OCR
RECOGNISING ACHIEVEMENT

H

Tuesday 22 January 2013 – Afternoon

GCSE METHODS IN MATHEMATICS

B392/02   Methods in Mathematics 2 (Higher Tier)

Duration: 2 hours

Candidate forename		Candidate surname	
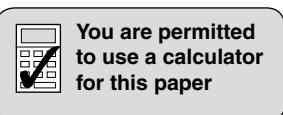
Centre number						Candidate number					

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. HB pencil may be used for graphs and diagrams only.
* Answer **all** the questions.
* 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).
* Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES
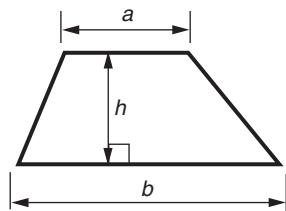
* The number of marks is given in brackets **[ ]** at the end of each question or part question.
* Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
* The total number of marks for this paper is **90**.
* This document consists of **20** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper
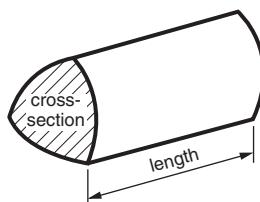
This paper has been pre modified for carrier language

OCR is an exempt Charity

Turn over

Formulae Sheet: Higher Tier

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

Volume of prism = (area of cross-section) × length
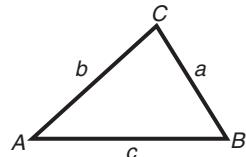
In any triangle *ABC*

**Sine rule** $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$
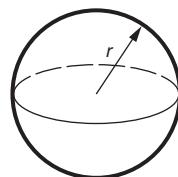
Cosine rule $\ a^2 = b^2 + c^2 - 2bc\cos A$

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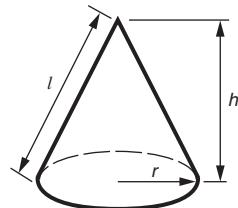
Volume of sphere $= \frac{4}{3}\pi r^3$

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

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

PLEASE DO NOT WRITE ON THIS PAGE

1 **(a)** Fill in the table below so that each row contains equivalent percentages, decimals and fractions. The fractions are in their simplest form.

The first row is done for you.

Percentage	Decimal	Fraction (in simplest form)
20%	0.2	$\frac{1}{5}$
18%		
	$0.\dot{3}$	
		$\frac{5}{16}$

[4]

(b) The ratio of boys to girls in one class at a school is 2 : 3.

What fraction of the class are boys?

(b) _____ **[1]**

2 Sadia knows that walking for an hour burns 200 calories.
A cake has 120 calories.

For how many minutes must Sadia walk to burn 120 calories?

_____minutes **[3]**

Turn over

3 **(a)** Write down the reciprocal of 4.

(a) _____ **[1]**

(b) Multiply $\frac{1}{8}$ by its reciprocal.

(b) _____ **[1]**

4 **(a)** Solve.

