H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS A

Unit A (Higher)

A501/02

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

SPECIMEN

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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.

SP (SLM) T12103

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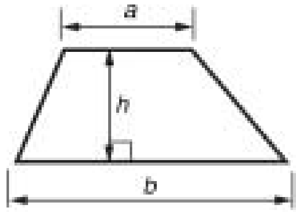
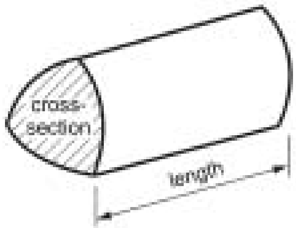
Turn over

Formulae Sheet: Higher Tier

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



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

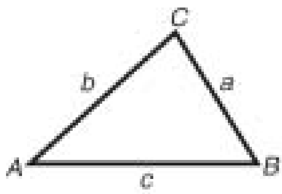


In any triangle *ABC*

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

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

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

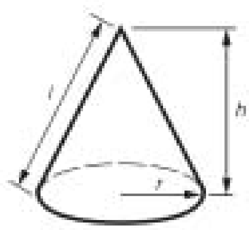


Volume of sphere $= \frac{4}{3}\pi r^3$

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

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

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?

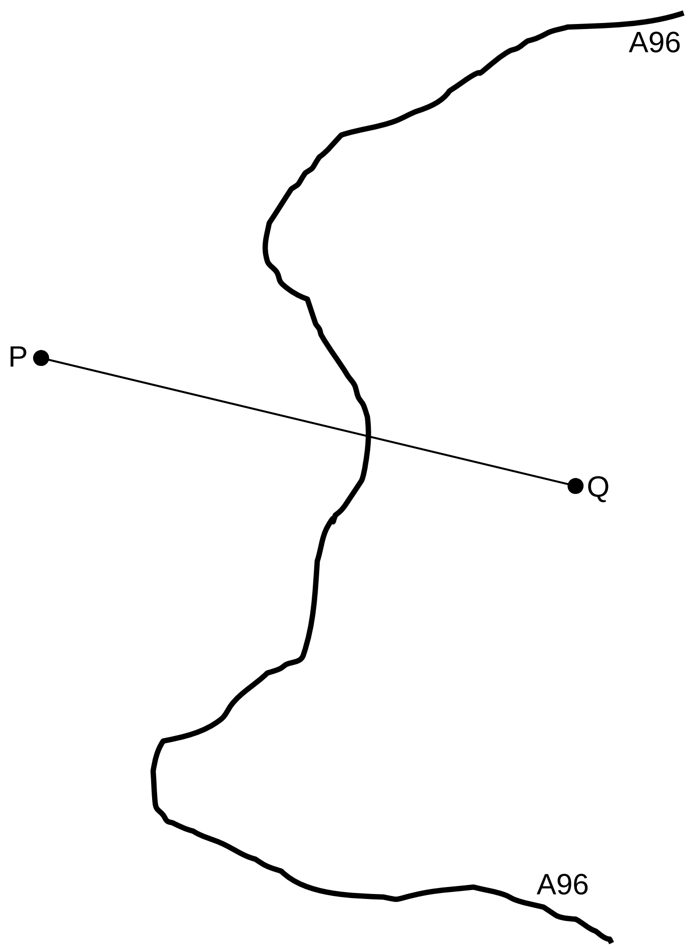
(b) £_________________________ **[3]**

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

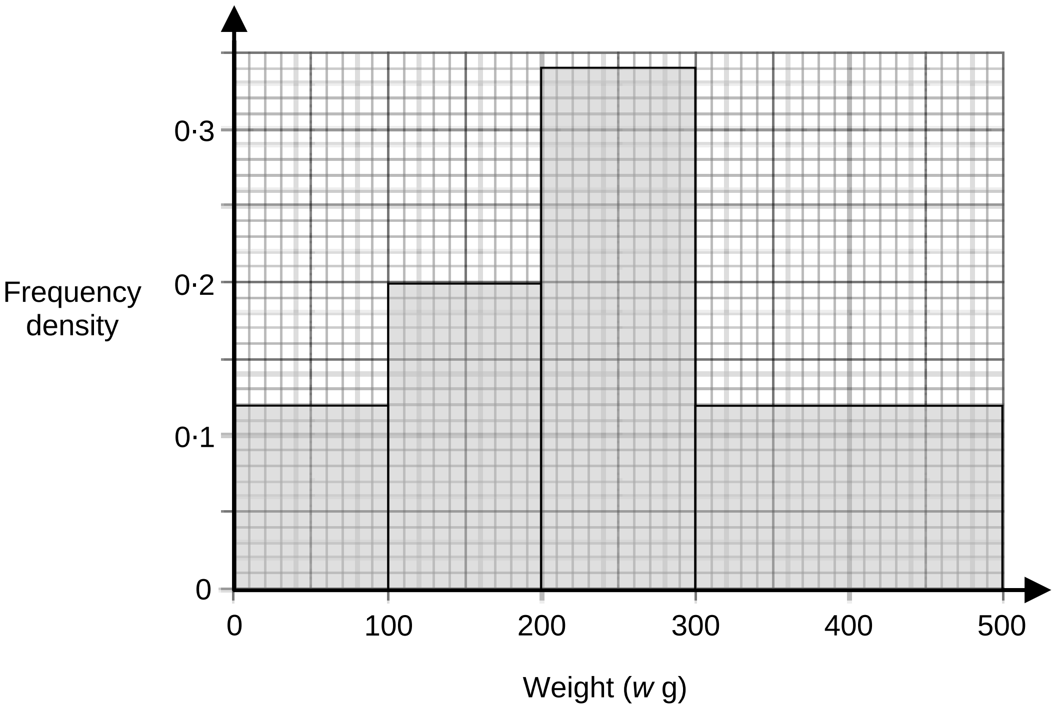
Rafael says the smallest potato might weigh exactly 100 g.

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 nth term of a series is $n(n + 2)$.

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

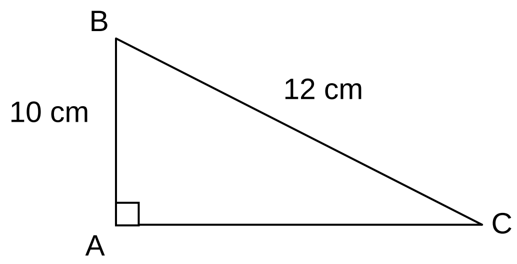
(a) ________________ , ________________ **[2]**

(b) Find an expression for the nth term of this series.

6 10 14 18 …

(b) __________________________ **[2]**

7 **(a)** Calculate the length AC.



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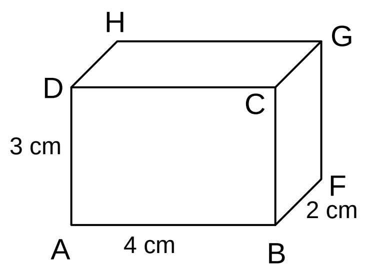
(a) ______________________ cm **[3]**

