CAMBRIDGE
International Education

Specimen Paper Answers
Paper 1 Non-calculator

Cambridge IGCSE™/Cambridge O Level
Additional Mathematics 0606/4037

For examination from 2025

Cambridge Pathway

v1

Contents

Introduction

These specimen answers have been produced by Cambridge International ahead of the examination in 2025 to exemplify approaches to the questions for those teaching Cambridge IGCSE Additional Mathematics (0606). Questions have been selected from Specimen Paper 1, Questions 2, 3, 4, 6(a), 8(b)(i) and 10.

These are model answers. The working is accompanied by a brief commentary explaining alternative approaches or key considerations for the answers. Comments include more information about common misconceptions and key steps in working for students to be aware of.

The specimen materials are available to download from the School Support Hub at **www.cambridgeinternational.org/support**

2025 Specimen Paper 01

2025 Specimen Paper Mark Scheme 01

Past exam resources and other teaching and learning resources are available on the School Support Hub **www.cambridgeinternational.org/support**

Details of the assessment

The syllabus for Cambridge IGCSE Additional Mathematics 0606 is available at **www.cambridgeinternational.org**

Assessment overview

All candidates take two components. Candidates will be eligible for grades A* to E.

Candidates should have a scientific calculator for Paper 2. Please see the *Cambridge Handbook* at **www.cambridgeinternational.org/eoguide** for guidance on use of calculators in the examinations Calculators are **not** allowed for Paper 1.

All candidates take:	**and:**
Paper 1 2 hours Non-calculator 50% 80 marks Structured and unstructured questions Use of a calculator is **not** allowed Externally assessed	**Paper 2** 2 hours Calculator 50% 80 marks Structured and unstructured questions A scientific calculator is required Externally assessed

Question 2

Specimen answer

2 The polynomial $p(x) = 6x^3 + ax^2 + bx + 2$, where a and b are integers, has a factor of $x - 2$.

(a) Given that $p(1) = -2p(0)$, find the values of a and b. [4]

$p(2) = 48 + 4a + 2b + 2$ using the factor theorem
$= 0$
$\therefore 50 + 4a + 2b = 0$
$25 + 2a + b = 0$ equation 1
$p(1) = 6 + a + b + 2$
$P(0) = 2$
$\therefore 8 + a + b = -4$ using $p(1) = -2p(0)$
$12 + a + b = 0$ equation 2
Solving equations 1 and 2 simultaneously
$25 + 2a + \mathrm{b} = 0$ equation 1
$12 + a + b = 0$ equation 2
Equation 1 – equation 2
$13 + a = 0$
$a = -13$
$b = 1$

(b) Using your values of a and b,

(i) find the remainder when $p(x)$ is divided by $2x - 1$ [2]

$p(x) = 6x^3 - 13x^2 + x + 2$

$p\left(\frac{1}{2}\right) = \frac{6}{8} - \frac{13}{4} + \frac{1}{2} + 2$ using the remainder theorem

$p\left(\frac{1}{2}\right) = \frac{3}{4} - \frac{13}{4} + \frac{2}{4} + \frac{8}{4}$

$= 0$
$\therefore$ the remainder $= 0$

(ii) factorise $p(x)$. [2]

Given that $x - 2$ is a factor and, using the work from **2(b)(i)**, $2x - 1$ is also a factor
$p(x) = (x - 2)(2x - 1)(3x + 1)$ using observation

Examiner comment

Each step has been shown clearly with explanation. As this was a non-calculator paper, numeric calculations were done term by term and simplified subsequently so that arithmetic errors were less likely.

Common errors and general guidance for candidates

- Candidates should read the question carefully. In this question the candidate is told that a and b are integers, so if non integer solutions are obtained in part **(a)**, a check of the work should be made in order to identify the error(s).
- Common errors in this type of question are usually arithmetic, however, some candidates make incorrect substitutions into the remainder and factor theorems e.g. $x = -2$ rather than the correct $x = 2$. If in doubt, equate the factor to zero and obtain the appropriate value for x from this equation.
- Candidates should always be aware that an answer to a question part may be used in a subsequent part. In this question the fact that the remainder found is zero implies that $2x - 1$ is also a factor of $p(x)$, so with two factors known, the third factor can be obtained from observation. Candidates could have used algebraic long division with the given factor of $x - 2$ as an alternative method.

