

LEVEL 2

# WJEC Level 2 Additional Mathematics

Approved by Qualifications Wales

## Sample Assessment Materials

### Unit 3: Geometry and Trigonometry

Teaching from 2026

For award from 2027





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Surname
First name(s)

Centre number

Candidate number
0



**Level 2**

**5322U3**

**Additional Mathematics – Unit 3  
Geometry and Trigonometry**

**50 minutes**

**SAMPLE ASSESSMENT  
MATERIALS**

**Additional materials**

The use of a calculator will be required for this examination.

**Instructions to candidates**

Use black ink or black ball-point pen. Do **not** use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided at the top of this page.

Answer **all** the questions in the spaces provided.

Write your answers in the spaces provided in this booklet. If you need more space, use the additional page(s) at the back of this booklet, taking care to number the question(s) correctly.

Take  $\pi$  as 3.14.

**Information for candidates**

The number of marks is given in brackets at the end of each question or part-question.

In question **3(a)**, the assessment will take into account the quality of your mathematical organisation, communication and accuracy in writing.

For examiner's use only		
Question	Maximum mark	Mark awarded
1.	4	
2.	6	
3.	8	
4.	5	
5.	3	
6.	8	
7.	2	
8.	4	
<b>Total</b>	<b>40</b>	

## Formula List – Unit 3 Geometry and Trigonometry

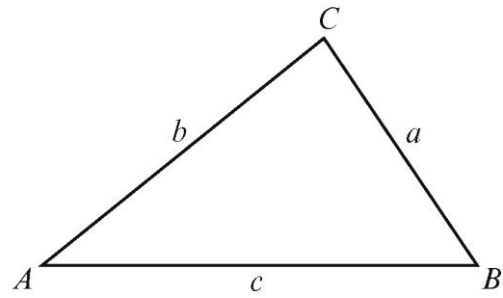
In any triangle  $ABC$

**Sine rule:**

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

**Cosine rule:**

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



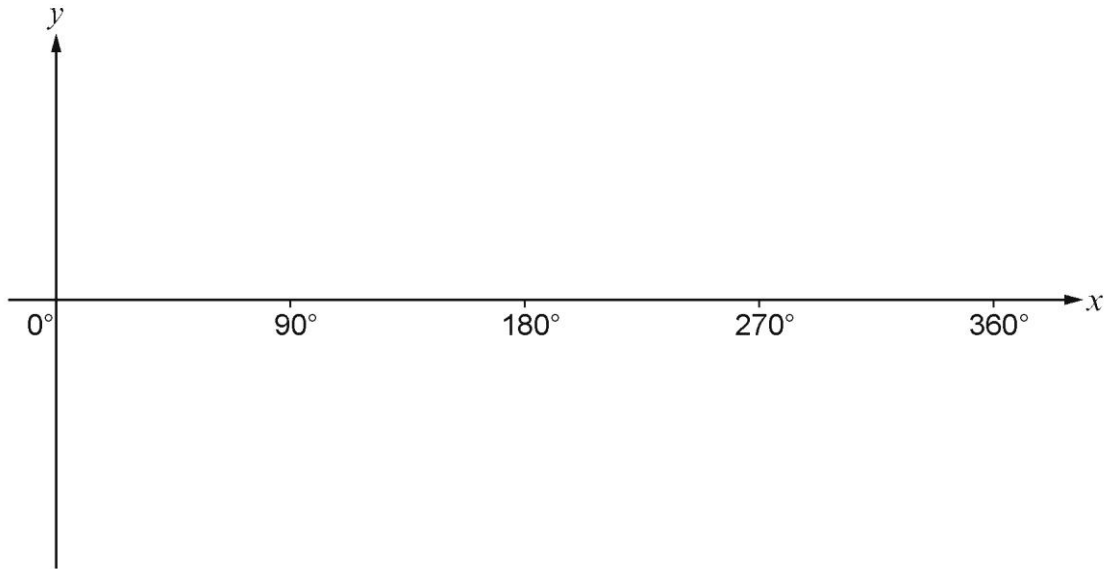
**Area of triangle**  $= \frac{1}{2}ab \sin C$

Answer **all** questions.

1. (a) On the axes below, sketch the graph of  $y = \cos x$  for values of  $x$  in the range  $0^\circ \leq x \leq 360^\circ$ .

