Name	Date started	Target end date

WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack

Angle reasoning — angles on a line, around a point, in triangles and quadrilaterals, between parallel lines, and inside regular and irregular po

REVISE
.wales

2.16 — Angle facts & polygons

Spec 3.4.1, 3.4.2, 3.4.3 — Unit 2 (no calculator)

Angle reasoning — angles on a line, around a point, in triangles and quadrilaterals, between parallel lines, and inside regular and irregular polygons. Sourced from legacy WJEC GCSE Mathematics / Mathematics-Numeracy Higher non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~2 hours 50 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (113 marks across 24 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 **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

Angle facts & polygons — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Lines & points 3.4.1

- Angles on a straight line sum to 180°.
- Angles around a point sum to 360°.
- Vertically opposite angles are equal.

Parallel lines 3.4.2

- Corresponding (F): equal.
- Alternate (Z): equal.
- Co-interior (C): sum to 180°.

Triangles & quadrilaterals 3.4.2

- Triangle interior angles sum to 180°.
- Quadrilateral interior angles sum to 360°.
- Isosceles triangles: two equal sides imply two equal angles.
- Exterior angle = sum of the two non-adjacent interior angles.

Polygons 3.4.3

- Interior sum $= 180(n-2)^\circ$.
- Exterior sum $= 360^\circ$ for any convex polygon.
- Regular polygon: each exterior $= 360^\circ/n$, each interior $= 180^\circ - 360^\circ/n$.
- Find n from one exterior angle: $n = 360/\text{ext}$.

Crib sheet »

Angle facts & polygons in one page

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

Angles on a line / round a point

$$\text{straight line} = 180^\circ, \text{round a point} = 360^\circ$$

Vertically opposite angles are equal — the 'X' pattern at a crossing.

Parallel lines

Corresponding angles (F-shape) are equal.

Alternate angles (Z-shape) are equal.

Co-interior (C-shape) add to 180°.

Triangles & quadrilaterals

$$\text{triangle} = 180^\circ, \text{quadrilateral} = 360^\circ$$

Isosceles: two sides equal $\Rightarrow$ two base angles equal.

Exterior angle of a triangle = sum of the two opposite interior angles.

Interior angles of a polygon

$$\text{sum} = 180(n-2)^\circ$$

n is the number of sides.

Regular polygon: each interior angle $= 180(n-2)/n$.

Exterior angles

$$\text{sum of exterior angles} = 360^\circ$$

Holds for *any* convex polygon — regular or not.

Regular polygon: each exterior angle $= 360^\circ/n$.

Number of sides from one exterior angle: $n = 360/\text{ext angle}$.

Worked example

Regular hexagon: $n = 6$, interior sum $= 180(6-2) = 720^\circ$, each interior $= 720/6 = 120^\circ$, each exterior $= 360/6 = 60^\circ$.

Proofs & reasoning

State the rule you're using on each step: 'angles on a line', 'co-interior', etc.

For a QER question, lay it out clearly with each conclusion justified.

Common traps

- Using 180° for a quadrilateral instead of 360°.
- Confusing alternate and co-interior on a parallel-line diagram.
- Forgetting that the exterior-angle sum is always 360°, irrespective of n.

Examiner only

3. A regular polygon has exterior angles of 45°.

(a) How many sides does this polygon have? [2]

.....

.....

.....

(b) Each side of this regular polygon is 7 cm.
A sketch of two sides, *AB* and *BC*, of the polygon is shown below.

