OCR

Friday 6 June 2014 – Afternoon

AS GCE MATHEMATICS (MEI)

4752/01 Concepts for Advanced Mathematics (C2)

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:
- Printed Answer Book 4752/01
- MEI Examination Formulae and Tables (MF2)

Other materials required:
- Scientific or graphical calculator

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **8** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER / INVIGILATOR

- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

Section A (36 marks)

1 Find $\int 7x^{\frac{5}{2}}\mathrm{d}x$. **[3]**

2 **(i)** Find $\sum_{r=1}^{5}\frac{21}{r+2}$. **[2]**

(ii) A sequence is defined by

$$u_1 = a, \text{ where } a \text{ is an unknown constant,}$$
$$u_{n+1} = u_n + 5.$$

Find, in terms of a, the tenth term and the sum of the first ten terms of this sequence. **[3]**

3 The points $\mathrm{P}(2, 3.6)$ and $\mathrm{Q}(2.2, 2.4)$ lie on the curve $y = \mathrm{f}(x)$. Use P and Q to estimate the gradient of the curve at the point where $x = 2$. **[2]**

4 The point $\mathrm{R}(6, -3)$ is on the curve $y = \mathrm{f}(x)$.

(i) Find the coordinates of the image of R when the curve is transformed to $y = \frac{1}{2}\mathrm{f}(x)$. **[2]**

(ii) Find the coordinates of the image of R when the curve is transformed to $y = \mathrm{f}(3x)$. **[2]**

5

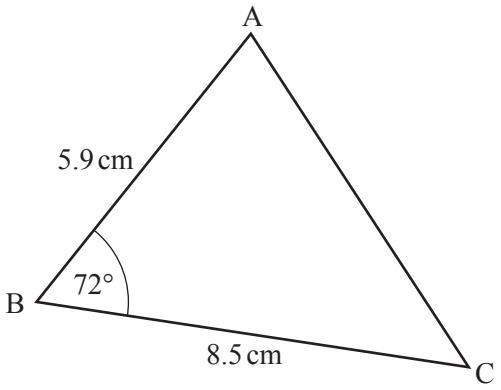


Fig. 5

Fig. 5 shows triangle ABC, where angle $\mathrm{ABC} = 72°$, $\mathrm{AB} = 5.9\,\mathrm{cm}$ and $\mathrm{BC} = 8.5\,\mathrm{cm}$. Calculate the length of AC. **[3]**

6

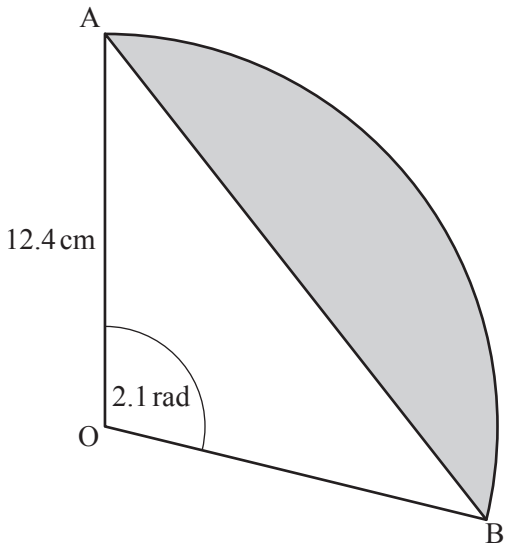


Fig. 6

A circle with centre O has radius 12.4 cm. A segment of the circle is shown shaded in Fig. 6. The segment is bounded by the arc AB and the chord AB, where the angle AOB is 2.1 radians. Calculate the area of the segment. **[4]**

7 The second term of a geometric progression is 24. The sum to infinity of this progression is 150. Write down two equations in a and r, where a is the first term and r is the common ratio. Solve your equations to find the possible values of a and r. **[5]**

8 Simplify $\dfrac{\sqrt{1-\cos^2\theta}}{\tan\theta}$, where θ is an acute angle. **[3]**

9 Solve the equation $\tan 2\theta = 3$ for $0° < \theta < 360°$. **[3]**

10 Use logarithms to solve the equation $3^{x+1} = 5^{2x}$. Give your answer correct to 3 decimal places. **[4]**

Section B (36 marks)

11

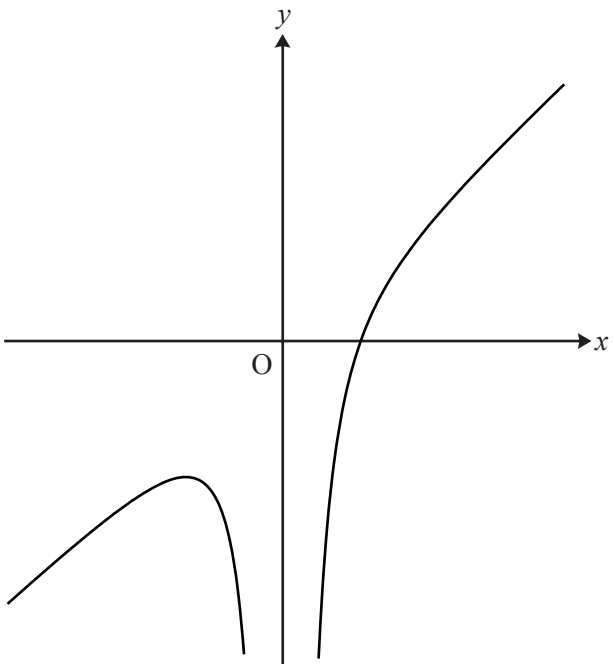


Fig. 11

Fig. 11 shows a sketch of the curve with equation $y = x - \frac{4}{x^2}$.

