Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
November 2013

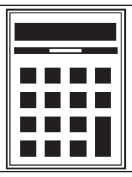
Mathematics 43603H

Unit 3

Monday 11 November 2013 9.00 am to 10.30 am

H

For this paper you must have:
- a calculator
- mathematical instruments.



Time allowed
- 1 hour 30 minutes

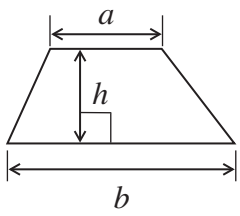
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- The quality of your written communication is specifically assessed in Questions 4, 7 and 9. These questions are indicated with an asterisk (*).
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.

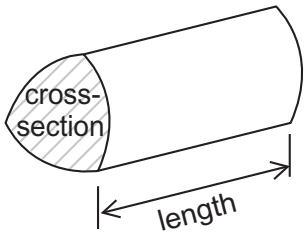
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

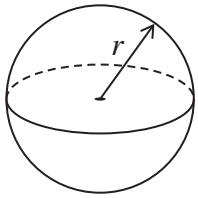


Volume of prism = area of cross-section × length



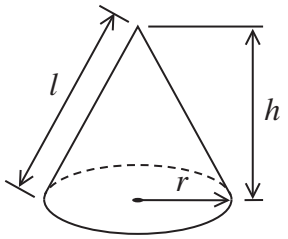
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

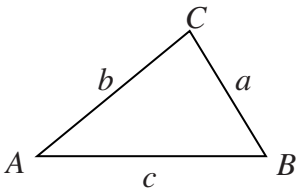
Curved surface area of cone = $\pi r l$



In any triangle ABC

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

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



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

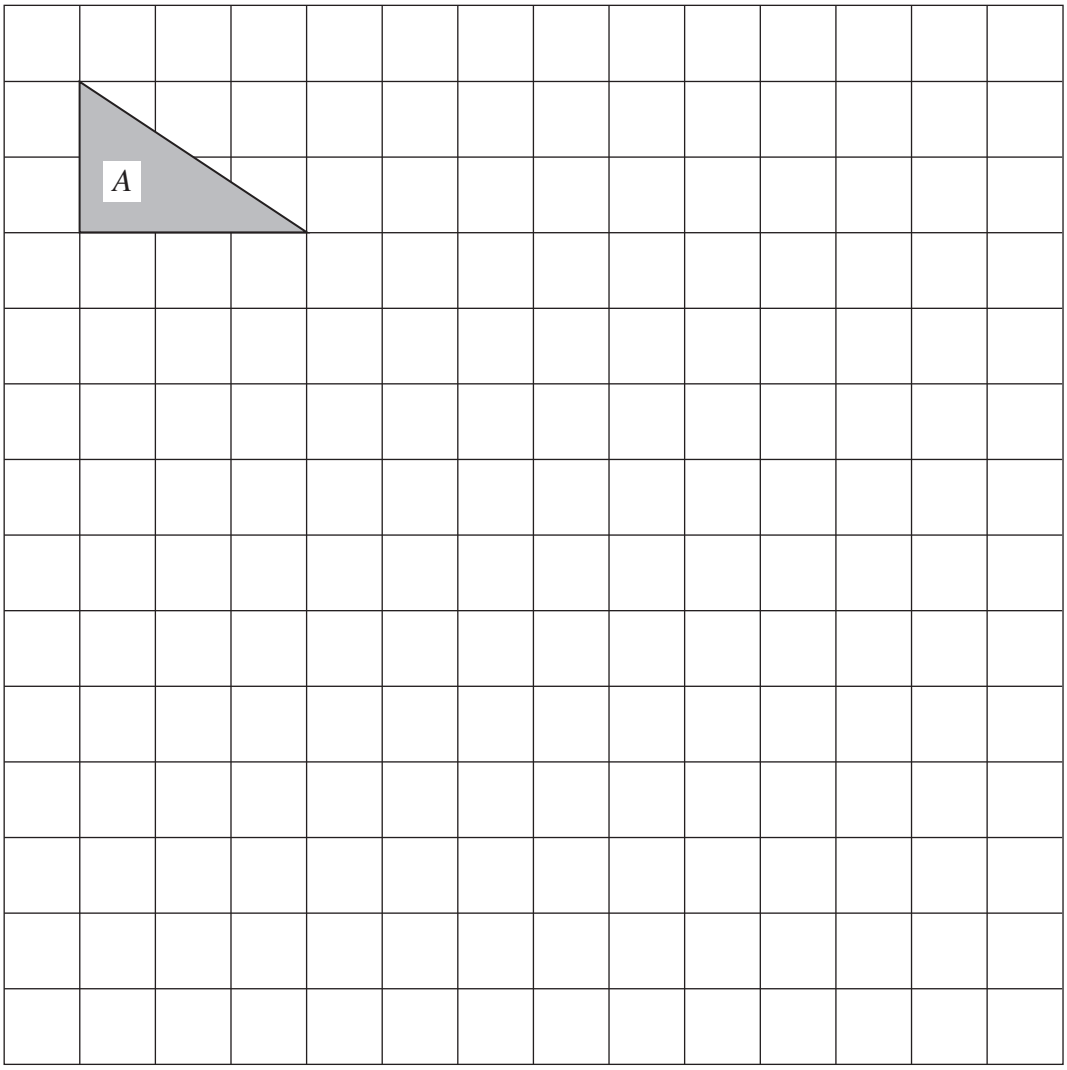
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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

