OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

APPLICATIONS OF MATHEMATICS

Applications of Mathematics 1 (Higher Tier)

A381/02

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
* Scientific or graphical calculator
* Geometrical instruments
* Tracing paper (optional)

**Monday 6 June 2011
Afternoon**

Duration: 1 hour 15 minutes

A38102

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

* Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
* Use black ink. Pencil may be used for graphs and diagrams only.
* Read each question carefully. Make sure you know what you have to do before starting your answer.
* Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
* Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
* Answer **all** the questions.
* Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

* The number of marks is given in brackets **[ ]** at the end of each question or part question.
* Your Quality of Written Communication is assessed in questions marked with an asterisk (*****).
* The total number of marks for this paper is **60**.
* This document consists of **16** pages. Any blank pages are indicated.

You are permitted
to use a calculator
for this paper
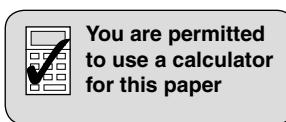
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Turn over

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$
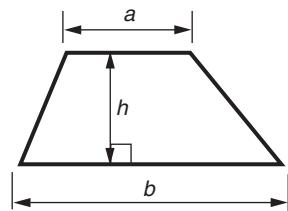
Volume of prism = (area of cross-section) × length
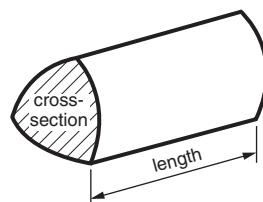
**In any triangle *ABC***

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

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

Area of triangle $= \frac{1}{2}ab \sin C$
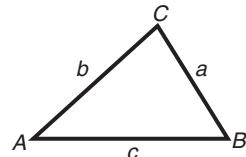
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
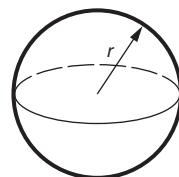
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
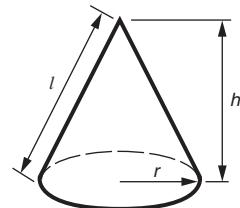
The Quadratic Equation

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

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

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1 Work out.

$$\frac{17.2^2 - 8.3}{1.8 + \sqrt{91.6}}$$

Give your answer correct to one decimal place.

_____ **[2]**

2 Solve.

$$5(3x - 1) = 3(3x + 4) - 2$$

_____ **[3]**

Turn over

3 These five triangles are drawn on a centimetre square grid.
Together they make up the parts of a puzzle.
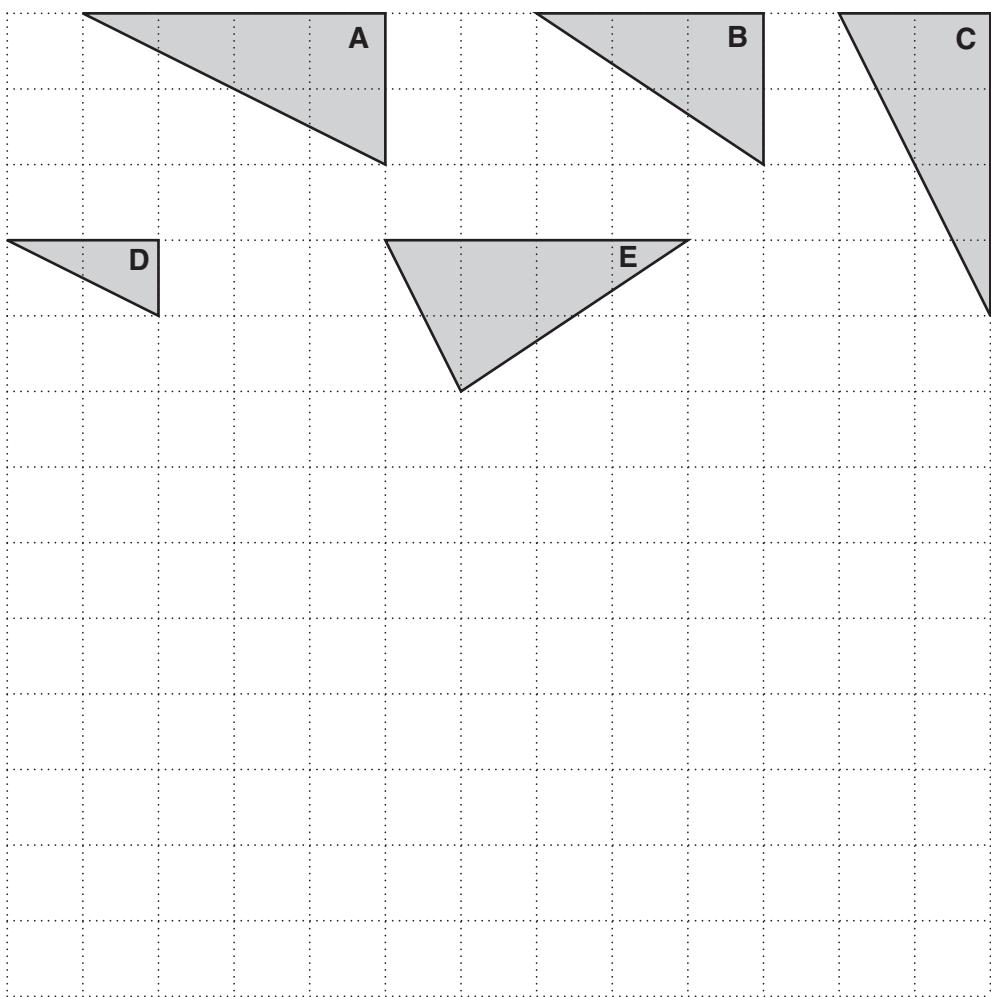
(a) Which of the triangles is congruent to triangle **A**?