(i) Find $\frac{dy}{dx}$ and show that $\frac{d^2y}{dx^2} = -\frac{24}{x^4}$. **[3]**

(ii) Hence find the coordinates of the stationary point on the curve. Verify that the stationary point is a maximum. **[5]**

(iii) Find the equation of the normal to the curve when $x = -1$. Give your answer in the form $ax + by + c = 0$. **[5]**

12 Oskar is designing a building. Fig. 12 shows his design for the end wall and the curve of the roof. The units for x and y are metres.

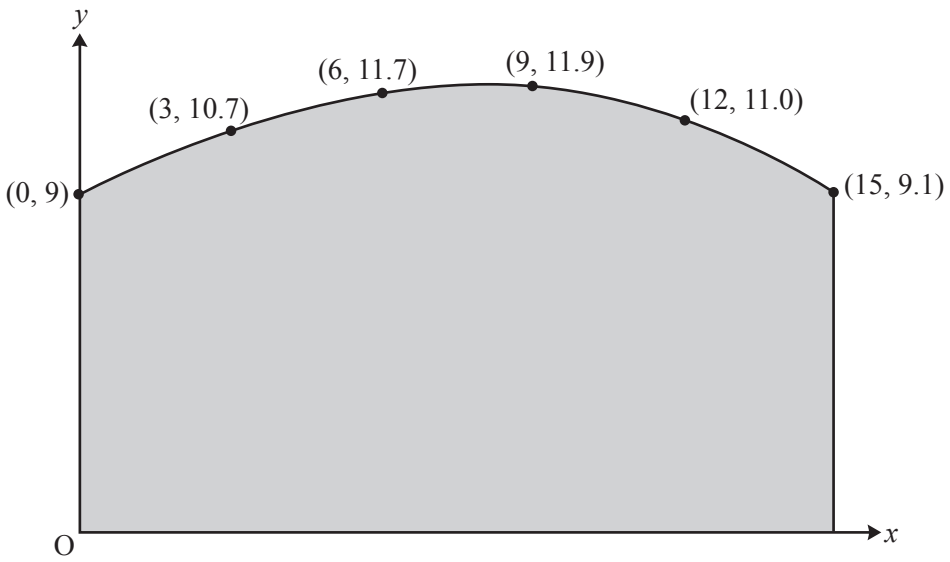


Fig. 12

(i) Use the trapezium rule with 5 strips to estimate the area of the end wall of the building. **[4]**

(ii) Oskar now uses the equation $y = -0.001x^3 - 0.025x^2 + 0.6x + 9$, for $0 \leqslant x \leqslant 15$, to model the curve of the roof.

(*A*) Calculate the difference between the height of the roof when $x = 12$ given by this model and the data shown in Fig. 12. **[2]**

(*B*) Use integration to find the area of the end wall given by this model. **[4]**

Question 13 begins on page 6

13 The thickness of a glacier has been measured every five years from 1960 to 2010.
The table shows the reduction in thickness from its measurement in 1960.

Year	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Number of years since 1960 (t)	5	10	15	20	25	30	35	40	45	50
Reduction in thickness since 1960 (h m)	0.7	1.0	1.7	2.3	3.6	4.7	6.0	8.2	12	15.9

An exponential model may be used for these data, assuming that the relationship between h and t is of the form $h = a \times 10^{bt}$, where a and b are constants to be determined.

(i) Show that this relationship may be expressed in the form $\log_{10} h = mt + c$, stating the values of m and c in terms of a and b. **[2]**

(ii) Complete the table of values in the answer book, giving your answers correct to 2 decimal places, and plot the graph of $\log_{10} h$ against t, drawing by eye a line of best fit. **[4]**

(iii) Use your graph to find h in terms of t for this model. **[4]**

(iv) Calculate by how much the glacier will reduce in thickness between 2010 and 2020, according to the model. **[2]**

(v) Give one reason why this model will not be suitable in the long term. **[1]**

END OF QUESTION PAPER

OCR

Friday 6 June 2014 – Afternoon

AS GCE MATHEMATICS (MEI)

4752/01 Concepts for Advanced Mathematics (C2)

PRINTED ANSWER BOOK

Candidates answer on this Printed Answer Book.

OCR supplied materials:
- Question Paper 4752/01 (inserted)
- MEI Examination Formulae and Tables (MF2)

Other materials required:
- Scientific or graphical calculator

Duration: 1 hour 30 minutes

* 4 7 5 2 0 1 *

* 3 1 8 7 5 4 3 3 3 8 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **8** pages. Any blank pages are indicated.

Section A (36 marks)

1	
2(i)	
2(ii)	

3	
4(i)	
4(ii)	
5	

6

7

8

9

10

Section B (36 marks)

11(i)	
11(ii)	

11(iii)	

PLEASE DO NOT WRITE IN THIS SPACE

12(i)