1 Shape A on the centimetre grid is enlarged by scale factor 3.



Work out the area of the enlargement.

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Answer ..... cm^2 *(3 marks)*

3

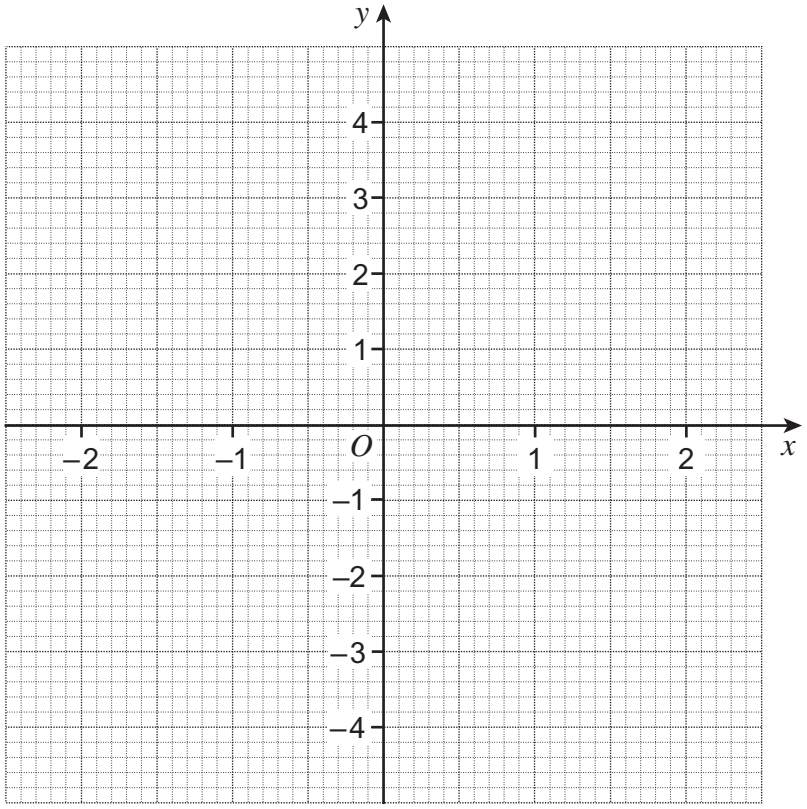
Turn over ▶

2 (a) Complete the table of values for $y = x^2$

x	–2	–1	0	1	2
y	4			1	

(2 marks)

2 (b) On the grid, draw the graph of $y = x^2$ for values of x from –2 to 2.