[2]

Examiner  
only



- (b) Calculate the size of angle  $x$ , given that:

[2]

- $12\cos x = 7$
- $360^\circ \leq x \leq 450^\circ$ .

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$x = \dots\dots\dots^\circ$

2. The coordinates of the points  $A$  and  $B$  are  $(10, 8)$  and  $(-8, 2)$  respectively.

(a) Find the coordinates of the midpoint of  $AB$ . [1]

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(b) Calculate the gradient of the line perpendicular to  $AB$ . [3]

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(c) Hence, find the equation of the straight line perpendicular to  $AB$  that passes through the midpoint of  $AB$ . [2]  
Express your answer in the form  $y = mx + c$ .

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3. A child's construction set contains rods and hinges.

Jessie makes a 2D model using 6 rods of equal length and 5 hinges, as shown in the diagram below.  
She lies her model flat on a horizontal table.

One of the angles in the model is marked  $x^\circ$ .  
Each rod is of length 10 cm.

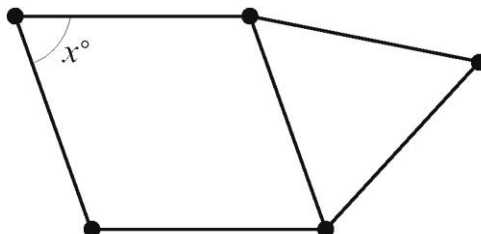


Diagram not drawn to scale

The hinges connecting the rods allow the model to move.

The total area contained within the model changes as  $x$  increases or decreases.

A further example of the same model is shown in the diagram below.

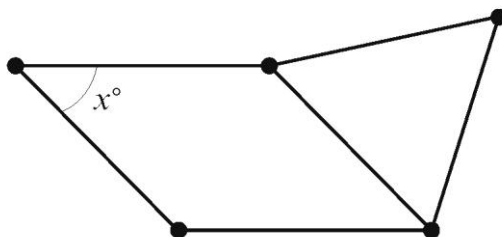


Diagram not drawn to scale

- (a) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Find an expression, in terms of  $x$ , for the total area contained within the model. [4 + 2 OCW]

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(b) Find the minimum area contained within the model.  
You must state a reason or condition for your answer. [2]

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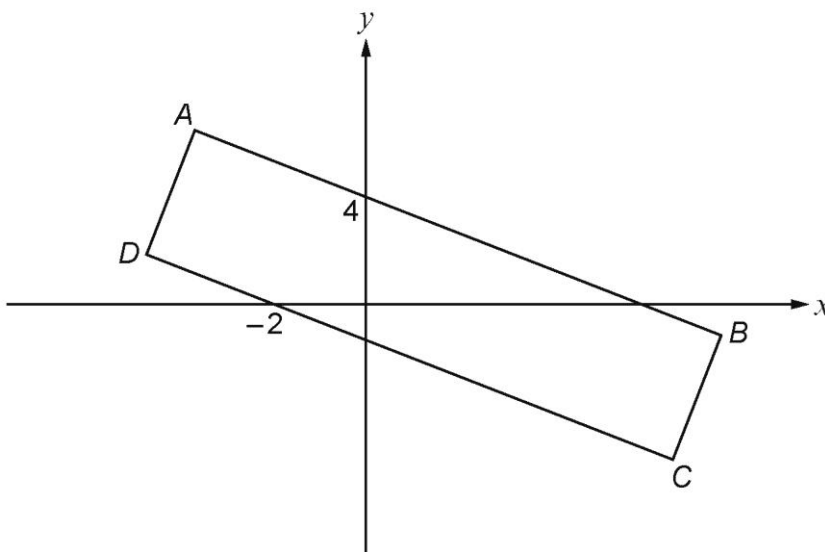
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5. The diagram below shows a sketch of rectangle  $ABCD$ .



The equation of  $AD$  is  $y = 2x + 10$ .  
 The equation of  $BC$  is  $y = 2x - 20$ .

Find the equation of  $AB$  and the equation of  $CD$ .

[3]

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Equation of  $AB$  is .....

Equation of  $CD$  is .....

6. The table below gives details of two circles,  $R$  and  $T$ .

Circle	Radius	Coordinates of the centre
$R$	3 units	$(-1, 2)$
$T$	2 units	$(3, -1)$

(a) By calculating the distance between the centres of the two circles, show that these circles touch. [4]

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(b) Find the equation of circle  $R$ .

