

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. D o	o not wri	te in the barcodes.		
Centre number			Candidate number		
First name(s)					
Last name					

INSTRUCTIONS

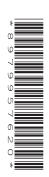
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided in the Printed Answer
 Booklet. If you need extra space use the lined pages at the end of the Printed Answer
 Booklet. The question numbers must be clearly shown.
- · 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.



Section A (60 marks)

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

3(a)	(continued)
3(b)	

4(a)	
4(b)	
5(a)(i)	
	dy
	$\frac{\mathrm{d}y}{\mathrm{d}x}$
	$\longrightarrow x$
	O
5(a)(ii)	
	dv
	$\frac{\mathrm{d}y}{\mathrm{d}x}$
	$\longrightarrow y$
	O

5(b)(i)	
5(b)(ii)	
	4
	A =
7 (1)(***)	k =
5(b)(iii)	

7	
8	

9(a)	
	<i>y</i>
	5
	$\longrightarrow x$
	-1 0 1 2 3 4 5 6 7 8
0.0	
9(b)	
	(answer space continued on next page)

9(b)	(continued)

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

)	(continued)
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11	
	(answer space continued on next page)

(continued)		

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]
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	(3)	
12		

13	(a)	Use triangle ABE in Fig.	C2 to show that	$\arctan x + \arctan$	$\left(\frac{1}{x}\right) = \frac{2}{x}$	$\frac{\pi}{2}$, as given in line 29.	[1]
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(b)	Sketch the graph of $y = \arctan x$.	[1	ĺ
(-)	3 n	· · · · · · · · · · · · · · · · · · ·	

(c)	What property of the arctan function ensures t line 30?	hat $y > \frac{1}{x} \Rightarrow \arctan y$	$> \arctan\left(\frac{1}{x}\right)$, as	given in [1]
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13(a)	

13(b)	
13(c)	

14	(a)	Show	that
14	(a)	SHOW	mat

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

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

14(b)	(continued)

[4]

15	Prove that	arctan 1	+ arctan 2 +	$\arctan 3 = \pi$	as o	iven in	line 4	41
13	riove mai	arctair i	T al Clail 2 T	arctair $3-n$,	as g		IIIIC '	+1

15	

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).



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