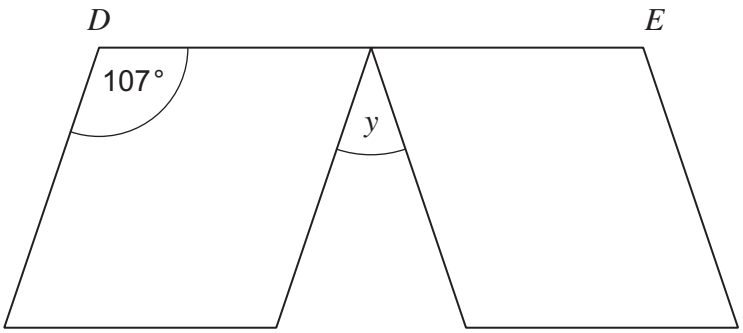


(2 marks)

2 (c) On the same grid, draw the graph of $y = x^2 - 3$ for values of x from –2 to 2.

(2 marks)

3 A rhombus is reflected as shown.
DE is a straight line.



Not drawn accurately

Work out the size of angle y.
Show your working, which may be on the diagram.

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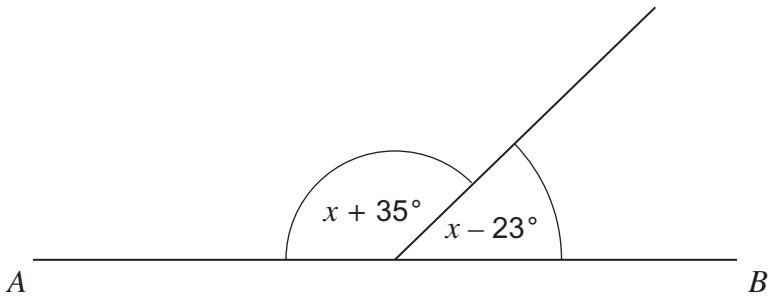
Answer ..... degrees *(3 marks)*

Turn over for the next question

9

***4** AB is a straight line.

Not drawn accurately



Set up and solve an equation to work out the size of the obtuse angle.

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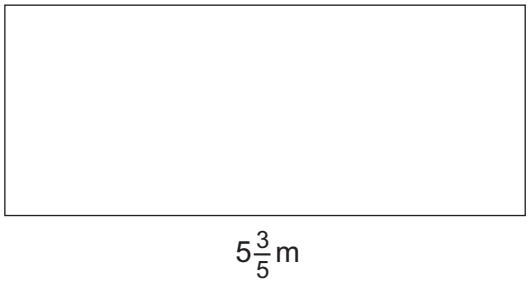
Answer ..... degrees *(4 marks)*

5 Use a calculator to work out the perimeter of the rectangle.



Not drawn accurately

Give your answer as a mixed fraction.

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Answer ..... m *(2 marks)*

6 The scale on a map is 1 : 500 000

Two towns are 8 cm apart on the map.

Work out the actual distance between the towns.
Give your answer in kilometres.

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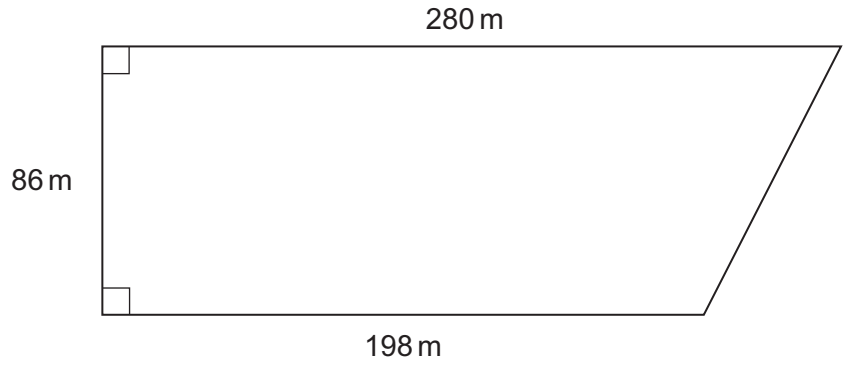
Answer ..... km *(3 marks)*

9

7 The diagram shows a field.

Not drawn accurately



7 (a) Work out the area of the field.