(a) _____ **[1]**

(b) Which of the triangles is similar to triangle **A** but **not** congruent to it?

(b) _____ **[1]**

(c) To solve the puzzle the triangles have to be fitted together to make a square.

What is the length of the side of the square?

(c) _____ cm **[3]**

4 By rounding each number to one significant figure, estimate the answer to this calculation.

$$\frac{289.4 \times \sqrt[3]{60}}{5.86}$$

_____ **[2]**

5 **(a)** In February 2011 a motor company made 13 200 cars.
     In March the number of cars made was 15% more than in February.

     How many cars were made in March?

(a) _____ **[2]**

   (b) In April the company made 2875 vans.
     This was 8% less than the previous month.

     How many vans were made in March?

(b) _____ **[2]**

Turn over

6 The sketch shows the floor plan of a room partially covered by a rug.
The room measures 7 m by 5 m.
The border around the rug is x metres wide.
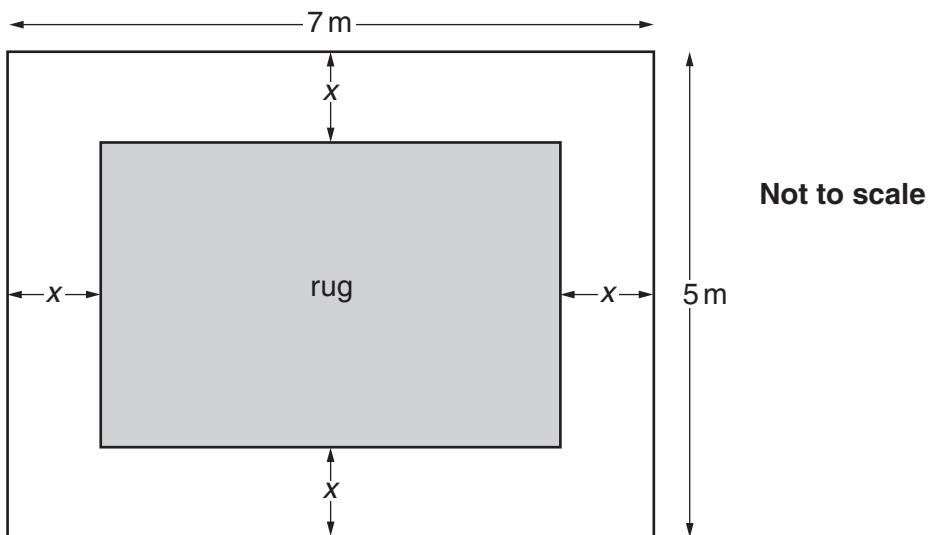
(a) (i) Find, in terms of x, an expression for the length of the rug.