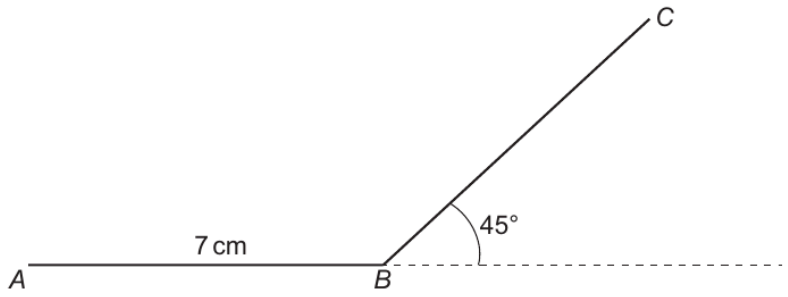


Diagram not drawn to scale

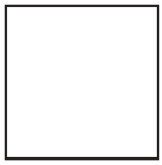
Using only a ruler and a pair of compasses, construct an accurate drawing that shows these **two sides** of the polygon.
The point *A* has been given.
You must show your construction arcs. [4]

A •

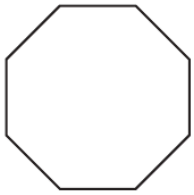
Examiner only

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

Each side of a square is of length $(2x + 3y)$ cm.
The perimeter of the square is 62 cm.



Each side of a regular octagon is of length $(x + 2y)$ cm.
The perimeter of the octagon is 72 cm.



Use an algebraic method to find the value of x and the value of y. [5 + 2 OCW]

x = ... y = ...

Examiner only

10. The shaded part of the diagram below shows the top surface of an engine part.

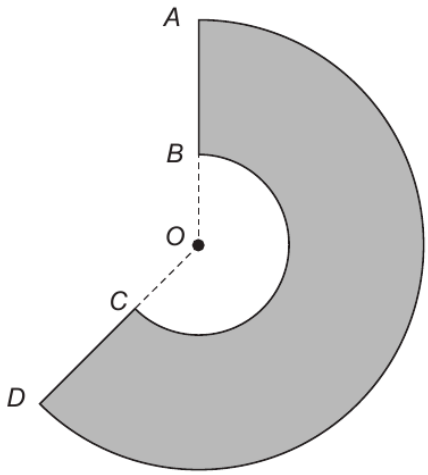


Diagram not drawn to scale

The measurements taken by a motor engineer are:

- reflex angle $B\hat{O}C = 240°$,
- $AO = OD = 6\,\text{cm}$,
- $BO = OC = 3\,\text{cm}$.

(a) The length of the major arc AD is to be sealed by attaching a flexible anti-rust strip.
Each flexible anti-rust strip is of length 35 cm.
What length of the anti-rust strip will be left over after sealing the length of the major arc AD?
Give your answer in terms of π, in its simplest form. [3]

Length of anti-rust strip left over = ... cm

Examiner only

(b) The top surface of the engine part is to be painted.
The paint costs 15p per cm^2.

(i) Calculate the cost of the paint to be used.
Give your answer in terms of π, in its simplest form. [4]

(ii) Using $\pi = 3$, calculate how much it costs to paint the top surface of 20 engine parts.
Give your answer in pounds. [1]

Paint cost is £ .....

END OF PAPER

Examiner only

16. Triangle ABC is an isosceles triangle with $\hat{ABC} = \hat{ACB}$.

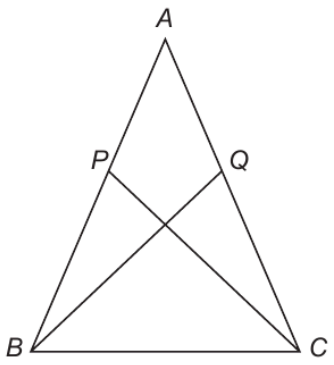


Diagram not drawn to scale

P and Q are points on AB and AC respectively such that $AP = AQ$.

Prove that triangle ABQ is congruent to triangle ACP.
You must give reasons for each step of your proof. [4]

Examiner only

1. *(a)* Calculate $\sqrt{8{\cdot}5^3 + (4{\cdot}5 - 0{\cdot}76)^2}$, correct to 3 significant figures. [2]

(b) Calculate the reciprocal of $-0{\cdot}07$, correct to 1 decimal place. [2]

