

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS A

A501/02

Unit A (Higher)

SPECIMEN

Duration: 1 hour

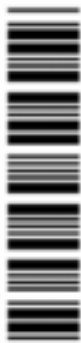
Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

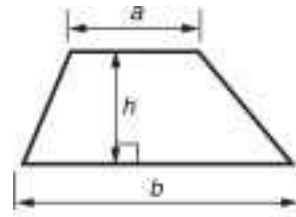


You are permitted to use a calculator for this paper.

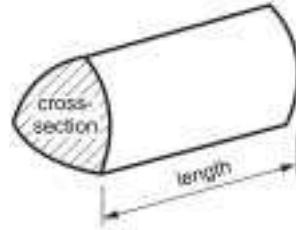


Formulae Sheet: Higher Tier

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



Volume of prism $= (\text{area of cross-section}) \times \text{length}$

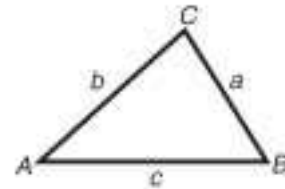


In any triangle ABC

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

1 (a) Solve.

(i) $\frac{x}{5} = 20$

(a)(i) _____ [1]

(ii) $4y + 1 = y + 22$

(ii) _____ [3]

(iii) $4(2x - 3) = 3(5x + 1) + 2$

(iii) _____ [4]

(b) Rearrange this formula to make m the subject.

$$t = 2m - v$$

(b) _____ [2]

2 (a) Divide £160 in the ratio 1 : 4.

(a) £_____ £_____ [2]

(b) A, B and C share some money in the ratio 4 : 5 : 7.
C gets £600 more than B.

How much money do they have altogether?

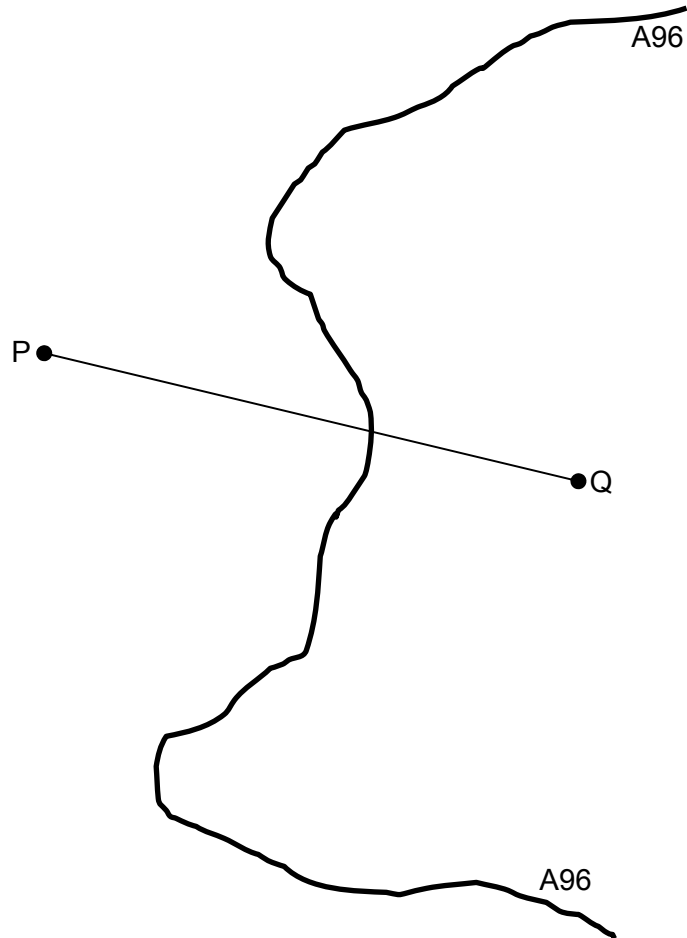
(b) £_____ [3]

- 3 (a) Use a ruler and pair of compasses for your construction in this question.
Leave in your construction lines.