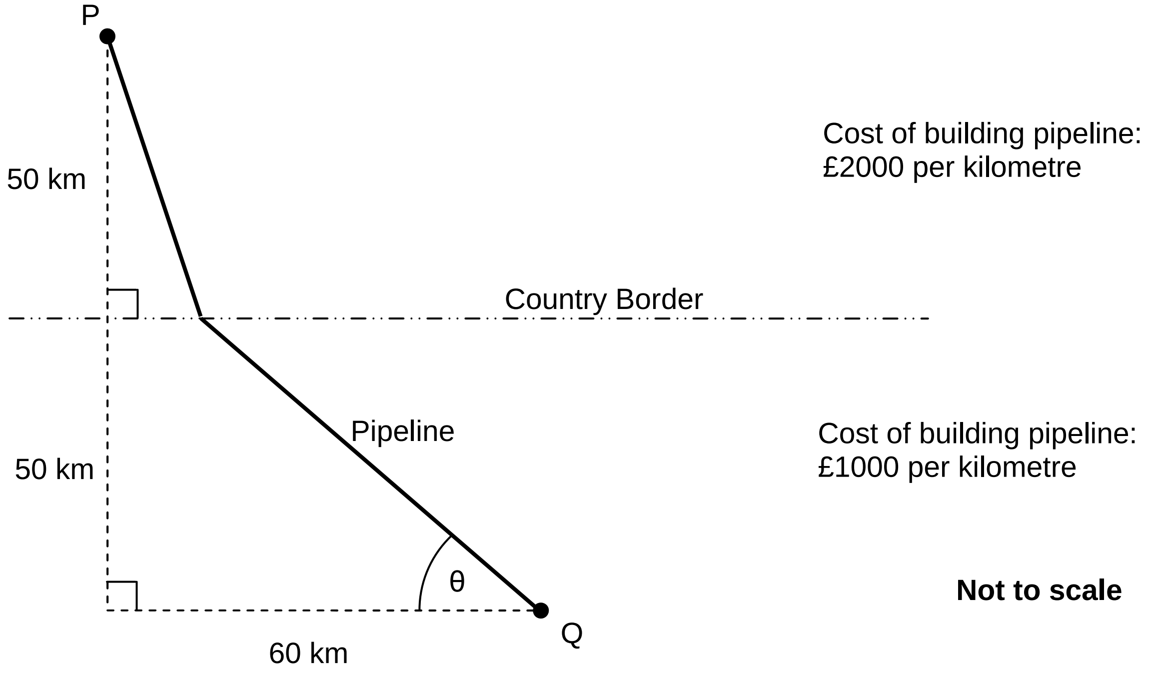
(b) A cuboid, ABCDEFGH, has sides 2 cm, 3 cm and 4 cm.



Calculate the length of the diagonal AG.

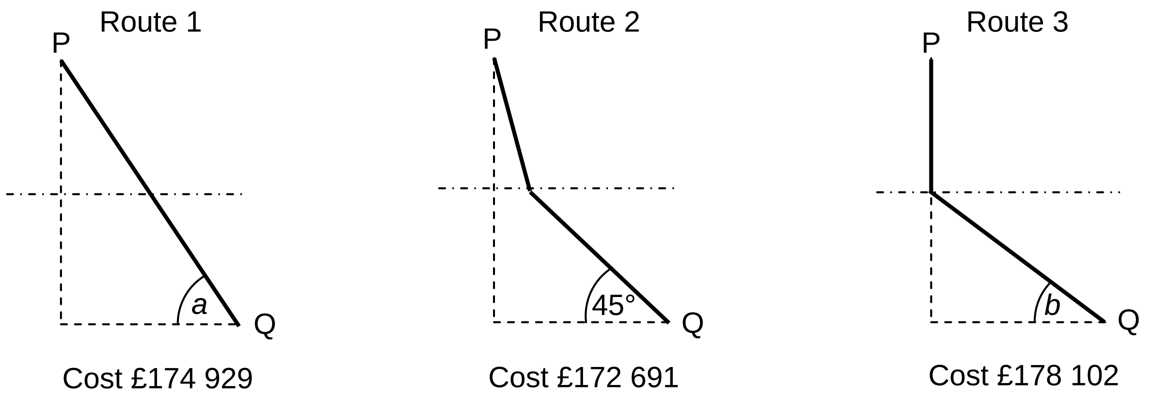
(b) ________________________ cm **[2]**

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* is approximately 59°.

$\tan b = \frac{5}{6}$, *b* is approximately 40°.

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]**

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

General Certificate of Secondary Education

MATHEMATICS A A501/02

Unit A (Higher)

Specimen Mark Scheme

The maximum mark for this paper is **60**.

