Homework Worksheet

GCSE Year 11 Maths | Previous Year Question Style

Name: _____ Date: _____ Score: _____ / 62

Calculator allowed. Show all your working. Give answers to 3 significant figures unless told otherwise. Diagrams are not drawn accurately.

1 An alloy is made by mixing 150 cm^3 of copper with 100 cm^3 of zinc.
The density of copper is 8.9 g/cm^3. The density of zinc is 7.1 g/cm^3.
Work out the density of the alloy.

Answer ..... **[3 marks]**

2 Car A leaves a town at 09:00 and travels along a straight road at a constant speed of 72 km/h.
Car B leaves the same town at 09:20 and follows car A along the same road at a constant speed of 90 km/h.
At what time does car B catch up with car A?

Answer ..... **[4 marks]**

3 Each interior angle of a regular polygon is 8 times the size of each exterior angle.
Work out the number of sides of the polygon.

Answer ..... **[3 marks]**

4 A ship sails from A to B, a distance of 12 km, on a bearing of 060°.
The ship then sails from B to C, a distance of 9 km, on a bearing of 150°.

(a) Work out the distance AC. **[2 marks]**

Answer .....

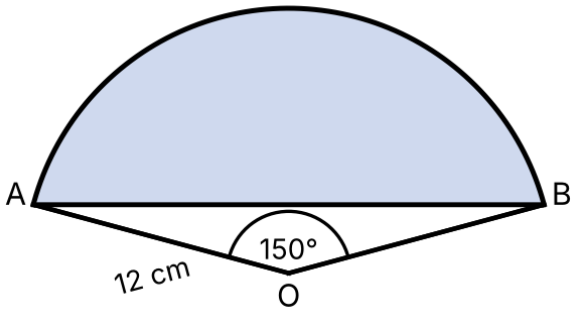
(b) Work out the bearing of C from A. Give your answer to 1 decimal place. **[3 marks]**

Answer .....

5 The perimeter of a rectangle is 38 cm. The area of the rectangle is 84 cm^2.
Work out the length and the width of the rectangle. You must show your working.

Answer ..... **[4 marks]**

6 OAB is a sector of a circle with centre O and radius 12 cm. Angle AOB = 150°.



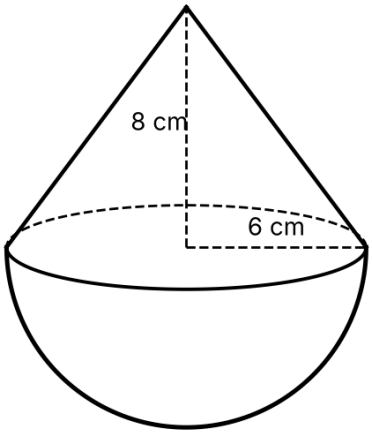
(a) Work out the area of the sector OAB. Give your answer to 3 significant figures. **[2 marks]**

Answer .....

(b) Work out the area of the shaded segment. Give your answer to 3 significant figures. **[3 marks]**

Answer .....

7 The diagram shows a solid made from a cone and a hemisphere. The base of the cone has radius 6 cm and is joined exactly to the flat face of the hemisphere. The perpendicular height of the cone is 8 cm.



(a) Work out the volume of the solid. Give your answer in terms of π. **[3 marks]**

Answer .....

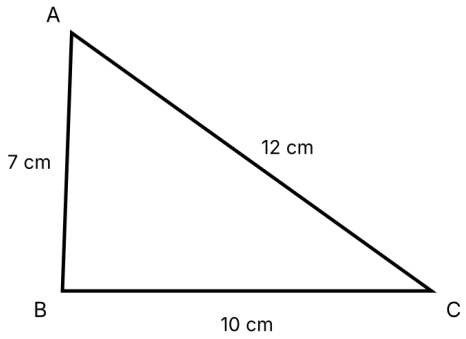
(b) Work out the total surface area of the solid. Give your answer in terms of π. **[3 marks]**

Answer .....

