OCR
RECOGNISING ACHIEVEMENT

H

Tuesday 6 November 2012 – Morning

GCSE MATHEMATICS A

A502/02   Unit B (Higher Tier)
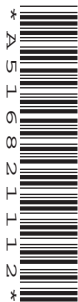
Candidates answer on the Question Paper.	**Duration:** 1 hour
OCR supplied materials: None	
Other materials required: • Geometrical instruments • Tracing paper (optional)	

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 **60**.
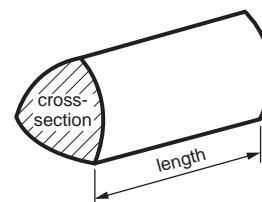* This document consists of **16** pages. Any blank pages are indicated.

WARNING

No calculator can be used for this paper

This paper has been pre modified for carrier language

OCR is an exempt Charity

Turn over

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Formulae Sheet: Higher Tier

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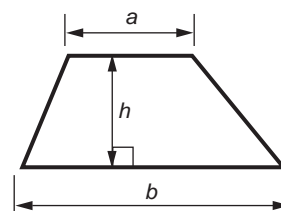
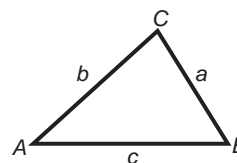**Volume of prism** = (area of cross-section) × length

In any triangle *ABC*

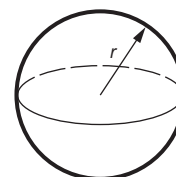**Sine rule** $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$
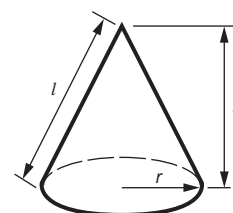
Area of triangle $= \frac{1}{2}ab \sin C$

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

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

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

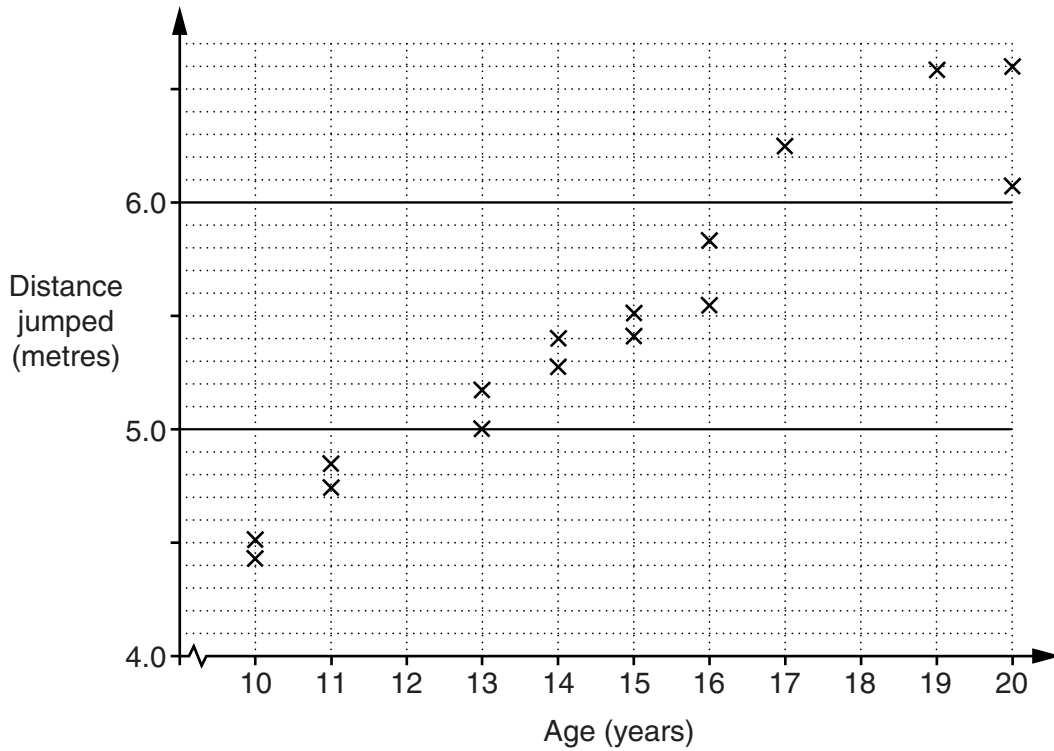**Curved surface area of cone** $= \pi r l$

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 This scatter graph represents the ages of 16 young people and the distance they jumped in a long jump competition.

The ages of two more competitors and the distance each jumped are given below.

