Name	Date started	Target end date

REVISE
.wales

3.16 — Sine & cosine rules, area = ½ab sin C

Spec 3.7.5, 3.7.6, 3.7.7 — Unit 3 (calculator allowed)

Non-right-angled triangles — the sine rule, the cosine rule, and the area formula $\frac{1}{2}ab\sin C$. Picking the right tool for AAS, SSA, SAS or SSS information. Sourced from legacy WJEC GCSE Mathematics Higher calculator-allowed papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~1 hours 44 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (69 marks across 13 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification. Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed on every question in this pack (Unit 3 is the calculator-allowed paper).

Sine & cosine rules, area = ½ab sin C — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 3: calculator-allowed.

Sine rule 3.7.5

- $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ for non-right-angled triangles.
- Use for AAS / ASA / SSA configurations.
- Be aware of the ambiguous SSA case — sometimes two valid triangles exist.

Cosine rule 3.7.6

- $a^2 = b^2 + c^2 - 2bc\cos A$ for SAS to find a missing side.
- Rearranged form $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ for SSS to find a missing angle.
- Negative cosine result indicates an obtuse angle.

Area = $\frac{1}{2}ab\sin C$ 3.7.7

- Triangle area from two sides and the included angle.
- Quote area in squared units; ensure the calculator is in degrees mode.
- Combine with sine/cosine rules to find missing pieces first if required.

Crib sheet »

Sine & cosine rules, area = ½ab sin C in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Sine rule

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

Each side is opposite its named angle.

Use when you have *two angles and a side* (AAS / ASA) or *two sides and a non-included angle* (SSA).

Sine rule — for a missing angle

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

Flip the ratio when chasing an angle, so the unknown ends up on top.

Take $\sin^{-1}$ on the calculator at the end.

Watch for the obtuse second case in ambiguous SSA situations.

Cosine rule — for a missing side

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

Use when you have *two sides and the included angle* (SAS).

a is opposite the known angle A; b and c are the two sides on either side of A.

Cosine rule — for a missing angle

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

Rearrangement of the cosine rule. Use when you have *three sides* (SSS) and want any angle.

A negative value here means the angle is obtuse.

Area of a triangle

$$\text{Area} = \tfrac{1}{2}\,ab\,\sin C$$

Two sides and the *included* angle. C sits between sides a and b.

Quote area in squared units (cm^2, m^2).

Which rule to use

- AAS / ASA → sine rule.
- SSA → sine rule (check for ambiguous case).
- SAS → cosine rule for the missing side; then $\frac{1}{2}ab\sin C$ for area.
- SSS → cosine rule rearranged for the missing angle.

Worked example

Triangle with $b = 6$, $c = 8$, $A = 60°$ — find a.

$a^2 = 36 + 64 - 2 \cdot 6 \cdot 8\cos 60° = 100 - 48 = 52$.

$a = \sqrt{52} \approx 7.21$.

Area $= \frac{1}{2} \cdot 6 \cdot 8 \sin 60° \approx 20.78\,\text{cm}^2$.

Common traps

- Mismatching side and opposite angle in the sine rule.
- Forgetting the *included* angle requirement for $\frac{1}{2}ab\sin C$ and the cosine rule.
- Rounding sides or angles mid-calculation — keep full precision until the end.
- Missing the obtuse alternative when applying $\sin^{-1}$.

Examiner only

13.

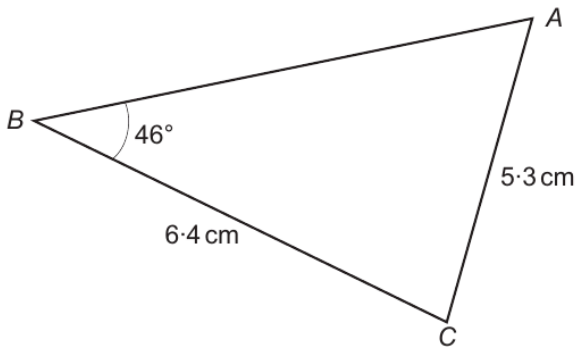

Diagram not drawn to scale

By first calculating the size of $B\hat{A}C$, calculate the area of triangle *ABC*.
You must show all your working. [5]

