

Tuesday 6 November 2012 – Morning

GCSE MATHEMATICS A

A502/02 Unit B (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:

- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour



Candidate forename		Candidate surname	
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Centre number							Candidate number				
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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.



This paper has been pre modified for carrier language

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) \times length



In any triangle ABC

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

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

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 = $\pi r l$



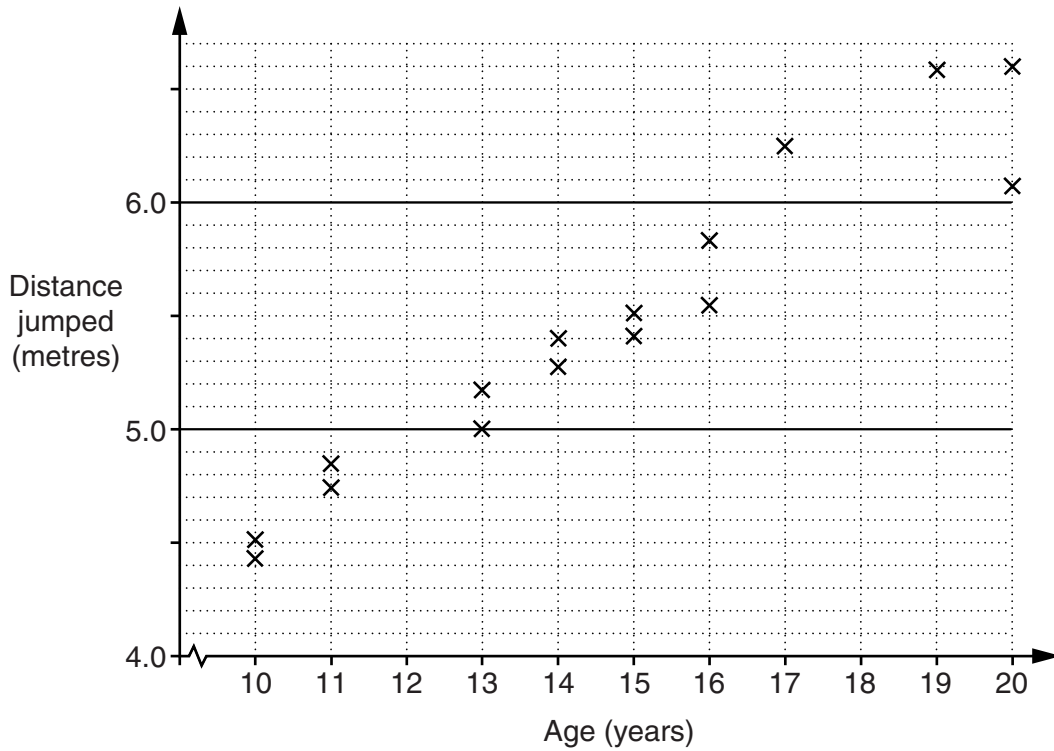
The Quadratic Equation

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

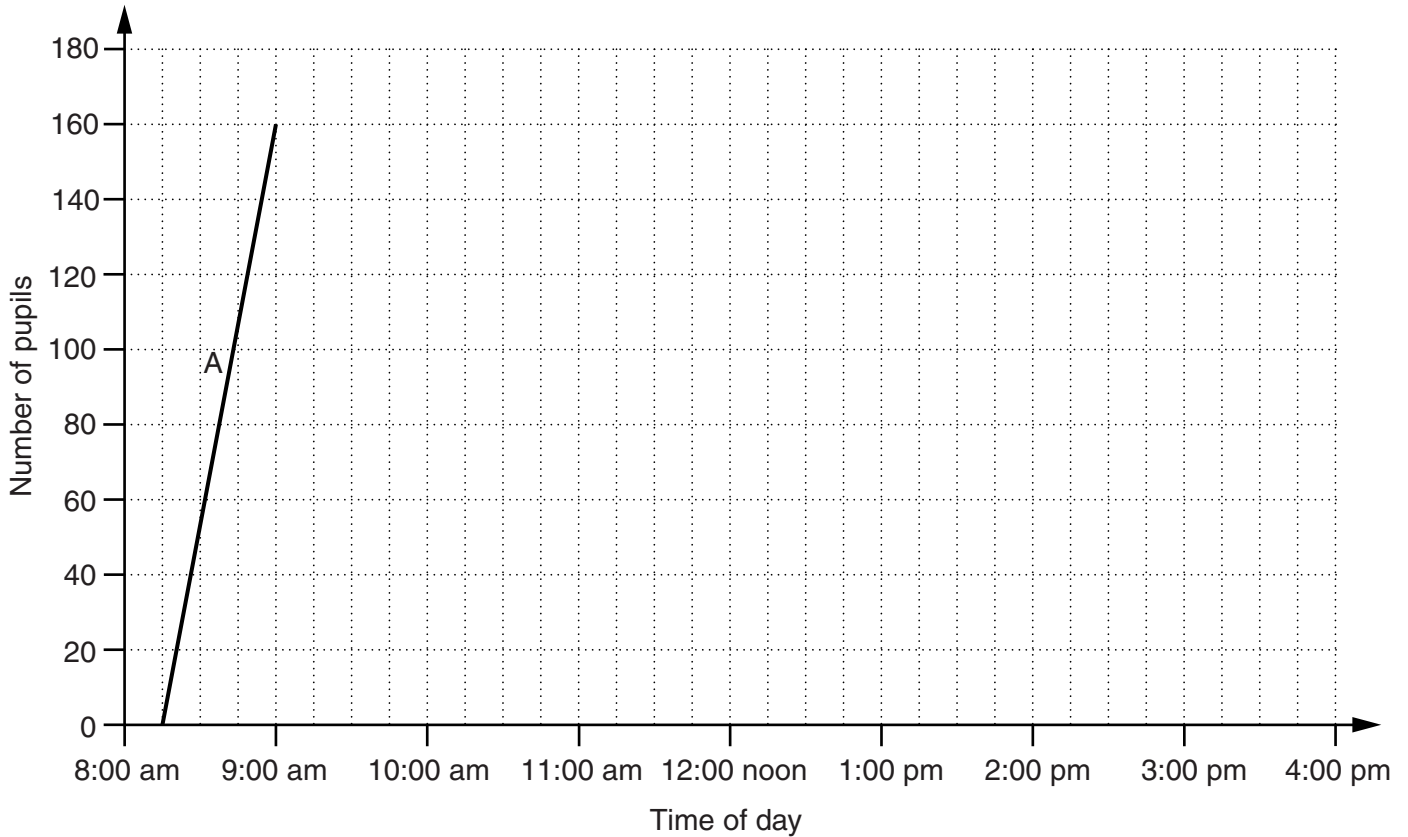
Carl _____ m [2]

- (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.

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

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]

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

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

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	
$\text{BMI} \leq 18.5$	Underweight
$18.5 < \text{BMI} \leq 25$	Normal
$25 < \text{BMI} \leq 30$	Overweight
$\text{BMI} > 30$	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]