(a)(i) _____ [1]

**(ii)** Find, and simplify, an expression for the perimeter of the rug.

(ii) _____ [2]

(b) The perimeter of the rug is 20 m.

Find the length and width of the rug.

(b)_____ m by _____ m **[3]**

7 David conducted an experiment to find an estimate for the density of sandstone.
He used weighing scales and a measuring cylinder.
He weighed the sandstone and then placed it in a measuring cylinder containing water.
The diagrams show the stages.
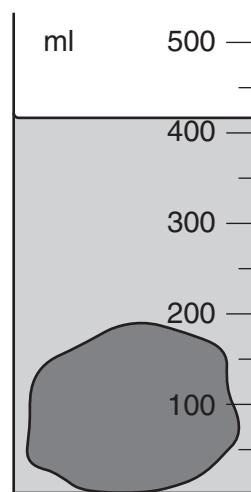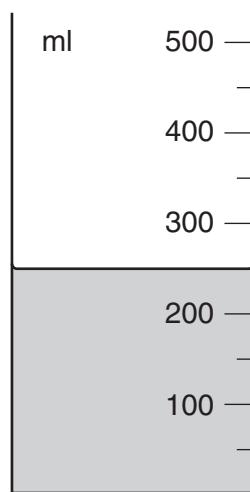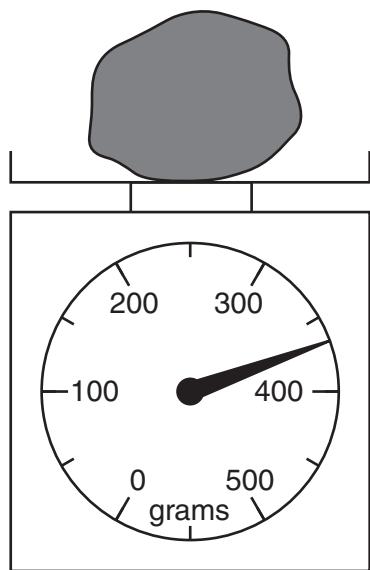
Use the information shown to estimate the density of sandstone.
Give the units of your answer.

_____ **[5]**

Turn over

8   Trevor drew this triangle.
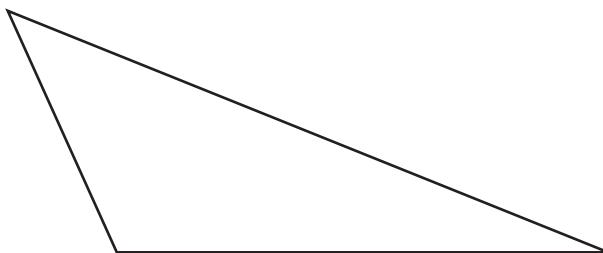
Work out the area of Trevor's triangle.

_____ cm^2 **[3]**

9 Ms Smith ran a competition for parents and pupils.
When she counted up the entries she noticed that the total number of entries was a square number greater than 100.

$\dfrac{5}{8}$ of the entries were from parents.

$\dfrac{1}{4}$ of the entries were from girls.

The rest of the entries were from boys.

Calculate the minimum possible number of entries from boys.

_____ **[4]**

10 Teresa's car has a trip computer.
It records the petrol consumption in litres per 100 km and also in miles per gallon.
The number of litres per 100 km, *L*, is inversely proportional to the number of miles per gallon, *M*.
For a journey the computer records *L* as 11.3 and *M* as 40.

**(a)** Find a formula for *L* in terms of *M*.

(a) _____ **[2]**

(b) For a different journey the computer records 50 miles per gallon.

How many litres per 100 km is this?

