



H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

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)

Monday 17 January 2011

Afternoon

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. 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.

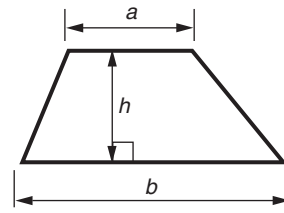
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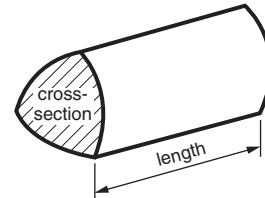
No calculator can be used for this paper

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 = $\pi r l$



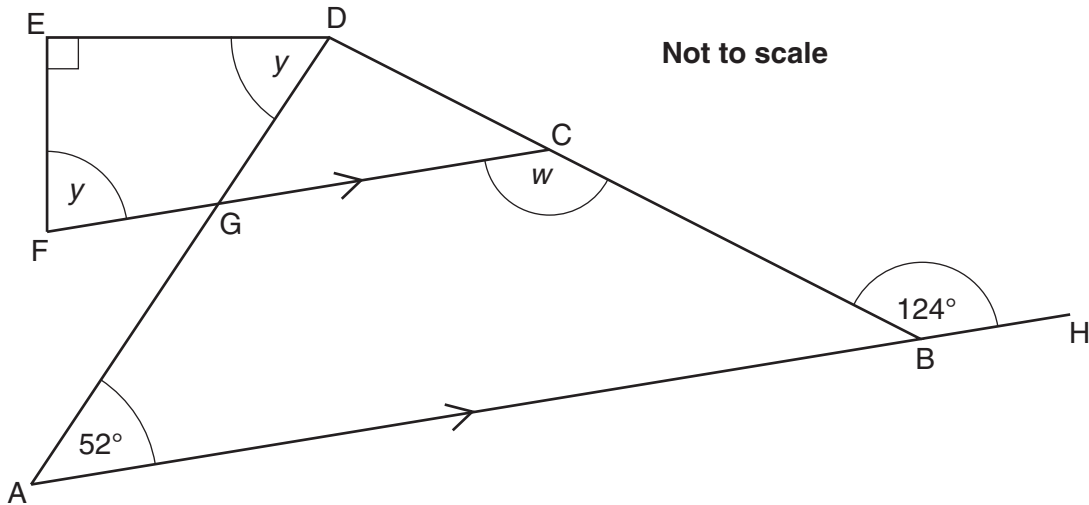
The Quadratic Equation

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 ABH and FGC are parallel straight lines.
 Angle GFE = angle GDE = y .
 Angle DEF = 90° .



- (a) (i) Write down the size of angle w .

(a)(i) _____ $^\circ$ [1]

- (ii) Give a reason for your answer.

 _____ [1]

- (b) Work out the size of angle y .
 Show your working clearly.

(b) _____ $^\circ$ [4]

- 2 (a) Work out $24 \div \frac{1}{3}$.

(a) _____ [1]

- (b) Daffodil bulbs are sold in bags of 80.
Eddie and Caroline each bought one bag of bulbs.

- (i) 32 of Eddie's bulbs did not grow.

What fraction of his 80 bulbs did not grow?
Write your answer in its simplest form.

(b)(i) _____ [2]

- (ii) $\frac{3}{5}$ of Caroline's bulbs produced white flowers.

How many of Caroline's bulbs produced white flowers?

(ii) _____ [2]

- (c) Write the following fractions in order of size, smallest first.
Show how you decide.

$$\frac{3}{5}$$

$$\frac{11}{15}$$

$$\frac{2}{3}$$

$$\frac{13}{20}$$

(c) _____ [4]
smallest

- 3 The acceleration of a drag racing car, $a \text{ m/s}^2$, is calculated using this formula.

$$a = \frac{v - u}{T - t}$$

$u \text{ m/s}$ is the velocity after time t seconds and $v \text{ m/s}$ is the velocity after time T seconds.

A drag racing car accelerates along a straight course.

After 1.3 seconds its velocity is 49.5 m/s, after 3.26 seconds its velocity is 124.1 m/s.

Work out an **estimate** of the acceleration of the drag racing car.

_____ m/s^2 [3]

- 4 Solve this inequality.

$$7x + 5 \leq 47$$

_____ [2]

- 5 Harpreet is doing an experiment. She attaches different weights to the end of a spring and then measures the length of the spring.

