find an equation of the line through A that is perpendicular to the line segment AB , giving your answer in the form $ax + by + c = 0$ where a , b and c are integers. [5]

Q7 June 2014

12.

The points A and B have coordinates $(2, 1)$ and $(5, -3)$ respectively.

- (i) Find the length of AB . [2]
- (ii) Find an equation of the line through the mid-point of AB which is perpendicular to AB , giving your answer in the form $ax + by + c = 0$ where a , b and c are integers. [7]

Q5 June 2015