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ADDITIONAL MATHEMATICS

0606/11

Paper 1 Non-calculator

October/November 2025

2 hours

You must answer on the question paper.

No additional materials are needed.

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.
- Calculators must **not** be used in this paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages.

List of formulas

Equation of a circle with centre (a, b) and radius r .

$$(x - a)^2 + (y - b)^2 = r^2$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi r l$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of pyramid or cone, base area A , height h .

$$V = \frac{1}{3}Ah$$

Volume, V , of sphere of radius r .

$$V = \frac{4}{3}\pi r^3$$

Quadratic equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial theorem

$$(a + b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \dots + \binom{n}{r}a^{n-r}b^r + \dots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series

$$u_n = a + (n-1)d$$

$$S_n = \frac{1}{2}n(a + l) = \frac{1}{2}n\{2a + (n-1)d\}$$

Geometric series

$$u_n = ar^{n-1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r} \quad (r \neq 1)$$

$$S_\infty = \frac{a}{1 - r} \quad (|r| < 1)$$

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulas for $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} ab \sin C$$



Calculators must **not** be used in this paper.

- 1 (a) Write down the amplitude and period of $3 \cos 2x - 1$.

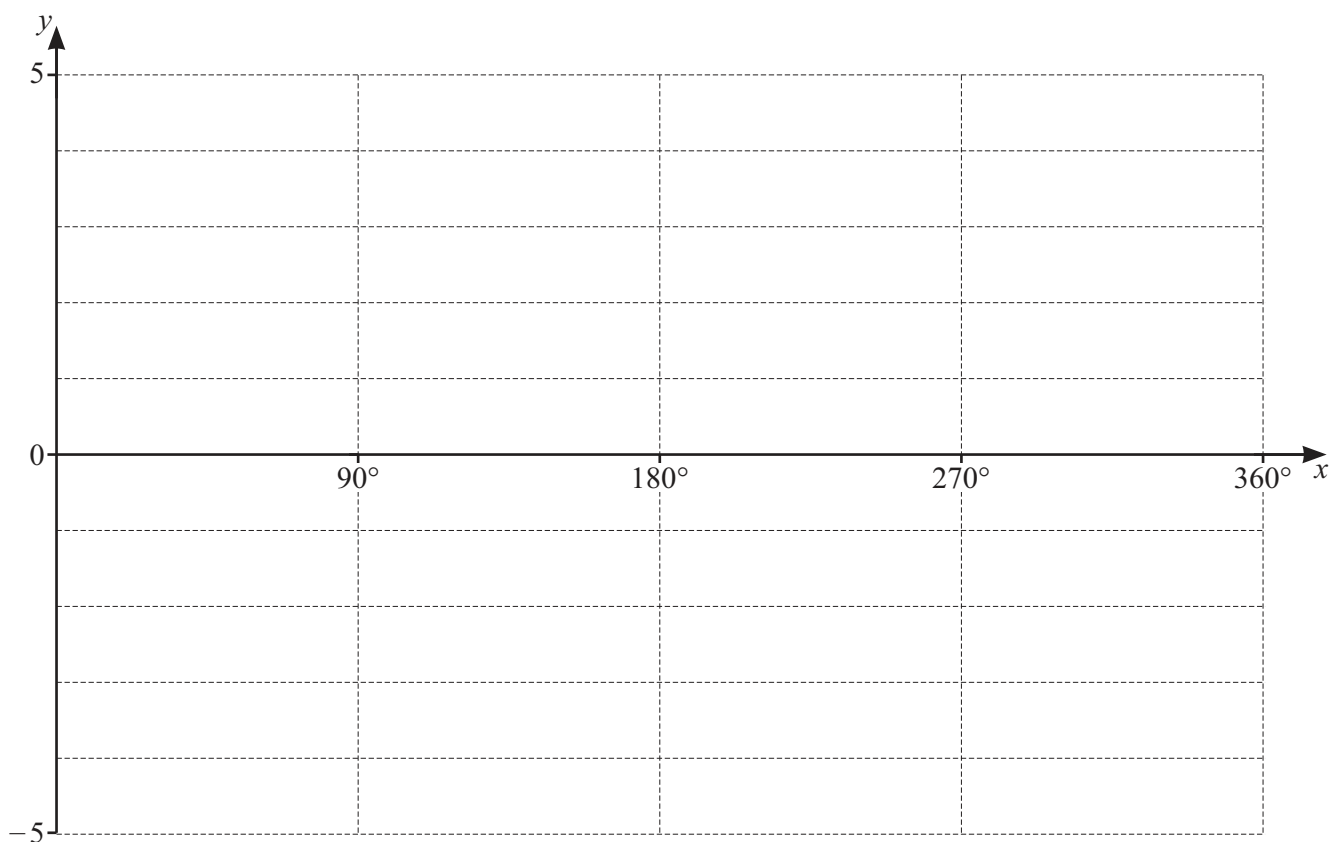
Amplitude = ...

