



eClassroom

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	2	
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	own PDF	
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](#)

[Free courses](#)

[More worksheets](#)

Name

Class

Date



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

2

CHAPTER 2 • KEY SKILLS

Quadratics

Specification P1: 1.3, 1.4, 1.5 • 10 questions • 65 marks • about 80 minutes

1 Solving quadratic equations

Factorise, or use the formula for exact answers.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

e.g. $x^2 - 4x + 1 = 0$ gives $x = 2 \pm \sqrt{3}$ **2 Completing the square**Take out the x^2 coefficient first, including a negative one.

e.g. $3x^2 + 12x + 5 = 3(x+2)^2 - 7$

3 Turning points

$y = a(x+p)^2 + q$ has its turning point at $(-p, q)$: a minimum if $a > 0$, a maximum if $a < 0$.

e.g. $y = 4 - (x-1)^2$: maximum (1, 4)**4 Sketching quadratic graphs**Shape from the sign of a ; mark the y intercept, the roots and the turning point with coordinates.**5 The discriminant** $b^2 - 4ac > 0$: two distinct real roots $b^2 - 4ac = 0$: equal roots $b^2 - 4ac < 0$: no real roots**6 Discriminant with a constant k** Form $b^2 - 4ac$ in terms of k , then solve the equation or inequality in k . Check the x^2 coefficient is not zero.**7 A quadratic from its graph**

Roots p, q : $y = a(x-p)(x-q)$. Turning point (h, k) : $y = a(x-h)^2 + k$. Find a from one more point.

8 Hidden quadraticsSpot a quadratic in x^2 or $\sqrt{x}$.

e.g. $x - 5\sqrt{x} + 4 = 0$:

$(\sqrt{x} - 1)(\sqrt{x} - 4) = 0$, so $x = 1$ or 16

9 Modelling with quadratics

Completed square gives the maximum and when it happens. Roots give when the value is zero. Question the model.

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	5	5	6	4	6	7	8	6	9	9
1 Solving quadratic equations	•				•		•		•	•
2 Completing the square		•	•			•	•			•
3 Turning points		•	•			•	•			
4 Sketching quadratic graphs			•							
5 The discriminant				•		•		•	•	•
6 Discriminant with a constant k				•				•	•	
7 A quadratic from its graph						•				
8 Hidden quadratics					•					•
9 Modelling with quadratics							•			
Interleaved: surds and exact answers (Chapter 1)	•						•			•
Interleaved: quadratic inequalities (Chapter 3)								•	•	•
Interleaved: intersections of graphs (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. The quadratic formula is *not* in the formula booklet. When a question gives a constant k , always check the value that makes the x^2 coefficient zero, and give *both* ends of any range.



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

1. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Solve $3x^2 + 10x - 8 = 0$

(2)

(b) Solve $2x^2 - 6x + 1 = 0$

giving your answers in the form $\frac{a \pm \sqrt{b}}{c}$, where a , b and c are integers.

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

Question 1 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 1 is 5 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

2. (a) Express $2x^2 - 12x + 23$ in the form $a(x+b)^2 + c$
where a , b and c are integers to be found.

(3)

- (b) Hence write down the minimum value of $2x^2 - 12x + 23$

(1)

- (c) Find the maximum value of $\frac{1}{2x^2 - 12x + 23}$

(1)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 2 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 2 is 5 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

3. The curve C has equation $y = 5 + 4x - x^2$

- (a) Write $5 + 4x - x^2$ in the form $p - (x + q)^2$
where p and q are integers to be found.

(2)

- (b) Sketch the curve C . On your sketch show clearly

- the coordinates of the turning point of C
- the coordinates of the points where C meets the coordinate axes

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 3 is 6 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

4. The equation $3x^2 + kx + 12 = 0$, where k is a constant, has equal roots.

(a) Find the possible values of k .

(2)

(b) For each value of k , find the root of the equation.

(2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 4 is 4 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

5. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

(a) Solve $x^4 - 10x^2 + 9 = 0$

(3)

(b) Solve $2x - 7\sqrt{x} + 3 = 0$, $x > 0$

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 5 is 6 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

6.

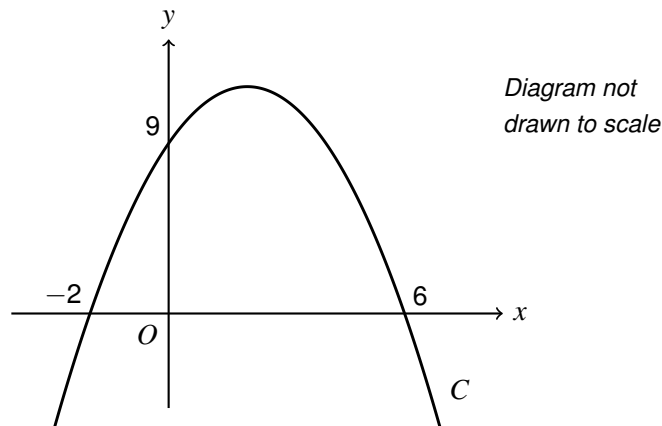
**Figure 1**

Figure 1 shows a sketch of the curve C with equation $y = f(x)$, where $f(x)$ is a quadratic expression. The curve C cuts the x -axis at -2 and 6 and cuts the y -axis at 9

- (a) Find $f(x)$, giving your answer in the form $ax^2 + bx + c$, where a , b and c are constants. (3)
- (b) Write $f(x)$ in the form $p - q(x - r)^2$, where p , q and r are constants. (2)
- (c) Hence write down the coordinates of the maximum point of C . (1)
- (d) Find the set of values of k for which the equation $f(x) = k$ has two distinct real roots. (1)



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 6 is 7 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

7. A stone is thrown upwards from the top of a platform.

The height, h metres, of the stone above the ground, t seconds after it is thrown, is modelled by the equation

$$h = 2 + 12t - 5t^2 \quad t \geq 0$$

- (a) Write $2 + 12t - 5t^2$ in the form $A - B(t - C)^2$, where A , B and C are constants to be found. (3)
- (b) Hence state, according to the model,
- (i) the maximum height of the stone above the ground,
 - (ii) the time taken for the stone to reach this maximum height. (2)
- (c) Find, according to the model, the time taken for the stone to hit the ground. Give your answer to 3 significant figures. (2)
- (d) Give one limitation of the model. (1)



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 7 is 8 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

8. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

The equation

$$(k+3)x^2 + 6x + k = 5$$

where k is a constant, has two distinct real roots.

(a) Show that $k^2 - 2k - 24 < 0$

(3)

(b) Hence find the set of possible values of k .

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 8 is 6 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 9 is 9 marks)



Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk

10. In this question you must show all stages of your working.

Solutions relying on calculator technology are not acceptable.

$$f(x) = x^4 - 6x^2 \quad x \in \mathbb{R}$$

- (a) Write $f(x)$ in the form $(x^2 + p)^2 + q$, where p and q are integers to be found. (2)
- (b) Hence solve $f(x) = 16$, giving your answers in simplest surd form. (3)
- (c) Explain why the equation $f(x) = -10$ has no real solutions. (1)
- (d) Find the set of values of A for which the equation $f(x) = A$ has exactly four real solutions. (3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk

Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 10 is 9 marks)

TOTAL FOR CHAPTER 2 IS 65 MARKS

Join students already acing their exams.

Book your FREE lesson at www.eclassroom.org.uk