2. Show that the triangle below is **not** a right-angled triangle. [5]

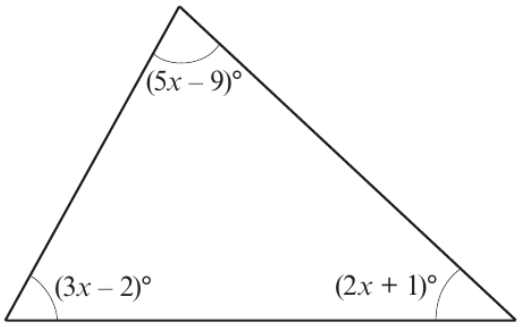


Diagram not drawn to scale

Examiner only

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

The area of triangle *ABD*, shown in the diagram below, is 35 cm^2.
AD = 5 cm and *BC* = 32 cm.
D is on the line *AC*, and *BD* is perpendicular to *AC*.

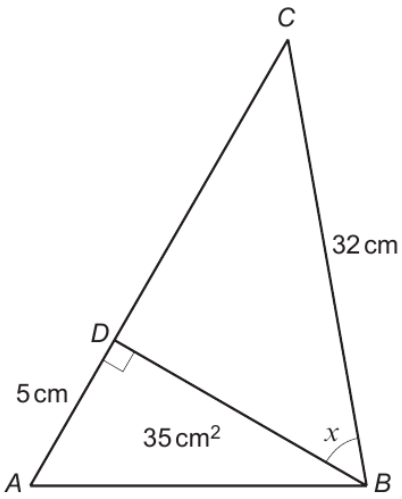


Diagram not drawn to scale

Calculate the size of angle x.
You must show all your working. [5 + 2 OCW]

Examiner only

3. *ABC* is an isosceles triangle with $AB = AC$.

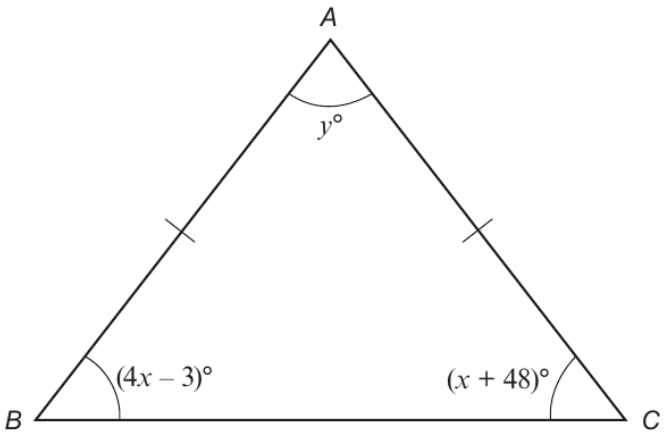


Diagram not drawn to scale

Calculate the value of y. [6]

Examiner only

1. *(a)* Calculate $\dfrac{145{\cdot}3}{(12{\cdot}4 - 9{\cdot}8)^3}$, giving your answer correct to 3 significant figures. [2]

(b) Calculate the reciprocal of 47, giving your answer correct to 4 decimal places. [2]

2. Circle the correct answer in each of the following.

(a) Which of the following values **cannot** be an external angle of a regular polygon? [1]

10° 18° 30° 48° 72°

(b) An arrow on a spinner is facing north.
It is turned clockwise through an angle of 1530°.
In which direction will the arrow now be facing? [1]

North East South West None of these

(c) Point *A* is on a bearing of 100° from point *B*.
What is the bearing of point *B* from point *A*? [1]

260° 100° 280° 180° 80°

Examiner only

7. Calculate the size of angle x in the diagram below. [3]

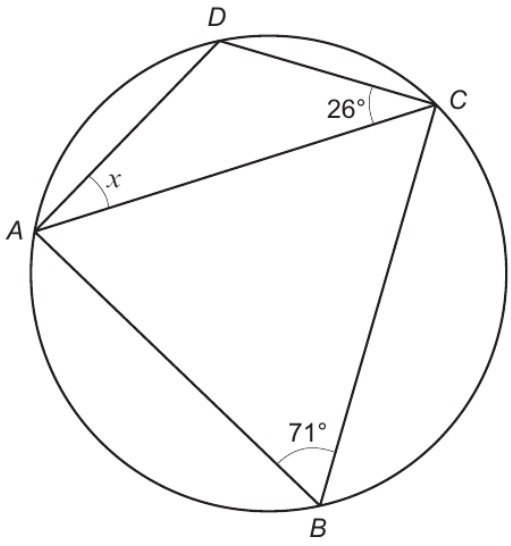


Diagram not drawn to scale

Examiner only

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

In the triangle ABC shown below, $B\hat{A}C = 40°$ and $A\hat{C}B = 80°$.
X is a point on side AC such that $BX = BC$.

