Name	Date started	Target end date

WJEC Level 2 Additional Mathematics — Question Pack

Gradients, midpoints, lengths and the equations of straight lines — including parallel and perpendicular lines.

REVISE
.wales

Coordinate geometry — straight lines

Coordinate geometry · Level 2 Certificate (9550) · calculator allowed

Gradients, midpoints, lengths and the equations of straight lines — including parallel and perpendicular lines.

LEVEL 2 · 9550

Estimated time for entire question pack: ~2 hours 25 minutes

*At the Additional Maths pace of **~1.2 min/mark** (121 marks across 14 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. It gathers every question on this topic from the 2011–2024 papers.

Questions are ordered by year, newest first.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed throughout this qualification.

Coordinate geometry — straight lines — what's examined

WJEC Level 2 Additional Mathematics (9550) · single written paper, calculator allowed.

Gradient & equation

Coord. geom.

- Gradient = rise / run.
- Use $y - y_1 = m(x - x_1)$.
- Rearrange to the required form.

Length & midpoint

Coord. geom.

- Length by Pythagoras on the coordinates.
- Midpoint is the average of the endpoints.
- Leave length exact if asked.

Parallel & perpendicular

Coord. geom.

- Parallel lines share a gradient.
- Perpendicular gradients multiply to −1.
- Use a given point to fix the line.

Crib sheet »

Coordinate geometry — straight lines in one page

Quick-reference notes — revisit before each question. Don’t use during the questions.

Gradient

$$m = (y_2 - y_1) / (x_2 - x_1)$$

Equation of a line

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

Length & midpoint

$$d = \sqrt{[(\Delta x)^2 + (\Delta y)^2]}$$

$$M = ((x_1+x_2)/2, (y_1+y_2)/2)$$

Perpendicular

$$m_1 \times m_2 = -1$$

13. Find the equation of the straight line that:

- passes through the midpoint of the straight line joining the points with coordinates (2, 7) and (–4, –5), and
- is perpendicular to the line $y = 8 - \frac{x}{4}$.

Express your answer in the form $ax + by + c = 0$, where a, b and c are integers.

Give your answer in its simplest form. [6]

14. Do **not** use a calculator to answer this question.

Solve $\sqrt{2}\sin 60^\circ + \sqrt{3}\sin 45^\circ = \sqrt{x}$. [3]

You must show all your working.

10. (a) The coordinates of the points A and B are (4, 6) and (−8, 1) respectively.

(i) Calculate the length of the line AB. [2]

(ii) Find the gradient of a line perpendicular to the line AB. [3]

(iii) Find the coordinates of the midpoint of the line AB. [2]

(b) Find the equation of the straight line with gradient 4 that passes through the point (−3, 9).
Express your answer in the form $y = mx + c$. [2]

11. (a) The coordinates of the points *A* and *B* are (12, 6) and (–3, 3) respectively.

(i) Calculate the length of the line *AB*.

Express your answer as a surd in its simplest form, $n\sqrt{m}$. [3]

(ii) Find the gradient of a line perpendicular to the line *AB*. [3]

(iii) Find the coordinates of the midpoint of the line *AB*. [2]

(b) Find the equation of the straight line with gradient 6 that passes through the point (2, 15).

Give your answer in the form $y = mx + c$. [2]

10. The coordinates of the points F and G are (–4, 10) and (8, 28) respectively.

(a) Calculate the length of the line FG.
Give your answer in the form $m\sqrt{n}$. [2]

(b) Find the gradient of the straight line that passes through points F and G. [2]

(c) Find the equation of the straight line that;
- passes through the mid-point of the line *FG*, and
- is perpendicular to the line *FG*.