P and Q are two mobile phone masts on either side of the A96 road.
Mobile phones pick up a signal from the closest mast.

Lizzie's car has broken down on this section of the A96.
She is told that she is receiving her mobile phone signal from mast P.

Indicate where on the road she might be.



[3]

- (b) Use a ruler and pair of compasses for your construction in this question.
Leave in your construction lines.

A garden sprinkler is a narrow pipe 3 metres long fixed to a lawn.
The pipe has holes along its length and at both ends.
All of the lawn within 2 metres of the pipe is watered.

Show, on the scale drawing below, the region that the sprinkler waters.



Scale: 2 cm represents 1 m

[3]

4 Calculate

(a) the reciprocal of 1.6,

(a) _____ [1]

(b) $\sqrt{4 \cdot 1^2 - 6 \cdot 09}$ giving your answer correct to 2 decimal places.

(b) _____ [3]

- 5 Rafael manages a fish and chip shop.
He wants to decide whether to use *King Edward*, *Maris Piper* or *Desiree* potatoes to make his chips.
The three varieties of potato all cost the same amount per kilogram.

Here is some information about a typical bag of each of these varieties of potato.

- (a) This table shows the distribution of weights of potatoes in a bag of 55 *King Edward* potatoes.

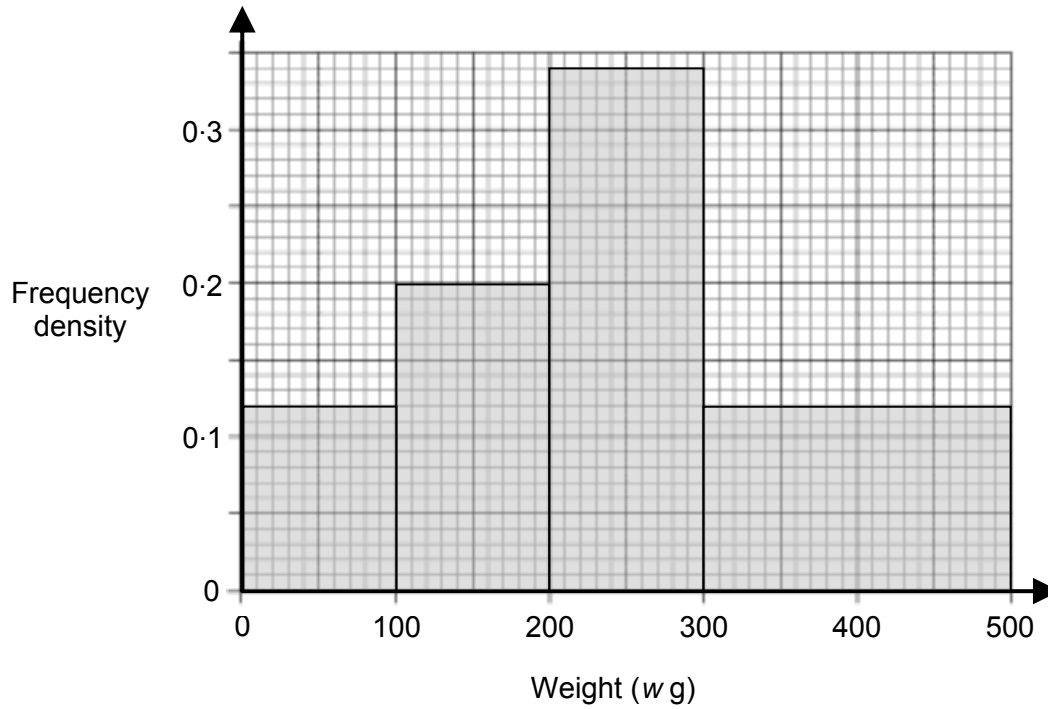
Weight (w g)	Frequency
$100 < w \leq 200$	16
$200 < w \leq 300$	25
$300 < w \leq 400$	9
$400 < w \leq 500$	5

Rafael says the smallest potato might weigh exactly 100 g.

