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INTERNATIONAL A LEVEL MATHEMATICS • PURE 1

Pure Mathematics 1

Exam Questions by Topic

Pearson Edexcel International Advanced Level (WMA11/01) • Calculator allowed

Multi-step exam questions at the difficulty of the real WMA11 paper, with a full mark scheme

Chapters (tap a chapter to jump to it)	Qs	Marks	Page	My score
1 Algebraic Expressions Indices, surds, expanding and factorising	10	57	own PDF	
2 Quadratics Completing the square, the discriminant, quadratic graphs	10	65	own PDF	
3 Equations and Inequalities Simultaneous equations, inequalities, regions	10	69	own PDF	
4 Graphs and Transformations Cubic and reciprocal graphs, intersections, transformations	10	68	own PDF	
5 Straight-line Graphs Gradients, equations of lines, parallel and perpendicular	10	68	2	
6 Trigonometric Ratios Sine and cosine rules, area of a triangle, trig graphs	10	66	own PDF	
7 Radians Radian measure, arc length, sector and segment areas	10	71	own PDF	
8 Differentiation Gradients, second derivatives, tangents and normals	10	71	own PDF	
9 Integration Integrating x^n , finding $y = f(x)$ from $f'(x)$	10	67	own PDF	

[Full mark scheme](#)

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CHAPTER 5 • KEY SKILLS

Straight-line Graphs

Specification P1: 2.1, 2.2 • 10 questions • 68 marks • about 80 minutes

1 Gradient

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

e.g. (1, 2) and (4, 11): $m = \frac{9}{3} = 3$

2 Equation of a line

$y - y_1 = m(x - x_1)$, then rearrange as asked.

e.g. $y - 2 = 3(x - 1)$ gives
 $3x - y - 1 = 0$ (integers, = 0)

3 Parallel and perpendicular

Parallel: equal gradients.

Perpendicular: $m_1 m_2 = -1$.

e.g. $3x + 4y = 18$ has $m = -\frac{3}{4}$;
 perpendicular $m = \frac{4}{3}$

4 Midpoints and bisectors

Midpoint $(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$. Perpendicular bisector: through the midpoint with the negative reciprocal gradient.

5 Distance between points

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

e.g. (1, 2) to (4, 6) is 5

6 Where lines meet

Solve the equations simultaneously.

e.g. $y = 2x + 1$ and $x + y = 7$ meet at (2, 5)

7 Areas of triangles

$\frac{1}{2} \times \text{base} \times \text{perpendicular height}$.

Look for a right angle or a side on an axis.

8 Proving properties

Show $m_1 m_2 = -1$ for a right angle, or equal gradients for parallel sides, and state the conclusion.

9 Linear models

In $C = 50d + 55$: the gradient 50 is the cost per day; the intercept 55 is the fixed charge.

Skills map every skill above is tested at least once; interleaved skills come from GCSE or other chapters

Skill	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Marks	4	5	4	7	6	8	8	7	9	10
1 Gradient	•			•	•			•		
2 Equation of a line	•	•	•		•	•	•		•	•
3 Parallel and perpendicular		•	•	•		•	•	•	•	•
4 Midpoints and bisectors			•				•			•
5 Distance between points				•			•		•	•
6 Where lines meet						•			•	•
7 Areas of triangles				•		•	•		•	•
8 Proving properties				•		•		•		
9 Linear models					•					
Interleaved: surds and exact answers (Chapter 1)				•				•	•	•
Interleaved: quadratics and inequalities (Chapters 2, 3)					•		•	•		•
Interleaved: curves meeting lines (Chapter 4)								•		

Exam difficulty. Questions 1 to 5 check each skill on its own. Questions 6 to 10 are multi-step questions built like the last questions on a real WMA11 paper, where one part leads into the next and skills from different topics are combined.

Must learn. Perpendicular means *negative* reciprocal. " $ax + by + c = 0$ " means integers and " $= 0$ ". When no diagram is given, draw your own sketch first.



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1. The line L passes through the points $A(-2, 7)$ and $B(4, -2)$.

Find an equation for L , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers.

(4)

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(Total for Question 1 is 4 marks)



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2. The line l_1 has equation $2x - 5y + 10 = 0$

(a) Find the gradient of l_1 .

(1)

The line l_2 is perpendicular to l_1 and passes through the point $(4, -1)$.

(b) Find an equation for l_2 , giving your answer in the form $y = mx + c$, where m and c are constants.

(3)

(c) Find the coordinates of the point where l_2 crosses the x -axis.

(1)

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Question 2 continued

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(Total for Question 2 is 5 marks)



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3. The points A and B have coordinates $(-3, 4)$ and $(5, 8)$ respectively.

Find an equation of the perpendicular bisector of AB , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers.