Express your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found. [6]

11. *(a)* Use the axes below to sketch the graph of $y = -5\sin x + 7$ for values of x from 0° to 360°. You must label any important values on the axes. [3]

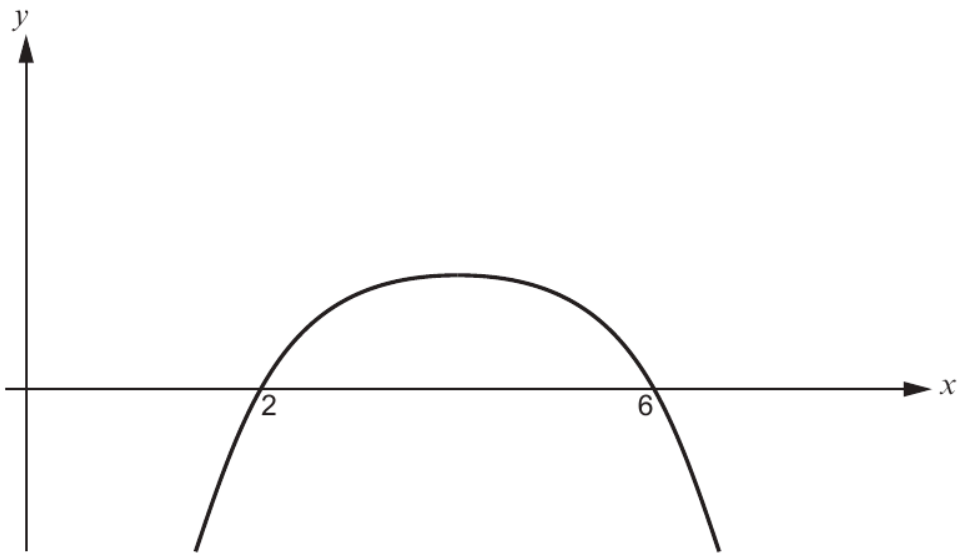
(b) State the maximum value and the minimum value of $y = -5\sin x + 7$. [1]

Maximum value .....

Minimum value .....

15. Do the points (7, 10) and (2, –5) lie on the curve $3y^2 - 5x^2 = 55$?
You must support your answer by showing all your working. [2]

16. A sketch of the curve $y = -x^2 + 8x - 12$ is shown below.



Calculate the area of the region bounded by the curve $y = -x^2 + 8x - 12$ and the x-axis.
You must show all your working. [5]

END OF PAPER

11. The coordinates of the points *A* and *B* are (10, 16) and (–6, 8) respectively.

(a) Calculate the length of the line *AB*.
Express your answer as a surd in its simplest form, $n\sqrt{m}$. [3]

(b) Find the equation of the straight line **perpendicular** to *AB* that passes through the midpoint of *AB*.
Express your answer in the form $y = mx + c$.
Give your answer in its simplest form. [8]

12. Find $\int (12x^5 + 24x^3 - 2 + \frac{4}{x^5})dx$.

Simplify your answer.
You must show all your working. [6]

6. The coordinates of the points *F* and *G* are (8, 20) and (–4, 10) respectively.

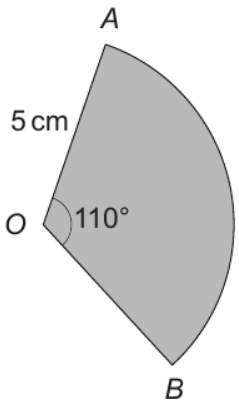
(a) Calculate the length of the line *FG*.
Express your answer as a surd in its simplest form, $n\sqrt{m}$. [3]

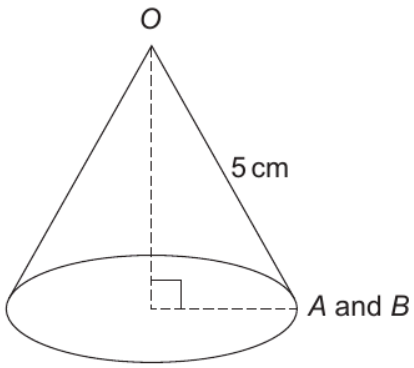
(b) Find the equation of the straight line **perpendicular** to *FG* that passes through the mid-point of *FG*.
Express your answer in the form $ax + by + c = 0$, where a, b and c are integers.
Give your answer in its simplest form. [9]

7. *You will be assessed on the quality of your written communication in this question.*

The volume of a cone = $\frac{1}{3}$ × *area of the base* × *perpendicular height.*

A thin piece of card in the shape of a sector of a circle has a centre *O*, and a radius of 5 cm, as shown below.
The card is used to form a cone by sticking *OA* and *OB* together with no overlap, such that the **arc** *AB* becomes the **circumference** of the base of the cone.