Examiner only

4. A triangular prism of length 2 metres is shown below.

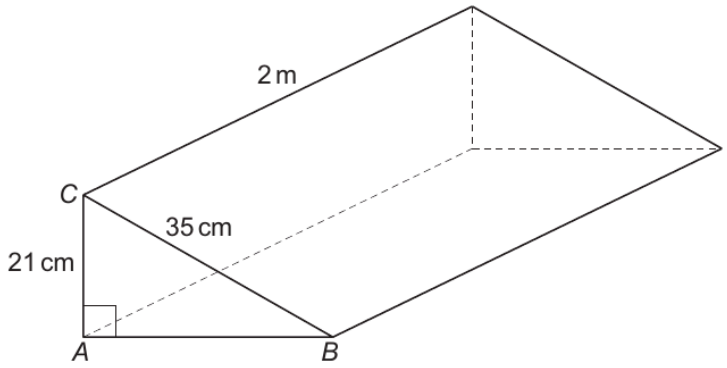

Diagram not drawn to scale

$AC = 21$ cm, $BC = 35$ cm and $B\hat{A}C = 90°$.

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

Calculate the area of triangle ABC.
Give your answer in cm^2.
You must show all your working. [5 + 2 OCW]

Examiner only

(b) Calculate the volume of the prism.
You must give the units of your answer. [3]

Examiner only

17. The diagram below shows two triangles *ABE* and *BCD*, which are constructed from the straight lines *AD* and *EC* crossing at point *B*.
AE = 11 cm, *EB* = 13 cm, *BC* = 10 cm and *BD* = 7 cm.
$E\hat{A}B = 37°$.

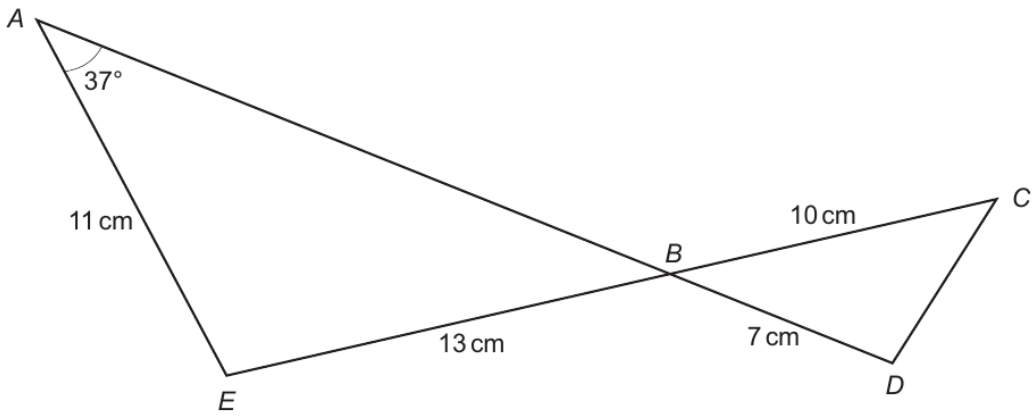

Diagram not drawn to scale.

Calculate the length *CD*. [7]

Examiner only

18. Triangle ABC has sides $AB = 17\,\text{cm}$, $AC = 13\,\text{cm}$ and $BC = 23\,\text{cm}$, as shown below.

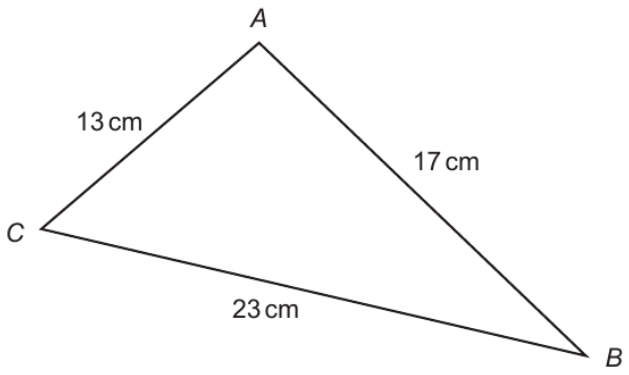

Diagram not drawn to scale

Calculate the size of $\hat{CAB}$. [3]