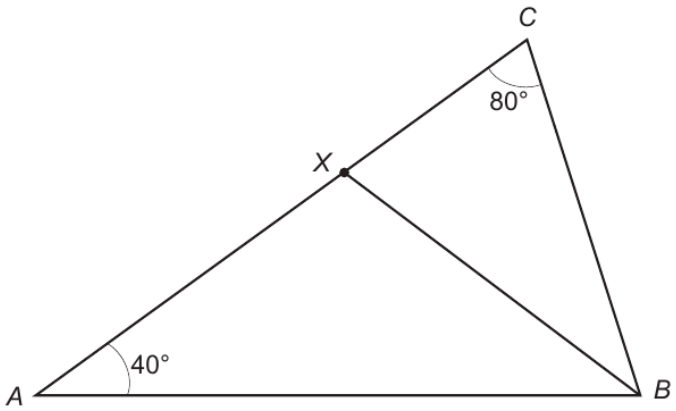


Diagram not drawn to scale

Prove that $AX = BX$.
Give reasons for each step of your proof.
You must show all your working. [5 + 2 OCW]

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Examiner only

2. Yousef has a piece of wallpaper.

He wants to draw some of the leaves to create a different design to screen print.

Diagram not drawn to scale

Yousef draws lines on the wallpaper.
Some of the lines are parallel.
He measures four angles and needs to calculate four more.

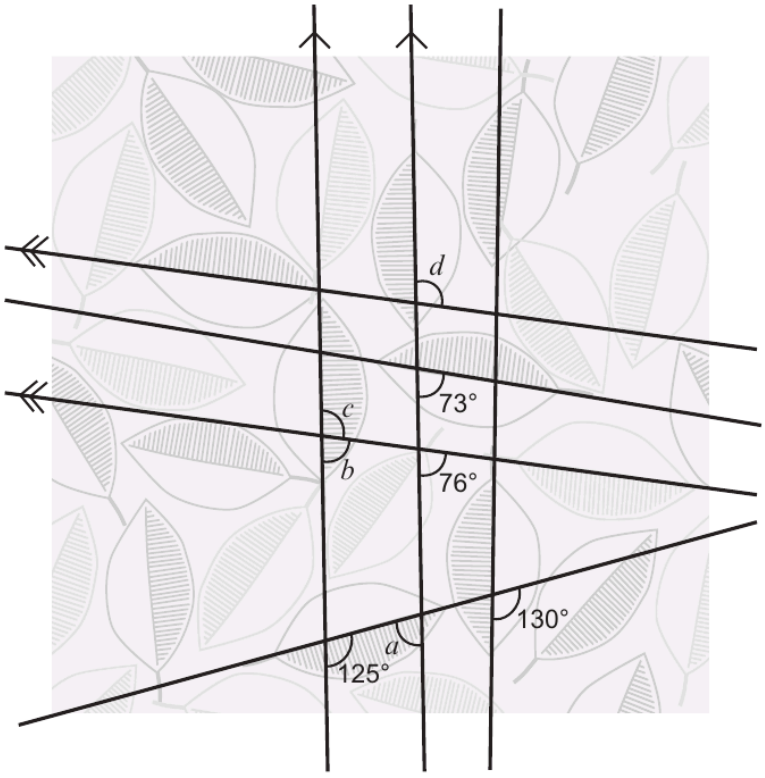

Diagram not drawn to scale

Find the size of each of the angles a, b, c and d. [4]

.....