(4)

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(Total for Question 3 is 4 marks)



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4. In this question you must show all stages of your working.**Solutions relying on calculator technology are not acceptable.**

The points P , Q and R have coordinates $(-2, 1)$, $(2, 3)$ and $(5, -3)$ respectively.

(a) Prove that angle $PQR = 90^\circ$

(3)

Given that $PQRS$ is a rectangle,

(b) find the coordinates of S .

(2)

(c) Find the area of the rectangle $PQRS$.

(2)

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Question 4 continued

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(Total for Question 4 is 7 marks)



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- $$C = pd + q$$

(a) Find the value of p and the value of q .

(3)

- (b)** Interpret the value of p in the context of the model.

(1)

(c) Find the least number of whole days for which hiring from company A is cheaper than hiring from company B .

(2)

Question 5 continued

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(Total for Question 5 is 6 marks)



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6.

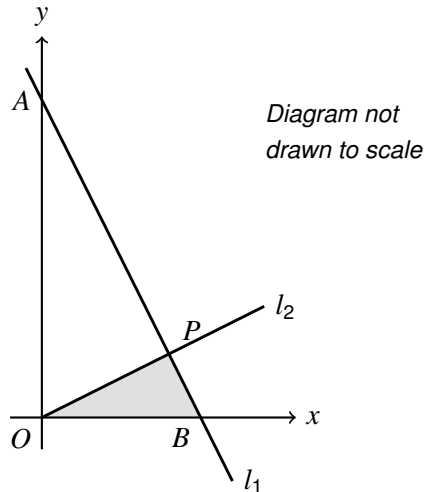


Figure 1

In Figure 1, the line l_1 passes through the points $A(0, 10)$ and $B(5, 0)$.

The line l_2 passes through the origin O and is perpendicular to l_1 . The lines meet at the point P .

- (a) Find an equation for l_1 . (2)
- (b) Find an equation for l_2 . (2)
- (c) Find the coordinates of P . (2)
- (d) Show that the area of triangle OPA is four times the area of triangle OPB . (2)



Question 6 continued

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(Total for Question 6 is 8 marks)



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Solutions relying on calculator technology are not acceptable.

The line l is the perpendicular bisector of AB .

- (3)**

- (1)

(c) Find the possible coordinates of C .

(4)



Question 7 continued

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(Total for Question 7 is 8 marks)



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8. In this question you must show all stages of your working.
Solutions relying on calculator technology are not acceptable.

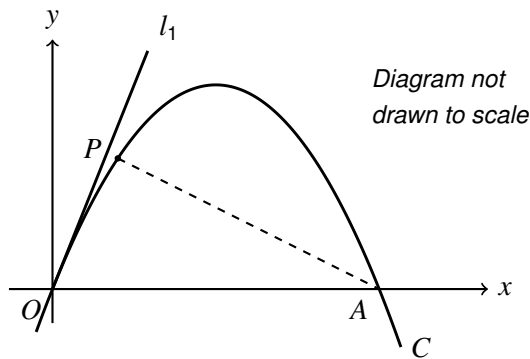


Figure 2

Figure 2 shows a sketch of the curve C with equation $y = x(6 - x)$ and the line l_1 with equation $y = kx$, where k is a constant and $0 < k < 6$

The line l_1 meets C at O and at the point P . The point A has coordinates $(6, 0)$.

- (a) Show that P has coordinates $(6 - k, 6k - k^2)$ (2)
- (b) Show that the gradient of the line PA is $k - 6$ (2)
- Given that l_1 is perpendicular to the line PA and that $k > 1$,
- (c) find the exact value of k , giving your answer in the form $a + b\sqrt{2}$, where a and b are integers. (3)



Question 8 continued

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(Total for Question 8 is 7 marks)



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Solutions relying on calculator technology are not acceptable.

The quadrilateral $ABCD$ is a trapezium with AB parallel to DC and angle $DAB = 90^\circ$

- (a) Find an equation of the line through C that is parallel to AB . (2)
- (b) Find an equation of the line through A that is perpendicular to AB . (2)
- (c) Hence find the coordinates of D . (2)
- (d) Find the exact area of the trapezium $ABCD$. (3)

Question 9 continued

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Question 9 continued

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(Total for Question 9 is 9 marks)



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Solutions relying on calculator technology are not acceptable.

(a) Find an equation of the line through P that is perpendicular to l .

(2)

(2)

(c) Find the coordinates of P' .

(2)

(d) Find the exact length of PP' , giving your answer in the form $a\sqrt{5}$

(1)

(e) Find the possible coordinates of Q .

(3)

Question 10 continued

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Question 10 continued

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(Total for Question 10 is 10 marks)

TOTAL FOR CHAPTER 5 IS 68 MARKS

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