Examiner only

12. The diagram shows a quadrilateral *DEFG*.

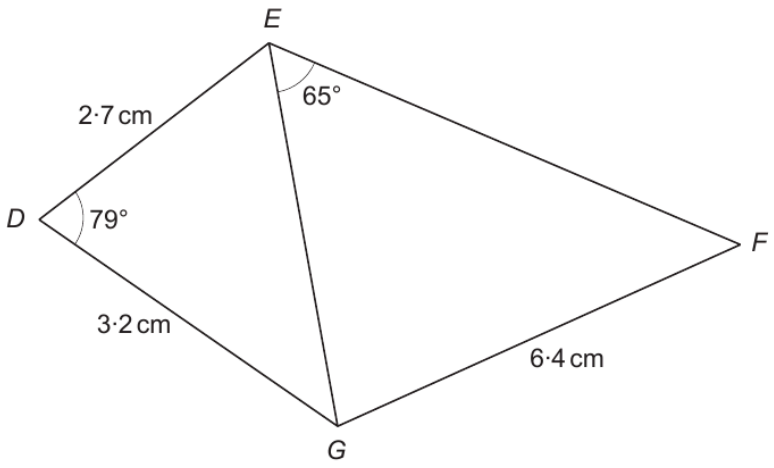

Diagram not drawn to scale

Calculate the size of $\hat{EFG}$. [7]

Examiner only

4. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

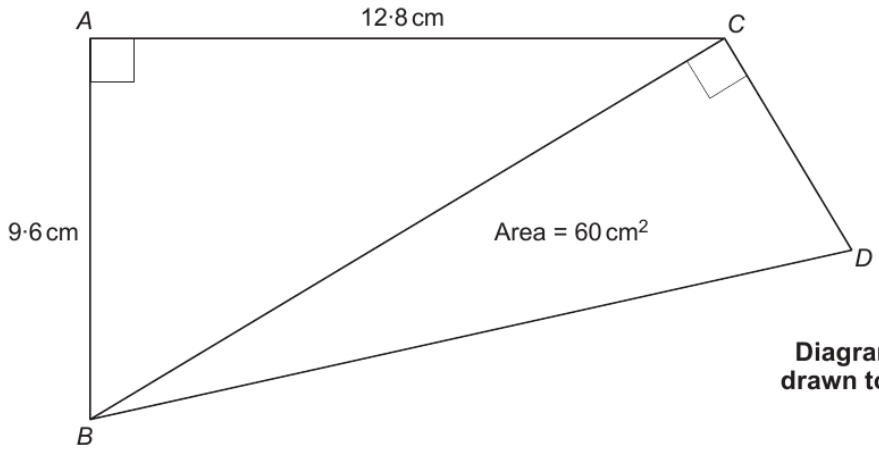

Diagram not drawn to scale

In the diagram above, the area of triangle *BCD* is 60 cm^2.
Calculate the length of *CD*.
You must show all your working. [6 + 2 OCW]

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7. (a) The diagram below shows a right-angled triangle.

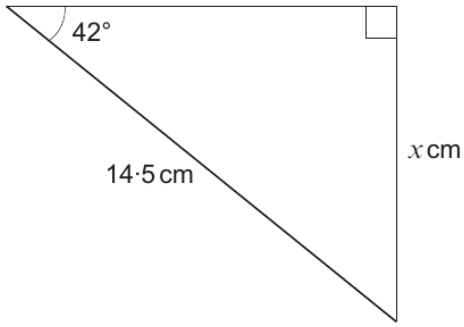

Diagram not drawn to scale

Calculate the value of x. [3]

x = ...

(b) The diagram below shows a different right-angled triangle.

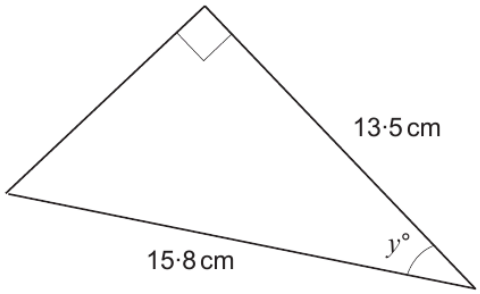

Diagram not drawn to scale

Calculate the value of y. [3]

y = ...