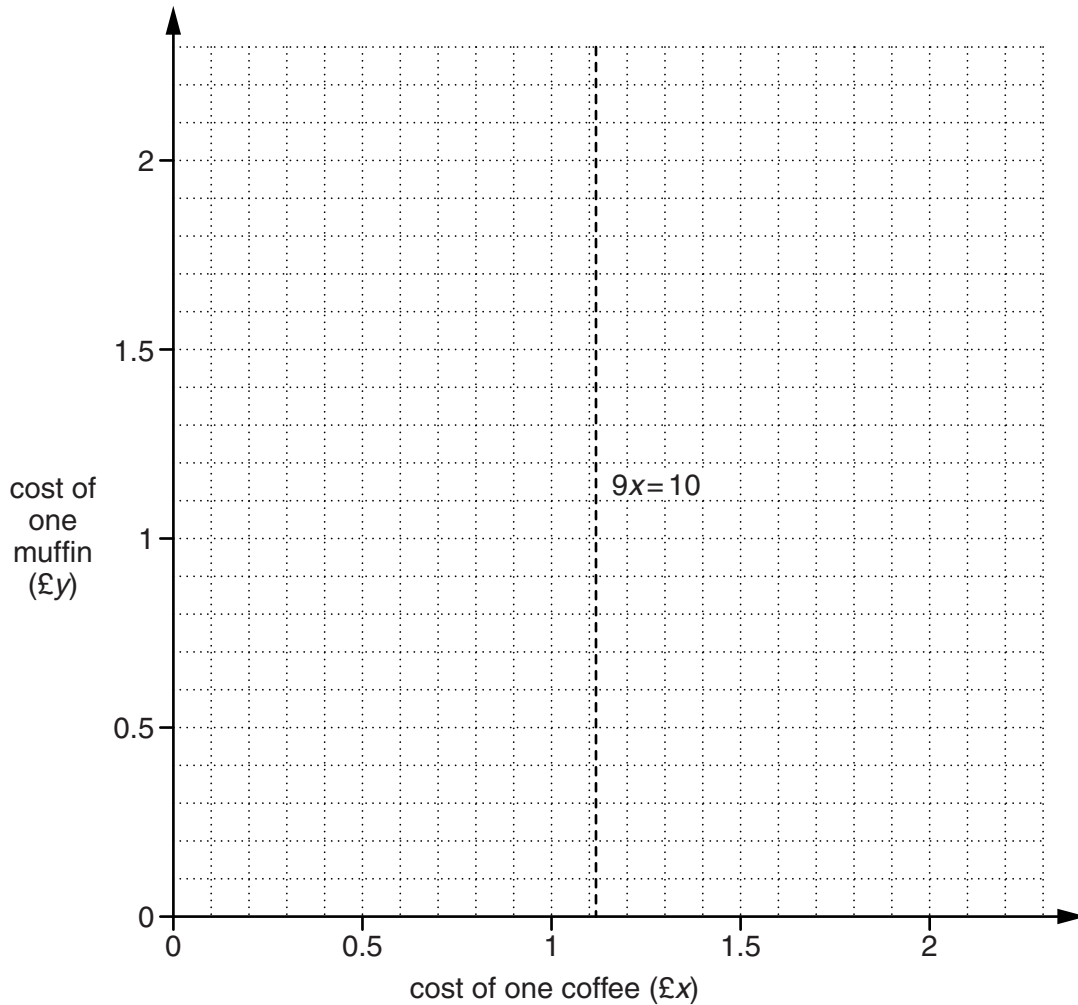
- 6 At a school event, muffins and coffee are sold.
Pippa has £10 to spend on muffins and coffees.

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]



- (b) With £10, Pippa could also buy 5 coffees and 5 muffins, so $5x + 5y \leq 10$.

Indicate clearly, by shading, the region satisfying the inequality $5x + 5y \leq 10$.
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.

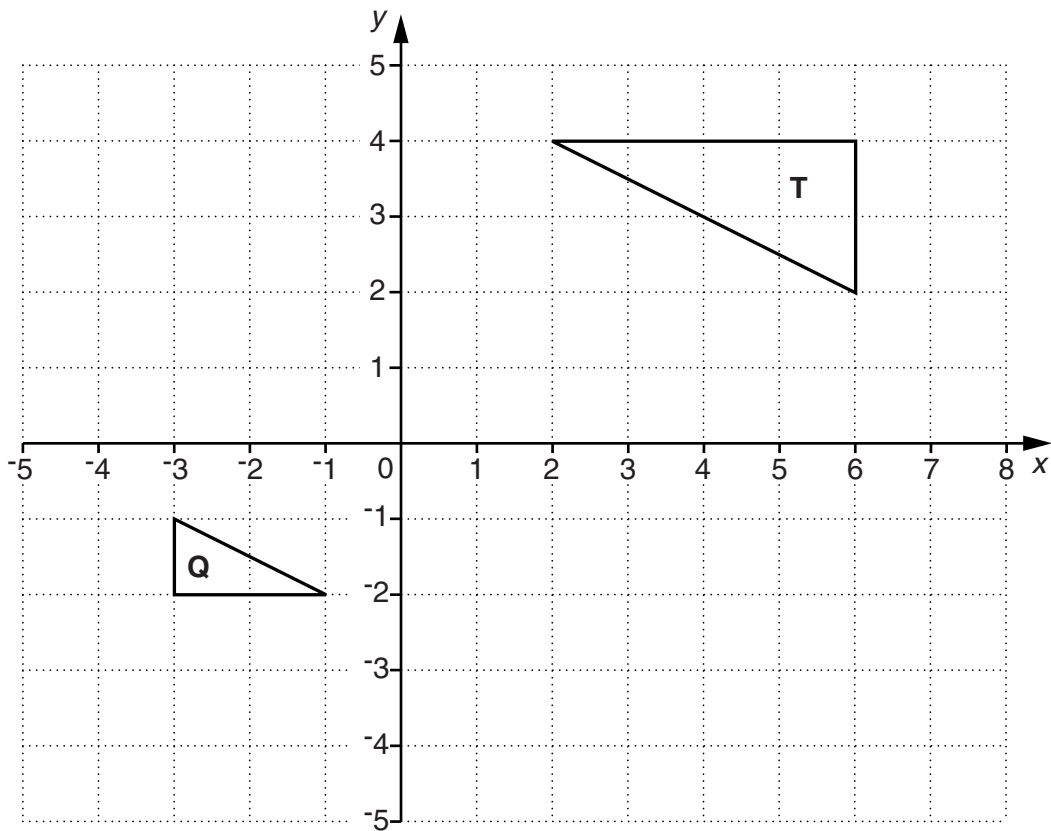
Represent this information on the diagram.