Age (years)	Distance jumped (m)
17	5.45
19	5.80

(a) Plot these values on the scatter graph. **[2]**

(b) Draw a line of best fit on your scatter graph. **[1]**

(c) Marco, aged 12, and Carl, aged 18, also took part in the competition.

   (i) Use your line of best fit to estimate the distance each jumped.
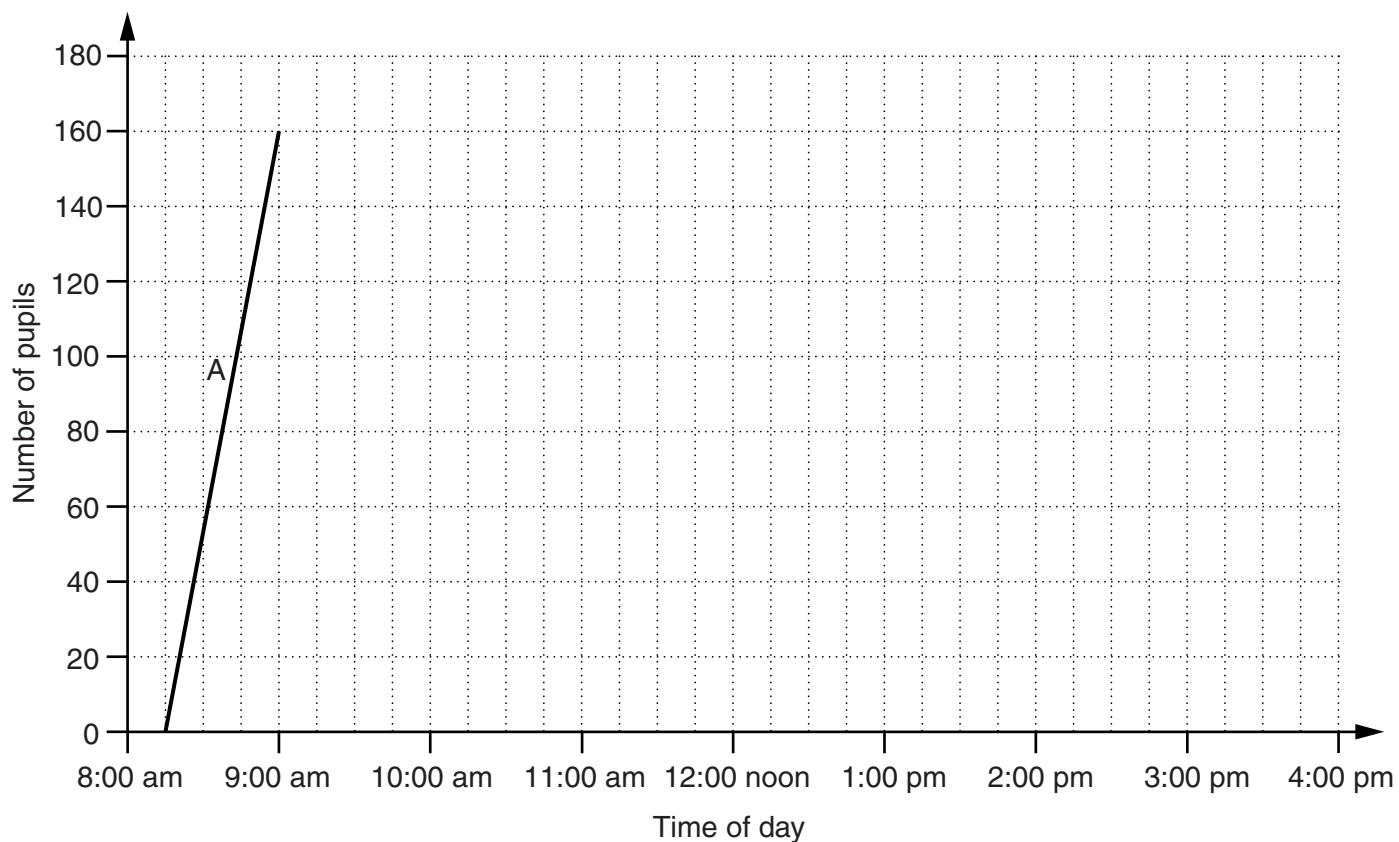
   (c)(i) Marco _____ m

   Carl _____ m **[2]**

   (ii) Which estimate in part **(c)(i)** is likely to be closer to the actual distance jumped? Explain why.

   _____ because _____

   _____ **[2]**

2   A primary school has 180 pupils.
    The headteacher records the number of pupils at the school throughout the course of one day.
    She shows the results on a graph.