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5. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

The shape below consists of a semicircle attached to one side of a right-angled triangle.
$A\hat{B}C = 90°$, $AB = 8$ cm, $BC = 6$ cm.
BC is the diameter of the semicircle.

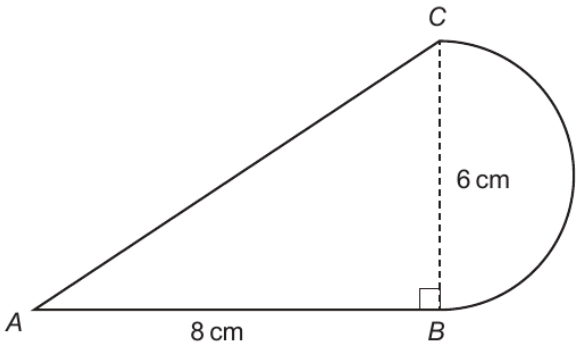

Diagram not drawn to scale

Calculate the perimeter of the shape.
Use $\pi = 3{\cdot}14$.
You must show all your working. [5 + 2 OCW]

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6. In the diagram below, AD is a straight line.

$B\hat{A}C = 90°$, $B\hat{D}E = 90°$ and $C\hat{B}E = 90°$.

$AC = 7{\cdot}7\,\text{cm}$, $BC = 11{\cdot}3\,\text{cm}$ and $BD = 13{\cdot}1\,\text{cm}$.

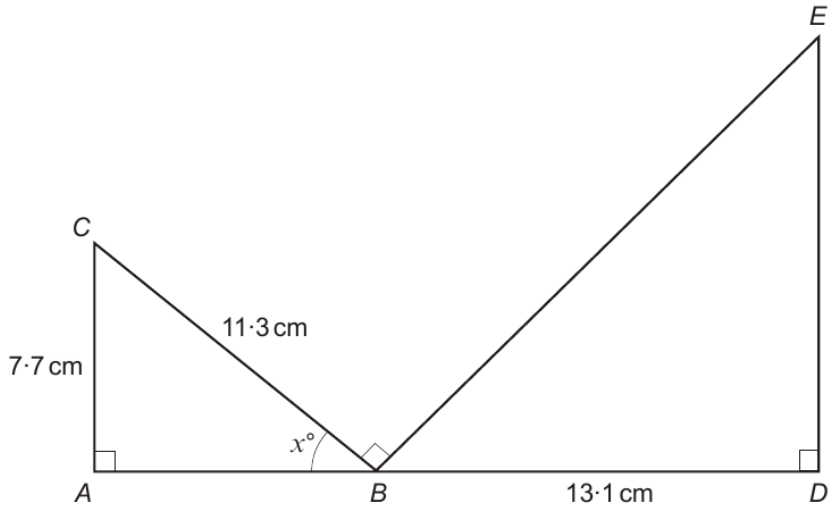

Diagram not drawn to scale

(a) Calculate the value of x. [3]

Examiner only

12. Triangle ABC has sides $AB = 36{\cdot}1$ cm and $AC = 13{\cdot}8$ cm, as shown below.
$B\hat{A}C = 29°$.

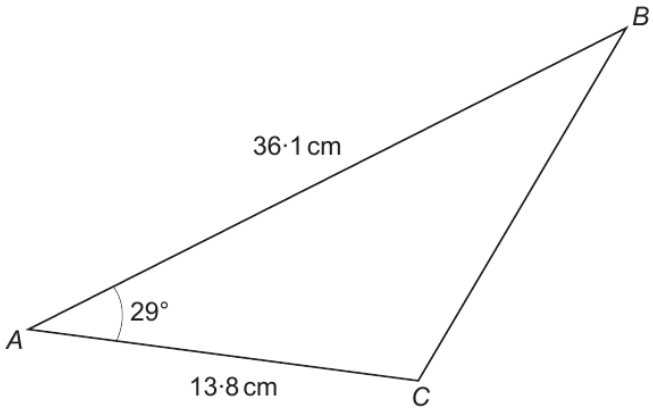

Diagram not drawn to scale

Calculate the length of the side BC. [3]

13. Calculate the cube root of 8×10^{216}.
Circle the correct answer. [1]

2×10^{6} 2×10^{72} 2×10^{216} 8×10^{6} 8×10^{72}

Examiner only

18. The diagram below is a sketch of a **regular** 12-sided polygon, with centre *O*.
The polygon has sides of length 5 cm.
AE and *OE* are straight lines.