Circle	Radius	Coordinates of the centre
$R$	3 units	$(-1, 2)$

Give your answer in the form  $x^2 + y^2 + ax + by + c = 0$ .

[4]

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7. Simplify  $\frac{5\sin x}{\cos x} - \tan x$ .

[2]

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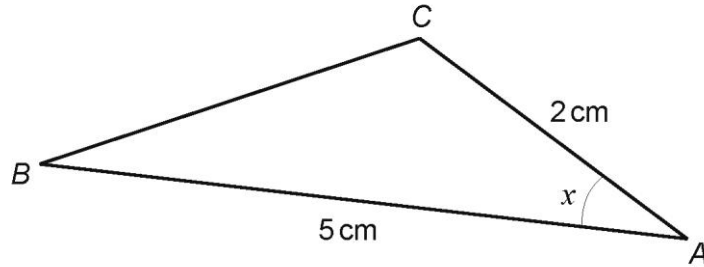
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8. You are advised not to use a calculator in this question.

In triangle  $ABC$ :

- $AC = 2 \text{ cm}$
- $AB = 5 \text{ cm}$
- $\widehat{CAB} = x$ .



*Diagram not drawn to scale*

Given that  $x < 90^\circ$  and  $\sin x = 0.6$ , without evaluating  $x$ , show that  $BC = \sqrt{13} \text{ cm}$ .

You **must** show all your working.

[4]

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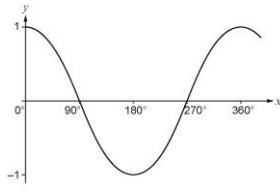
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**END OF QUESTIONS**



## MARK SCHEME

Level 2 Additional Mathematics Unit 3: Geometry and Trigonometry SAMs		Mark	Comments
1(a)	<p>Correct general cosine graph that:</p> <ul style="list-style-type: none"> <li>intersects <math>x</math>-axis <math>(90^\circ, 0)</math> <math>(270^\circ, 0)</math></li> <li>has minimum at <math>180^\circ</math></li> <li>has maximum at <math>0^\circ</math> and <math>360^\circ</math></li> <li>has <math>-1</math> and <math>1</math> indicated on the <math>y</math>-axis</li> </ul> 	B2	<p>Must show a clear curve, not straight at turning points</p> <p>B1 for a cosine graph, allowing straight rather than curves at turning points, that:</p> <ul style="list-style-type: none"> <li>intersects <math>x</math>-axis <math>(90^\circ, 0)</math> <math>(270^\circ, 0)</math></li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>has minimum at <math>180^\circ</math>, and</li> <li>has maximum at <math>0^\circ</math> and <math>360^\circ</math></li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>has <math>-1</math> and <math>1</math> indicated on the <math>y</math>-axis</li> </ul>
1(b)	$(x =) 414.(3\dots^\circ)$	B2	<p>Must be unambiguous</p> <p>Answer space takes precedence</p> <p>B1 for sight of <math>54.(3\dots^\circ)</math></p>
2(a)	Midpoint $AB$ $(1, 5)$	B1	CAO
2(b)	<p>Gradient <math>AB</math> <math>\frac{8-2}{10-8}</math> or equivalent</p> <p><math>\frac{6}{18}</math> or <math>\frac{1}{3}</math> or equivalent</p> <p>Perpendicular gradient <math>-3</math></p>	<p>M1</p> <p>A1</p> <p>B1</p>	<p>Or equivalent</p> <p>CAO. Mark final answer and then FT</p> <p>FT <math>-1</math>/'their gradient' fully simplified</p> <p>B0 for <math>-\frac{18}{6}</math></p>
2(c)	<p><math>5 = -3 \times 1 + c</math> with <math>c = 8</math></p> <p>or <math>y - 5 = -3(x - 1)</math></p> <p><math>y = -3x + 8</math></p>	<p>M1</p> <p>A1</p>	<p>FT 'their midpoint' from (a) AND 'their perpendicular gradient' from (b)</p> <p>CAO</p>
3(a)	<p>Method to find the area of equilateral triangle, e.g.</p> <ul style="list-style-type: none"> <li><math>\frac{1}{2} \times 10^2 \times \sin 60</math></li> <li><math>\frac{1}{2} \times 10 \times \sqrt{10^2 - 5^2}</math></li> </ul> <p>Method to find the area of rhombus, e.g.</p> $2 \times \frac{1}{2} \times 10^2 \times \sin x$ <p>(Total area in <math>\text{cm}^2</math>) <math>25\sqrt{3} + 100 \sin x</math> or <math>43.3(\dots) + 100 \sin x</math></p>	<p>M1</p> <p>M1</p> <p>A2</p>	<p>Allow M1 for area of <math>\frac{1}{2}</math> rhombus, <math>\frac{1}{2} \times 10^2 \times \sin x</math></p> <p>CAO. Mark final answer</p> <p>A1 for any one of the following, provided not from incorrect working:</p> <ul style="list-style-type: none"> <li>(area equilateral triangle) <math>25\sqrt{3}</math> (<math>\text{cm}^2</math>)</li> <li>(area equilateral triangle) <math>43.3(\dots \text{cm}^2)</math></li> <li>(area of rhombus) <math>100 \sin x</math> (<math>\text{cm}^2</math>)</li> <li>(area of <math>\frac{1}{2}</math> rhombus) <math>50 \sin x</math> (<math>\text{cm}^2</math>)</li> </ul>