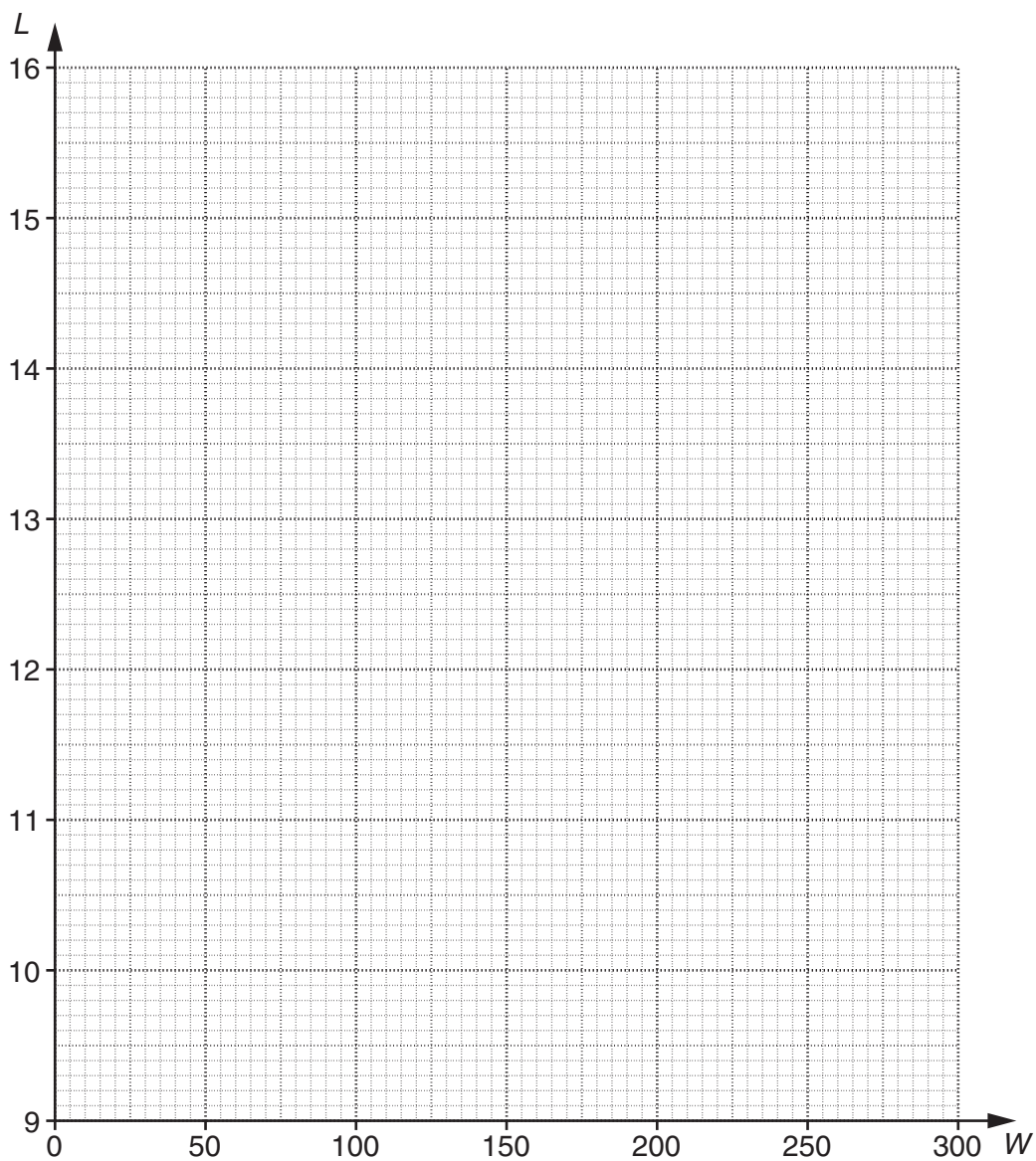
She records the length, L cm, of the spring for each weight, W g.

Her results are given in the table.



W	50	80	120	200	260
L	11	11.6	12.4	14	15.2

- (a) Use these values to draw the straight line graph of L against W .



[3]

(b) How long was the spring before Harpreet attached any weight to it?

(b) _____ cm [1]

(c) Calculate the gradient of the graph in part (a).

(c) _____ [2]

(d) Write down the equation of your graph in the form $L = mW + c$.

(d) _____ [1]

(e) Harpreet says that she can use the equation in part (d) to calculate the length of the spring if she attaches a 5 kg weight to it.