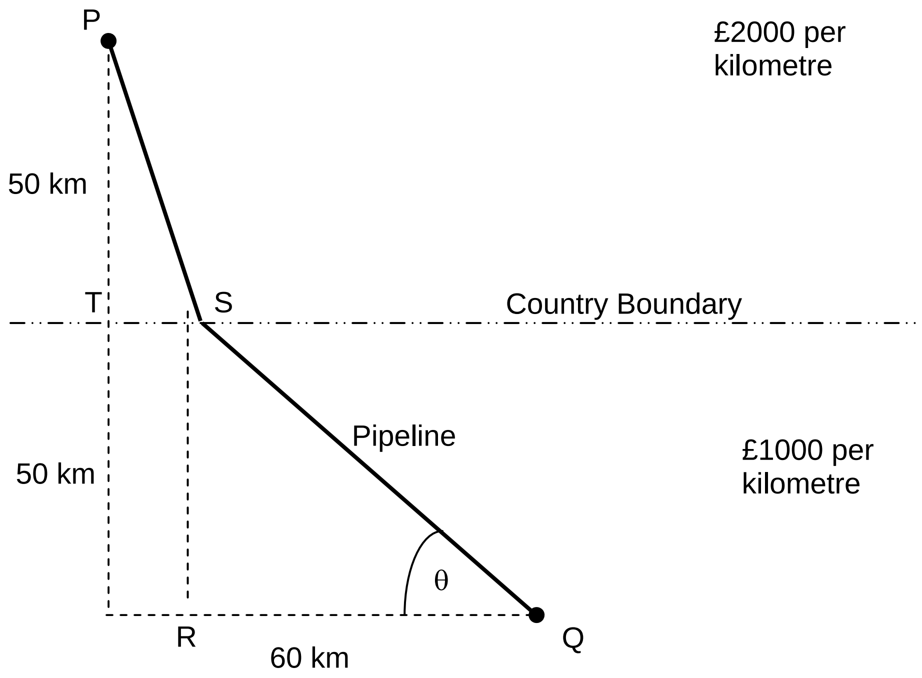
This document consists of **8** printed pages.

1	(a)	(i) 100	**1**	
		(ii) 7	**3**	Or **M2** for 3*y* = 21 Or **M1** for 3*y* or 21
		(iii) ⁻17/7 oe	**4**	Or **M3** for 7*x* = ⁻17 Or **M2** for both 8*x* − 12, 15*x* + 3 and some attempt to simplify Or **M1** for either 8*x* − 12 or 15*x* + 3
	(b)	$\frac{t+v}{2}$	**2**	Or **M1** for *t* + *v*
2	(a)	32 128	**2**	Allow **M1** for 160/5
	(b)	4800	**3**	Or **M2** for 600/2 × 16 Or **M1** for anything × 16
3	(a)	Perpendicular bisector drawn with arcs (± 2°, ± 2mm). At least one correct point indicated	**3**	Or **M1A1** for bisector only Or **M1** if outside tolerance but arcs clear Or **SC1** if no construction and at least one correct position indicated
	(b)	Correct area indicated, scale correct	**3**	Or **B1** for (at least) one semicircular arc radius 4cm And **B1** for 2 straight lines at least 6cm long, 4cm from the sprinkler and parallel
4	(a)	0·625 or 5/8	**1**	
	(b)	3·27	**3**	Or **M2** for 3·274(…) or 3·2 Or **M1** for 10·72 Or **SC1** for a clear rounding to 2dp