Question 3

Specimen answer

3 In this question, all angles are in radians.

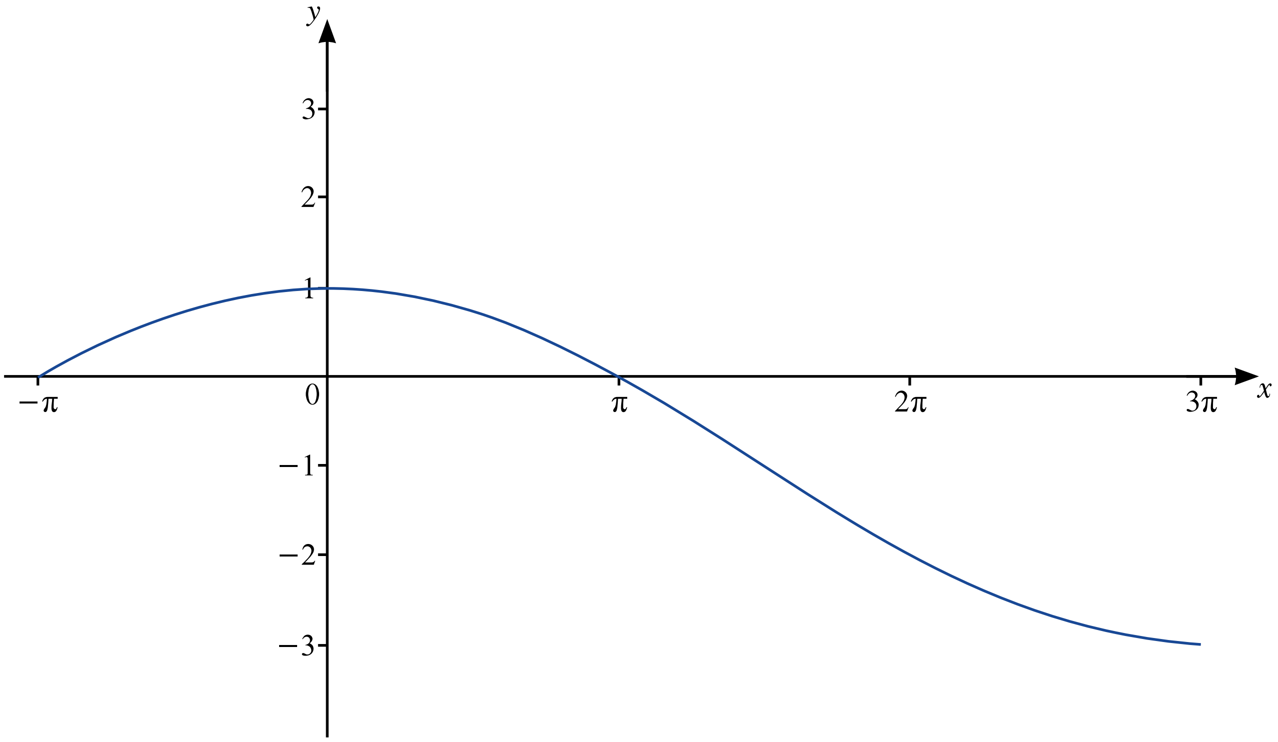
(a) Write down the amplitude of $2\cos\frac{x}{3} - 1$. [1]

the amplitude is 2

(b) Write down the period of $2\cos\frac{x}{3} - 1$. [1]

the period is 6π or $1080°$

(c) On the axes below, sketch the graph of $y = 2\cos\frac{x}{3} - 1$ for $-\pi \leqslant x \leqslant 3\pi$. [3]



Working out the coordinates of other points

when $x = 0$, $y = 2\cos(0) - 1$

$y = 2(1) - 1$

$y = 1$

when $x = \pi$, $y = 2\cos\left(\frac{\pi}{3}\right) - 1$

$y = 2\left(\frac{1}{2}\right) - 1$

$y = 0$

when $x = 2\pi$, $y = 2\cos\left(\frac{2\pi}{3}\right) - 1$

$y = 2\left(-\frac{1}{2}\right) - 1$

$y = -2$

Examiner comment

The relationship between the amplitude in connection with the equation $y = a\cos bx + c$ and the period in connection with the equation $y = a\cos bx + c$ was recognised. As the units for angles had not been specified at this point, an answer in either degrees or radians was acceptable. The y-coordinates of the main points given on the graph were calculated. These points were joined using a smooth curve as befitting a trigonometric curve. The answers for parts **(a)** and **(b)** could have been used as a check of the correct shape of the graph.

