



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	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	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	2	

[Full mark scheme](#)

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CHAPTER 9 • KEY SKILLS

Integration

Specification P1: 5.1, 5.2 • 10 questions • 67 marks • about 80 minutes

1 Integrating x^n

$$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c, \quad n \neq -1$$

Raise the power by one, then divide by the new power.

2 Rewrite first

Split fractions and expand brackets. Never integrate the top and bottom separately.

e.g. $\frac{x^3 + 2}{x^2} = x + 2x^{-2}$

3 Negative and fractional powers

Divide by a fraction by multiplying by its reciprocal.

e.g. $\int x^{-\frac{1}{2}} dx = 2x^{\frac{1}{2}} + c$

4 The constant c

Every indefinite integral needs $+c$. Simplify each coefficient.

5 $f(x)$ from $f'(x)$

Integrate, then substitute the given point to find c . Write $f(x)$ out in full.

6 Integrating twice

From $f''(x)$: integrate, find the first constant using a gradient, then integrate again and use a point.

7 Using tangents and normals

A tangent gives $f(a)$ and $f'(a)$. A normal with gradient m gives $f'(a) = -\frac{1}{m}$.

8 Unknown constants

Each condition gives one equation. Two unknowns need two equations: solve them simultaneously.

9 Check by differentiating

Differentiate your answer: you should get back to the expression you integrated.

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	5	5	5	9	8	8	8	10
1 Integrating x^n	•	•	•	•	•	•	•	•	•	•
2 Rewrite first		•	•							•
3 Negative and fractional powers	•	•	•	•	•		•	•	•	•
4 The constant c	•	•	•		•					
5 $f(x)$ from $f'(x)$				•		•	•	•		•
6 Integrating twice									•	
7 Using tangents and normals							•	•	•	•
8 Unknown constants							•	•		
9 Check by differentiating					•	•				•
Interleaved: tangents and normals (Chapter 8)					•		•	•	•	•
Interleaved: simultaneous equations, discriminant (Chapters 2, 3)								•		•
Interleaved: factorising and sketching cubics (Chapters 1, 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. Integration of x^n is *not* in the formula booklet. A gradient condition finds the constant in $f'(x)$; a point condition finds the constant in $f(x)$. Don't mix them up.



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1. Find

$$\int \left(6x^5 + \frac{4}{x^3} - \frac{3}{\sqrt{x}} \right) dx \quad x > 0$$

giving each term in simplest form.

(4)

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(Total for Question 1 is 4 marks)



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

Find

$$\int \frac{3x^4 - 2}{x^2\sqrt{x}} dx \quad x > 0$$

giving your answer in simplest form.

(5)

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Question 2 continued

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(Total for Question 2 is 5 marks)



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3. Given that $x > 0$,

- (a) show that $\frac{(2\sqrt{x}-3)^2}{\sqrt{x}}$ can be written in the form $4x^{\frac{1}{2}} + A + Bx^{-\frac{1}{2}}$, where A and B are constants to be found.

(2)

- (b) Hence find $\int \frac{(2\sqrt{x}-3)^2}{\sqrt{x}} dx$, giving each term in simplest form.

(3)

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Question 3 continued

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(Total for Question 3 is 5 marks)**Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk

4. The curve C has equation $y = f(x)$, $x > 0$, where

$$f'(x) = 3\sqrt{x} - \frac{4}{x^2}$$

Given that the point $(4, 10)$ lies on C , find $f(x)$.

(5)

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Question 4 continued

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(Total for Question 4 is 5 marks)



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5.

$$y = 2x^3 - \frac{6}{\sqrt{x}} \quad x > 0$$

(a) Find $\frac{dy}{dx}$

(2)

(b) Find $\int y dx$

(3)

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Question 5 continued

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(Total for Question 5 is 5 marks)



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6. The curve C has equation $y = f(x)$, where

$$f'(x) = 3x^2 - 8x + 5$$

The point $(3, 4)$ lies on C .

- (a) Find $f(x)$.

(4)

- (b) Show that $f(x) = (x - 1)^2(x - 2)$

(2)

- (c) Sketch C , showing clearly the coordinates of the points where C meets the coordinate axes.

(3)

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Question 6 continued

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Question 6 continued

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(Total for Question 6 is 9 marks)



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7. The curve C has equation $y = f(x)$, $x > 0$, where

$$f'(x) = kx - 3\sqrt{x}$$

and k is a constant. The point $P(4, 20)$ lies on C .

The normal to C at P has equation $x + 10y = 204$

- (a) Show that $k = 4$

(3)

- (b) Find $f(x)$, giving each term in simplest form.

(5)

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Question 7 continued

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(Total for Question 7 is 8 marks)



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8. The curve C has equation $y = f(x)$, $x > 0$, where

$$f'(x) = ax + b\sqrt{x}$$

and a and b are constants. Given that

- the tangent to C at the point where $x = 1$ has equation $y = 5x - 2$
- the normal to C at the point where $x = 4$ has gradient $-\frac{1}{16}$

- (a) show that $a + b = 5$ and $2a + b = 8$

(3)

- (b) Hence find $f(x)$.

(5)

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Question 8 continued

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(Total for Question 8 is 8 marks)



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9. A curve C has equation $y = f(x)$, $x > 0$. Given that

- $f''(x) = 12x - \frac{4}{x^3}$

- the point P has x coordinate 1 and lies on C

- the tangent to C at P has equation $y = 2x + 3$

(a) find an equation of the normal to C at P , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers,

(2)

(b) find $f(x)$, writing your answer in simplest form.

(6)

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Question 9 continued

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(Total for Question 9 is 8 marks)



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

Solutions relying on calculator technology are not acceptable.

The curve C has equation $y = f(x)$, $x > 0$, where

$$f'(x) = \frac{x^2 - 9}{x^2}$$

Given that C passes through the point $(3, 2)$,

- (a) find $f(x)$. (4)
- (b) Find an equation of the tangent to C at the point where $x = 1$ (3)
- (c) Using algebra, show that this tangent does not meet C at any other point. (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 9 IS 67 MARKS

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