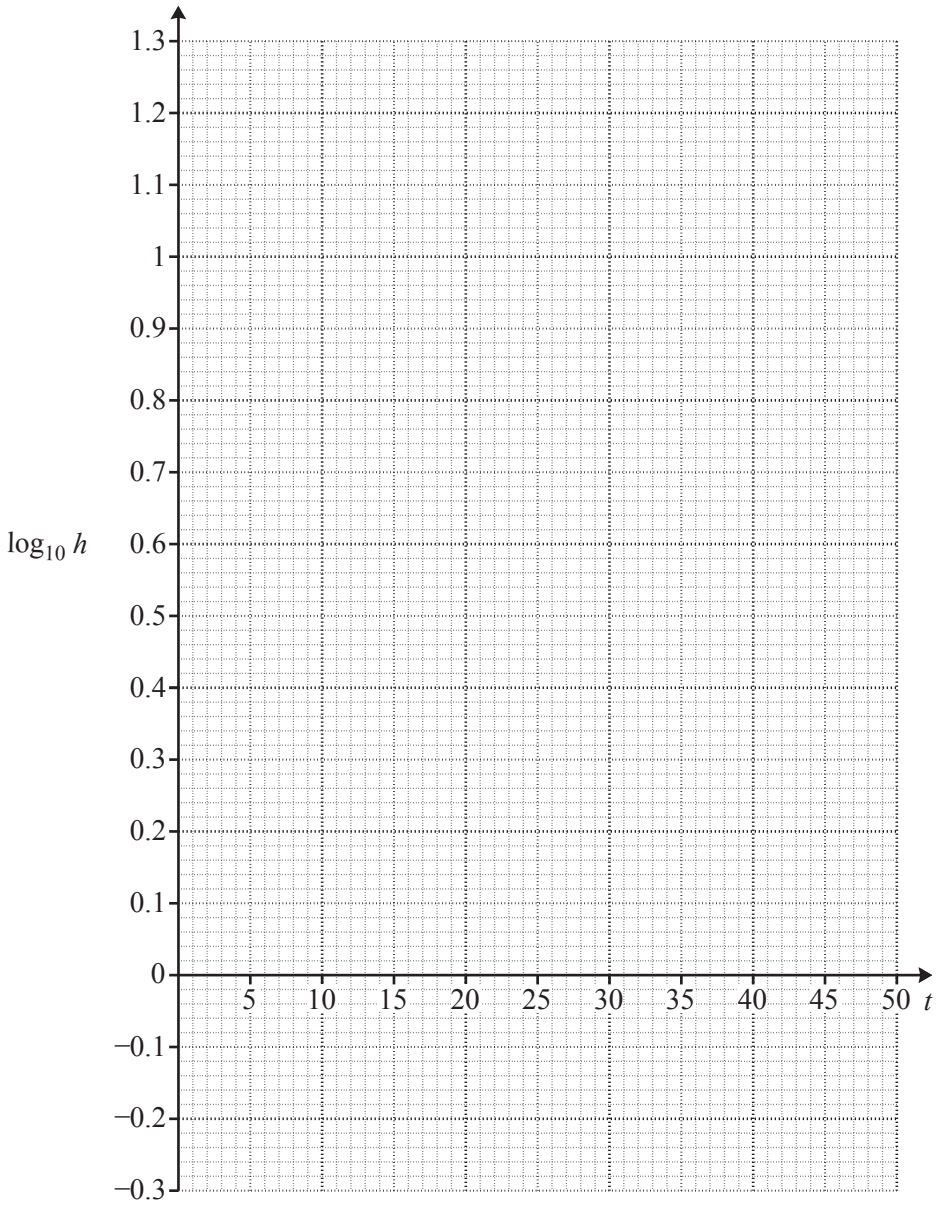
12(ii)(*A*)

12(ii)(*B*)

13(i)

13(ii)

t	5	10	15	20	25	30	35	40	45	50
h	0.7	1.0	1.7	2.3	3.6	4.7	6.0	8.2	12	15.9
$\log_{10} h$										



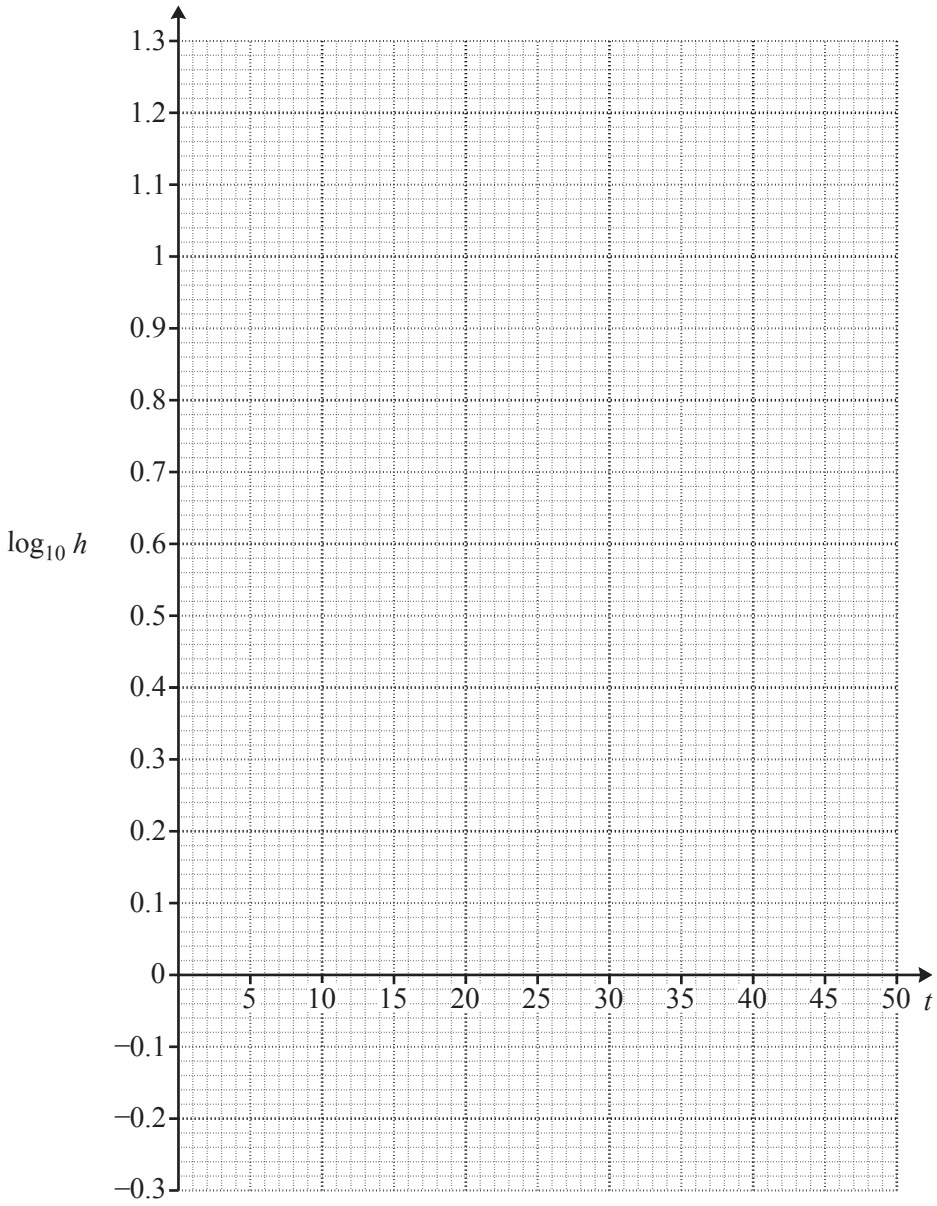
A spare copy of this table and graph can be found on page 12.