Explain why he must be wrong.

[1]

- (b) This histogram shows the distribution of weights of potatoes in a bag of *Maris Piper* potatoes.



- (i) Explain how you know that there are 12 potatoes with weight less than 100 g.

[1]

- (ii) How many *Maris Piper* potatoes were in this bag?

(b)(ii) _____ [2]

This stem and leaf table shows the weights, to the nearest 10 g, of the potatoes in a bag of 30 *Desiree* potatoes.

1	2	2	3	4	6	8	8				
2	0	1	3	7	9	9					
3	0	2	3	3	3	4	5	5	8	9	9
4	3	4	4	8	8	9					

Key 1 | 2 represents 120 g

- (c) Rafael needs a variety of potato with a high average weight. He knows that small potatoes are not good for making chips.

Use the information given in this question to decide which of the three varieties of potato he should buy.

(c) _____ [9]

- 6 (a) The expression for the n th term of a series is $n(n + 2)$.

Work out the 3rd and 4th terms of this series.

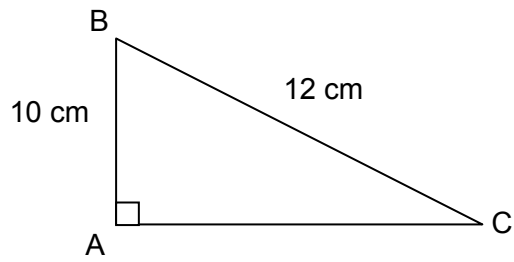
(a) _____ , _____ [2]

- (b) Find an expression for the n th term of this series.

6 10 14 18 ...

(b) _____ [2]

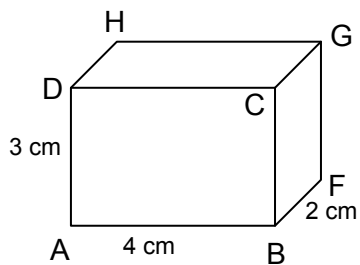
7 (a) Calculate the length AC.



Not to scale

(a) _____ cm [3]

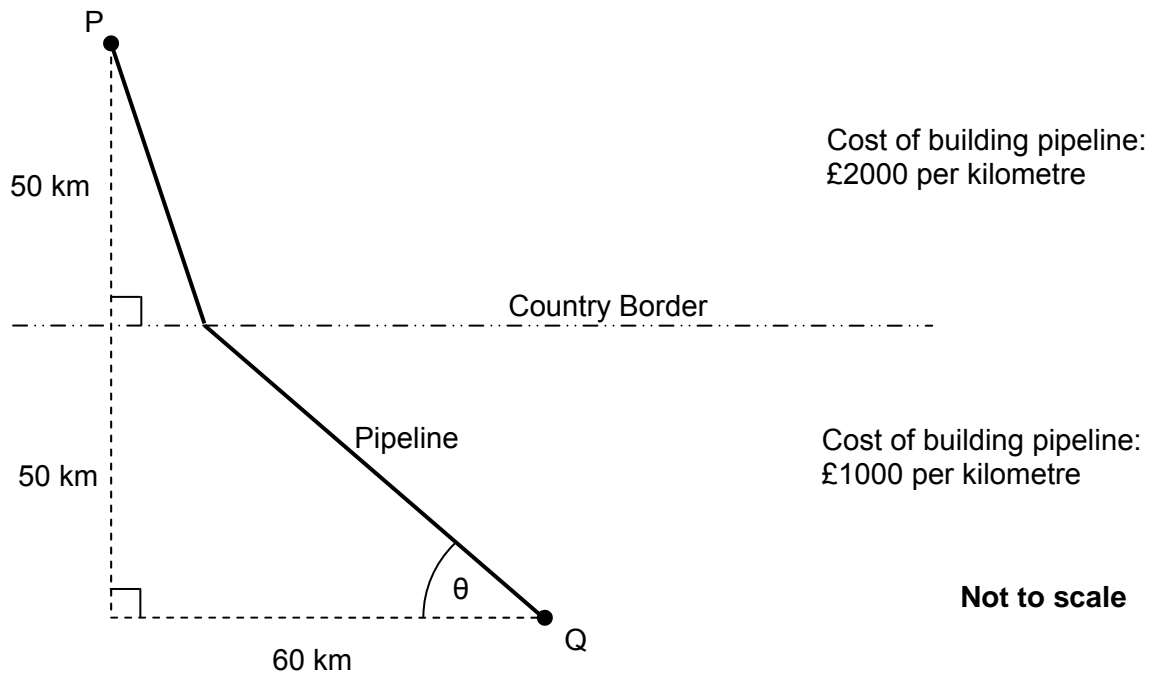
(b) A cuboid, ABCDEFGH, has sides 2 cm, 3 cm and 4 cm.