8 ABC is an isosceles triangle with AB = AC = 13 cm and BC = 10 cm.
Work out the area of the triangle.

Answer ..... **[2 marks]**

9 In triangle ABC, AB = 7 cm, BC = 10 cm and AC = 12 cm.



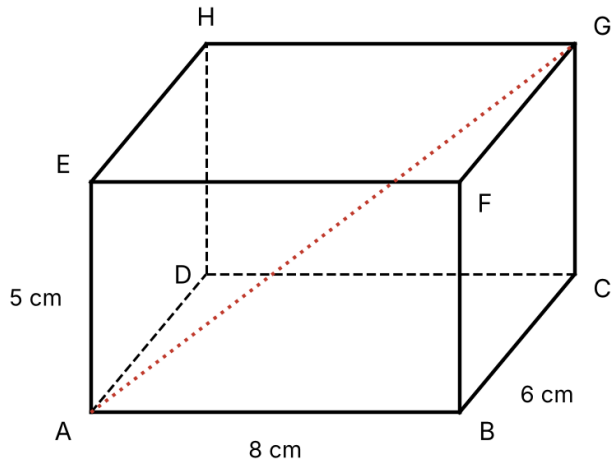
(a) Work out the size of angle ABC. Give your answer to 1 decimal place. **[3 marks]**

Answer .....

(b) Work out the area of triangle ABC. Give your answer to 3 significant figures. **[2 marks]**

Answer .....

10 ABCDEFGH is a cuboid. AB = 8 cm, BC = 6 cm and AE = 5 cm.



(a) Work out the length of AG. Give your answer to 3 significant figures. **[3 marks]**

Answer .....

(b) Work out the size of the angle between AG and the base ABCD. Give your answer to 1 decimal place. **[3 marks]**

Answer .....

11 Bottle A and bottle B are mathematically similar. The height of bottle A is 12 cm. The height of bottle B is 18 cm.
The surface area of bottle A is 160 cm^2.

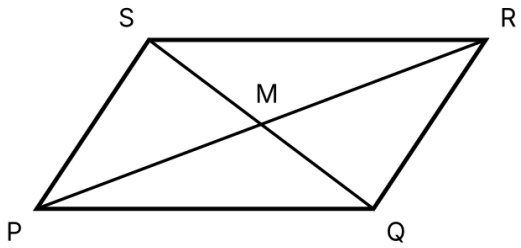
(a) Work out the surface area of bottle B. **[2 marks]**

Answer .....

(b) Bottle B holds 810 ml of water. Work out how much water bottle A holds. **[2 marks]**

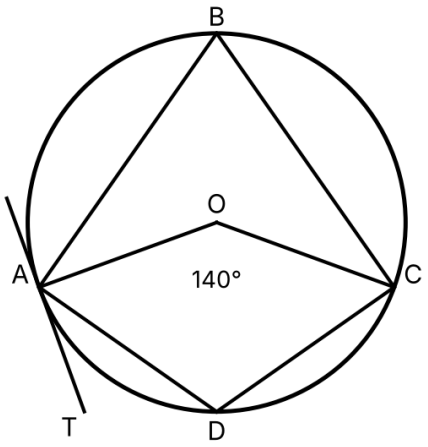
Answer .....

12 PQRS is a parallelogram. The diagonals PR and QS meet at M.
Prove that triangle PMQ is congruent to triangle RMS.



Answer ..... **[4 marks]**

13 A, B, C and D are points on a circle with centre O. The line AT is a tangent to the circle at A. Angle AOC = 140°.



(a) Work out the size of angle ABC. Give a reason for your answer. **[2 marks]**

Answer .....

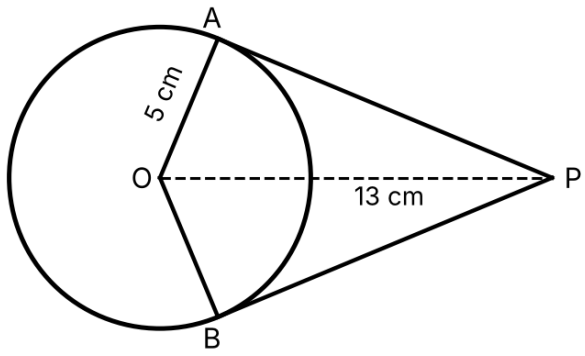
(b) Work out the size of angle ADC. Give a reason for your answer. **[2 marks]**

Answer .....

(c) Work out the size of angle TAC. Give a reason for your answer. **[2 marks]**

Answer .....

14 The diagram shows a circle with centre O and radius 5 cm. PA and PB are tangents to the circle at A and B. OP = 13 cm.