Period = ...

[2]

- (b) Sketch the graph of $y = 3 \cos 2x - 1$ for $0^\circ \leq x \leq 360^\circ$.

[3]



- 2 Find the set of values of k for which the line $y = kx - 3$ meets the curve $y = x^2 + 2x$ at two distinct points.
Give your answer in simplest surd form.

[6]

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3 (a) Solve the equation $\log_2 x - 4 = 5 \log_x 2$.

[5]

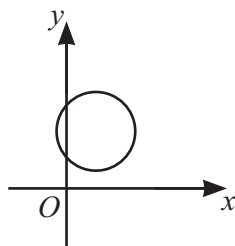
(b) Solve the equation $e^{x^2-3} = 25e^{7-x^2}$.

[4]





4 (a)



Explain why this graph does **not** represent a function.

[1]

(b) The table shows the graphs of four different functions.

	is one-one	is many-one	is its own inverse

Tick (✓) each correct box in the table.

There may be more than one tick in a row or a column.

[4]





(c) Functions f and g are defined as follows.

$$f: x \mapsto \sin x \quad \text{for } 30^\circ \leq x \leq a^\circ$$

$$g: x \mapsto \sqrt{x - \frac{1}{2}} \quad \text{for } x \geq \frac{1}{2}$$

It is given that the function gf exists.

(i) Find the value of a so that the domain of gf is as large as possible.

You may use the information that $\sin 30^\circ = \frac{1}{2}$.

[2]

(ii) For the domain found in **part (i)**, find the range of the function gf .

[2]

(iii) Determine whether the function g^2 exists.

[1]



5 (a) In an arithmetic progression:

- the first term is 3
- the sum of the first 10 terms is 4 times the sum of the first 5 terms.

Find the common difference.

[3]



- (b) The 1st, 2nd and 5th terms of another arithmetic progression are the 1st, 2nd and 3rd terms of a geometric progression.

It is given that the 1st terms of the progressions are **not** 0.

Find the common ratio, r , where $r \neq 1$, of the geometric progression.

[4]



6 Solve the equation $|x^2 - 5x| = 6$.

[5]

7 (a) Differentiate $\frac{\sin x + \cos x}{e^{1-3x}}$ with respect to x .

[4]

(b) Find $\int (1 + \tan^2 3x) dx$.

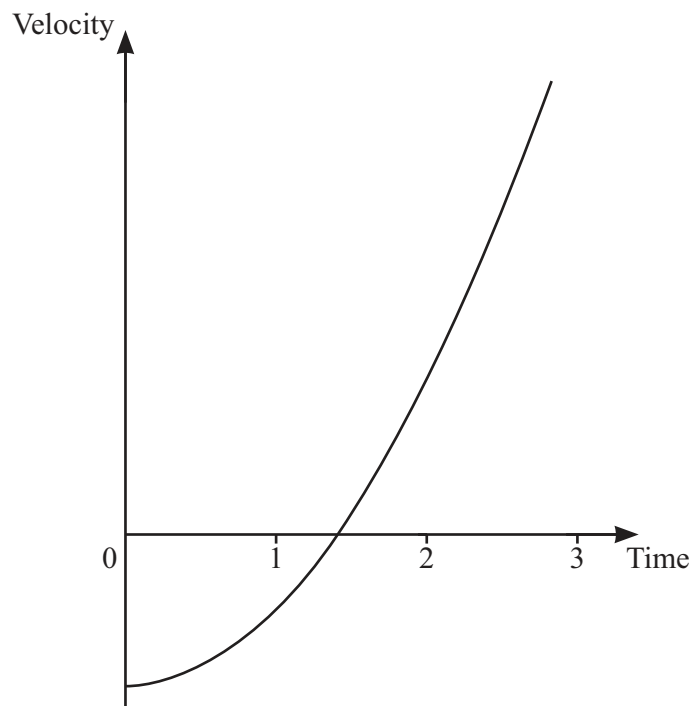
[3]



- 8 Solve the simultaneous equations $\frac{x}{2y} - \frac{4y}{x} = -1$ and $x = 1 - 6y$. [5]

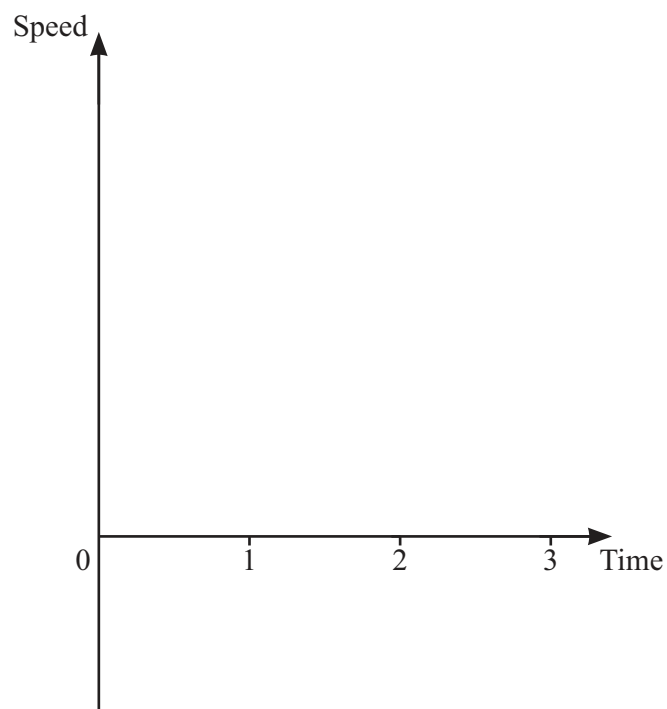


- 9 The diagram shows the velocity–time graph for a particle moving in a straight line.



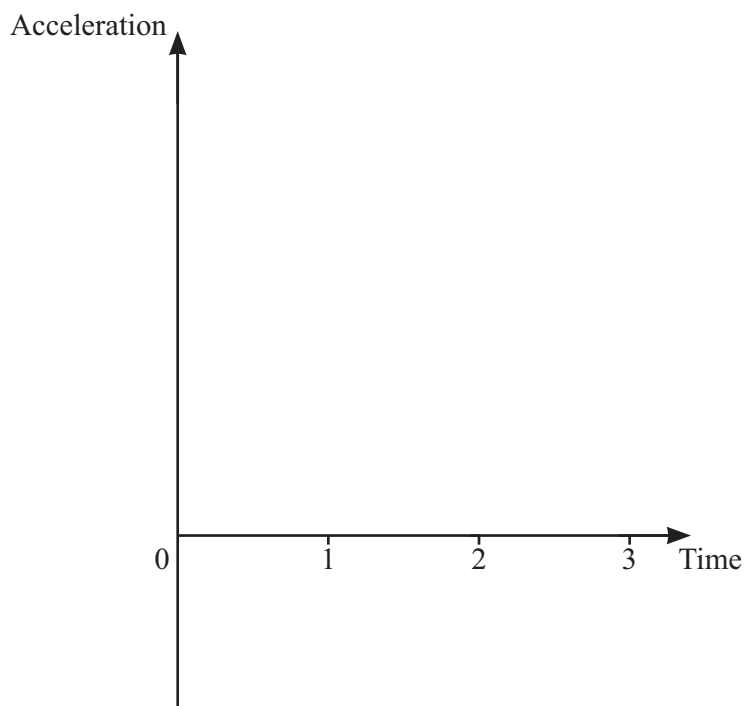
- (a) On the diagram below, sketch the speed–time graph for the motion of this particle.

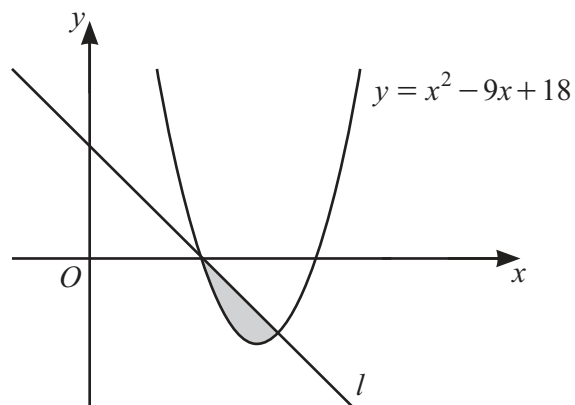
[1]



It is given that the velocity–time graph is part of a quadratic curve.
The curve has gradient 0 when time is 0.

- (b) On the diagram below sketch a possible acceleration–time graph for the motion of the particle. [2]





The diagram shows the curve $y = x^2 - 9x + 18$ and the line l , which is the normal to this curve at the point where $x = 5$.

Find the area of the shaded region.

[11]



Continuation of working space for Question 10.

- 11 The number of permutations of n items taken 4 at a time is equal to $\frac{1}{6} \times$ the number of permutations of $2n$ items taken 3 at a time.

(a) Show that n satisfies the equation $3n^2 - 19n + 20 = 0$. [4]

(b) Hence find the value of n . [2]

Question 12 is printed on the next page.



**12 Solutions to this question by accurate drawing will not be accepted.**

Relative to an origin O , the position vectors of the points A , B and C are

$$\overrightarrow{OA} = \begin{pmatrix} 1 \\ 7 \end{pmatrix}, \overrightarrow{OB} = \begin{pmatrix} 7 \\ 4 \end{pmatrix} \text{ and } \overrightarrow{OC} = k \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \text{ where } k \text{ is a scalar constant.}$$

Given that C lies on the line AB , use a vector method to find the ratio $AC : AB$.

[6]

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