$$2x + 11 = 4x - 21$$
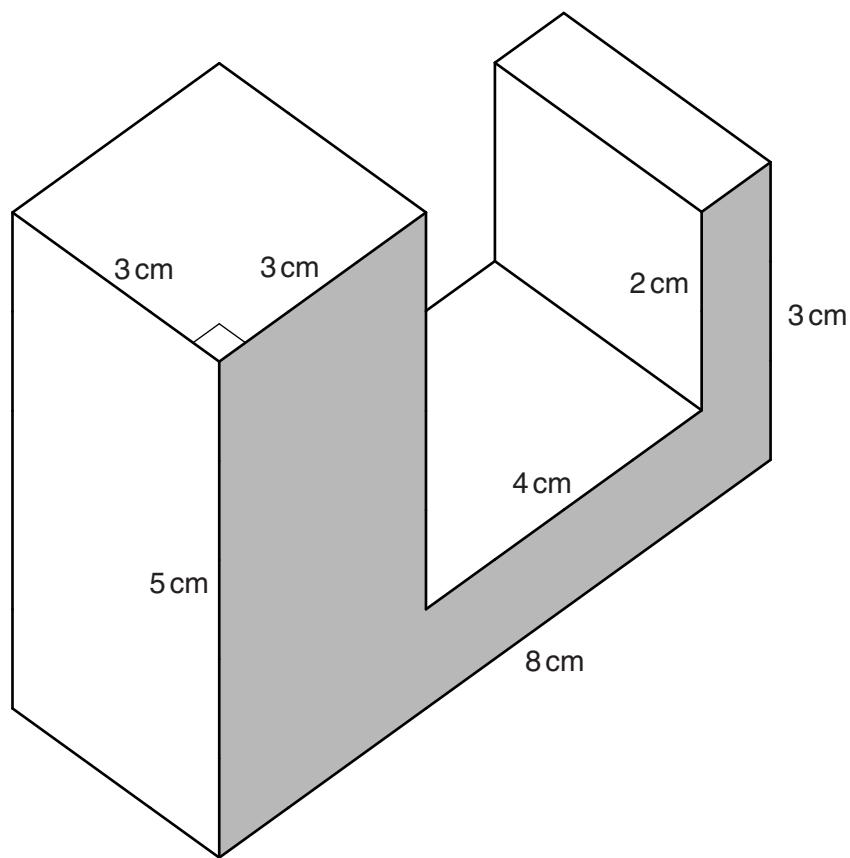
(a) _____ **[3]**

(b) Solve.

$$3x - 5 \leqslant 19$$

(b) _____ **[3]**
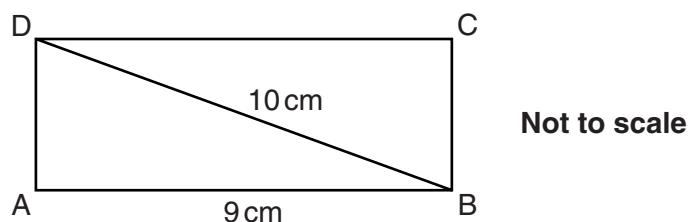
5 The cross-section of this prism is shaded.
Each side of the cross-section is either horizontal or vertical.

3 cm   3 cm

2 cm

3 cm

4 cm

5 cm

8 cm

Work out the volume of the prism.

_____ cm³ **[3]**

Turn over

6 **(a)** Rectangle ABCD has a diagonal 10 cm long.
Side AB is 9 cm long.

D _____ C

10 cm   **Not to scale**

A _____ 9 cm _____ B

Use Pythagoras' theorem to show that AD is 4.36 cm, correct to two decimal places.

_____

_____

_____

_____

_____
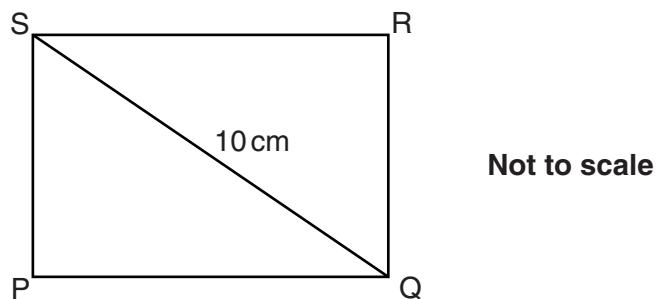
_____ **[3]**

(b) A different rectangle, PQRS, also has a diagonal 10 cm long.
The area of rectangle PQRS is bigger than the area of rectangle ABCD.

S _____ R
| \ |
| \ |
| \ 10 cm |
| \ |
| \ |
P _____ Q

Not to scale

Work out a possible pair of values for the length and the width of this rectangle, showing that the area of rectangle PQRS is bigger than the area of rectangle ABCD.