13(iii)	
13(iv)	
13(v)	

13(ii)

Spare copy of table and graph for question 13(ii)

t	5	10	15	20	25	30	35	40	45	50
h	0.7	1.0	1.7	2.3	3.6	4.7	6.0	8.2	12	15.9
$\log_{10} h$										



OCR
Oxford Cambridge and RSA

GCE

Mathematics (MEI)

Unit **4752**: Concepts for Advanced Mathematics

Advanced Subsidiary GCE

Mark Scheme for June 2014

1. Annotations and abbreviations

Annotation in scoris	Meaning
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
✓and ✗	
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working
M0, M1	Method mark awarded 0, 1
A0, A1	Accuracy mark awarded 0, 1
B0, B1	Independent mark awarded 0, 1
SC	Special case
^	Omission sign
MR	Misread
Highlighting	
Other abbreviations in mark scheme	**Meaning**
E1	Mark for explaining
U1	Mark for correct units
G1	Mark for a correct feature on a graph
M1 dep*	Method mark dependent on a previous mark, indicated by *
cao	Correct answer only
oe	Or equivalent
rot	Rounded or truncated
soi	Seen or implied
www	Without wrong working

2. Subject-specific Marking Instructions for GCE Mathematics (MEI) Pure strand

a Annotations should be used whenever appropriate during your marking.

The A, M and B annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks. It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

For subsequent marking you must make it clear how you have arrived at the mark you have awarded.

b An element of professional judgement is required in the marking of any written paper. Remember that the mark scheme is designed to assist in marking incorrect solutions. Correct *solutions* leading to correct answers are awarded full marks but work must not be judged on the answer alone, and answers that are given in the question, especially, must be validly obtained; key steps in the working must always be looked at and anything unfamiliar must be investigated thoroughly.

Correct but unfamiliar or unexpected methods are often signalled by a correct result following an *apparently* incorrect method. Such work must be carefully assessed. When a candidate adopts a method which does not correspond to the mark scheme, award marks according to the spirit of the basic scheme; if you are in any doubt whatsoever (especially if several marks or candidates are involved) you should contact your Team Leader.

c The following types of marks are available.

M
A suitable method has been selected and *applied* in a manner which shows that the method is essentially understood. Method marks are not usually lost for numerical errors, algebraic slips or errors in units. However, it is not usually sufficient for a candidate just to indicate an intention of using some method or just to quote a formula; the formula or idea must be applied to the specific problem in hand, eg by substituting the relevant quantities into the formula. In some cases the nature of the errors allowed for the award of an M mark may be specified.

A
Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. Accuracy marks cannot be given unless the associated Method mark is earned (or implied). Therefore M0 A1 cannot ever be awarded.

B
Mark for a correct result or statement independent of Method marks.

E

A given result is to be established or a result has to be explained. This usually requires more working or explanation than the establishment of an unknown result.

Unless otherwise indicated, marks once gained cannot subsequently be lost, eg wrong working following a correct form of answer is ignored. Sometimes this is reinforced in the mark scheme by the abbreviation isw. However, this would not apply to a case where a candidate passes through the correct answer as part of a wrong argument.

d When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. (The notation 'dep *' is used to indicate that a particular mark is dependent on an earlier, asterisked, mark in the scheme.) Of course, in practice it may happen that when a candidate has once gone wrong in a part of a question, the work from there on is worthless so that no more marks can sensibly be given. On the other hand, when two or more steps are successfully run together by the candidate, the earlier marks are implied and full credit must be given.

e The abbreviation ft implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only — differences in notation are of course permitted. A (accuracy) marks are not given for answers obtained from incorrect working. When A or B marks are awarded for work at an intermediate stage of a solution, there may be various alternatives that are equally acceptable. In such cases, exactly what is acceptable will be detailed in the mark scheme rationale. If this is not the case please consult your Team Leader.

Sometimes the answer to one part of a question is used in a later part of the same question. In this case, A marks will often be 'follow through'. In such cases you must ensure that you refer back to the answer of the previous part question even if this is not shown within the image zone. You may find it easier to mark follow through questions candidate-by-candidate rather than question-by-question.

f Wrong or missing units in an answer should not lead to the loss of a mark unless the scheme specifically indicates otherwise. Candidates are expected to give numerical answers to an appropriate degree of accuracy, with 3 significant figures often being the norm. Small variations in the degree of accuracy to which an answer is given (e.g. 2 or 4 significant figures where 3 is expected) should not normally be penalised, while answers which are grossly over- or under-specified should normally result in the loss of a mark. The situation regarding any particular cases where the accuracy of the answer may be a marking issue should be detailed in the mark scheme rationale. If in doubt, contact your Team Leader.

g Rules for replaced work

If a candidate attempts a question more than once, and indicates which attempt he/she wishes to be marked, then examiners should do as the candidate requests.

If there are two or more attempts at a question which have not been crossed out, examiners should mark what appears to be the last (complete) attempt and ignore the others.

NB Follow these maths-specific instructions rather than those in the assessor handbook.

h For a *genuine* misreading (of numbers or symbols) which is such that the object and the difficulty of the question remain unaltered, mark according to the scheme but following through from the candidate's data. A penalty is then applied; 1 mark is generally appropriate, though this may differ for some units. This is achieved by withholding one A mark in the question.