Complete the graph using the descriptions in the table.
Section A has been drawn for you.

Section	Description
A	The school opens at 8:15 am and 160 pupils have arrived by 9:00 am.
B	All 180 pupils have arrived by 10:00 am.
C	All the pupils stay in school until lunchtime at 12:00 noon. At this time, half of the pupils leave the school to go home for lunch. They have all returned by 1:00 pm.
D	All pupils stay in school until it finishes at 3:00 pm. All the pupils have left by 3:30 pm.

[5]

3 **(a)** The voltage in an electric circuit is calculated using this formula.

Voltage in volts = Current in amps × Resistance in ohms

Calculate the voltage when the resistance is 6.5 ohms and the current is 3.6 amps.
Give your answer correct to **two** significant figures.

(a) _____ volts **[4]**

(b) The resistance in an electric circuit is calculated using this formula.

$$\text{Resistance in ohms} = \frac{\text{Voltage in volts}}{\text{Current in amps}}$$

Calculate the resistance when the voltage is 10^{12} volts and the current is 10^3 amps.

(b) _____ ohms **[1]**

6

4   Body Mass Index (BMI) is used by doctors to check if a person is a healthy weight for their height.

$$BMI = \frac{w}{h^2}$$

w is the weight (in kilograms) and *h* is the height (in metres) of the person.

This table shows how to interpret the value of a person's BMI.

BMI	
BMI ⩽ 18.5	Underweight
18.5 < BMI ⩽ 25	Normal
25 < BMI ⩽ 30	Overweight
BMI > 30	Obese

Alex is 1.9 m tall and weighs 100.4 kg.

(a) Use **approximation** to find an estimate of Alex's BMI value.
      Show clearly the approximations you use.

(a) _____ **[3]**

(b) (i) Is your answer to part **(a)** an underestimate or an overestimate? Explain your answer.

_____

_____

_____ **[1]**

(ii) What advice should Alex's doctor give him? Explain your answer.

_____

_____

_____ **[1]**

5 **(a)** Work out $3\frac{2}{5} - 2\frac{3}{4}$.

Give your answer as a fraction in its simplest form.

(a) _____ **[3]**

(b) **(i)** Work out the reciprocal of 2.5.
Give your answer as a fraction in its simplest form.

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

**(ii)** Which number has no reciprocal?

(ii) _____ **[1]**

8

6 At a school event, muffins and coffee are sold.
Pippa has £10 to spend on muffins and coffees.

One coffee costs £x and one muffin costs £y.

(a) With £10, Pippa could buy a maximum of 9 coffees, so $9x < 10$.
The line $9x = 10$ has been drawn for you.

Indicate clearly, by shading, the region satisfying the inequality $9x < 10$.
Label this region R. **[1]**

cost of one muffin (£y)