(b) _____ cm and _____ cm **[4]**

7   Mr Lee needs someone to do repairs in his house.
He can use Handyman Dan or Mr Fixit.
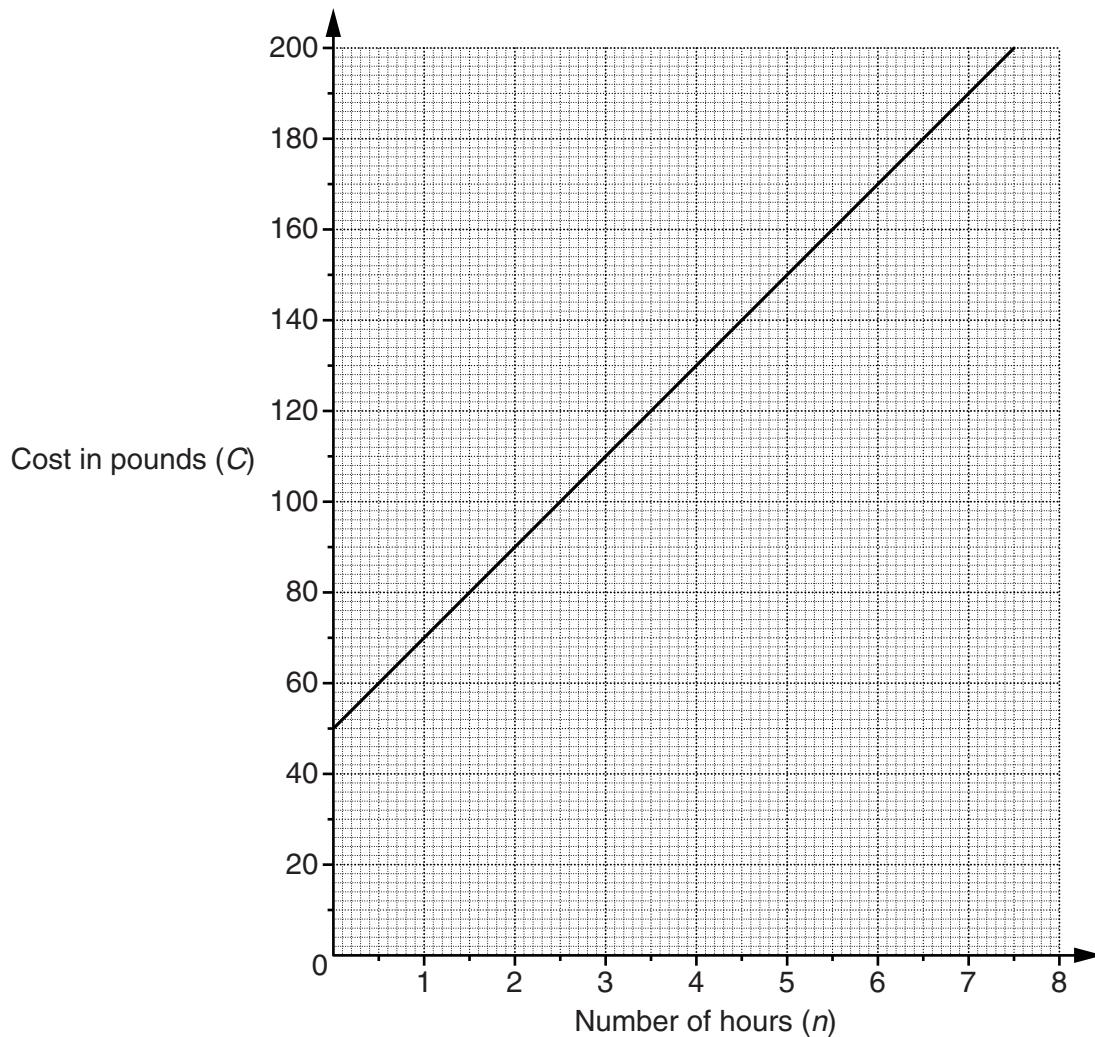
Handyman Dan £50 call out fee plus £20 an hour

Mr Fixit No call out fee £30 an hour

The graph shows the cost for Handyman Dan.
n stands for the number of hours.
C stands for the cost in pounds.

(a) For Handyman Dan, write down the formula for *C* in terms of *n*.

(a) *C* = _____ **[2]**

(b) The formula for the cost for Mr Fixit is $C = 30n$.

   Using the grid on the opposite page, draw the graph which shows the cost for Mr Fixit.   **[2]**

(c) **(i)** Write down the coordinates of the point of intersection of the two graphs.

(c)(i) (_____ , _____) **[1]**

   (ii) What does this point of intersection represent?