(a) Work out the length of PA. **[2 marks]**

Answer .....

(b) Work out the size of angle APB. Give your answer to 1 decimal place. **[3 marks]**

Answer .....

Answers and Mark Scheme

GCSE Year 11 Maths | Homework Worksheet

How to read the mark scheme

- **M1 (method mark):** given for using a correct method, even if there is an arithmetic slip. For example, writing 2045 ÷ 250 earns the method mark even if the final number is wrong.
- **A1 (accuracy mark):** given for a correct answer, but only if the method mark before it was earned. A right answer from a wrong method gets no A1.
- **B1 (independent mark):** given for a correct fact, value or reason that does not depend on a method, for example "angle ABC = 70°" or a circle theorem stated correctly.
- **C1 (communication mark):** given for a clear concluding statement in a proof or explanation, for example "so the triangles are congruent (ASA)".
- The number after the letter is how many marks it is worth. "M1 M1" means two separate method marks. In a 3-mark question marked M1 M1 A1, a student with the right method but a wrong final answer still scores 2 out of 3.
- Answers in **bold** are the final answers that must be seen. Always show every step of the working: a bare answer with no working can score 0 on a multi-mark question, even when it is correct.

Total: 62 marks.

Question 1 — 3 marks

Mass of copper = 150 × 8.9 = 1335 g and mass of zinc = 100 × 7.1 = 710 g (M1 M1)
Total mass 2045 g, total volume 250 cm^3
Density = 2045 ÷ 250 = **8.18 g/cm^3** (A1)

Examiner tip: A common wrong answer is the mean of the two densities (8.0). The volumes are different, so the mean is not valid.

Question 2 — 4 marks

Distance car A has travelled by 09:20 = 72 × ⅓ = 24 km (M1)
Car B gains 90 − 72 = 18 km each hour (M1)
Time to close the gap = 24 ÷ 18 = 4/3 h = 1 h 20 min (M1)
Time = 09:20 + 1 h 20 min = **10:40** (A1)
Check: by 10:40 each car has travelled 120 km.

Question 3 — 3 marks

Interior + exterior = 180° so 9 × exterior = 180° (M1)
Exterior angle = 20° (A1)
360 ÷ 20 = **18 sides** (A1)

Question 4 — 5 marks

(a) Work out the distance AC. *[2]*
Angle ABC = 90° because the bearing changes from 060° to 150° (back bearing from B is 240°, 240° − 150° = 90°) (M1)
AC = $\sqrt{(12^2 + 9^2)}$ = **15 km** (A1)

(b) Work out the bearing of C from A. Give your answer to 1 decimal place. *[3]*
Angle BAC = $\tan^{-1}(9/12)$ = 36.87° (M1 A1)
Bearing = 60° + 36.87° = **096.9°** (A1)

Examiner tip: Draw a North line at A and at B before you start. Bearings need three figures, so write 096.9°.

Question 5 — 4 marks

Let width = x, then length = 19 − x (M1)
$x(19 - x) = 84$ so $x^2 - 19x + 84 = 0$ (M1)
$(x - 7)(x - 12) = 0$ (M1)
Length **12 cm** and width **7 cm** (A1)
Check: 2(12 + 7) = 38 and 12 × 7 = 84.

Examiner tip: Half the perimeter (19) is the sum of length and width. Setting this up first avoids simultaneous equations.

Question 6 — 5 marks

(a) Work out the area of the sector OAB. Give your answer to 3 significant figures. *[2]*
$150/360 \times \pi \times 12^2$ (M1)
60π = **188 cm^2** (A1)

(b) Work out the area of the shaded segment. Give your answer to 3 significant figures. *[3]*
Area of triangle OAB = ½ × 12 × 12 × sin 150° = 36 (M1 A1)
Segment = $60\pi - 36 = 152.5$ = **152 cm^2** (A1)
(accept 152 or 153 for 152.496…)

Examiner tip: Segment = sector − triangle. The triangle is not right-angled, so use ½ab sin C.