.....

a = ... ° b = ... ° c = ... ° d = ... °

Examiner only

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

Luned's tent is in the shape of a triangular prism.
The cross-section of her tent is an isosceles triangle.

She noted a few measurements on a diagram of her tent, as shown below.

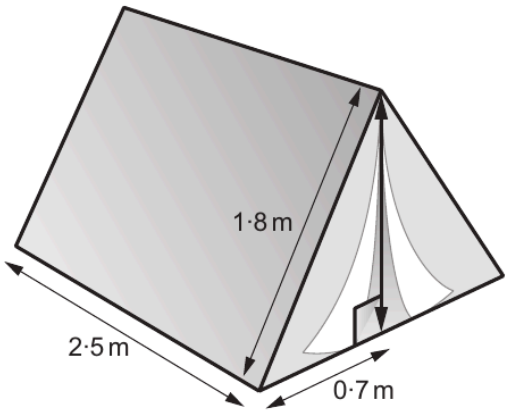

Diagram not drawn to scale

Calculate the volume of Luned's tent.
Give your answer in m^3.
You must show all your working. [5 + 2 OCW]

Volume of Luned's tent is ..... m^3

(b) Which of the following is equal to $0{\cdot}2\,m^3$?
Circle your answer. [1]

$20\,cm^3$ $200\,cm^3$ $2000\,cm^3$ $200\,000\,cm^3$ $2\,000\,000\,cm^3$

Examiner only

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

A **regular** octagon with centre O is shown below.

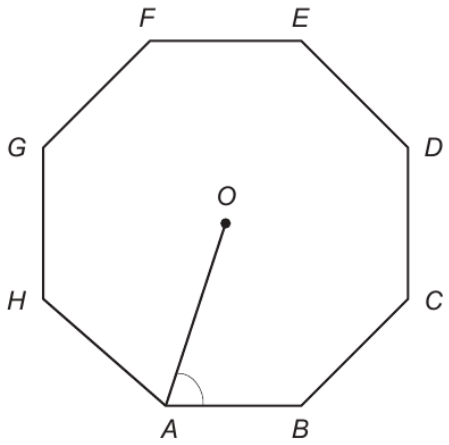

Diagram not drawn to scale

Calculate the exact size of $O\hat{A}B$.
You may choose to draw additional lines on the diagram to help you.
You must show all your working. [4 + 2 OCW]

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Examiner only

3. *(a)* *Sam's Garden Centre* buys trees to sell.

Sam bought 200 trees.
Each tree cost Sam £25.

22% of the trees were not sold.
Sam sold all the other trees for £40 each.

How much profit did Sam make?

You must show all your working. [5]

(b) The trees are planted in identical pots. They each have a uniform cross-section in the shape of a regular hexagon.

Show that these pots will tessellate. [1]

Examiner only

1. The exterior angle of a regular polygon is 36°.

(a) How many sides does the polygon have? [2]

(b) Calculate the sum of all the interior angles of this regular polygon. [2]

Examiner only

6. In the diagram below, *AB*, *BC* and *CD* are three sides of a **regular polygon**.
The polygon has 15 sides.
The length of each side is 8 cm.

The exterior angle of the polygon is $x°$.
BRC is a right-angled triangle.

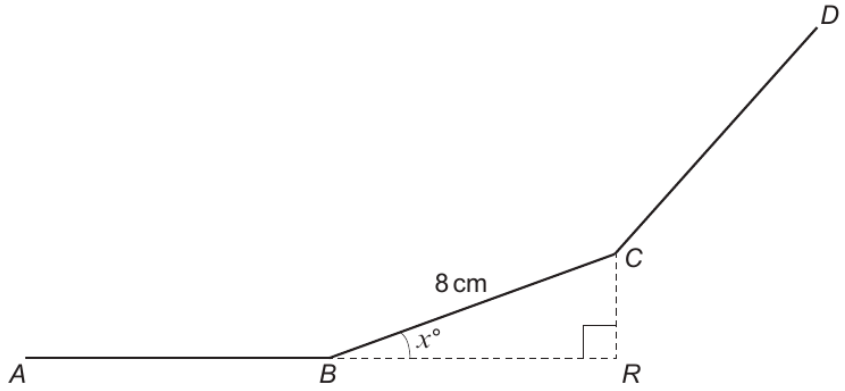

Diagram not drawn to scale

Calculate the length of *BR*. [5]

Examiner only

10. The diagram below shows a circle with centre at point *O*.
A, *B*, *C* and *D* are all points on the circumference of the circle.