Diagrams not drawn to scale

Calculate the volume of the cone correct to 3 significant figures. [10]

7. The coordinates of the points *F* and *G* are (–2, 14) and (4, 6) respectively.

(a) Calculate the length of the line *FG*. [2]

(b) Find the gradient of the straight line that passes through points *F* and *G*. [2]

(c) Find the equation of the straight line that
- passes through the mid-point of the line *FG*, and
- is perpendicular to the line *FG*.

Express your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

8. Find the coordinates and nature of each of the stationary points on the curve $y = x^3 - 3x^2 + 11$. You must show all your working. [7]

4. The coordinates of the points *D* and *E* are (6, 22) and (–4, 14) respectively.

(a) Calculate the length of the line *DE*.
Express your answer as a surd in its simplified form $n\sqrt{m}$. [3]

(b) Find the equation of the straight line perpendicular to *DE* that passes through the mid-point of *DE*.
Express your answer in the form $ax + by + c = 0$, where a, b and c are integers. [8]

5. *You will be assessed on the quality of your written communication in this question.*

The length of a solid rectangular block is x cm.
The width of the block is 4 cm less than its length.
The height is 1 cm more than the length.
The total surface area of the rectangular block is 124 cm^2.

By showing that $x^2 - 2x = 22$, find the length of the rectangular block, giving your answer in its simplest surd form.
You must use an algebraic method and show all your working. [10]

7. The coordinates of the points *D* and *E* are (–1, 13) and (5, 5) respectively.

(a) Calculate the length of the line *DE*. [2]

(b) Find the gradient of the straight line that passes through points *D* and *E*. [2]

(c) Find the equation of the straight line that passes through points *D* and *E*.
Express your answer in the form $ax + by = c$, where a, b and c are whole numbers. [4]

8. Find the coordinates and nature of each of the stationary points on the curve $y = 4x^3 - 12x + 7$. You must show all your working. [7]

13. The following equations represent straight lines.

$$2x + 4y = 7$$
$$2x + 5y = 7$$
$$x + 2y = 7$$
$$4x - 2y = 7$$
$$2x - 4y = 7$$

(a) Which equations represent lines that are parallel?
You must explain how you know that these lines are parallel. [2]

(b) Write down any two of the equations that represent lines that are perpendicular.
You must explain how you know that these lines are perpendicular. [3]

14. Find the coordinates of the points of intersection of the curve $y = x^2 - 7x + 12$ and the straight line $x + y = 4$. [4]

4. The coordinates of the points A and B are (3, 9) and (–5, 7) respectively.

(a) Calculate the length of the line AB.
Express your answer as a surd in its simplified form $a\sqrt{b}$.

[3]

(b) *You will be assessed on the quality of your written communication in this part of the question.*
Find the equation of the straight line perpendicular to AB that passes through the midpoint of AB. Express your answer in the form $y = mx + c$.

[10]

5. Solve $(3x - 1)(3x + 1) - (1 - x)(1 + x) + 3(1 - 2x)(1 + 2x) = -199$.

[5]

6. Find the coordinates of the points of intersection of the curve with equation $y = x^2 + 2x - 3$ and the straight line with equation $y = x + 1$.
Give your answers correct to 2 decimal places.

[6]

7. The coordinates of the points R and S are (5, 7) and (15, 31) respectively.

(a) Calculate the length of the line RS.

[2]

(b) Find the gradient of a straight line perpendicular to RS.

[3]

3. The coordinates of the points A and B are (2, 8) and (4, –6) respectively.

(a) Calculate the length of the line AB.

[2]

(b) Find the equation of the straight line perpendicular to AB that passes through the mid-point of AB.

[7]

End of question pack