Note that a miscopy of the candidate's own working is not a misread but an accuracy error.

Question			Answer	Marks	Guidance	
1			$kx^{\frac{5}{2}+1}$ $2x^{\frac{7}{2}}$ cao $+ c$	M1 A1 A1 **[3]**	k is any non-zero constant	
2	(i)		$21\left(\frac{1}{1+2}+\frac{1}{2+2}+\frac{1}{3+2}+\frac{1}{4+2}+\frac{1}{5+2}\right)$ oe soi 22.95 or $\frac{459}{20}$ or $22\frac{19}{20}$	M1 A1 **[2]**	may be implied by correct answer	NB 7 + 5.25 + 4.2 + 3.5 + 3 M0 if extra terms or terms missing
2	(ii)		$a + 45$ cao $\frac{10}{2}\ a + a + their 45$ $5(2a + 45)$ or $10a + 225$ cao isw	B1 M1 A1 **[3]**	mark the final answer must be explicitly stated or $\frac{10}{2}\ 2a + (10-1)\times 5$ ignore further work attempting to find a	 condone wrongly attributed answers B2 if correct answer derived from adding terms separately
3			$\frac{2.4-3.6}{2.2-2}$ oe -6 cao	M1 A1 **[2]**		M1 may be embedded eg in equation of straight line B2 if unsupported ignore subsequent work irrelevant to finding the gradient

Question			Answer	Marks	Guidance	
4	(i)		(6, –1.5) oe	B2 **[2]**	B1 for each value; allow $x = 6$, $y = -1.5$	SC0 for (6, − 3)
4	(ii)		(2, –3)	B2 **[2]**	B1 for each value; allow $x = 2$, $y = -3$	SC0 for (6, − 3)
5			$5.9^2 + 8.5^2 - 2 \times 5.9 \times 8.5 \times \cos 72$ 107 – 31 or better 8.7(2…)	M1 M1 A1 **[3]**	 76.(….) or 204.(…) (radians) 	 or 64.(…..) (grad) NB 6.76cos72 or 2.08(8954882..) scores M1M0 if M0M0, B3 for 8.72 or better if unsupported or 8.7(2…) if obtained from other valid method
6			½ × 12.4^2 ×2.1 (= 161.448) ½ × 12.4^2 × sin2.1 (= 66.3 to 66.4) or ½ × 21.5(121..) × 6.16(9…) their 161.448 – their 66.36 95 to 95.1	M1* M1* M1dep* A1 **[4]**	or $\pi \times \frac{120.32}{360} \times 12.4^2$ angle in degrees to 3 sf or better	angle in degrees to 3 sf or better may be implied by 2.81(7168325…) (degrees) or 2.53(5559362) (grad) if unsupported, B4 for 95.08(446) r.o.t. to 4 sf or better

Question			Answer	Marks	Guidance	
7			$ar = 24$ (i)	B1*		allow $ar^{2-1} = 24$
			$\frac{a}{1-r} = 150$ (ii)	B1*		
			correct substitution to eliminate one unknown	M1dep*	eg subst. of $a = 150(1 - r)$ or $r = \frac{150-a}{150}$ in (i) alternatively, subst. of $a = \frac{24}{r}$ or $r = \frac{24}{a}$ in (ii)	if M0, B1 for both values of r and B1 for both values of a, or B1 for each pair of correct values NB $150r^2 - 150r + 24$ [= 0] $a^2 - 150a + 3600$ [= 0]
			$r = 0.8$ or 0.2	A1	or A1 for each correct pair of values	A0 if wrongly attributed
			$a = 30$ or $a = 120$	A1	ignore incorrect pairing if correct values already correctly attributed	A0 if wrongly attributed
				[5]		
8			$\frac{\sqrt{\sin^2\theta}}{\frac{\sin\theta}{\cos\theta}}$ or $\frac{\cos\theta\sqrt{\sin^2\theta}}{\sin\theta}$	M1	correct substitution for numerator	allow maximum of M1M1 if
				M1	correct substitution for denominator	$\pm\sqrt{\sin^2\theta}$ oe substituted
			$\cos\theta$ cao	A1	A0 if follows wrong working or B3 www or if unsupported	mark the final answer but ignore attempts to solve for θ allow recovery from omission of θ
				[3]		

Question			Answer	Marks	Guidance	
9			71.5(6505118..) soi	M1	or 1.24(9045772..) (rad) or 79.5(1672353..) (grad)	
			35.7 to 36	A1	if A0, SC1 for all four answers in radians or grad r.o.t to 3 or more sf 0.62452286, 2.195319213, 3.76611554, 5.336911867 (rad), but 0 if extra values in range	39.75836177.., 139.75…, 239.75… 339.75…(grad)
			125.78..., 215.78..., 305.78... to 3 or more sf	A1	if M1A0A0, SC1 for 251.565…, 431.565…, 611.565…	for second A1, ignore extra values outside range, A0 if extra values in range
				[3]		
10			$(x + 1)\log 3 = 2x \log 5$ oe	M1	or $x + 1 = 2x \log_3 5$ or $(x + 1)\log_5 3 = 2x$	allow recovery from omission of brackets in later working
			$\log 3 = x(2\log 5 - \log 3)$ oe	A1	$x(1 - 2\log_3 5) = -1$ oe or $x(2 - \log_5 3) = \log_5 3$ oe	NB $0.477121254 = 0.920818754x$ $-1.929947041x = -1$ $1.317393806x = 0.682606194..$
			$\frac{\log 3}{2\log 5 - \log 3}$ oe	A1	$\frac{1}{2\log_3 5 - 1}$ oe or $\frac{\log_5 3}{2 - \log_5 3}$ oe	
			0.518 cao	A1		answer only does not score
				[4]		

Question			Answer	Marks	Guidance	
11	(i)		$y' = 1 + 8x^{-3}$ $y'' = -24x^{-4}$ oe	M2 A1 **[3]**	M1 for just $8x^{-3}$ or $1 - 8x^{-3}$	but not just $\frac{-24}{x^4}$ as AG
11	(ii)		their $y' = 0$ soi $x = -2$ $y = -3$ substitution of $x = -2$: $\frac{-24}{(-2)^4}$ < 0 or $= -1.5$ oe correctly obtained isw	M1 A1 A1 M1 A1 **[5]**	 A0 if more than one x-value A0 if more than one y-value or considering signs of gradient either side of -2 with negative x-values signs for gradients identified to verify maximum	 $x = -2$ must have been correctly obtained for all marks after first M1 condone any bracket error must follow from M1 A1 A0 M1 or better
11	(iii)		$y = -5$ soi substitution of $x = -1$ in their y' grad normal $= {}^{-1}/_{\text{their} - 7}$ $y -$ their$(-5) =$ their ${}^{1}/_{7}(x - -1)$ $-x + 7y + 34 = 0$ oe	B1 M1 M1* M1dep* A1 **[5]**	 may be implied by -7 may be implied by eg ${}^{1}/_{7}$ or their $(-5) =$ their ${}^{1}/_{7} \times (-1) + c$ allow eg $y - \frac{1}{7}x + \frac{34}{7} = 0$	 must see $= 0$ do not allow eg $y = \frac{x}{7} - \frac{34}{7}$

Question			Answer	Marks	Guidance	
12	(i)		$h = 3$ soi	B1		allow if used with 6 separate trapezia
			$\frac{3}{2}\ 9 + 9.1 + 2(10.7 + 11.7 + 11.9 + 11.0)$	M1	basic shape of formula correct with their 3; omission of brackets may be recovered later; M0 if any x-values used (NB $y0 = 9$ and $x3 = 9$, so check position)	with 3, 4 or 5 y-values in middle bracket, eg $\frac{3}{2}\ 9 + 2(10.7 + 11.7 + 11.9) + 11.0$
			all y-values correctly placed in formula	B1	condone omission of outer brackets	
			163.05 or 163.1 or 163 isw	A1	answer only does not score	or **B1** + **B3** if 5 separate trapezia calculated to give correct answer NB 29.55 + 33.6 + 35.4 + 34.35 + 30.15
				[4]		
12	(ii)	(*A*)	$-0.001\times12^3 - 0.025\times12^2 + 0.6\times12 + 9$ soi	M1	may be implied by 10.872, 10.87 or 10.9	NB allow misread if minus sign omitted in first term if consistent in (A) and (B). Lose A1 in this part only
			±0.128[m] or ±12.8cm or ±128mm isw	A1	B2 if unsupported	appropriate units must be stated if answer not given in metres
				[2]		

Question			Answer	Marks	Guidance	
12	(ii)	(*B*)	$F[x] = \frac{-0.001x^4}{4} - \frac{0.025x^3}{3} + \frac{0.6x^2}{2} + 9x$	M2	M1 if three terms correct ; ignore + *c*	
			F(15) [– F(0)] soi	M1	dependent on at least two terms correct in F[*x*]	condone F(15) + 0
			161.7 to 162	A1	A0 if a numerical value is assigned to *c*	answer only does not score NB allow misread if minus sign omitted in first term if consistent in (A) and (B). 187.03…
				[4]		
13	(i)		$\log_{10}h = \log_{10}a + bt$ www	B1		condone omission of base
			$m = b$, $c = \log_{10}a$	B1		must be clearly **stated**: linking equations is insufficient
				[2]		
13	(ii)		–0.15, 0[.00], 0.23, 0.36, 0.56, 0.67, 0.78, 0.91, 1.08, 1.2[0]	B2	B1 if 1 error	
			plots correct (tolerance half square)	B1	condone 1 error – see overlay	no ft available for plots
			single ruled line of best fit for values of *x* from 5 to 50 inclusive	B1	line must not go outside overlay between *x* = 5 and *x* = 50	
				[4]		

Question			Answer	Marks	Guidance	
13	(iii)		$-0.3 \leq$ *y*-intercept ≤ -0.22	B1	may be implied by $0.5 \leq a \leq 0.603$	
			valid method to find gradient of line	M1	may be embedded in equation; may be implied by eg *m* between 0.025 and 0.035	condone values from table; condone slips eg in reading from graph
			$h = \text{their}a \times 10^{\text{their}bt}$ or $h = 10^{\text{their log}\,a + \text{their}bt}$	M1		if B1M1M0, then SC1 for logh = loga + theirbt isw
			$0.028 \leq b \leq 0.032$ and $0.5 \leq a \leq 0.603$ or $-0.3 \leq \log a \leq -0.22$	A1		if both values in the acceptable range for A1
				[4]		
13	(iv)		$a10^{60b} - a10^{50b}$ their values for *a* and *b*	M1	or $10^{\log a + b \times 60} - 10^{\log a + b \times 50}$ or their values for log*a* and *b*	condone 15.9 as second term may follow starting with log*h* = log*a* + their*bt*
			8.0 to 26.1 inclusive	A1		NB A0 for estimate without clear valid method using model; both marks available even if *a* or *b* or both are outside range in (iii)
				[2]		
13	(v)		comment on the **continuing reduction** in thickness **and** its consequences	B1	eg in long term, it predicts that reduction in thickness will continue to increase, even when the glacier has completely melted	
				[1]		

4752 Concepts for Advanced Mathematics (C2)

General Comments:

The paper was accessible to a large majority of the candidates, and most candidates seemed well-prepared. A significant minority of candidates demonstrated a fair degree of understanding of Core 2 syllabus material, but failed to do themselves justice in the examination because of poor (GCSE level) algebra and careless arithmetical slips. Premature approximation followed by over-specification of final answers also cost some candidates easy marks.