   _____

   _____ **[1]**

8 **(a)** Work out the following.
Give your answer as a fraction in its simplest form.

$$\frac{1}{6} \times \frac{2}{3}$$

(a) _____ **[2]**

(b) Two fractions are multiplied together.
Each fraction must be smaller than 1.
The answer is $\frac{4}{11}$ when simplified.

What could the two fractions be?

(b) _____ and _____ **[2]**

9 (a)* The sum of the interior angles of any triangle is 180°.

Using this fact, prove that the sum of the interior angles of any pentagon is 540°.
You should use a diagram as part of your answer.

_____

_____

_____

_____

_____
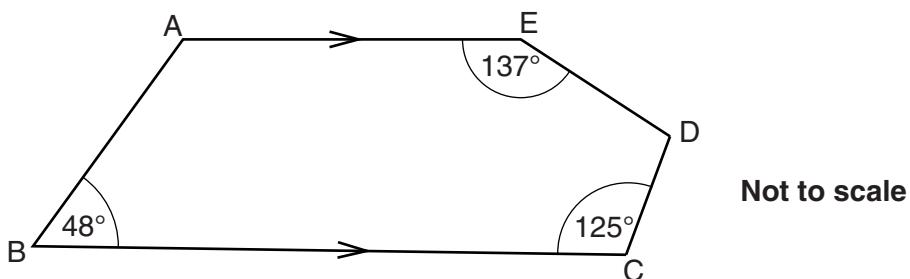
_____ **[3]**

(b) ABCDE is a pentagon.
AE is parallel to BC.
Angle B is 48°, angle C is 125° and angle E is 137°.

Not to scale

Calculate the size of angle A and angle D.

(b) A = _____°, D = _____° **[3]**

Turn over

10 (a) Expand and simplify.

$$(x-3)(x+5)$$

(a) _____ **[3]**

(b) The formula for the nth term of a sequence is $5n^2 + 7n - 5$.

    (i) Work out the first three terms of the sequence.

(b)(i) _____ , _____ , _____ **[3]**

    (ii)* Peter thinks that all the terms of the sequence will be prime numbers.

    Prove that Peter is wrong.

_____

_____

_____

_____

_____

_____ **[3]**

11 Work out the following.
   Give your answer in standard form.
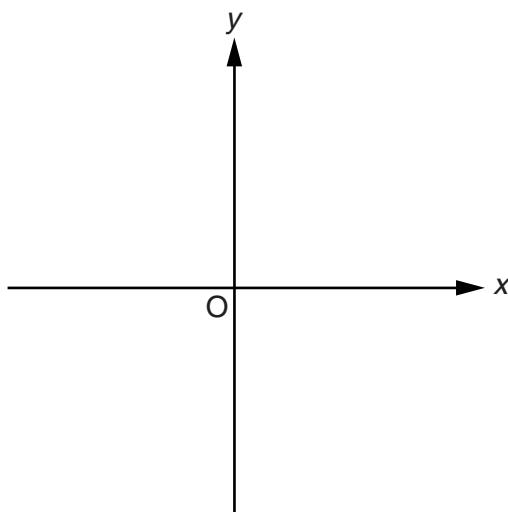
$$(1.3 \times 10^{60})^2$$

_____ **[2]**
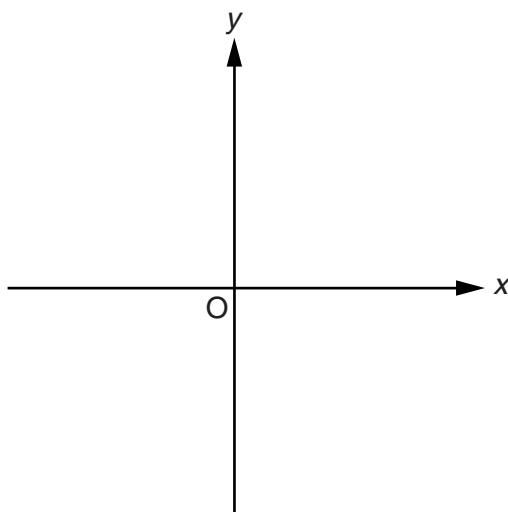
**12** Sketch the following graphs. You do not need to number the axes.

