RECOGNISING ACHIEVEMENT

Oxford Cambridge and RSA Examinations

General Certificate of Secondary Education

MATHEMATICS B (MEI)

PAPER 2 SECTION B
HIGHER TIER

1968/2316B

Specimen Paper 2003

Additional materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

Candidates answer on the question paper.

TIME 45 minutes.

Candidate Name	Centre Number	Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

You are expected to use an electronic calculator for this paper.

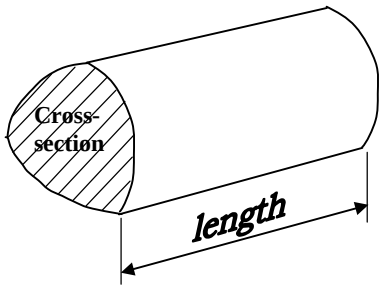
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Unless otherwise instructed in the question, take π to be 3.142 or use the π button on your calculator.
- Section B begins with question 12.

For Examiner's Use Only	
Section B	
TOTAL	

FORMULAE SHEET: HIGHER TIER

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

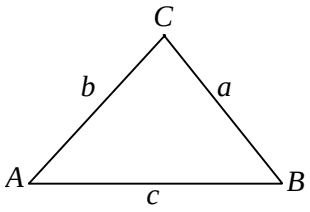


In any triangle ABC

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

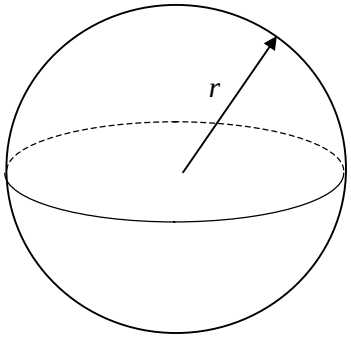
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



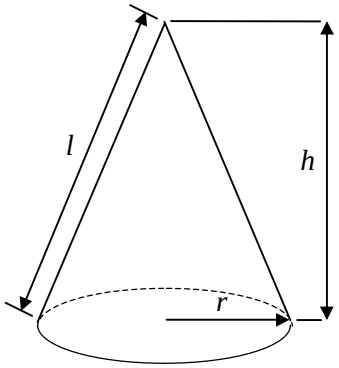
Volume of sphere = $\frac{4}{3}\pi r^3$

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 solution of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

12 The number 1800 can be written as $2^p \times 3^q \times 5^r$ where p, q and r are integers.
Calculate the values of p, q and r.

Answer $p =$ _____ $q =$ _____ $r =$ _____ [3]

13 The table shows the population and area, in square kilometres, of some countries.

Country	**Population**	**Area**
Norway	4.10×10^6	3.24×10^5
Portugal	9.70×10^6	9.21×10^4
Spain	3.68×10^7	5.05×10^5

(a) Find the combined area of Spain and Portugal.
Give your answer in standard form.

Answer *(a)* _____ km^2 [2]

(b) Calculate the population density of Norway.
Give your answer in number of people per square kilometre.

Answer *(b)* _____ [2]

14 Evaluate the following, rounding your answers to three significant figures.

(a) $\frac{1}{3}+\frac{2}{5}+\frac{3}{7}+\frac{4}{9}$

Answer *(a)* _____ [1]

(b) $\frac{4.3\times5.3^2}{12.5+17.3}$

Answer *(b)* _____ [1]

(c) $\sqrt[3]{\frac{300}{4\pi}}$

Answer *(c)* _____ [1]

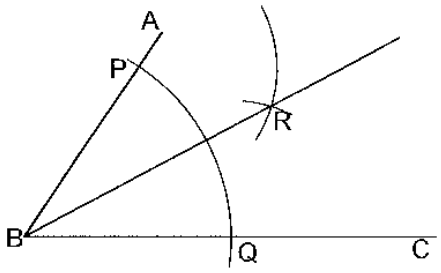
15 Use trial and improvement to find the positive root of the equation $x^3+5x=10$.
Show all your trials and give your answer to one decimal place.