Most candidates presented their work neatly and clearly, but in some cases work was very difficult to follow, and candidates should understand the importance of presenting a clear mathematical argument, especially when there is a "show that" request in the question.
It is disappointing to see some candidates misquoting formulae that are given to them in the booklet.
Centres are advised that using a graphical calculator to evaluate a definite integral or to solve an equation (eg question 10) will earn no credit unless the relevant working is presented.

Comments on Individual Questions:

Question No. 1
This was done well. A large number of candidates omitted " + *c* " and lost an easy mark, and a few candidates went astray when simplifying $7 \div \frac{7}{2}$, or didn't simplify it at all. A very few differentiated instead of integrating.

Question 2
Part (i)
This was done very well. A few candidates didn't appreciate the meaning of Σ and merely listed the terms. Similarly, a small number of candidates simply added the first and the last terms. Very few resorted to AP or GP formulae.

Part (ii)
Most recognised the arithmetic progression, but some were uncomfortable with a non-numerical *a* and made a spurious attempt to find its value. For a significant number of candidates, the tenth term was either left as $a + 9\times5$ or simplified thus: $a + 45 = 45a$. In both cases an easy mark was lost. Many started again to find the sum of the first ten terms, and did so successfully. There was no credit for those candidates who left their answers in terms of *a* and *d*. A number of candidates wasted time by trying to find the numerical value of *a*.

Question 3
Many candidates scored full marks here. A few switched the values in the numerator round to obtain + 6 and lost both marks. A small minority found the reciprocal of the gradient, which didn't score, and a tiny minority wrote down the correct calculation, but obtained an incorrect answer. Some candidates needlessly went on to obtain the equation of the chord, and then differentiated it just to convince themselves that the gradient really was – 6, and a few went straight to finding the equation of the chord, and then left the answer embedded, which cost the accuracy mark.

Question 4
Both parts were generally very well done, with many candidates scoring full marks. The most common errors were (6, − 6) and (12, − 3) in part (i) and (18, − 3) and (6, − 1) in part (ii). Some candidates applied the scale factor to both values.

Question 5
The cosine rule was very well understood and most candidates scored full marks. A small number left the calculator in radian mode and lost the final mark; a very small number tried to use Pythagoras or lost their way after earning the first method mark.

Question 6
This was very well done. By and large the correct formulae were used and the entire solution was worked in radians, nearly always resulting in full marks. Some candidates worked in degrees and then worked with rounded numbers, often following on to over specify their answer and lose the final mark. A significant minority did not use $\frac{1}{2}\times r^2\times\sin\theta$, but used a variety of methods in order to arrive at ½×base×height for the area of the triangle. Often this went astray, resulting in a loss of three marks.

Question 7
Most candidates wrote down the required equations, and most went on to eliminate one of the variables correctly. What followed often proved too difficult, and no further marks were earned. A number of candidates obtained negative answers for both *a* and *r*, but never suspected anything was amiss.

Question 8
Most candidates recognised one of the trigonometric identities required, and then made no further progress. Of those who spotted both relationships, a good proportion made a mess of simplifying the fraction, often resulting in a final answer of $\frac{1}{\cos\theta}$ .A surprising number tried squaring top and bottom, or concocted an equation which they attempted to solve.

Question 9
Most candidates started correctly, a few doubled 71.6 instead of halving it, but most successfully obtained 35.8°. 215.8° was frequently found, but the other two values were often missed. Some candidates rounded off their calculator value, and then over-specified their final values (215.79 etc was common), thus losing the second A mark. A common error was arctan(1.5) to start, and some candidates unwittingly worked in radians and went on to add multiples of 90°.

Question 10
Most candidates understood the initial step, but many omitted the brackets and never recovered. Many of those who did earn the first mark often made errors in manipulating the equation, and scored no further marks. The best candidates usually went on to score 4/4.

Question 11
Part (i)
Most knew what to do here, but $8x^{-3}$ and $1 - 8x^{-3}$ were often seen. Only a few candidates failed to show sufficient detail of their working to earn the third mark following a fully correct $\frac{dy}{dx}$.
Part (ii)
There were many correct solutions, although some candidates neglected to find the corresponding value of *y*, or evaluated the second derivative as + 1.5, and concluded the stationary value must be a local maximum. A few obtained $x = 2$ following correct differentiation, but never looked at the graph to realise that this must be wrong. It was surprising just how many candidates solved $8x^{-3} = 0$ to obtain $x = 2$, without realising that something must have gone wrong.
Part (iii)

This was generally well done. Only a small minority of candidates did not understand how to obtain the gradient of the normal, and many obtained follow through marks, at least. Some candidates slipped up finding the value of *y*, and a few made sign errors when finishing off.

Question 12
Part (i)
This was very well done, with many candidates scoring full marks. The most common error was the omission of the outer brackets; occasionally $h = 5$ was seen, and occasionally y- values were misplaced.

Part (ii) A
Many correctly substituted $x = 12$, and showed their working so that even if arithmetic went astray, a method mark was still earned. A common error was to omit the minus sign from the first term. Strangely many candidates stopped there, or subtracted 10.872 from 12 instead of 11.

Part (ii) B
This was generally very well done. Occasionally candidates made a sign error or inserted an extra zero in one or both of the first two terms. Some left "9" untouched or used an upper limit of 12 instead of 15.

Question 13
Part (i)
Wrong working often spoiled a correct final answer in this question.

Part (ii)
This was very well done. A few candidates made errors in the table – usually the first or the penultimate value. A tiny minority gave all values to a different degree of accuracy to the one requested, thus losing two easy marks – although credit was still available for the plots and the line. Most plotted the points adequately and drew a single ruled line of best fit across the whole range of x-values to earn two marks.

Part (iii)
Those candidates who used their graph to find the gradient and the intercept often went on to score full marks in this part. Those who adopted other methods such as simultaneous equations often went astray, and obtaining a positive value for the Y- intercept or a large value for the gradient evidently did not cause concern. It would seem that a significant minority did not connect this part with earlier parts of the question.

