



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	2	
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 6 • KEY SKILLS

Trigonometric Ratios

Specification P1: 3.1, 3.3 • 10 questions • 66 marks • about 80 minutes

1 Cosine rule for a side

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Use it when you know two sides and the angle between them.

2 Cosine rule for an angle

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

A negative value means A is obtuse.

3 Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Use it with a side and its opposite angle.

4 The ambiguous case

$\sin \theta = \sin(180^\circ - \theta)$, so a sine rule angle may be acute *or* obtuse. Check both fit in the triangle.

5 Area of a triangle

Area = $\frac{1}{2}ab \sin C$, where C is the angle *between* a and b .

Given the area, $\sin C$ may give two angles.

6 Multi-step triangle problems

Split the shape into triangles, find the shared side first, and keep full accuracy until the end.

7 Graphs of sin, cos, tan

sin and cos: period 360° , between -1 and 1 .

tan: period 180° , asymptotes at $x = 90^\circ, 270^\circ$

8 Transforming trig graphs

$y = a \sin x$: height a . $y = \sin(x + 30^\circ)$: 30° left.

$y = \sin bx$: period $\frac{360^\circ}{b}$

9 Counting solutions

Sketch both graphs over the whole interval and count the intersections. Check end points, asymptotes and repeating periods.

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	8	9	8	8	9
1 Cosine rule for a side	•					•				•
2 Cosine rule for an angle			•							
3 Sine rule		•				•				•
4 The ambiguous case		•				•				•
5 Area of a triangle	•		•			•				
6 Multi-step triangle problems						•				•
7 Graphs of sin, cos, tan				•	•		•	•	•	
8 Transforming trig graphs				•	•		•	•		
9 Counting solutions				•	•		•	•	•	
Interleaved: surds and exact values (Chapter 1)			•					•		•
Interleaved: quadratics and straight lines (Chapters 2, 5)							•		•	•
Interleaved: graph transformations (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 sine rule, the cosine rule and $\frac{1}{2}ab \sin C$ are *not* in the formula booklet. Read whether an angle is acute or obtuse, and keep full calculator accuracy until the final answer.



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1. In the triangle ABC , $AB = 8$ cm, $AC = 11$ cm and angle $BAC = 50^\circ$

(a) Find the length of BC , giving your answer in cm to 3 significant figures.

(2)

(b) Find the area of triangle ABC , giving your answer in cm^2 to 3 significant figures.

(2)

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(Total for Question 1 is 4 marks)



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2. In the triangle PQR , $PQ = 9$ cm, $QR = 7$ cm and angle $QPR = 42^\circ$

- (a) Find the two possible values of angle PRQ , giving each answer in degrees to one decimal place.

(3)

Given that angle PRQ is obtuse,

- (b) find the length of PR , giving your answer in cm to 3 significant figures.

(2)

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Question 2 continued

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(Total for Question 2 is 5 marks)



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Solutions relying on calculator technology are not acceptable.

(a) Show that $\cos \theta = -\frac{1}{10}$

(2)

(b) Find the exact area of the triangle, giving your answer in the form $\frac{a\sqrt{11}}{b}$ cm², where a and b are integers.

(3)

Question 3 continued

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(Total for Question 3 is 5 marks)



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4. (a) Sketch the graph of $y = \tan(x - 45^\circ)$, $0 \leq x \leq 360^\circ$
On your sketch show clearly the equations of any asymptotes and the coordinates of the points where the graph meets the coordinate axes. (3)
- (b) State the number of solutions of the equation $\tan(x - 45^\circ) = 2$ in the interval $0 \leq x \leq 360^\circ$ (1)
- (c) State the number of solutions of the equation $\tan(x - 45^\circ) + 1 = 0$ in the interval $0 \leq x \leq 360^\circ$ (1)

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Question 4 continued

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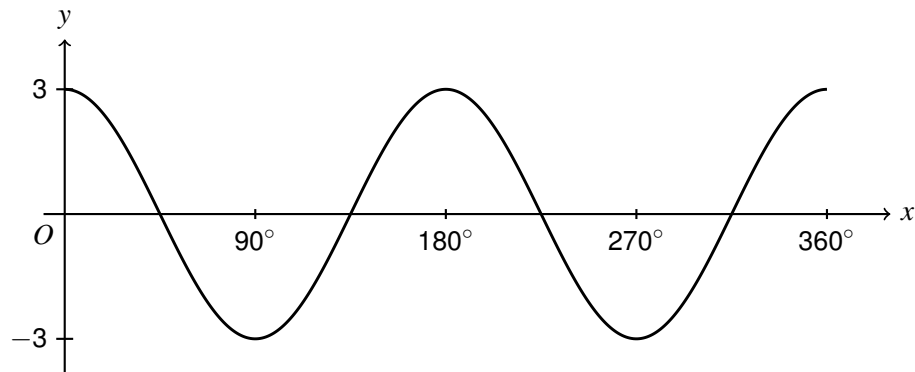


Figure 1

Figure 1 shows the graph of $y = f(x)$, $0 \leq x \leq 360^\circ$, where $f(x) = a \cos bx$ and a and b are positive constants.