AB = 7·5 cm and *BC* = 4·7 cm.

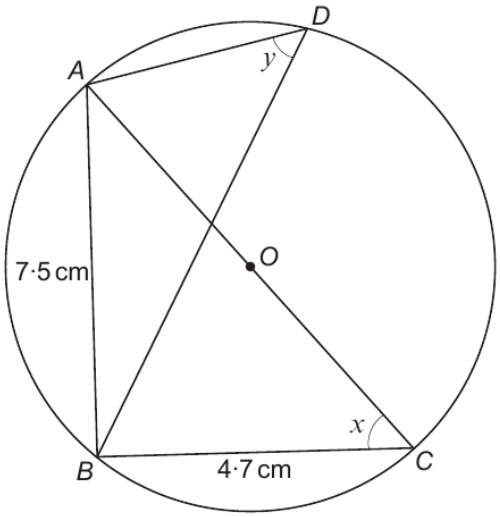

Diagram not drawn to scale

(a) (i) Give the reason why $\hat{ABC}$ is 90°. [1]

(ii) Calculate the size of angle x. [3]

(b) Write down the size of angle y.
State the circle theorem you have used to find your answer. [2]

y = ...

Circle theorem used: .....

Examiner only

4. Show that the triangle below is **not** a right-angled triangle. [5]

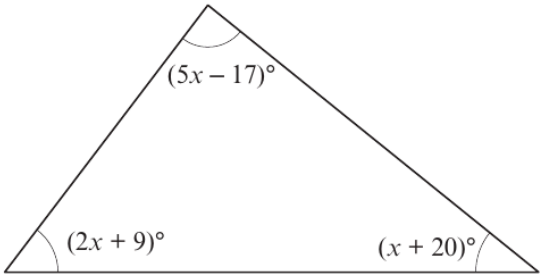

Diagram not drawn to scale

Examiner only

10. *ABCDE* is a regular pentagon with sides of length 11 cm.
CDE is a sector of a circle with centre *D* and radius 11 cm.
The two shapes are joined together, as shown below.

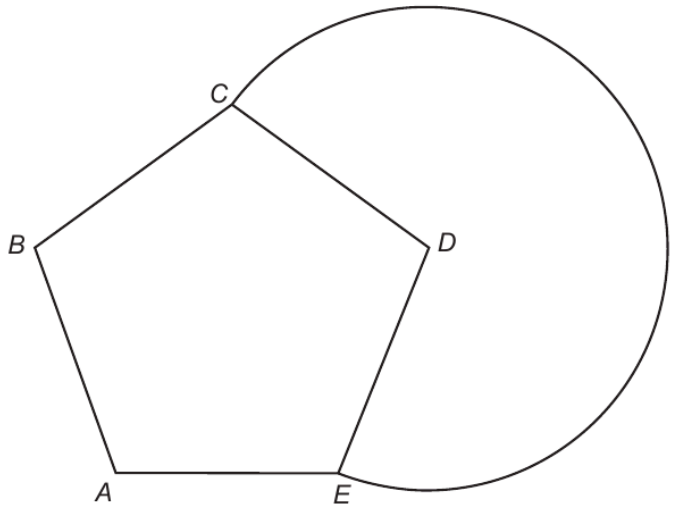

Diagram not drawn to scale

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

Calculate the length of the arc *CE* shown in the diagram.
You must show all your working. [4 + 2 OCW]

Examiner only

1. Rhodri is organising a 21st birthday party.

(a) Confetti for the party is packed in small boxes.
Each box is in the shape of a triangular prism.
The cross-section of each box is an isosceles triangle.
The measurements are shown on the diagram below.