Part (iv)
$t =$ 70, 10 and 55 were all seen, but many candidates used $t = 60$ successfully with their model, and then subtracted either 15.9 or f(50) to earn both marks. Unfortunately a few candidates stopped at f(60) and lost both marks.

Part (v)
Many candidates wrote sensible responses to this question. Unfortunately, many of them failed to score, in spite of their likely truth, as they were vague or missed the point. Candidates were expected to comment on the model continuing to predict an ever increasing rate of reduction in the thickness of the ice, in spite of the fact that at some point all the ice will have melted.

For a description of how UMS marks are calculated see:
www.ocr.org.uk/learners/ums_results.html

Unit level raw mark and UMS grade boundaries June 2014 series

AS GCE / Advanced GCE / AS GCE Double Award / Advanced GCE Double Award

GCE Mathematics (MEI)

			Max Mark	a	b	c	d	e	u
4751/01	(C1) MEI Introduction to Advanced Mathematics	Raw	72	61	56	51	46	42	0
		UMS	100	80	70	60	50	40	0
4752/01	(C2) MEI Concepts for Advanced Mathematics	Raw	72	57	51	45	39	33	0
		UMS	100	80	70	60	50	40	0
4753/01	(C3) MEI Methods for Advanced Mathematics with Coursework: Written Paper	Raw	72	58	52	47	42	36	0
4753/02	(C3) MEI Methods for Advanced Mathematics with Coursework: Coursework	Raw	18	15	13	11	9	8	0
4753/82	(C3) MEI Methods for Advanced Mathematics with Coursework: Carried Forward Coursework Mark	Raw	18	15	13	11	9	8	0
4753	(C3) MEI Methods for Advanced Mathematics with Coursework	UMS	100	80	70	60	50	40	0
4754/01	(C4) MEI Applications of Advanced Mathematics	Raw	90	68	61	54	47	41	0
		UMS	100	80	70	60	50	40	0
4755/01	(FP1) MEI Further Concepts for Advanced Mathematics	Raw	72	63	57	51	45	40	0
		UMS	100	80	70	60	50	40	0
4756/01	(FP2) MEI Further Methods for Advanced Mathematics	Raw	72	60	54	48	42	36	0
		UMS	100	80	70	60	50	40	0
4757/01	(FP3) MEI Further Applications of Advanced Mathematics	Raw	72	57	51	45	39	34	0
		UMS	100	80	70	60	50	40	0
4758/01	(DE) MEI Differential Equations with Coursework: Written Paper	Raw	72	63	56	50	44	37	0
4758/02	(DE) MEI Differential Equations with Coursework: Coursework	Raw	18	15	13	11	9	8	0
4758/82	(DE) MEI Differential Equations with Coursework: Carried Forward Coursework Mark	Raw	18	15	13	11	9	8	0
4758	(DE) MEI Differential Equations with Coursework	UMS	100	80	70	60	50	40	0
4761/01	(M1) MEI Mechanics 1	Raw	72	57	49	41	34	27	0
		UMS	100	80	70	60	50	40	0
4762/01	(M2) MEI Mechanics 2	Raw	72	57	49	41	34	27	0
		UMS	100	80	70	60	50	40	0
4763/01	(M3) MEI Mechanics 3	Raw	72	55	48	42	36	30	0
		UMS	100	80	70	60	50	40	0
4764/01	(M4) MEI Mechanics 4	Raw	72	48	41	34	28	22	0
		UMS	100	80	70	60	50	40	0
4766/01	(S1) MEI Statistics 1	Raw	72	61	53	46	39	32	0
		UMS	100	80	70	60	50	40	0
4767/01	(S2) MEI Statistics 2	Raw	72	60	53	46	40	34	0
		UMS	100	80	70	60	50	40	0
4768/01	(S3) MEI Statistics 3	Raw	72	61	54	47	41	35	0
		UMS	100	80	70	60	50	40	0
4769/01	(S4) MEI Statistics 4	Raw	72	56	49	42	35	28	0
		UMS	100	80	70	60	50	40	0
4771/01	(D1) MEI Decision Mathematics 1	Raw	72	51	46	41	36	31	0
		UMS	100	80	70	60	50	40	0
4772/01	(D2) MEI Decision Mathematics 2	Raw	72	46	41	36	31	26	0
		UMS	100	80	70	60	50	40	0
4773/01	(DC) MEI Decision Mathematics Computation	Raw	72	46	40	34	29	24	0
		UMS	100	80	70	60	50	40	0
4776/01	(NM) MEI Numerical Methods with Coursework: Written Paper	Raw	72	54	48	43	38	32	0
4776/02	(NM) MEI Numerical Methods with Coursework: Coursework	Raw	18	14	12	10	8	7	0
4776/82	(NM) MEI Numerical Methods with Coursework: Carried Forward Coursework Mark	Raw	18	14	12	10	8	7	0
4776	(NM) MEI Numerical Methods with Coursework	UMS	100	80	70	60	50	40	0
4777/01	(NC) MEI Numerical Computation	Raw	72	55	47	39	32	25	0
		UMS	100	80	70	60	50	40	0
4798/01	(FPT) Further Pure Mathematics with Technology	Raw	72	57	49	41	33	26	0
		UMS	100	80	70	60	50	40	0

GCE Statistics (MEI)

			Max Mark	a	b	c	d	e	u
G241/01	(Z1) Statistics 1	Raw	72	61	53	46	39	32	0
		UMS	100	80	70	60	50	40	0
G242/01	(Z2) Statistics 2	Raw	72	55	48	41	34	27	0
		UMS	100	80	70	60	50	40	0
G243/01	(Z3) Statistics 3	Raw	72	56	48	41	34	27	0
		UMS	100	80	70	60	50	40	0