



## Monday 18 October 2021 – Afternoon

### A Level Mathematics B (MEI)

H640/03 Pure Mathematics and Comprehension

**Printed Answer Booklet** 

Time allowed: 2 hours

#### You must have:

- Question Paper H640/03 (inside this document)
- the Insert (inside this document)
- · a scientific or graphical calculator



Please write clearly in black ink	Do not write in the barcodes.	
Centre number	Candidate number	
First name(s)		
Last name		

#### **INSTRUCTIONS**

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided in the Printed Answer Booklet. If you need extra space use the lined pages at the end of the Printed Answer Booklet. The question numbers must be clearly shown.
- Answer all the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Give your final answers to a degree of accuracy that is appropriate to the context.

#### **INFORMATION**

• This document has 20 pages.

#### **ADVICE**

· Read each question carefully before you start your answer.

# 2 Section A (60 marks)

1(a)	
1(b)	
, ,	
1(c)	
2	
2	
3(a)	
	(answer space continued on next page)

3(a)	(continued)
<b>3</b> (b)	

<b>4</b> (a)	
<b>4(b)</b>	
5(a)(i)	
	$\frac{\mathrm{d}y}{\mathrm{d}x}$
	$\frac{dx}{dx}$
	$\longrightarrow x$
	•
F(.)(**)	
<b>5</b> (a)(ii)	
	$\frac{\mathrm{d}y}{\mathrm{d}x}$
	$\frac{\mathrm{d}x}{\uparrow}$
	$\longrightarrow y$

5(b)(i)	
5(b)(ii)	
3(0)(11)	
	A =
	k =
5(b)(iii)	

6	

7	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	
8	

9(a)	
	y
	5
	3
	$\rightarrow x$
	-1 0 1 2 3 4 5 6 7 8
0.7	
9(b)	
	(answer space continued on next page)

<b>9</b> (b)	(continued)

<b>10(a)</b>	
<b>10(b)</b>	
	(onewer are as continued on west are as)
	(answer space continued on next page)

<b>10(b)</b>	(continued)
	A =
	B =

11	
	(answer space continued on next page)
	(min in space communa on none page)

11	(continued)

## 14 Section B (15 marks)

The questions in this section refer to the article on the Insert. You should read the article before attempting the questions.

12	Show that $\beta = \arctan\left(\frac{1}{3}\right)$ , as given in line 15.	[3]
----	--	-----

	(3)	
12		

- 13 (a) Use triangle ABE in Fig. C2 to show that  $\arctan x + \arctan\left(\frac{1}{x}\right) = \frac{\pi}{2}$ , as given in line 29. [1]
  - (b) Sketch the graph of  $y = \arctan x$ . [1]
  - (c) What property of the arctan function ensures that  $y > \frac{1}{x} \Rightarrow \arctan y > \arctan \left(\frac{1}{x}\right)$ , as given in [1]

13(a)	

13(c)	

14 (a) Show that

$$\arctan\left(\frac{1}{n+1}\right) + \arctan\left(\frac{1}{n^2+n+1}\right) = \arctan\left(\frac{1}{n}\right) \Rightarrow \arctan\left(\frac{1}{2}\right) + \arctan\left(\frac{1}{3}\right) = \arctan 1.$$
 [1]

(b) Use the arctan addition formula in line 23 to show that

$$\arctan\left(\frac{1}{n+1}\right) + \arctan\left(\frac{1}{n^2+n+1}\right) = \arctan\left(\frac{1}{n}\right)$$
, as given in line 39. [4]

14(a)	
14(b)	
	(answer space continued on next page)

<b>14(b)</b>	(continued)

[4]

15	Prove that arctan 1	$+ \arctan 2 + \arctan 3 =$	$\pi$ , as given in line 41.
----	---------------------	-----------------------------	------------------------------

15	
,	

### 19 ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).



#### 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 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 OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

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.