(b) _____ **[1]**

11*
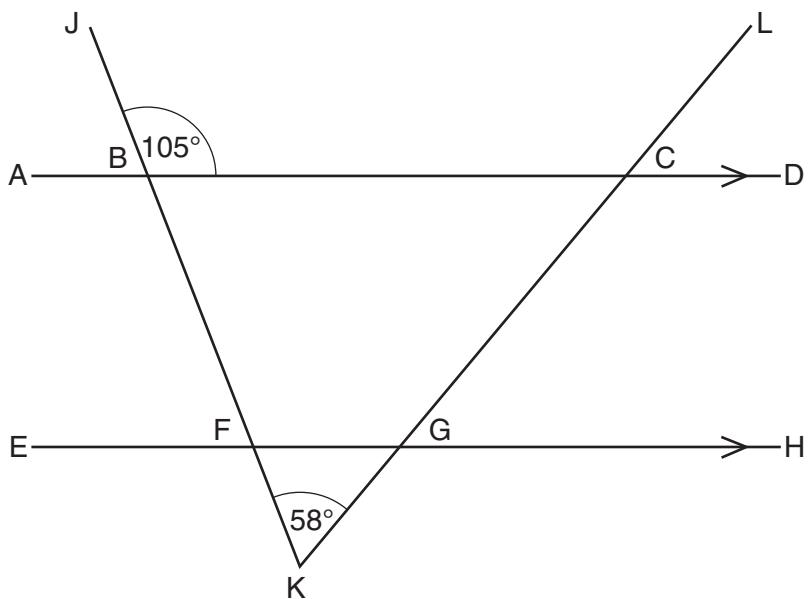
Not to scale

AD and EH are parallel straight lines.
Angle JBC = 105° and angle FKG = 58°.
JBFK and LCGK are straight lines.

Calculate angle FGC.
Give clear mathematical reasons for each step of your working.

_____

_____

_____

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_____

_____ **[4]**

12 Pino is going on holiday to St Anton in Austria.

(a) He changes £500 into euros (€).
The exchange rate is £1 = €1.16.

What is £500 in euros?

(a) € _____ **[1]**

(b) Pino will drive from Calais to St Anton.
This table gives some information about his route.

> Total distance = 896 km (548 km of which is on motorways)
>
> Average speed on motorways = 120 km/h
>
> Average speed on other roads = 80 km/h
>
> Petrol consumption on motorways = 11.3 litres per 100 km
>
> Petrol consumption on other roads = 10.0 litres per 100 km
>
> Average cost of petrol = €1.30 per litre

(i) Calculate the total driving time for this route.
Give your answer in hours and minutes.

(b)(i) _____ hours _____ minutes **[4]**

(ii) Calculate the total cost of the petrol for this route.

(ii) € _____ **[4]**

13 **(a)** Write these as a power of 5.

    (i) 1

(a)(i) _____ **[1]**

    (ii) $\dfrac{1}{25}$

(ii) _____ **[1]**

(b) Find the value of $16^{\frac{3}{2}}$.

(b) _____ **[2]**

Turn over

14
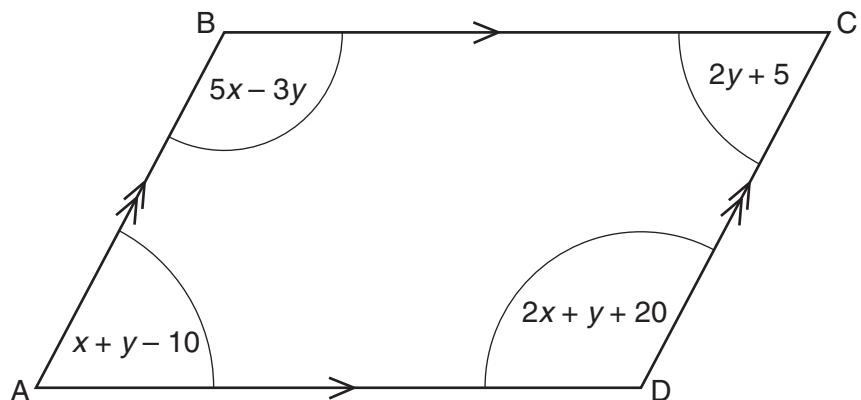
Work out the size of each angle in the parallelogram.

_____ **[6]**

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