3(a)	<p>Organisation and communication</p> <p>Writing</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>present their response in a structured way</li> <li>explain to the reader what they are doing at each step of their response</li> <li>lay out their explanations and working in a way that is clear and logical</li> <li>write a conclusion that draws together their results and explains what their answer means.</li> </ul> <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> <li>show all their working</li> <li>use correct mathematical form in their working</li> <li>use appropriate terminology, units, etc.</li> </ul>
3(b)	<p><math>25\sqrt{3}</math> (cm) or 43.3(...) (cm)</p> <p>Reason or condition: states or implies <math>x = 0</math>, e.g.</p> <ul style="list-style-type: none"> <li><math>x = 0</math></li> <li>the area of the rhombus would be zero</li> <li>the only area contained would be that of the equilateral triangle</li> </ul>	<p>B1</p> <p>E1</p>	<p>FT from 'their total area in (a)' with <math>x = 0</math>, provided it is an expression including <math>\sin x</math> and 'their answer' <math>\neq 0</math></p>
4(a)	<p><math>\sin \hat{J}LM = \frac{\sin 28^\circ}{6.4} \times 9.5</math> (= 0.69687...)</p> <p><math>\hat{J}LM = 135.8(2\dots^\circ)</math> or <math>136^\circ</math></p>	<p>M2</p> <p>A2</p>	<p>M1 for one of the following:</p> <ul style="list-style-type: none"> <li><math>\frac{9.5}{\sin \hat{J}LM} = \frac{6.4}{\sin 28^\circ}</math></li> <li><math>\frac{\sin \hat{J}LM}{9.5} = \frac{\sin 28^\circ}{6.4}</math></li> </ul> <p>A1 for <math>44(.176\dots^\circ)</math> or <math>44.2^\circ</math> Allow A1 for <math>44.1^\circ</math></p>
4(b)	<p><math>(\hat{J}KL = 180 - 135.82\dots =) 44(.176\dots^\circ)</math> or <math>(180 - 135.8 =) 44.2^\circ</math></p>	<p>B1</p>	<p>Allow B1 for <math>(180 - 135.82\dots =) 44.1^\circ</math> FT <math>180 -</math> 'their <math>\hat{J}LM</math>' correctly evaluated, provided 'their <math>\hat{J}LM &gt; 90^\circ</math>'</p>
5	<p><math>AB \ y = -\frac{1}{2}x + 4</math> and <math>CD \ y = -\frac{1}{2}x - 1</math></p> <p>or equivalents</p>	<p>B3</p>	<p>Mark final answer</p> <p>B2 for <math>AB \ y = -\frac{1}{2}x + 4</math> or <math>CD \ y = -\frac{1}{2}x - 1</math></p> <p>or equivalent</p> <p>B1 for <math>AB</math> or <math>CD \ y = -\frac{1}{2}x (+ \dots)</math></p> <p>or equivalent</p>

