OCR
Oxford Cambridge and RSA

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Thursday 21 May 2015 – 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	

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 **12** pages. Any blank pages are indicated.

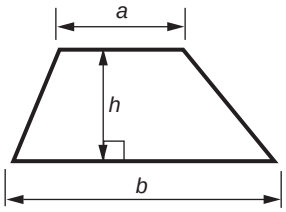
WARNING

No calculator can be used for this paper

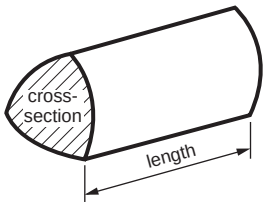
OCR is an exempt Charity

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

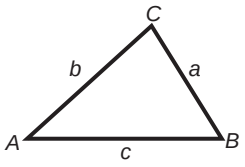


In any triangle *ABC*

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

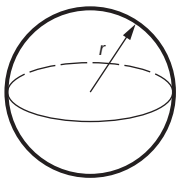
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



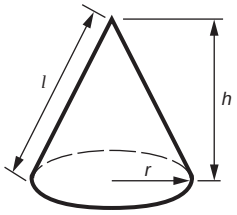
Volume of sphere = $\frac{4}{3}\pi r^3$

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

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

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 Complete these calculations.

(a)

$41 + \square = 100$

$100 - \square = 72$

$7 \times 9 = \square$

$54 \div 9 = \square$

[2]

(b) A tap dancer does one tap every 0.05 seconds.
Lucy wants to work out how many taps this dancer does in one minute.

(i) What division could Lucy do to work this out?

(b)(i) ..... **[1]**

(ii) Work out how many taps this dancer could do in one minute.

(ii) ..... **[3]**

2 **(a)** Complete this identity.

$$h \times h \times h \times h \times h \times h \equiv h^{\square}$$ **[1]**

(b) Harry is asked to write down the total weight of five onions each weighing m grams.
He writes m5 grams.

What should Harry have written?

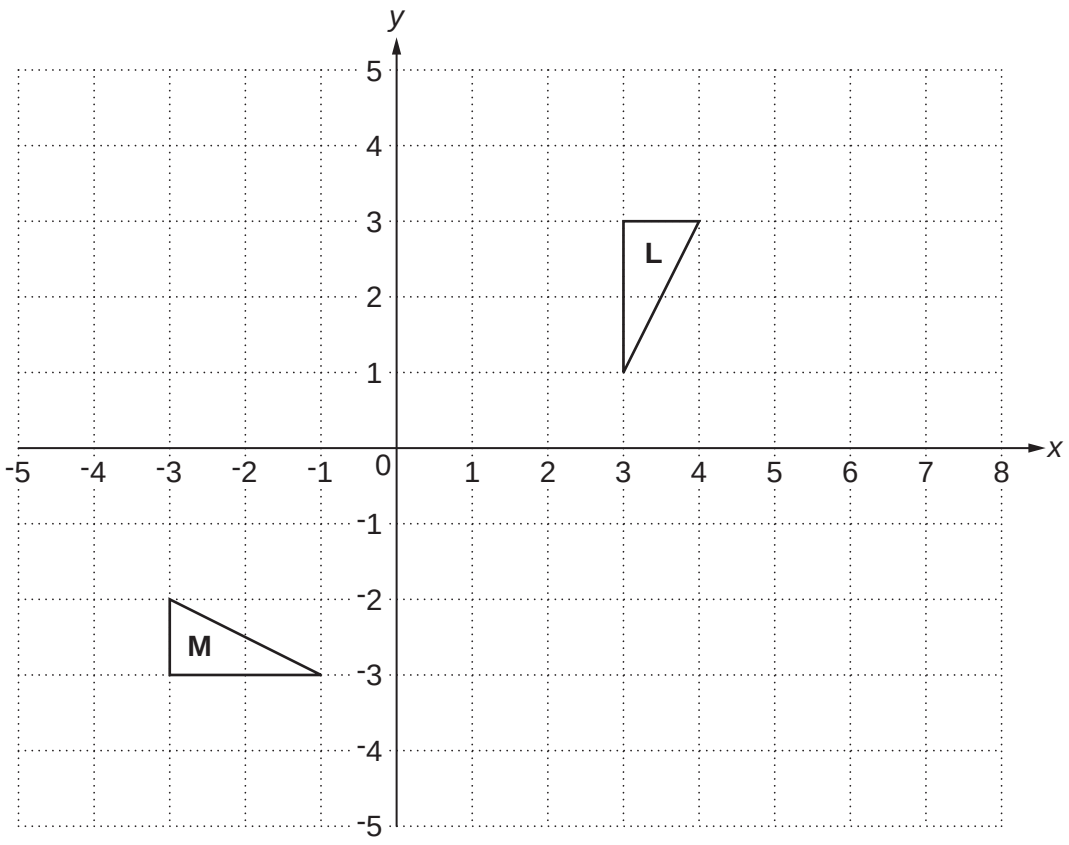
(b) ..... grams **[1]**

(c) Decide whether each of the following is an equation, a formula, an identity or an expression.
For each one, put a tick (✓) in the correct column.

	Equation	Identity	Formula	Expression
$3x - 7 = 12$				
$s = ut - \frac{1}{2}gt^2$				
$\frac{4}{3}\pi r^3$				
$r^2 = a^2 + b^2$				

[3]

3 Triangles **L** and **M** are drawn on the grid below.



(a) Describe fully the **single** transformation that maps triangle **L** onto triangle **M**.

.....

..... **[3]**

(b) Translate triangle **L** using the vector $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$. Label your image **T**. **[2]**

(c) With the transformations in **(a)** and **(b)** both the lengths *and* the angles in the image are the same as in the original shape.

Describe what would happen to the lengths and angles of triangle **L** after an enlargement of scale factor 4.

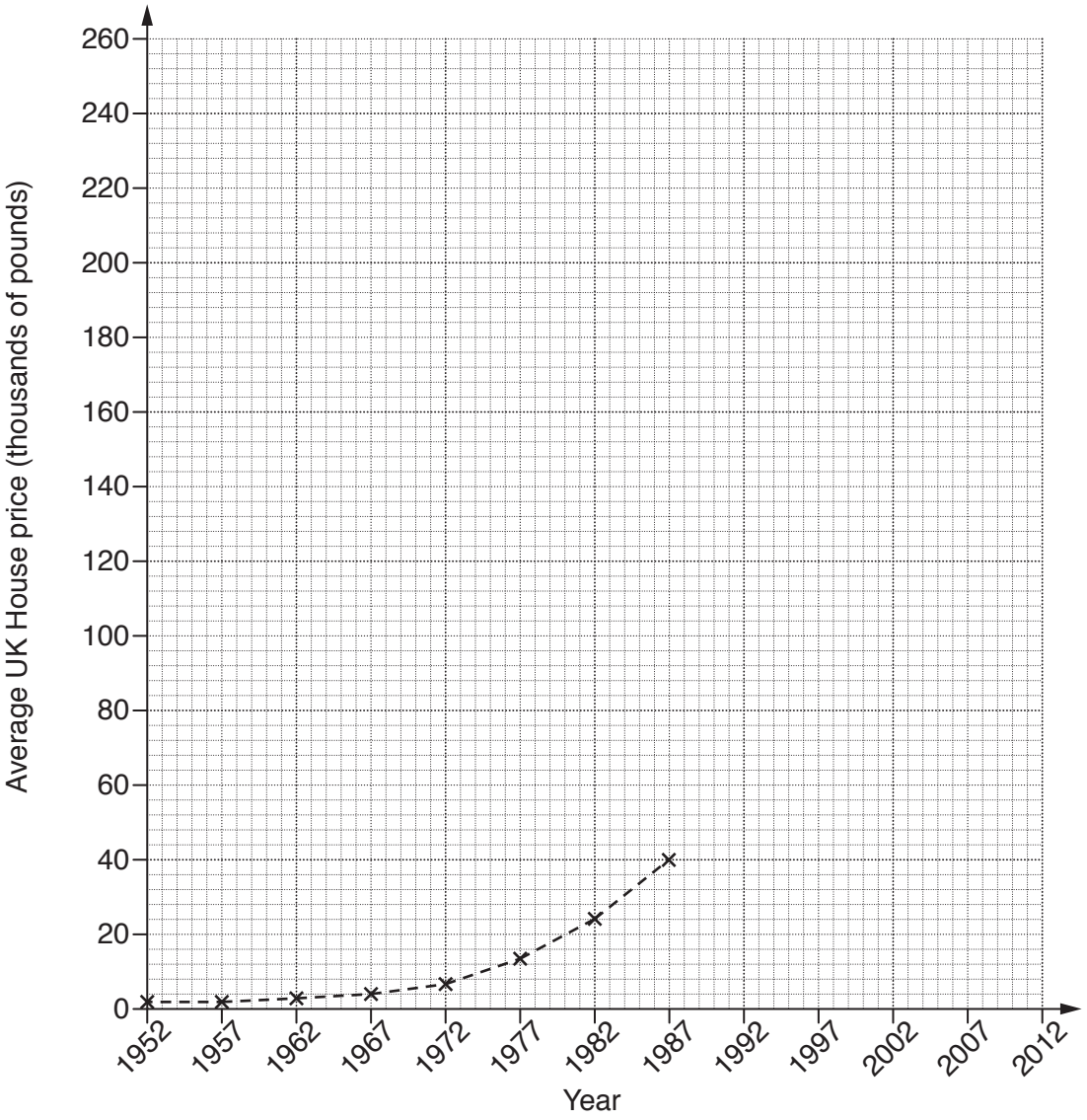
.....