Answer $x=$ _____ [4]

16 Jack buys a television for £246.75 including VAT at 17½%.
Find the price excluding VAT.

Answer £ _____ [3]

17 The following is the usual "straight edge and compasses" procedure used to bisect angle ABC.
It is illustrated in the diagram.



1. Draw an arc centred on B; the radius used is unimportant; this arc cuts AB at P and BC at Q.
2. Using a radius which is more than half of PQ draw two arcs, one centred at P and the other centred at Q: these two arcs meet at R.
3. Draw the straight line BR.

(a) Prove that triangles PBR and QBR are congruent.

Answer (a) _____

_____

_____

_____ [4]

(b) Complete the proof that BR bisects angle ABC.

Answer (b) _____

_____

_____ [1]

18 Solve this equation.

$$\frac{3x-5}{4} + \frac{12-11x}{6} = 4$$

Answer $x =$ _____ [5]

19 In this question assume that exactly 85% of our trains arrive on time.

(a) Jack and Jill each catch a train.
Assuming the trains' arrival times are independent, calculate the probability that

(i) both trains arrive on time,

Answer *(a)(i)* _____ [2]

(ii) one train arrives on time but not the other.

Answer *(ii)* _____ [3]

(b) Describe a situation where assuming trains' arrival times are independent

(i) is reasonable,

Answer (b)(i) _____

_____

_____ [1]

(ii) is not reasonable.

Answer (ii) _____

_____

_____ *[1]*

20 $\overrightarrow{OA}=\mathbf{a}$ and $\overrightarrow{OB}=\mathbf{b}$.

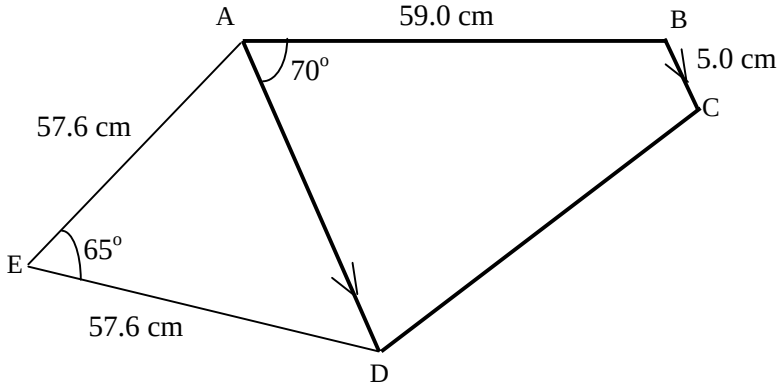
P is a point on AB such that AP = 2PB.
Write $\overrightarrow{AP}$ in terms of **a** and **b**.

Answer $\overrightarrow{AP}$ _____ [3]

21 Make r the subject of the equation $3(r - 4) = s(7 - 2r)$.

Answer $r =$ _____ [4]

22 The diagram shows a bicycle frame made of tubes.
Tubes BC and AD are parallel.
Angle AED = 65°, angle BAD = 70°, AB = 59.0 cm, and AE = DE = 57.6 cm.



Calculate the total length of the four tubes used to construct ABCD.
Explain your work and give your answer to a reasonable degree of accuracy.