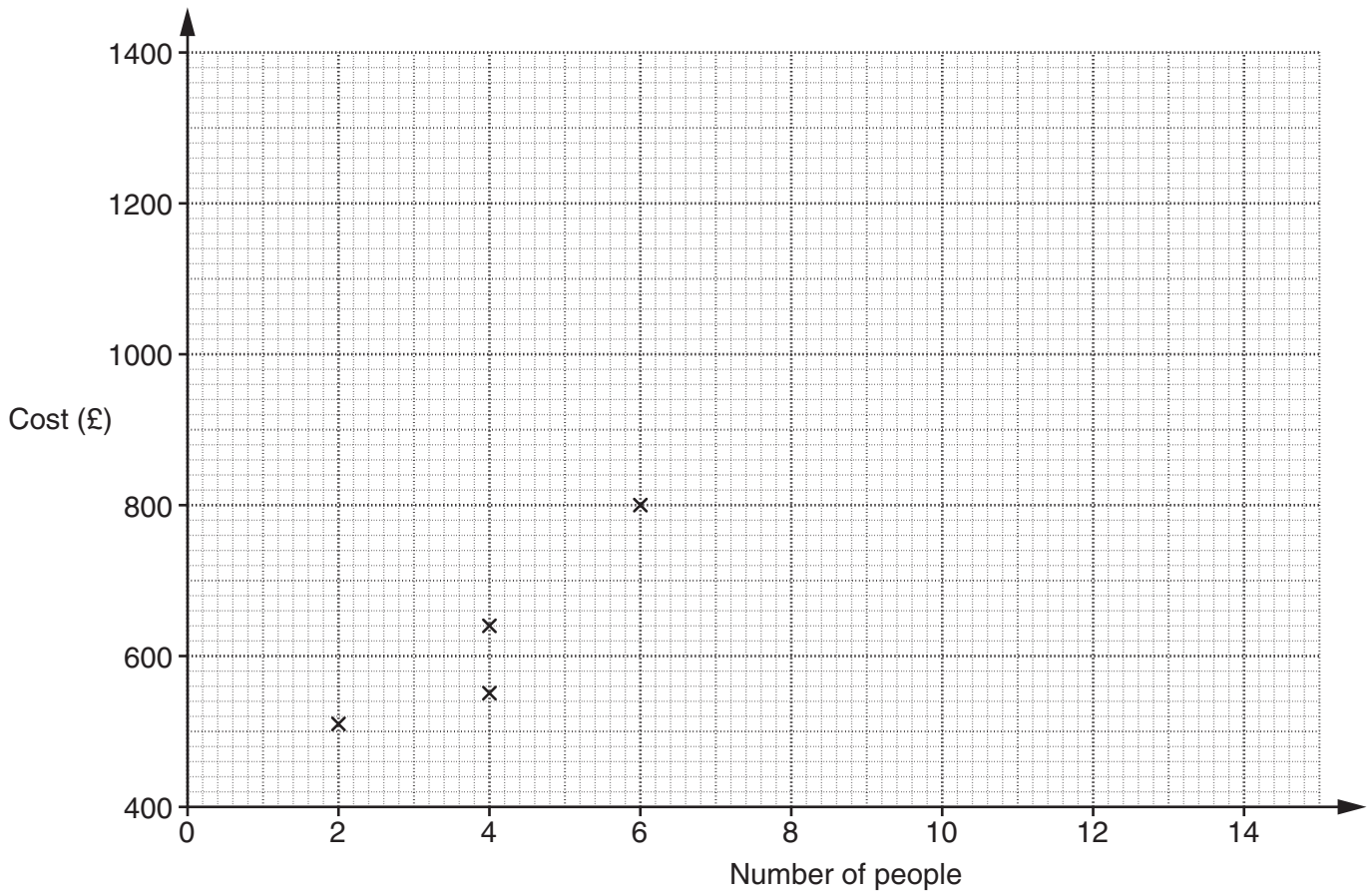
Explain why she may be wrong.

_____ [1]

- 6 *Island Holidays* has many cottages for rent in the Shetland Islands. They are for any number of people from 2 to 15. The table shows information for nine of their cottages. It shows the number of people each cottage can accommodate, and the cost of renting it for a week in July.

Number of people	2	4	4	6	7	8	8	9	12
Cost (£)	510	640	550	800	820	1040	1130	1110	1350

The results for the first four cottages are plotted on the scatter diagram.



- (a) Complete the scatter diagram and draw a line of best fit.