   (a) $y = x^3$

[2]

   (b) $y = \dfrac{1}{x}$

[2]

Turn over
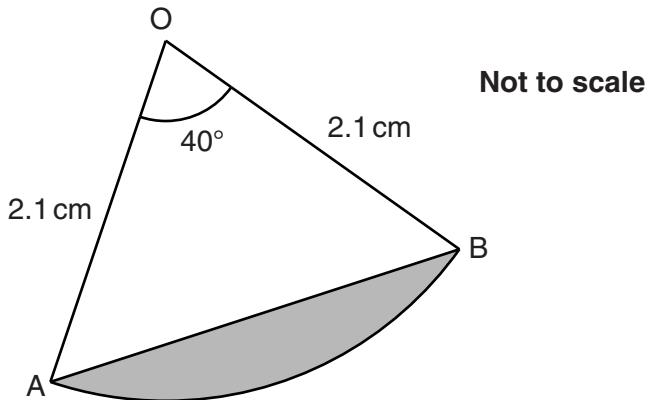
13 O is the centre of a circle with radius 2.1 cm.
A and B are points on the circle.
Angle AOB is 40°.

Calculate the area of the shaded segment.

O

Not to scale

40°   2.1 cm

2.1 cm

B

A

_____ cm² **[5]**

14 Amelia is studying rabbits on an island.
The rabbit population on January 1st 2013 was 200.
Each year, the number of rabbits is expected to increase by 16% of the population at the start of the year.

How many rabbits are there expected to be on January 1st 2016?

_____ **[3]**

15 M is inversely proportional to the square of d.
When $d = 2$, $M = 50$.

Find an equation connecting M and d.

_____ **[3]**

Turn over

16 **(a)** Solve this equation. Give your answers correct to two decimal places.

$$x^2 - 4x + 2 = 0$$

(a) _____ **[4]**

(b) **(i)** Factorise.

$$3x^2 + x - 2$$
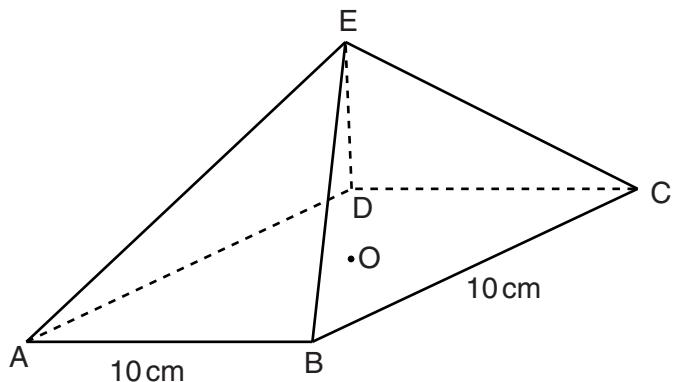
(b)(i) _____ **[2]**

(ii) Hence simplify.

$$\frac{3x^2 + x - 2}{x^2 - 1}$$

(ii) _____ **[3]**
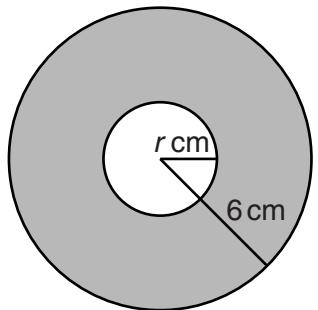
17 The diagram shows a pyramid with square base ABCD.
Each side of the square is 10 cm long.
O is the centre of the square base.
The vertex of the pyramid, E, lies directly above O.
Each triangular face of the pyramid is equilateral.

Calculate angle EAO. You must show your method.

_____ ° **[5]**

18 The diagram shows a circle of radius 6 cm.
There is a circle of radius *r* cm drawn inside it.
The area between the two circles is shaded.

Not to scale

(a) Tick the correct statement below.

The circle of radius *r* cm is similar to the circle of radius 6 cm. ☐

The circle of radius *r* cm is not similar to the circle of radius 6 cm. ☐

It is not possible to tell if the two circles are similar. ☐

[1]

(b) When *r* = 3, what percentage of the area of the larger circle is shaded?

(b) _____ % **[3]**

(c) When 99% of the area of the larger circle is shaded, what is the value of *r*?

(c) _____ **[4]**

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE