



Cambridge International AS & A Level

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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MATHEMATICS

9709/11

Paper 1 Pure Mathematics 1

May/June 2023

1 hour 50 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer all questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid.
- Do not write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].

This document has 20 pages. Any blank pages are indicated.

1 Solve the equation $4 \sin \theta + \tan \theta = 0$ for $0^\circ < \theta < 180^\circ$.

[3]

$$4 \sin \theta = -\tan \theta \rightarrow 4 \sin \theta = -\frac{\sin \theta}{\cos \theta} \rightarrow 4 \sin \theta \cos \theta = -\sin \theta$$

$$\rightarrow 4 \sin \theta \cos \theta + \sin \theta = 0 \rightarrow \sin \theta (4 \cos \theta + 1) = 0$$

$$\rightarrow \begin{cases} \sin \theta = 0 \rightarrow \theta = 0^\circ, \theta = 180^\circ & \text{both rejected} \\ \cos \theta = -1/4 \rightarrow \theta = \cos^{-1}(-1/4) \rightarrow \theta = 104.5^\circ & \checkmark \end{cases}$$

- 2 (a) Find the first three terms in the expansion, in ascending powers of x , of $(2 + 3x)^4$. [2]

$$C_0^4 (2)^4 (3x)^0 + C_1^4 (2)^3 (3x)^1 + C_2^4 (2)^2 (3x)^2 + \dots$$

$$= 16 + 96x + 216x^2$$

- (b) Find the first three terms in the expansion, in ascending powers of x , of $(1 - 2x)^5$. [2]

$$C_0^5 (1)^5 (-2x)^0 + C_1^5 (1)^4 (-2x)^1 + C_2^5 (1)^3 (-2x)^2 + \dots$$

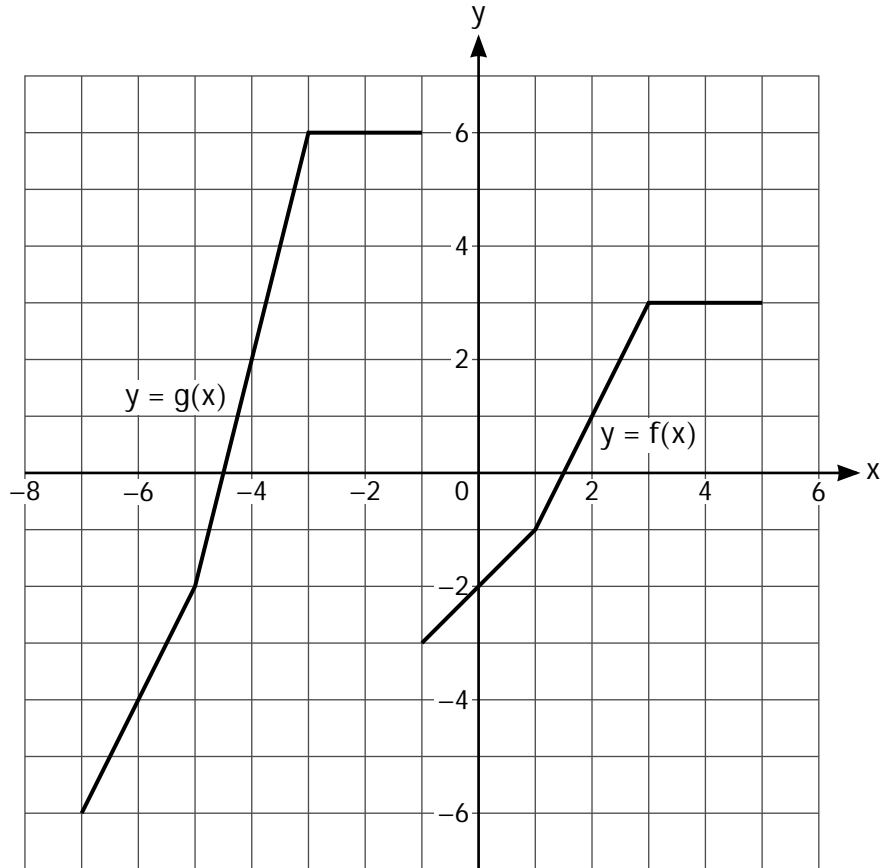
$$= 1 - 10x + 40x^2 + \dots$$

- (c) Hence find the coefficient of x^2 in the expansion of $(2 + 3x)^4(1 - 2x)^5$. [2]

$$(16 + 96x + 216x^2 + \dots)(1 - 10x + 40x^2 + \dots)$$

$$= (16 \times 40)x^2 - (96 \times 10)x^2 + (1)(216x^2)$$

$$= -104x^2 \rightarrow \text{answer: } -104 \neq$$



The diagram shows graphs with equations $y = f(x)$ and $y = g(x)$.

Describe fully a sequence of two transformations which transforms the graph of $y = f(x)$ to $y = g(x)$. [4]

y-coordinates of each point is doubled →

Stretch in y-direction SF=2

Then each points moved 6 units to left →

Translation $\begin{pmatrix} -6 \\ 0 \end{pmatrix}$