[3]

- (b)* Lizzie wants to rent a cottage for 10 people for a week in July.
She expects the food bill to be £400.
The cost of food and rent is to be shared equally between the 10 people.

Calculate how much each person should expect to pay.
Explain **how** you have worked out your answer.

[4]

10

7 Solve algebraically these simultaneous equations.

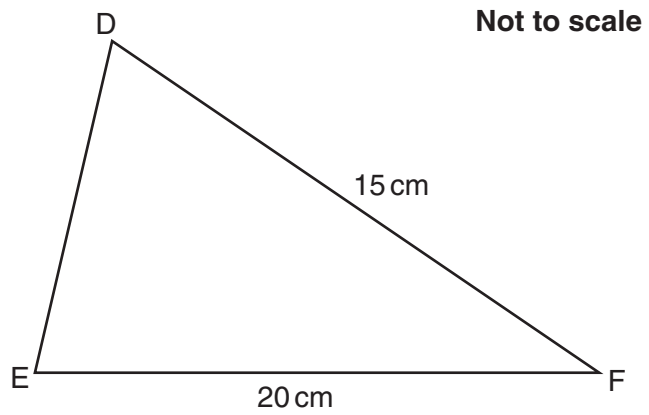
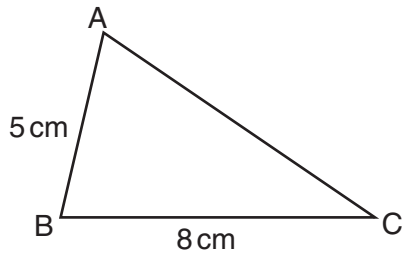
$$3x + 4y = 17$$

$$5x - 6y = 22$$

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

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

8 Triangle ABC is similar to triangle DEF.



(a) Calculate DE.

(a) _____ cm [3]

(b) Calculate AC.

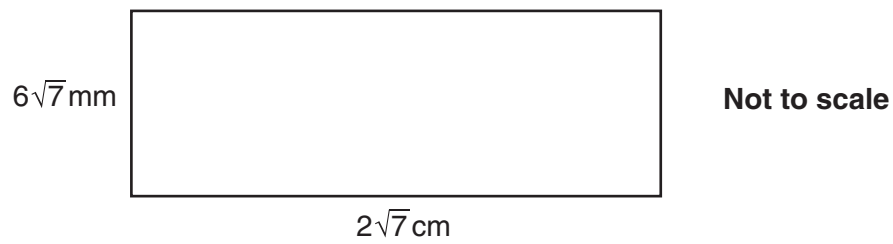
(b) _____ cm [2]

9 (a) Simplify.

$$(3 - \sqrt{5})(2 + \sqrt{5})$$

(a) _____ [3]

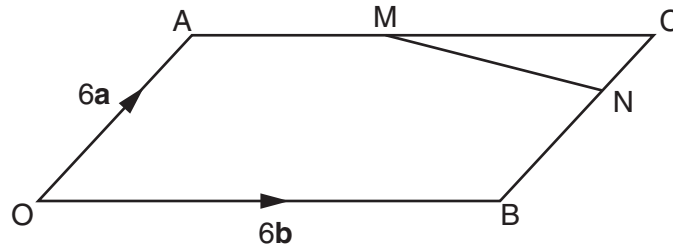
(b) Find the area of this rectangle.
Give the units of your answer.



(b) _____ [3]

10 OACB is a parallelogram.

$\vec{OA} = 6\mathbf{a}$, $\vec{OB} = 6\mathbf{b}$, M is the midpoint of AC and $CN = \frac{1}{3}CB$.



Find, in terms of \mathbf{a} and \mathbf{b} , the vector that represents each of the following. Give each answer in its simplest form.

(a) \vec{OC}

(a) _____ [1]

(b) \vec{AM}

(b) _____ [1]

(c) \vec{OM}

(c) _____ [1]

(d) \vec{MN}

(d) _____ [2]

11 (a) Find the value of

(i) 8^0 ,

(a)(i) _____ [1]

(ii) 8^{-2} .

(ii) _____ [2]

(b) Kepler's 3rd law of planetary motion can be given approximately as

$$T = \frac{1}{4} r^{\frac{3}{2}}$$

where T days is the time it takes a planet to orbit the Sun and r is the distance of the planet from the Sun in millions of kilometres.

The planet Venus is 100 million kilometres from the Sun.

How many days does it take Venus to orbit the Sun?

(b) _____ [2]

15
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