Question 7 — 6 marks

(a) Work out the volume of the solid. Give your answer in terms of π. *[3]*
Hemisphere: ⅔ × π × 6^3 = 144π (M1)
Cone: ⅓ × π × 6^2 × 8 = 96π (M1)
Total volume = **240π cm^3** (A1)

(b) Work out the total surface area of the solid. Give your answer in terms of π. *[3]*
Slant height = $\sqrt{(6^2 + 8^2)}$ = 10 cm (B1)
Cone curved area = π × 6 × 10 = 60π and hemisphere curved area = $2\pi \times 6^2$ = 72π (M1)
Total = **132π cm^2** (A1)

Examiner tip: The joined faces are inside the solid, so do not include the circular base of the cone or the flat face of the hemisphere.

Question 8 — 2 marks

Perpendicular height = $\sqrt{(13^2 - 5^2)}$ = 12 cm (M1)
Area = ½ × 10 × 12 = **60 cm^2** (A1)

Question 9 — 5 marks

(a) Work out the size of angle ABC. Give your answer to 1 decimal place. *[3]*
cos B = (7^2 + 10^2 − 12^2) ÷ (2 × 7 × 10) (M1)
cos B = 5/140 (A1)
B = **88.0°** (A1)

(b) Work out the area of triangle ABC. Give your answer to 3 significant figures. *[2]*
½ × 7 × 10 × sin 87.95° (M1)
35.0 cm^2 (A1)

Examiner tip: Use the unrounded value of B (87.95…°) in part (b).

Question 10 — 6 marks

(a) Work out the length of AG. Give your answer to 3 significant figures. *[3]*
$AC^2 = 8^2 + 6^2 = 100$, so AC = 10 (M1)
$AG^2 = 10^2 + 5^2 = 125$ (M1)
AG = **11.2 cm** (A1)

(b) Work out the size of the angle between AG and the base ABCD. Give your answer to 1 decimal place. *[3]*
The angle is GAC (B1)
tan GAC = 5/10 (M1)
GAC = **26.6°** (A1)

Examiner tip: Always draw the right-angled triangle you are using, with the base diagonal AC as one side.

Question 11 — 4 marks

(a) Work out the surface area of bottle B. *[2]*
Length scale factor = 18/12 = 1.5, area scale factor = 2.25 (M1)
160 × 2.25 = **360 cm^2** (A1)

(b) Bottle B holds 810 ml of water. Work out how much water bottle A holds. *[2]*
Volume scale factor = 1.5^3 = 3.375 (M1)
810 ÷ 3.375 = **240 ml** (A1)

Examiner tip: In (b) go from the larger bottle to the smaller one, so divide by the volume scale factor.

Question 12 — 4 marks

PQ = SR because opposite sides of a parallelogram are equal (B1)
Angle MPQ = angle MRS (alternate angles, PQ parallel to SR) (B1)
Angle MQP = angle MSR (alternate angles, PQ parallel to SR) (B1)
So triangles PMQ and RMS are congruent (ASA) (C1)

Examiner tip: Every statement needs a reason in brackets. Name the congruence condition (ASA) at the end.

Question 13 — 6 marks

(a) Work out the size of angle ABC. Give a reason for your answer. *[2]*
Angle ABC = 140 ÷ 2 = **70°** (B1)
The angle at the centre is twice the angle at the circumference (B1)

(b) Work out the size of angle ADC. Give a reason for your answer. *[2]*
Angle ADC = 180 − 70 = **110°** (B1)
Opposite angles of a cyclic quadrilateral add up to 180° (B1)

(c) Work out the size of angle TAC. Give a reason for your answer. *[2]*
Angle TAC = **70°** (B1)
Alternate segment theorem (B1). Accept the full method: angle OAC = 20° and the tangent is perpendicular to the radius, so 90° − 20° = 70°.

Examiner tip: The wording of the reason must be the full circle theorem. "Angle at the centre" on its own does not score.

Question 14 — 5 marks

(a) Work out the length of PA. *[2]*

Angle OAP = 90° (tangent is perpendicular to the radius) (M1)

PA = $\sqrt{(13^2 - 5^2)}$ = **12 cm** (A1)

(b) Work out the size of angle APB. Give your answer to 1 decimal place. *[3]*

Angle APO = $\sin^{-1}(5/13)$ (M1 A1) = 22.62°

OP bisects angle APB (tangents from a point are equal), so APB = 2 × 22.62° = **45.2°** (A1)

Examiner tip: Do not round 22.62° before doubling. 2 × 22.6 = 45.2 happens to work here, but rounding early can lose the mark.