5	(a)	Potatoes in this class must be **greater than** 100	**1**	
	(b)	(i) 0·12 × 100 (or area) = 12	**1**	
		(ii) 90	**2**	**M1** for 12 + 20 + 34 + 24 (at least 2 correct)
	(c)		 **2** **4** **1** **2**	KE(0 small), MP(12/90 small), D(0 small) Mean 255, 236·6, 303 Mode 2-300, 2-300, 3-400 (or 330) Median 2-300, 2-300, 325 Consideration of small potatoes **B2**, **1**, **0** Calculation of averages **B4**, **3**, **2**, **1**, **0** (means using mid-interval and attempts to estimate a value for median within class can score up to 4 marks, medians up to 3, modes up to 2) Comparison of at least 2 averages (same type) **B1** Interpretation of results **B2**, **1**, **0**
6	(a)	15, 24	**2**	**1** each
	(b)	4*n* + 2	**2**	Or **M1** for 4*n* seen
7	(a)	6·6(3…)	**3**	Or **M2** for $\sqrt{12^2-10^2}$ Or **M1** for 12^2 and 10^2 seen
	(b)	5·4 or 5·3(8…)	**2**	Or **M1** for $\sqrt{2^2+3^2+4^2}$
8		A correct cost for a route plus a comment	**7**	See angles, lengths and costs on back page **M1** Attempt to calculate any length using trig **And M1** for calc of length QS **And M1** for calc of length QR **And M1** for calc of length TS **And M1** for calc of length PS **And M1** for calc of total cost **And B1** for comment interpreting *their* result

9	(a)	(i) $2 \times 2 \times 3 \times 5$	**2**	Or **M1** for factor tree or evidence of repeated division
		(ii) 30	**2**	Or **M1** for writing 210 as prime factors or for at least two factors of both 60 and 210 listed (not incl. 1 itself)
	(b)	2205	**2**	Or **M1** for 12×17 or for at least two multiples of both 12 and 17 listed (not incl. 1 itself)

Not to scale



Theta	Rads	QS	Cost of QS	RQ	TS	PS	Cost of PS	Total cost
40	0.698132	77.78619	77786.19134	59.58768	0.41232	50.0017	100003.4	177789.6
41	0.715585	76.21265	76212.65434	57.51842	2.48158	50.06154	100123.1	176335.7
42	0.733038	74.72383	74723.82749	55.53063	4.469374	50.19936	100398.7	175122.5
43	0.750492	73.31396	73313.95928	53.61844	6.381564	50.4056	100811.2	174125.2
44	0.767945	71.97783	71977.82698	51.77652	8.223484	50.67174	101343.5	173321.3
45	0.785398	70.71068	70710.67812	50	10	50.9902	101980.4	172691.1
46	0.802851	69.50818	69508.17955	48.28444	11.71556	51.35421	102708.4	172216.6
47	0.820305	68.36637	68366.37305	46.62575	13.37425	51.75781	103515.6	171882
48	0.837758	67.28164	67281.63648	45.0202	14.9798	52.19573	104391.5	171673.1
49	0.855211	66.25065	66250.64967	43.46434	16.53566	52.66335	105326.7	171577.3
50	0.872665	65.27036	65270.36447	41.95498	18.04502	53.15659	106313.2	171583.5
51	0.890118	64.33798	64337.97829	40.4892	19.5108	53.67189	107343.8	171681.7
52	0.907571	63.45091	63450.91075	39.06428	20.93572	54.20613	108412.3	171863.2
53	0.925025	62.60678	62606.78291	37.6777	22.3223	54.7566	109513.2	172120
54	0.942478	61.8034	61803.39887	36.32713	23.67287	55.32093	110641.9	172445.3
55	0.959931	61.03873	61038.72944	35.01038	24.98962	55.89706	111794.1	172832.8
60	1.047198	57.73503	57735.02692	28.86751	31.13249	58.90018	117800.4	175535.4

Assessment Objectives and Functional Elements Grid

GCSE MATHEMATICS A

A501/02: Unit A (Higher)

Qn	Topic	AO1	AO2	AO3	Functional
1	Solve, rearrange	10			
2	Ratio	2	3		
3	Loci		6		3
4	Using a calculator	4			
5	Statistics		8	5	8
6	Sequences	4			
7	Pythagoras	5			
8	Trigonometry		2	5	7
9	Prime factors, HCF, LCM	4	2		
	TOTAL	29	21	10	18

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