- (a) Write down the value of a and the value of b . (2)
- (b) Write down the coordinates of the minimum points of the graph. (2)
- (c) State the number of solutions of the equation $f(x) = 1$ in the interval $0 \leq x \leq 360^\circ$ (1)



Question 5 continued

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(Total for Question 5 is 5 marks)



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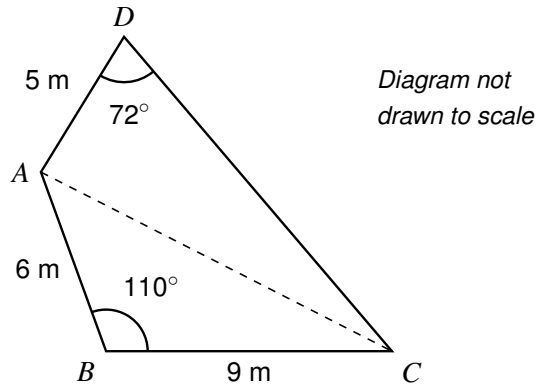


Figure 2

Figure 2 shows the plan of a garden $ABCD$.

$AB = 6$ m, $BC = 9$ m, $AD = 5$ m, angle $ABC = 110^\circ$ and angle $ADC = 72^\circ$

- (a) Find the length of AC , giving your answer in metres to 3 significant figures. (2)
- (b) Find the size of angle ACD , giving your answer in degrees to one decimal place. Explain why there is only one possible value. (3)
- (c) Find the total area of the garden, giving your answer in m^2 to 3 significant figures. (3)



Question 6 continued

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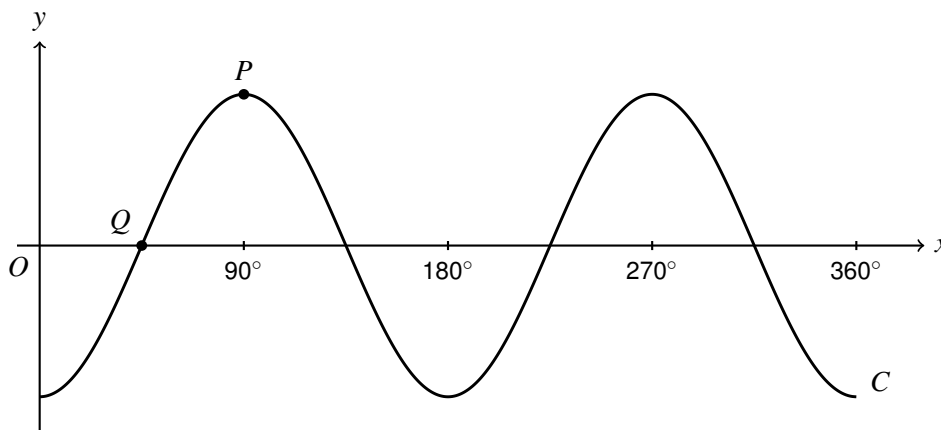


Figure 3

Figure 3 shows part of the curve C with equation

$$y = -4 \cos 2x \quad 0 \leq x \leq 360^\circ$$

The point P is a maximum point of C and the point Q is where C first crosses the positive x -axis.

(a) Write down the coordinates of P and the coordinates of Q .

(3)

The curve C is translated k units in the positive y direction, where k is a constant. The translated curve passes through the point $(30^\circ, 5)$

(b) Find the value of k .

(2)

(c) Hence write down the coordinates of the minimum points of the translated curve for $0 \leq x \leq 360^\circ$

(2)

(d) By drawing a suitable straight line on Figure 3, state the number of solutions of the equation

$$4 \cos 2x + 2 = \frac{x}{45} \quad 0 \leq x \leq 360^\circ$$

giving a reason for your answer.

