



SPECIMEN MATERIAL

Please write clearly, in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# A-level

# FURTHER MATHEMATICS

## Paper 2

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Exam Date

Morning

Time allowed: 2 hours

### Materials

For this paper you must have:

- The AQA booklet of formulae and statistical tables.
- You may use a graphics calculator.

### Instructions

- Use black ink or black ball-point pen. Pencil should be used for drawing.
- Answer **all** questions.
- You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.

### Advice

Unless stated otherwise, you may quote formulae, without proof, from the booklet. You do not necessarily need to use all the space provided.

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Answer **all** questions in the spaces provided.

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- 1 Given that  $z_1 = 4e^{i\frac{\pi}{3}}$  and  $z_2 = 2e^{i\frac{\pi}{4}}$   
state the value of  $\arg\left(\frac{z_1}{z_2}\right)$

Circle your answer.

[1 mark]

$$\frac{\pi}{12}$$

$$\frac{4}{3}$$

$$\frac{7\pi}{12}$$

2

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2 Given that  $z$  is a complex number and that  $z^*$  is the complex conjugate of  $z$

prove that  $zz^* = |z|^2$

[3 marks]

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**9** A student claims:  
“Given any two non-zero square matrices, **A** and **B**, then  $(\mathbf{AB})^{-1} = \mathbf{B}^{-1}\mathbf{A}^{-1}$ ”

**9 (a)** Explain why the student’s claim is incorrect giving a counter example.

**[2 marks]**

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**9 (b)** Refine the student’s claim to make it fully correct.

**[1 mark]**

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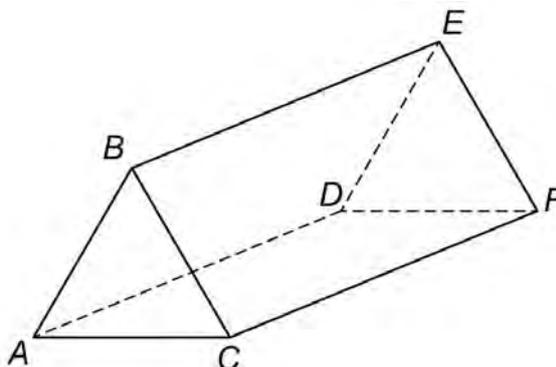








- 16 A designer is using a computer aided design system to design part of a building. He models part of a roof as a triangular prism  $ABCDEF$  with parallel triangular ends  $ABC$  and  $DEF$ , and a rectangular base  $ACFD$ . He uses the metre as the unit of length.



The coordinates of  $B$ ,  $C$  and  $D$  are  $(3, 1, 11)$ ,  $(9, 3, 4)$  and  $(-4, 12, 4)$  respectively.

He uses the equation  $x - 3y = 0$  for the plane  $ABC$ .

He uses  $\left[ \mathbf{r} - \begin{pmatrix} -4 \\ 12 \\ 4 \end{pmatrix} \right] \times \begin{pmatrix} 4 \\ -12 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$  for the equation of the line  $AD$ .

Find the volume of the space enclosed inside this section of the roof.

**[9 marks]**

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