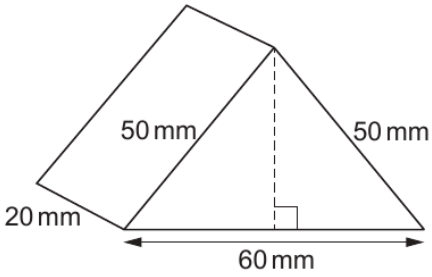

Diagram not drawn to scale

(i) Show that the perpendicular height of the cross-section of a confetti box is 40 mm.
You must show all your working. [3]

(ii) This is the label on a confetti box..

> The volume of this box is at least 20000 mm^3.

Calculate the volume of a confetti box to show that the statement on the label is correct. [3]

Examiner only

20. In the diagram below, $AB = 13\,\text{cm}$, $AD = 17\,\text{cm}$, $BC = 19\,\text{cm}$ and $DC = 11\,\text{cm}$.

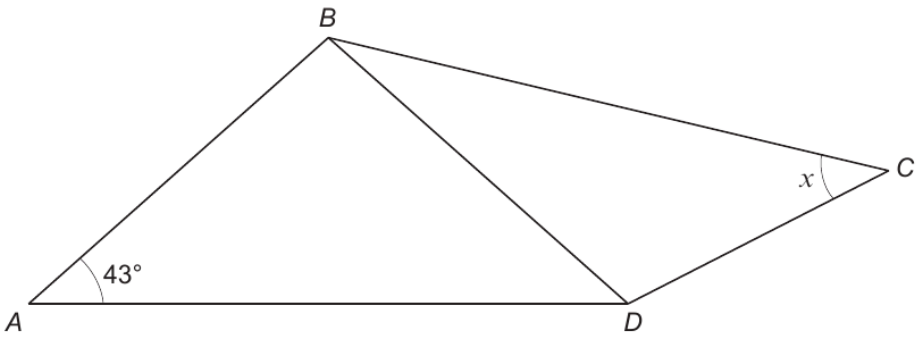

Diagram not drawn to scale

Calculate the size of angle x.
You must show all your working. [6]

END OF PAPER

Examiner only

3. Find five numbers so that:

- their mean is 4·5
- their mode is 3·5.

Write your five numbers in the boxes below. [3]

The five numbers are ☐ ☐ ☐ ☐ ☐

4. The interior angle of a regular polygon is 171°.

How many sides does the polygon have? [3]

Examiner only

20. In the shape shown below, $CD = 6\,\text{cm}$, $CH = 7\,\text{cm}$ and $GH = 5\,\text{cm}$.
$C\hat{G}H = x$.
GH is the radius of the circle with centre G.
CDG is a straight line.

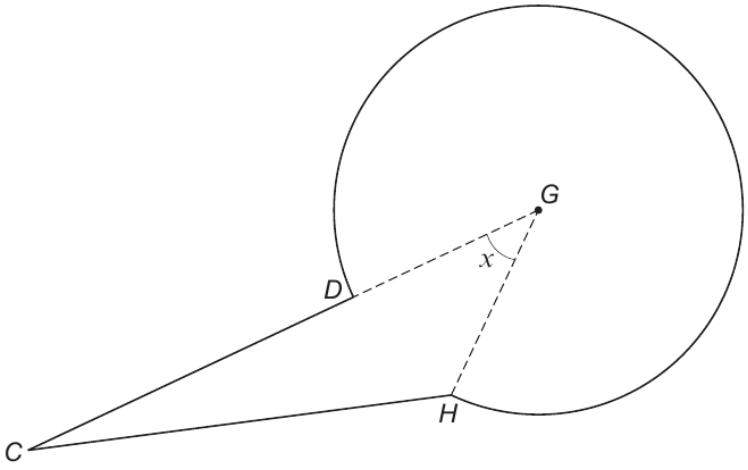

Diagram not drawn to scale

(a) Calculate the size of angle x. [3]

Angle x = ... °

Examiner only

(b) Hence, calculate the total area of the shape. [5]

END OF PAPER