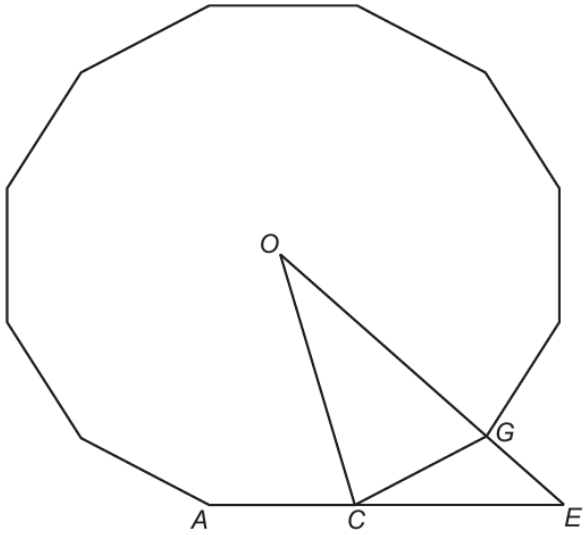

Diagram not drawn to scale

(a) Calculate the length of *CE*.
You must show all your working. [6]

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(b) Hence, calculate the area of triangle *CGE*. [2]

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6. In the diagram below, *ABD* and *BCD* are both right-angled triangles.

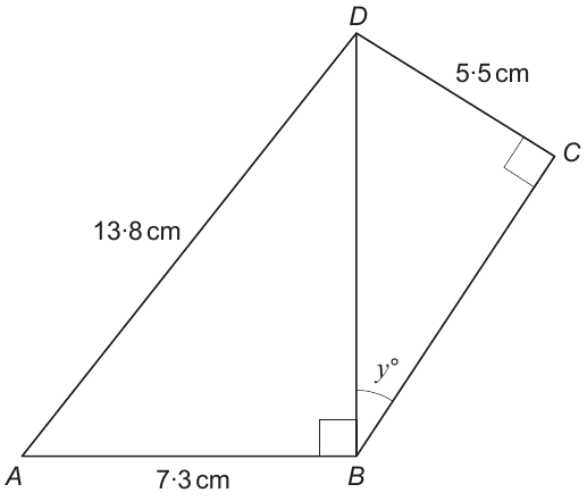

Diagram not drawn to scale

AB = 7·3 cm, *AD* = 13·8 cm and *CD* = 5·5 cm.

Calculate the value of y. [6]

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14. Triangle ABC has sides AB = 24·1 cm and AC = 17·9 cm, as shown below.
$B\hat{A}C = 37°$.

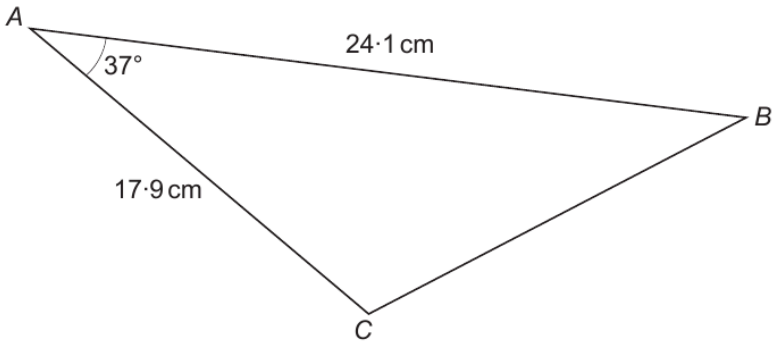

Diagram not drawn to scale

Calculate the area of the triangle ABC. [2]

15. The values e = 7·1, f = 73·9 and g = 65·7 are each given correct to 1 decimal place.

The value of h is found using the formula $h = \dfrac{e}{f - g}$.

Calculate the **greatest** value of h.
Give your answer correct to four decimal places.
You must show all your working. [3]