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**.

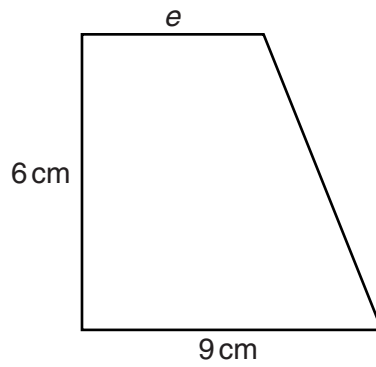
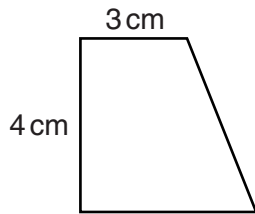
[2]

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

[3]

10

8 These two trapeziums are similar.



Not to scale

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.

$$\begin{aligned}3x + 2y &= 5 \\5x - 3y &= 21\end{aligned}$$

$x = \underline{\hspace{10cm}}$

$y = \underline{\hspace{10cm}} \quad [4]$

11 Find the value of the following.

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

(a) $\underline{\hspace{10cm}} \quad [1]$

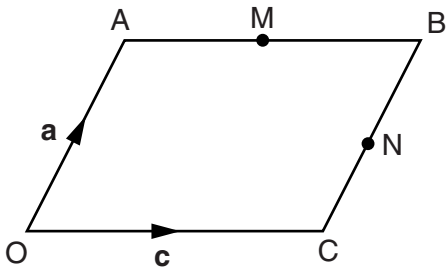
(b) $8^{\frac{-1}{3}}$

(b) $\underline{\hspace{10cm}} \quad [2]$

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

(a) $\left(\begin{array}{c} \\ \end{array} \right)$ [1]

- (b) OABC is a parallelogram.
M is the midpoint of AB.
N is the midpoint of BC.
 $\vec{OA} = \mathbf{a}$ and $\vec{OC} = \mathbf{c}$.



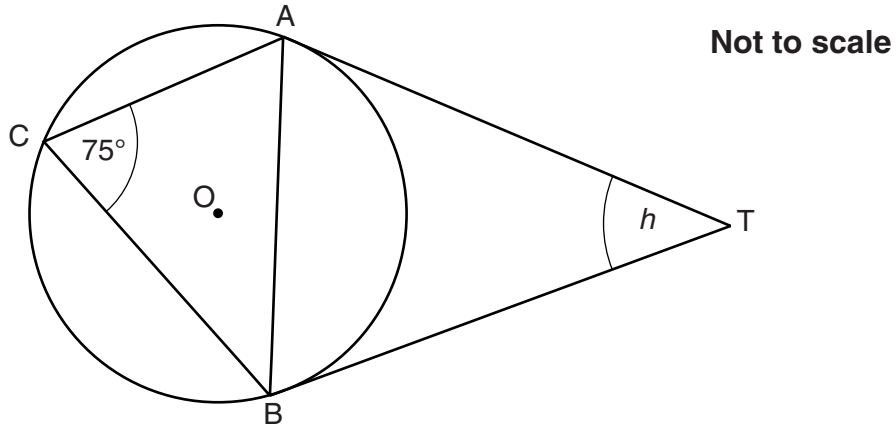
Find \vec{MN} in terms of \mathbf{a} and \mathbf{c} .

(b) _____ [2]

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

Work out angle h .

Give a reason for each step of your working.



_____ ° [5]

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