6(a)	<p>(Distance<sup>2</sup> =) <math>(3 - (-1))^2 + (-1 - 2)^2</math> or <math>4^2 + 3^2</math></p> <p>Distance<sup>2</sup> = 25 or (Distance =) <math>\sqrt{25}</math></p> <p>(Distance =) 5 (units)</p> <p>Statement or calculation to show: Radius sum = Distance between centres <math>3 + 2 = 5</math></p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p>	<p>Or equivalent. Allow 1 slip in sign of substitution</p> <p>May be implied</p> <p>CAO</p> <p>Depends on all previous marks</p>
6 (b)	<p>Method to find the equation, for appropriate sight of any one of the following:</p> <ul style="list-style-type: none"> <li>• <math>(x + 1)^2 + (y - 2)^2 = 3^2</math> with a correct expansion of <math>(x + 1)^2</math> or <math>(y - 2)^2</math></li> <li>• <math>(x + 1)^2 + (y - 2)^2 = x^2 + 2x + 1 + y^2 - 4y + 4</math></li> <li>• <math>x^2 + y^2 + 2x - 4y + c = 0</math> and <math>c = (-1)^2 + 2^2 - 3^2</math> (or with <math>c</math> not isolated)</li> </ul> <p style="text-align: center;"><math>x^2 + y^2 + 2x - 4y - 4 = 0</math></p>	<p>M3</p> <p>A1</p>	<p>Allow '- -1' for '+1' and <math>1^2</math> for <math>(-1)^2</math> throughout</p> <p>M2 for appropriate sight of any one of the following:</p> <ul style="list-style-type: none"> <li>• <math>(x + 1)^2 + (y - 2)^2 = d</math> where <math>d</math> is an integer with a correct expansion of <math>(x + 1)^2</math> or <math>(y - 2)^2</math></li> <li>• <math>x^2 + y^2 + ax + by - 4 = 0</math> with <math>a = 2</math> or <math>b = -4</math></li> <li>• <math>x^2 + y^2 + 2x - 4y + c = 0</math> where <math>c</math> is an integer and an attempt to find <math>c</math> involving at least 2 of <math>(-1)^2, 2^2, 3^2</math> in their calculation</li> </ul> <p>M1 for appropriate sight of any one of the following:</p> <ul style="list-style-type: none"> <li>• <math>(x + 1)^2 + (y - 2)^2</math></li> <li>• <math>x^2 + y^2 + 2x + by + c = 0</math> where <math>b</math> and <math>c</math> are integers</li> <li>• <math>x^2 + y^2 + ax - 4y + c = 0</math> where <math>a</math> and <math>c</math> are integers</li> </ul> <p>CAO</p>
7	4 tan $x$	B2	<p>CAO</p> <p>B1 for appropriate sight of <math>\frac{\sin x}{\cos x} = \tan x</math></p>
8	<p><math>\cos^2 x = 1 - 0.6^2 = 0.64</math> <math>\cos x = 0.8</math></p> <p><math>BC^2 = 2^2 + 5^2 - 2 \times 2 \times 5 \times 0.8</math> <math>BC^2 = 13</math> (and <math>BC = \sqrt{13}</math> cm)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p><u>Working must be shown</u> Calculation must be seen</p> <p>Award M1 A1 for working showing use of 3, 4, 5 triangle with <math>\cos x = \frac{4}{5}</math>, or M1 for use of 3, 4, 5 triangle with <math>\sin x = \frac{3}{5}</math></p> <p>FT 'their value for <math>\cos x</math>', provided <math>&lt; 1</math></p> <p>CAO</p>

## How to read the mark scheme

- 'M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- 'm' marks are dependent method marks. They are only given if the relevant previous 'M' mark has been earned.
- 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves
- 'OC' marks are awarded for 'organising and communicating', a strand of OCW (organising, communicating and writing accurately)
- 'W' marks are awarded for 'writing accurately', a strand of OCW (organising, communicating and writing accurately)
- 'SC' marks are awards for special cases
- CAO: correct answer only
- ISW: ignore subsequent working
- FT: follow through

### Mapping grid

Question	Marks	Assessment objective			OCW
		AO1	AO2	AO3	
1(a)	2	2			
1(b)	2		2		
2(a)	1	1			
2(b)	3	3			
2(c)	2	2			
3(a)	6		6		*
3(b)	2			2	
4(a)	4	4			
4(b)	1		1		
5	3			3	
6(a)	4	4			
6(b)	4	4			
7	2	2			
8	4			4	
<b>Total</b>	<b>40</b>	<b>22</b>	<b>9</b>	<b>9</b>	