Calculate the length of the diagonal AG.

(b) _____ cm [2]

8 P and Q are towns in different countries.

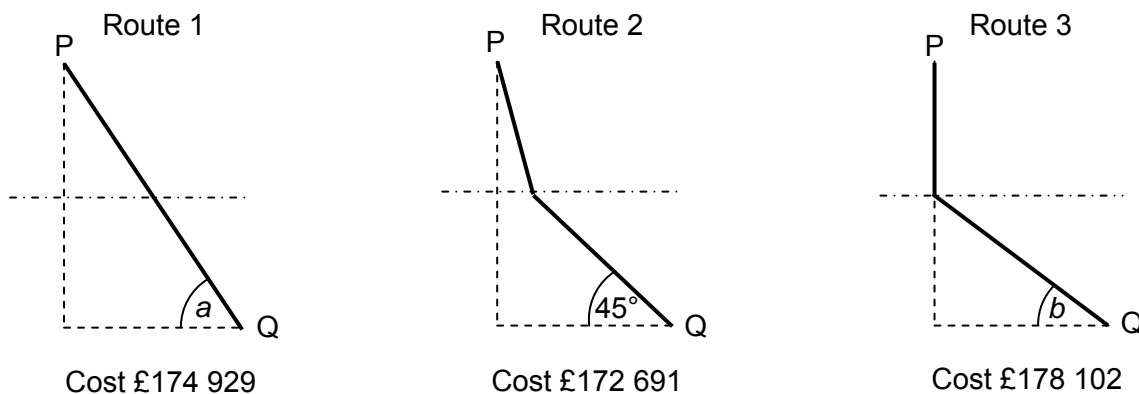


A water company wants to build a water pipeline between P and Q.

The company can build it either in **one** straight section or in **two** straight sections with a connection on the country border.

The cost of building one kilometre of pipeline in each country is shown on the diagram above. The company wants to build the pipeline as cheaply as possible.

The company has investigated three routes between P and Q and worked out the costs, as shown below.



$$\tan a = \frac{5}{3}, a \text{ is approximately } 59^\circ.$$

$$\tan b = \frac{5}{6}, b \text{ is approximately } 40^\circ.$$

In this question you have to find the cost of another route from P to Q to see if the pipeline can be built more cheaply.

Chose another value of θ and work out the cost of that route between P and Q.
Your value of θ should be between 40° and 59° .
Comment on your result.

[7]

TURN OVER FOR QUESTION 9

9 (a) (i) Write 60 as a product of prime factors.

(a)(i) _____ [2]

(ii) Find the highest common factor (HCF) of 60 and 210.

(ii) _____ [2]

(b) In a part of Africa there is a high population of cicada (a type of insect) every 17 years.
In the same part of Africa there is a high population of lizards every 12 years.
There was a high population of **both** cicadas and lizards in the year 2001.

In what year will there next be a large population of **both** cicadas and lizards?

(b) _____ [2]



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