.....

..... **[2]**

4 This table shows the average price of a house in the UK every five years from 1952 to 2012. The prices are given to the nearest £1000.

Year	1952	1957	1962	1967	1972	1977	1982	1987	1992	1997	2002	2007	2012
Price (thousands of pounds)	2	2	3	4	7	14	24	40	61	76	128	223	246



(a) Complete the time series graph to show all the data. **[2]**

(b) In which 5 year period did the average house price increase the most?

(b) from ..... to .....**[1]**

(c) Helen said that house prices did not increase from 1952 to 1957.

Explain why Helen might be wrong. Use figures to support your answer.

.....

..... **[2]**

5 Arjun buys family size cartons of orange juice.
Each carton holds 1.75 litres.

(a) How many millilitres of juice does one carton contain?

(a) ..... ml **[1]**

(b) One day Arjun uses $\frac{1}{6}$ of a carton of this juice.

What **division** should Arjun do to work out how many millilitres of juice he uses?
You do not need to calculate the answer.

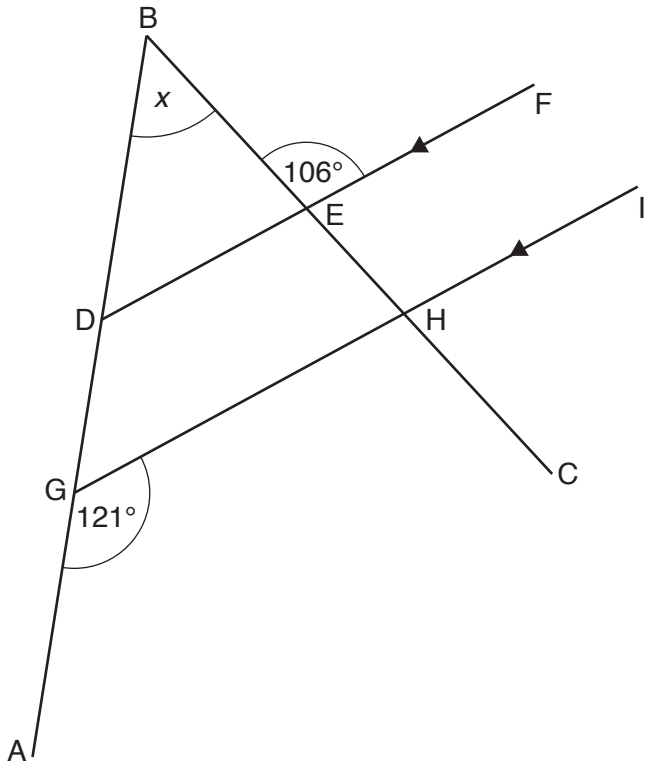
(b) ..... **[1]**

(c) Arjun's family drinks $\frac{3}{4}$ of a carton each day.