$9x = 10$

cost of one coffee (£x)
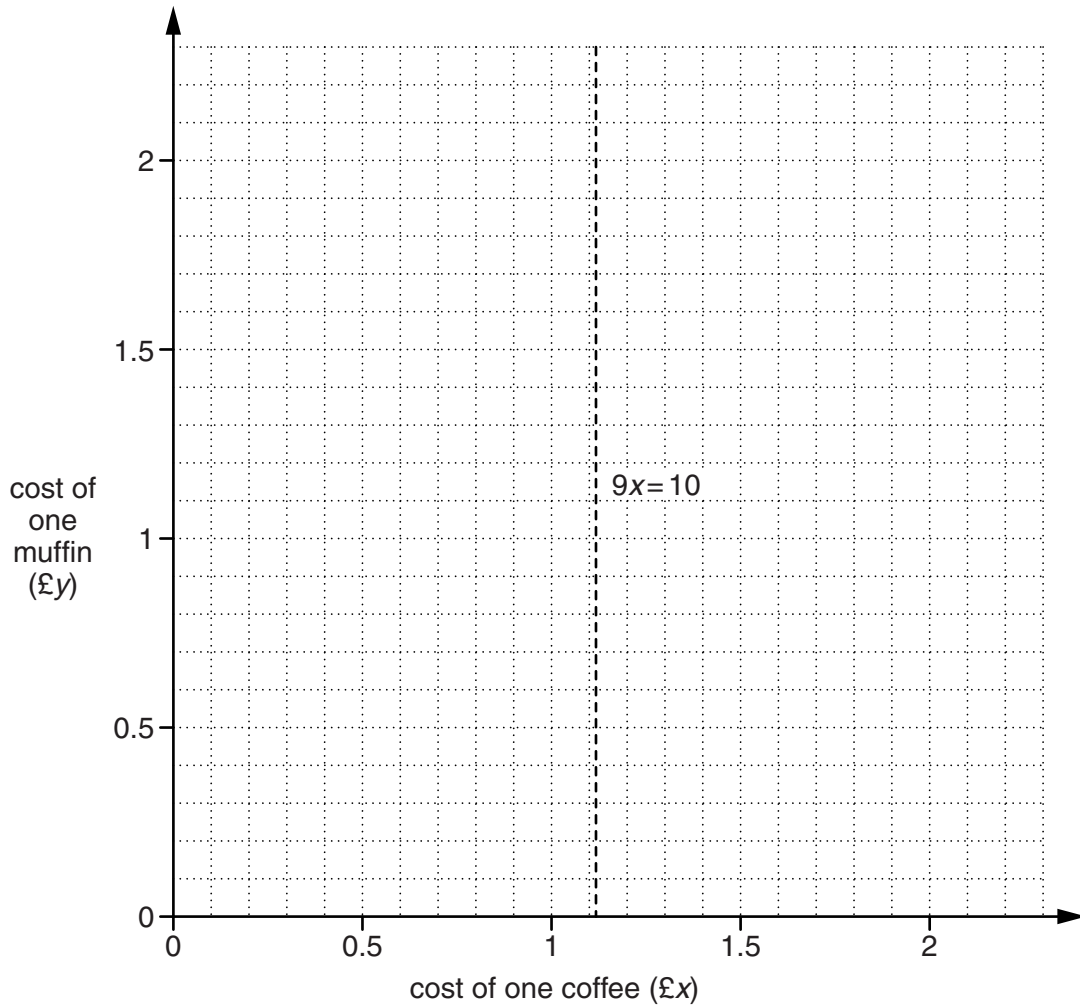
(b) With £10, Pippa could also buy 5 coffees and 5 muffins, so $5x + 5y \leqslant 10$.

Indicate clearly, by shading, the region satisfying the inequality $5x + 5y \leqslant 10$.
Label this region T. **[2]**

(c) At the event, muffins and coffee are each priced in multiples of 50p.
A coffee costs more than a muffin.

Represent this information on the diagram.
Using your diagram, write down the cost of one coffee and one muffin.

(c) One coffee costs £ _____

One muffin costs £ _____ **[3]**

7 Triangles **T** and **Q** are drawn on a grid.
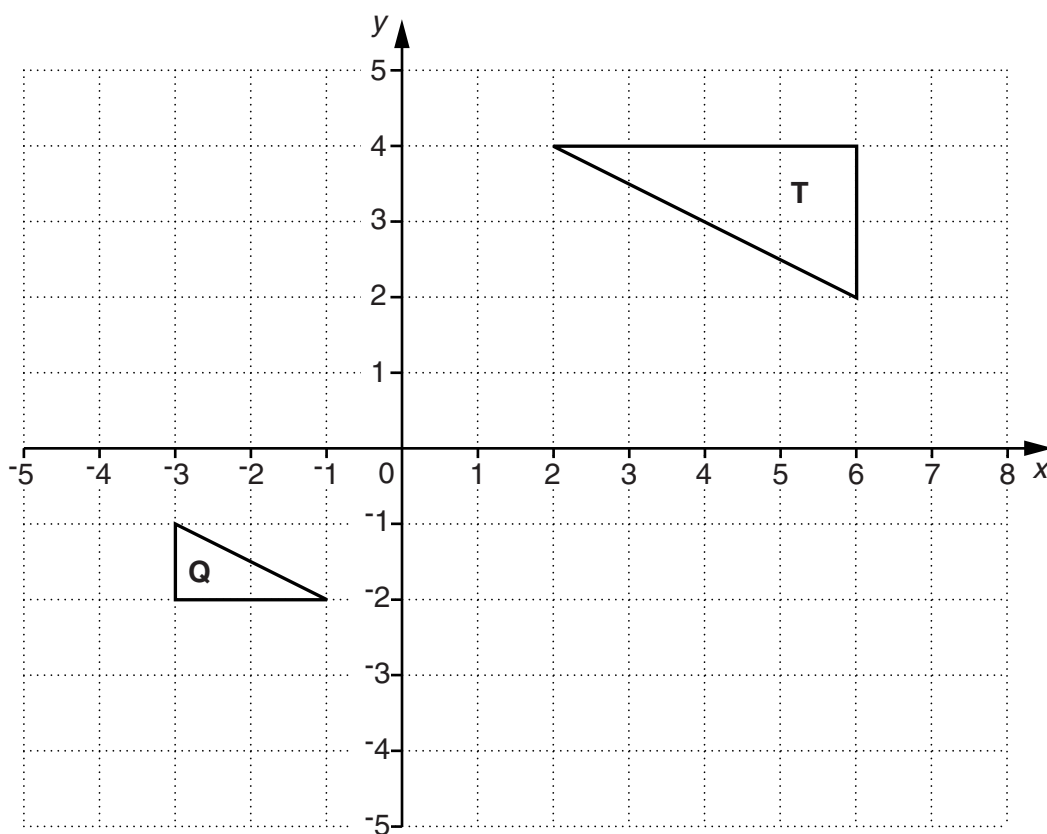
(a) Reflect triangle **Q** in the line $x = 1$.
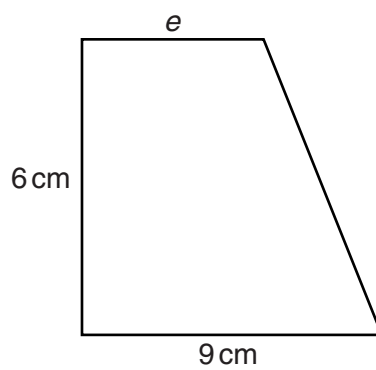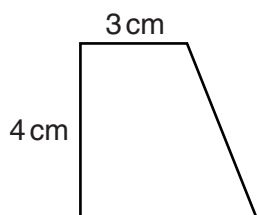Label the image **R**. **[2]**