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Answer ..... m^2 *(2 marks)*

***7 (b)** 1 acre = 4047 square metres

A farmer keeps cows in the field.
He is allowed 7 cows per acre.

Work out the maximum number of cows he is allowed to put in the field.

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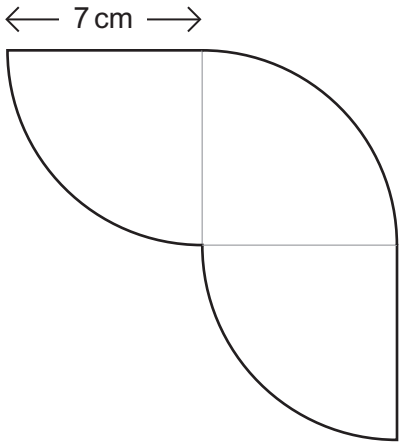
Answer ..... *(4 marks)*

8 This shape is made from identical quarter circles.



Not drawn accurately

Work out the perimeter of the shape.

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Answer ..... cm *(4 marks)*

Turn over for the next question

10

***9** Use trial and improvement to find a solution to the equation

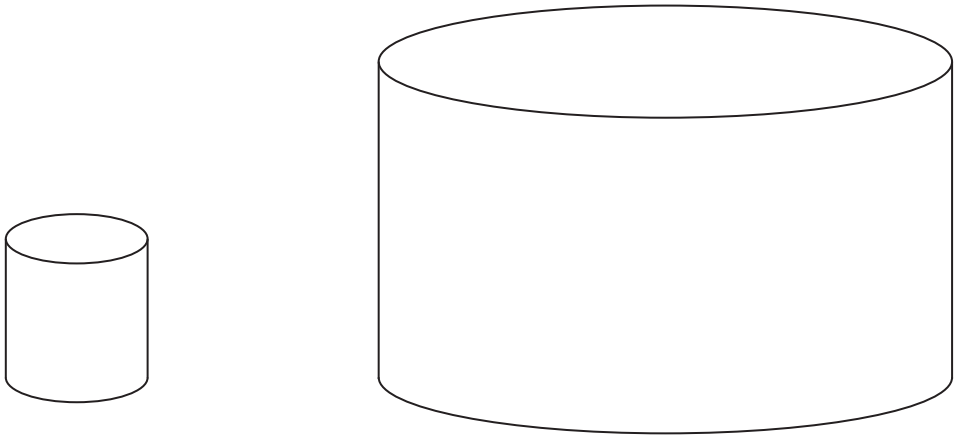
$$x^3 + x = 25$$

The first step is shown in the table.
Give your solution to 1 decimal place.

x	$x^3 + x$	**Comment**
2	10	Too small

x = ... *(4 marks)*

10 The diagram shows two cylinders.



radius 4 cm
height 9 cm

radius 10 cm
height 36 cm

How many times bigger is the volume of the large cylinder than the small cylinder?
You **must** show your working.

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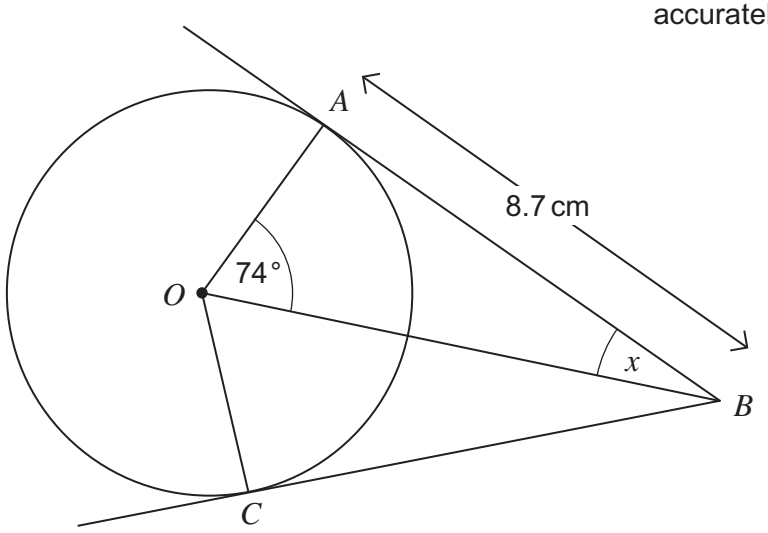
Answer ..... *(4 marks)*

8

11 The diagram shows a circle centre O.

A and C are points on the circumference.
AB and CB are tangents.

Not drawn accurately



11 (a) Work out the size of angle x.

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Answer ..... degrees *(2 marks)*

11 (b) Write down the length of BC.
Give a reason for your answer.

Answer ..... cm

Reason .....

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(1 mark)

11 (c) Work out the radius of the circle.

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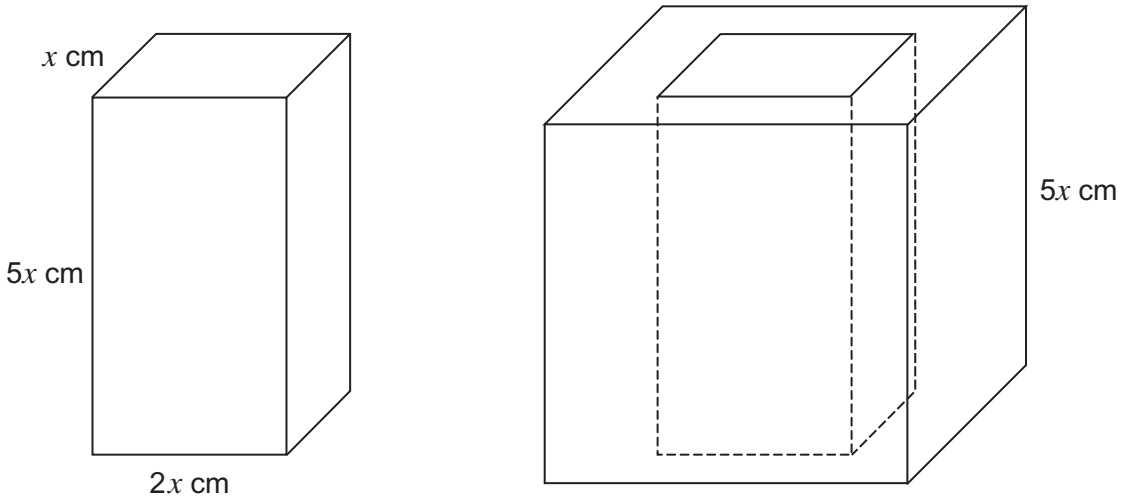
Answer ..... cm *(3 marks)*

Turn over for the next question

6

12 The cuboid has been cut out of the wooden cube as shown.



12 (a) Show clearly why the volume of wood remaining, in cubic centimetres, is $115x^3$.

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(3 marks)

12 (b) You are given that $x = 3.5$

Work out the volume of wood remaining.

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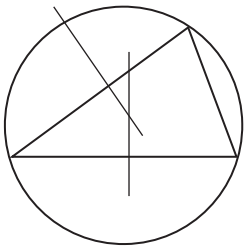
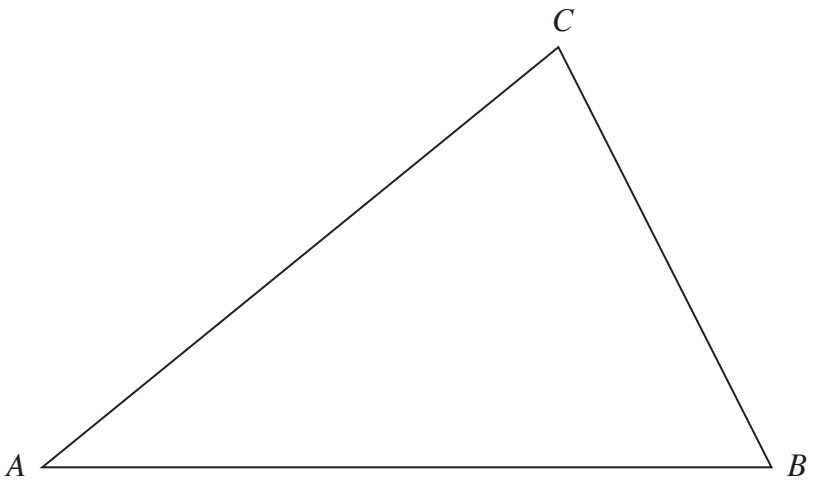
Answer ..... cm^3 *(2 marks)*