Calculate how many **litres** of orange juice Arjun's family drinks each day.
Give your answer as a mixed number in its simplest form.

(c) ..... litres **[4]**

6* The diagram is made from four straight lines. DEF and GHI are parallel.



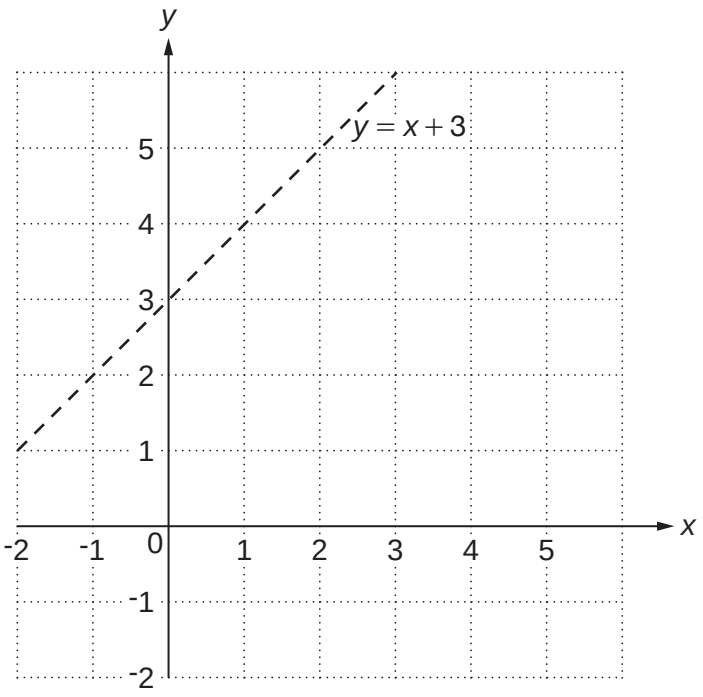
Not to scale

Calculate the size of angle *x*.
Give a reason for each stage of your working.

..... ° **[5]**

7 *In this question, represent the inequalities by shading the area **not** required.*

On the grid below, the line $y = x + 3$ is shown.



(a) Indicate clearly the region $y < x + 3$ by shading the area **not** required. **[1]**

(b) Indicate clearly the region $x + y < 5$.

Shade the area **not** required. **[2]**

(c) You are given that x and y are integers that satisfy these **three** inequalities.

$$y < x + 3$$
$$x + y < 5$$
$$y > 2$$

Use your diagram to find x and y.

(c) x = ...

y = ... **[3]**

8 Richard is a window cleaner.
For each house he visits, he charges a fixed amount of £5 plus 60p for each window cleaned.

(a) Sam's house has 10 windows.

How much does Richard charge to clean Sam's windows?

(a) ..... **[1]**

(b) Richard's charges lead to the formula $C = 0.6w + 5$, where C is the charge in £ for cleaning the windows of a house with w windows.

Anna is also a window cleaner.
For each house she visits, she charges a fixed amount of £8 plus 20p for each window cleaned.

(i) Write down the formula to give the charge £C for Anna to clean the windows of a house with w windows.

(b)(i) ..... **[1]**

(ii) Use algebra to find the value of w that gives the same charge for both Richard and Anna.

(ii) ..... **[3]**

(iii) Comment on what your answer to part **(b)(ii)** means in real life.

..... **[1]**

9 Use division to express $\frac{4}{11}$ as a recurring decimal.

..... **[2]**

10 Simplify the following, giving your answer in the form $k\sqrt{2}$, where k is an integer.

$$8\sqrt{50} + \frac{30}{\sqrt{2}}$$

..... **[4]**

11 Given that $f(x) = x^2 - 3x + 1$, find and simplify an expression for $f(-4x)$.

..... **[3]**

12 **(a)** Find the resultant of $\begin{pmatrix} 8 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ -5 \end{pmatrix}$.

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

(b) You are given that $\mathbf{p} + \mathbf{q} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

Write the following as column vectors.

(i) $\left[\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \mathbf{p}\right] + \mathbf{q}$

(b)(i) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[2]**

(ii) $-4(\mathbf{q} + \mathbf{p})$

(ii) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[2]**

END OF QUESTION PAPER