(b) Describe fully the **single** transformation that maps triangle **Q** onto triangle **T**.

_____

_____

_____ **[3]**

Turn over

8 These two trapeziums are similar.

3 cm

4 cm

e

Not to scale

6 cm

9 cm

Calculate length *e*.

_____ cm **[3]**

9 A straight line has gradient 6 and passes through the point (0, ⁻5).

Write down the equation of the line.

_____ **[2]**

10 Solve, algebraically, these simultaneous equations.

$$3x + 2y = 5$$
$$5x - 3y = 21$$

$x =$ _____

$y =$ _____ **[4]**

11 Find the value of the following.

(a) $36^{\frac{1}{2}}$

(a) _____ **[1]**

(b) $8^{\frac{-1}{3}}$

(b) _____ **[2]**

Turn over

12

12 (a) Find the resultant of the vectors $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$.

(a) $\begin{pmatrix} \\ \end{pmatrix}$ **[1]**

(b) OABC is a parallelogram.
M is the midpoint of AB.
N is the midpoint of BC.
$\overrightarrow{OA}$ = **a** and $\overrightarrow{OC}$ = **c**.
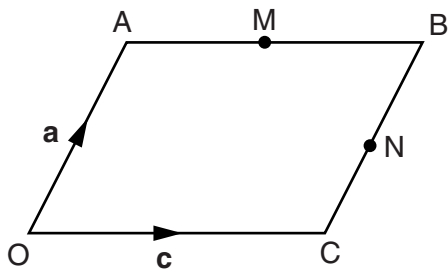
Find $\overrightarrow{MN}$ in terms of **a** and **c**.

(b) _____ **[2]**

13* AT and BT are tangents to the circle, centre O.
C is a point on the circle such that angle ACB = 75°.

Work out angle *h*.
Give a reason for each step of your working.

Not to scale
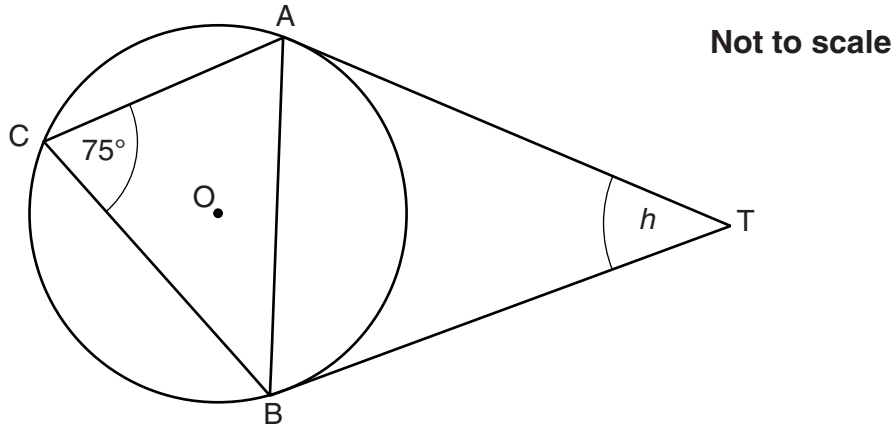
_____ ° **[5]**

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