

ADVANCED SUBSIDIARY GCE

MATHEMATICS (MEI)

Concepts for Advanced Mathematics (C2)

4752/01

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

Thursday 15 May 2008
Morning

Duration: 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

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

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **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. 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a 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 destroyed.

Section A (36 marks)

- 1 Express $\frac{7\pi}{6}$ radians in degrees. [2]
- 2 The first term of a geometric series is 5.4 and the common ratio is 0.1.
- (i) Find the fourth term of the series. [1]
- (ii) Find the sum to infinity of the series. [2]
- 3 State the transformation which maps the graph of $y = x^2 + 5$ onto the graph of $y = 3x^2 + 15$. [2]
- 4 Use calculus to find the set of values of x for which $f(x) = 12x - x^3$ is an increasing function. [3]
- 5 In Fig. 5, A and B are the points on the curve $y = 2^x$ with x -coordinates 3 and 3.1 respectively.

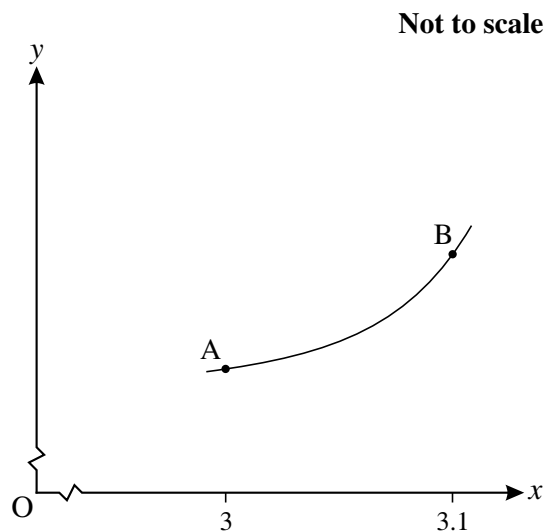
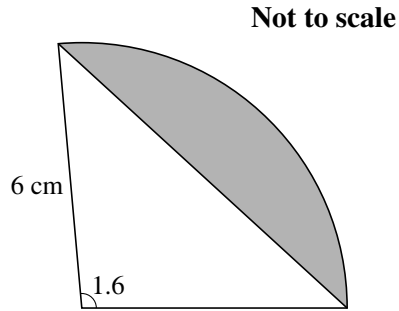


Fig. 5

- (i) Find the gradient of the chord AB. Give your answer correct to 2 decimal places. [2]
- (ii) Stating the points you use, find the gradient of another chord which will give a closer approximation to the gradient of the tangent to $y = 2^x$ at A. [2]
- 6 A curve has gradient given by $\frac{dy}{dx} = 6\sqrt{x}$. Find the equation of the curve, given that it passes through the point (9, 105). [4]

7

**Fig. 7**

A sector of a circle of radius 6 cm has angle 1.6 radians, as shown in Fig. 7.

Find the area of the sector.

Hence find the area of the shaded segment.

[5]

- 8** The 11th term of an arithmetic progression is 1. The sum of the first 10 terms is 120. Find the 4th term. [5]
- 9** Use logarithms to solve the equation $5^x = 235$, giving your answer correct to 2 decimal places. [3]
- 10** Showing your method, solve the equation $2 \sin^2 \theta = \cos \theta + 2$ for values of θ between 0° and 360° . [5]

Section B (36 marks)

11

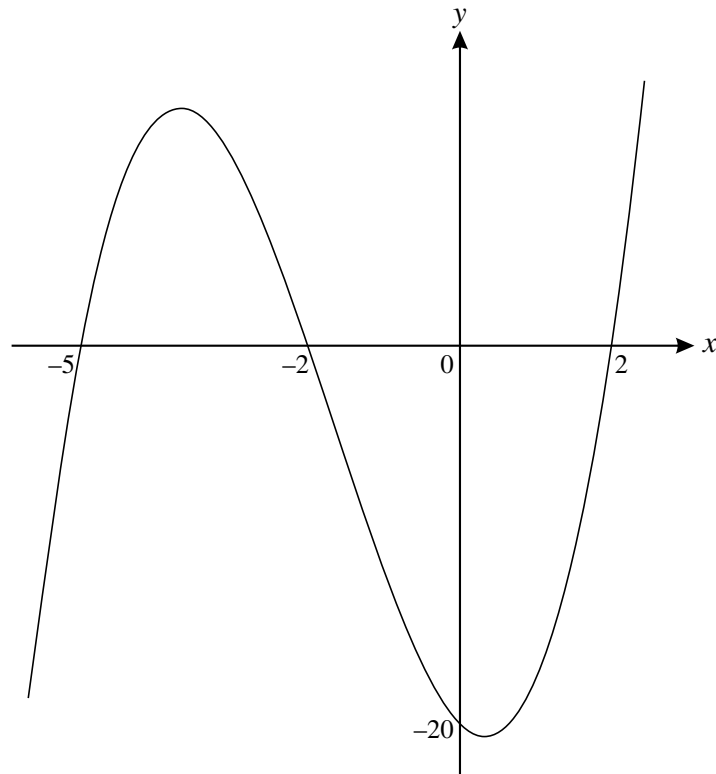


Fig. 11

Fig. 11 shows a sketch of the cubic curve $y = f(x)$. The values of x where it crosses the x -axis are -5 , -2 and 2 , and it crosses the y -axis at $(0, -20)$.