13 Use these steps to construct a circle passing through the vertices of the triangle ABC.



- Construct the perpendicular bisector of AB.
- Construct the perpendicular bisector of AC.
- Use the point of intersection of the bisectors as the centre of the circle.
- Draw the circle through A, B and C.

Show your construction arcs clearly.



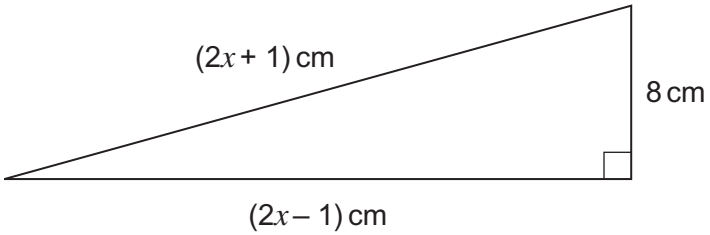
(4 marks)

9

Turn over ▶

14 Work out the value of x.

Not drawn accurately



You **must** show your working.

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x = ... *(5 marks)*

15 y is **inversely** proportional to x.

When $y = 5$, $x = 9$

15 (a) Work out an equation connecting y and x.

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Answer ..... *(3 marks)*

15 (b) Work out the value of y when $x = 15$

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Answer ..... *(2 marks)*

Turn over for the next question

10

16 Three items were bought at a car boot sale.

Item A	Item B	Item C
Mass = 9.5 grams Volume = 2 cm^3	Mass = 57 grams Volume = 3 cm^3	Mass = 76 grams Volume = 4 cm^3

The density of gold is **approximately** 19 grams per cm^3.

Which item or items **cannot** be gold?
You **must** show your working.

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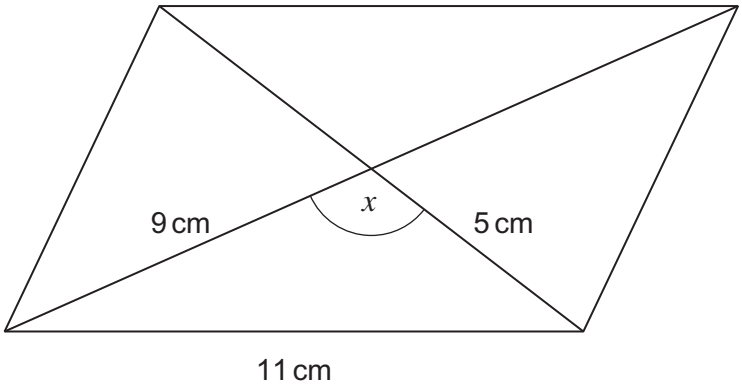
Answer ..... *(4 marks)*

17 The diagram shows a parallelogram.



17 (a) Work out the size of angle x.

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Answer ..... degrees *(3 marks)*

17 (b) Work out the area of the parallelogram.

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Answer ..... cm^2 *(3 marks)*

Turn over for the next question

10

18 A car and a lorry complete the same 240 mile journey without stopping.

The average speed of the car is x mph.
The average speed of the lorry is 12 mph slower than the car.

The lorry takes 1 hour longer than the car.

Use an algebraic method to work out the average speed of the car.

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Answer ..... mph *(6 marks)*

END OF QUESTIONS