(2)



Question 7 continued

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Question 7 continued

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(Total for Question 7 is 9 marks)**Join students already acing their exams.**Book your FREE lesson at www.eclassroom.org.uk

8. The curve C has equation

$$y = 2 \sin(x + 60^\circ) \quad 0 \leq x \leq 360^\circ$$

- (a) Find the exact coordinates of the points where C meets the coordinate axes. (3)
- (b) Find the coordinates of the maximum point and the minimum point of C . (2)
- (c) Find the set of values of k for which the line with equation $y = k$ meets C at exactly two points. (2)
- (d) State the number of solutions of the equation $2 \sin(2x + 60^\circ) = 1$ in the interval $0 \leq x \leq 360^\circ$ (1)

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Question 8 continued

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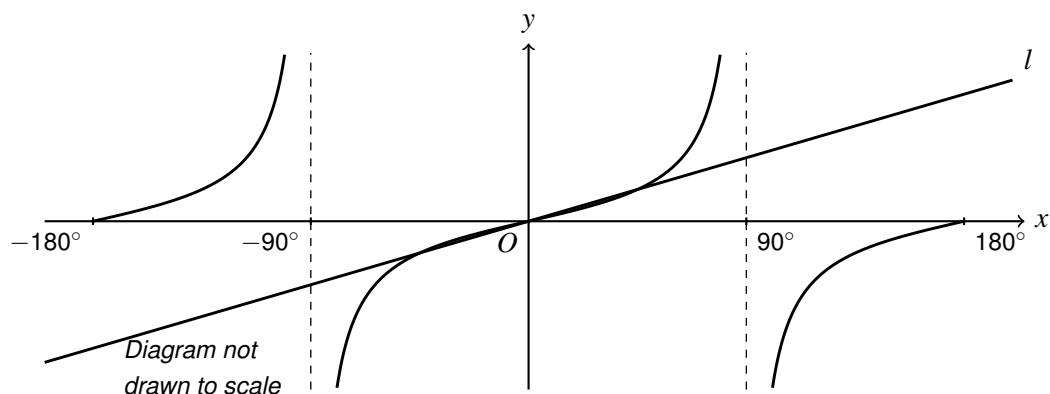


Figure 4

Figure 4 shows part of the curve with equation $y = \tan x$ and the straight line l with equation $y = \frac{x}{45}$, in the interval $-180^\circ < x < 180^\circ$

- (a) State the period of $\tan x$. (1)
- (b) Show that $x = 45^\circ$ is a solution of the equation $\tan x = \frac{x}{45}$. (1)
- (c) Write down the number of solutions of the equation $\tan x = \frac{x}{45}$ in the interval
- (i) $-180^\circ < x < 180^\circ$
 - (ii) $-360^\circ < x < 360^\circ$
 - (iii) $-9000^\circ < x < 9000^\circ$
- (4)
- (d) State the number of solutions of the equation $\tan x = -\frac{x}{45}$ in the interval $-180^\circ < x < 180^\circ$, giving a reason for your answer. (2)



Question 9 continued

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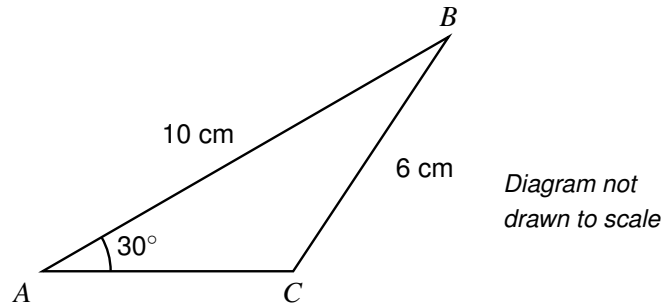


Figure 5

Figure 5 shows the triangle ABC with $AB = 10$ cm, $BC = 6$ cm and angle $BAC = 30^\circ$. The angle ACB is obtuse.

- (a) Find the size of angle ACB , giving your answer in degrees to one decimal place.

(3)

- (b) By applying the cosine rule to triangle ABC , show that $AC = x$ cm satisfies

$$x^2 - 10\sqrt{3}x + 64 = 0$$

and hence show that $AC = 5\sqrt{3} - \sqrt{11}$ cm.

(Solutions relying on calculator technology are not acceptable.)

(4)

The point D lies on AC extended, beyond C , such that $BD = 6$ cm.

- (c) Find the exact length of CD .

(2)



Question 10 continued

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Question 10 continued

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TOTAL FOR CHAPTER 6 IS 66 MARKS

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