- (i) Express $f(x)$ in factorised form. [2]
- (ii) Show that the equation of the curve may be written as $y = x^3 + 5x^2 - 4x - 20$. [2]
- (iii) Use calculus to show that, correct to 1 decimal place, the x -coordinate of the minimum point on the curve is 0.4 .
Find also the coordinates of the maximum point on the curve, giving your answers correct to 1 decimal place. [6]
- (iv) State, correct to 1 decimal place, the coordinates of the maximum point on the curve $y = f(2x)$. [2]

12

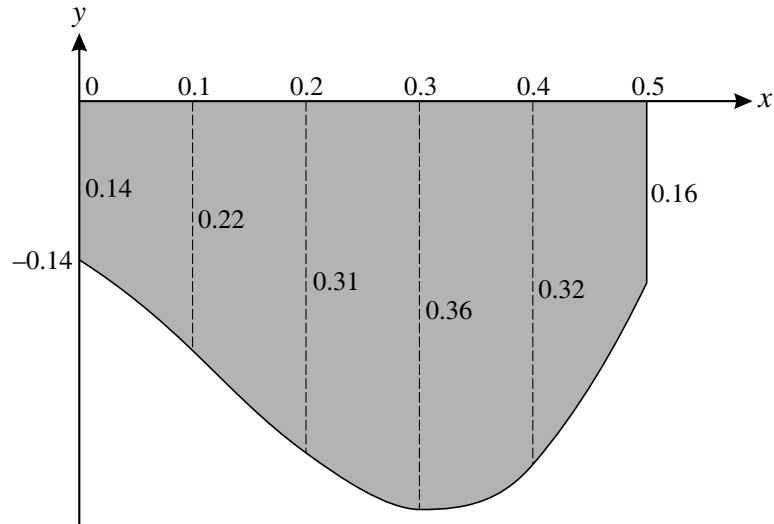


Fig. 12

A water trough is a prism 2.5 m long. Fig. 12 shows the cross-section of the trough, with the depths in metres at 0.1 m intervals across the trough. The trough is full of water.

- (i) Use the trapezium rule with 5 strips to calculate an estimate of the area of cross-section of the trough.

Hence estimate the volume of water in the trough. [5]

- (ii) A computer program models the curve of the base of the trough, with axes as shown and units in metres, using the equation $y = 8x^3 - 3x^2 - 0.5x - 0.15$, for $0 \leq x \leq 0.5$.

Calculate $\int_0^{0.5} (8x^3 - 3x^2 - 0.5x - 0.15) dx$ and state what this represents.

Hence find the volume of water in the trough as given by this model. [7]

[Question 13 is printed overleaf.]

- 13 The percentage of the adult population visiting the cinema in Great Britain has tended to increase since the 1980s. The table shows the results of surveys in various years.

Year	1986/87	1991/92	1996/97	1999/00	2000/01	2001/02
Percentage of the adult population visiting the cinema	31	44	54	56	55	57

Source: Department of National Statistics, www.statistics.gov.uk

This growth may be modelled by an equation of the form

$$P = at^b,$$

where P is the percentage of the adult population visiting the cinema, t is the number of years after the year 1985/86 and a and b are constants to be determined.

- (i) Show that, according to this model, the graph of $\log_{10} P$ against $\log_{10} t$ should be a straight line of gradient b . State, in terms of a , the intercept on the vertical axis. [3]
- (ii) Complete the table of values, and plot $\log_{10} P$ against $\log_{10} t$. Draw by eye a line of best fit for the data. [4]
- (iii) Use your graph to find the equation for P in terms of t . [4]
- (iv) Predict the percentage of the adult population visiting the cinema in the year 2007/2008 (i.e. when $t = 22$), according to this model. [1]

BLANK PAGE

Acknowledgements:

Q.13 Source: Department of National Statistics, www.statistics.gov.uk. Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

ADVANCED SUBSIDIARY GCE

MATHEMATICS (MEI)

Concepts for Advanced Mathematics (C2)

4752/01

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

Thursday 15 May 2008
Morning

Duration: 1 hour 30 minutes



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.

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the spaces provided on the Printed Answer Book.
- **The questions are on the inserted Question Paper.**
- **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. 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are permitted to use a 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	

5 (i)	
5 (ii)	
6	

Section B (36 marks)

11 (i)	
11 (ii)	
11 (iii)	

11 (iii)	(continued)
11 (iv)	

13 (iii)	
13 (iv)	

PLEASE DO NOT WRITE ON THIS PAGE



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.