Answer _____ [9]

RECOGNISING ACHIEVEMENT

Oxford Cambridge and RSA Examinations

General Certificate of Secondary Education

MATHEMATICS B (MEI)

PAPER 2 SECTION B
HIGHER TIER

1968/2316B

MARK SCHEME

Specimen Paper 2003

SECTION B

12			$p = 3$	B1	
			$q = 2$	B1	
			$r = 2$	B1	
13	**(a)**		$5.97(1) \times 10^5$	B2	B1 if correct value in incorrect form
	(b)		$(4.10 \times 10^6) / (3.24 \times 10^5)$	M1	
			12.65	A1	
14	**(a)**		1.61	B1	
	(b)		4.05	B1	
	(c)		2.88	B1	
15			In [1, 2] or better	M1	
			In [1.4, 1.5] or better	M1	
			In [1.4, 1.45] or better	M1	
			1.4	A1	
16			$246.75 \div 1.175 = 210$	M2A1	M1: 1.175 seen
17	**(a)**		BP = BQ radii	B1	
			PR = QR (equal) radii	B1	
			BR is common	B1	
			SSS	B1	
	(b)		ABR = CBR	B1	
18			$3(3x – 5) + 2(12 – 11x) = 48$	M2	M1: attempts to multiply by 6
			$9x – 15 + 24 – 22x = 48$	M1	
			$–13x = 39$	M1	
			$x = –3$	A1	
19	**(a)**	**(i)**	$0.85 \times 0.85 = 0.7225$	M1 A1	
		(ii)	0.85×0.15	M1	
			$\times 2 = 0.255$	M1 A1	
	(b)		e.g. If travelling in different areas or (same area different times) then probably independent.	B1	
			If travelling in the same area at the same time, not independent.	B1	

20	$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$	M1
	Uses thirds	M1
	$\overrightarrow{AP} = \frac{2}{3}(\mathbf{b} - \mathbf{a})$	A1
21	$3r - 12 = 7s - 2rs$	M1
	$3r + 2rs = 7s + 12$	M1
	$r(3 + 2s) = 7s + 12$	M1
	$r = (7s + 12) / (3 + 2s)$	A1
22	$AD^2 = 57.6^2 + 57.6^2 - 2 \times 57.6 \times 57.6 \cos 65$	M1
	3831. …	M1
	AD = 61.896…	A1
	Some explanation or diagram to create triangle ABD′ or 56.896… seen	M1
	$(BD')^2 = 59.0^2 + 56.9^2 - 2 \times 59.0 \times 56.9 \cos 70$	M1
	= 4422. …	M1
	BD′ = 66.49…	A1
	Attempt at 66.5 + 61.9 + 59.0 + 5.0	M1
	192.4	A1

Mathematics B (MEI) 1968. Assessment Grid – Paper 2 Higher Tier

Paper: 2316			Year:2003 Specimen					Target grades					UAM Marks				
Qn	NC Ref	Topic/Context	Nu	Man Alg	Non Mal Alg	SS	HD	C	B	A	A*	M/S	PS	C	R	Notes F/I	I/H
1	2.5	Use of symbols, Index notation		3					1	2							
2	3.4	Loci				3		3									3
3	4.4	Processing and representing data					4		4								
4	3.3	Properties of transformations				5		5						3			
5	4.1	Using and applying handling data					4		4					2			
6	2.3	Number operations and the relationship between them, Written methods	6							3	3			1			
7	2.5	Simultaneous linear and quadratic equations		4						4							
8	3.2	Properties of triangles and other rectilinear shapes				3					3						
9	2.6	Quadratic functions			5						5						
10	2.5	Use of symbols		8						3	5						
11	2.5	Direct and inverse proportion		5							5	5	5				
12	2.3	Number operations and the relationships between them	3					3									
13	2.2	Powers and roots	4						4								4
14	2.3	Number operations and the relationship between them, Calculator methods	3					3									3
15	2.5	Numerical methods			4			4									4
16	2.3	Number operations and the relationships between them	3						3								3
17	3.1	Using and applying shape, space and measure				5				5					4		
18	2.5	Equations		5					5								
19	4.4	Processing and representing data					7			7				2			
20	3.3	Vectors				3					3						
21	2.5	Formulae		4							4						
22	3.2	Properties of angles and other rectilinear shapes				9					9	9					
		Total	19	29	9	28	15	18	21	24	37	14	5	8	4		17