Common errors and general guidance for candidates

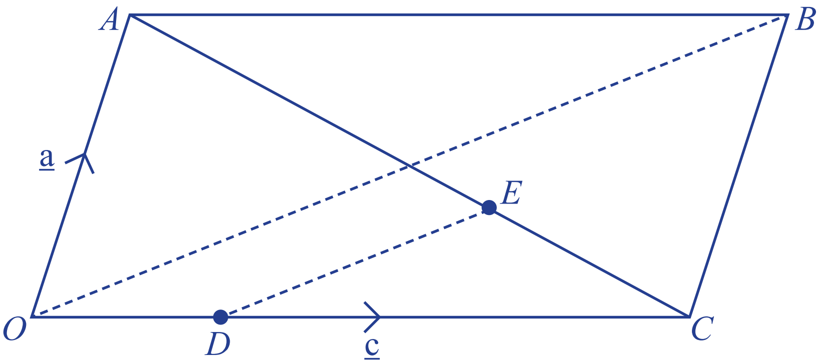
- Candidates are expected to know the exact values of basic trigonometric ratios from IGCSE mathematics and be able to convert degrees to radians without the use of a calculator when necessary. This is especially important for a non-calculator paper.
- The instruction to 'Write down; as in parts **(a)** and **(b)**, implies that candidates should be able to identify the answer with very little or no working.
- Some candidates have difficulties working out the period of a given trigonometric function of the type given in this question. It is essential that candidates recognise that the period is either $\frac{360^\circ}{b}$ or $\frac{2\pi}{b}$ depending on the angle unit being used in the question when appropriate.
- The sketches of trigonometric curves should be smooth curves, Candidates should not just join the points whose coordinates they have calculated with straight lines.
- It is important that the sketches of curves are drawn using the complete domain given, so calculation of the coordinates of the 'endpoints' is essential.
- It is also important that the coordinates of any other appropriate points, such as intercepts with the coordinate axes, are calculated where possible.

Question 4

Specimen answer

4 The parallelogram $OABC$ is such that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$. The point D lies on OC such that $OD : DC = 1 : 2$. The point E lies on AC such that $AE : EC = 2 : 1$.

Show that $\overrightarrow{OB} = k\overrightarrow{DE}$, where k is an integer to be found. [5]



$\overrightarrow{OB} = \underline{a} + \underline{c}$

$\overrightarrow{AC} = \underline{c} - \underline{a}$

$\overrightarrow{OD} : \overrightarrow{DC} = 1:2$ so $\overrightarrow{DC} = \frac{2}{3}\underline{c}$

$\overrightarrow{AE} : \overrightarrow{EC} = 2:1$ so $\overrightarrow{EC} = \frac{1}{3}(\underline{c} - \underline{a})$

$\overrightarrow{DE} = \overrightarrow{DC} + \overrightarrow{CE}$

$= \overrightarrow{DC} - \overrightarrow{EC}$

$= \frac{2}{3}\underline{c} - \frac{1}{3}(\underline{c} - \underline{a})$

$= \frac{1}{3}\underline{c} + \frac{1}{3}\underline{a}$

$= \frac{1}{3}(\underline{c} + \underline{a})$

$= \frac{1}{3}\overrightarrow{OB}$

$\therefore \overrightarrow{OB} = 3\overrightarrow{DE}$

Examiner comment

A diagram was drawn to show the situation clearly. This was only one of the possible diagrams that could have been drawn. The ratios were dealt with correctly and correct vector addition was used to obtain the required result. Each step was shown clearly and concisely. There were also other valid methods that could have been used.

Common errors and general guidance for candidates

- In questions where a diagram is not provided, it is essential that candidates draw one so that a full appreciation of the situation is clear.
- Candidates should be mindful that diagrams may be drawn in different ways, but they must ensure that labelling of the vertices follow in either a clockwise or anticlockwise direction.
- In questions where the demand is ‘Show that’, it is essential that sufficient detail is provided, as in the worked solution above.
- Candidates should also be aware that in many questions on the subject of vectors, there are often several acceptable methods that can be used to obtain a required result.
- It is good practice to denote vector quantities using an appropriate vector notation as in the worked solution.

Question 6(a)

Specimen answer

6 **(a)** $f(x) = 3e^{2x} + 1$ for $x \in \mathbb{R}$

$g(x) = x + 1$ for $x \in \mathbb{R}$

(i) Write down the range of f and the range of g. [2]

Range of f: $f > 1$
Range of g: $x \in \mathbb{R}$

(ii) Find $g^2(0)$. [1]

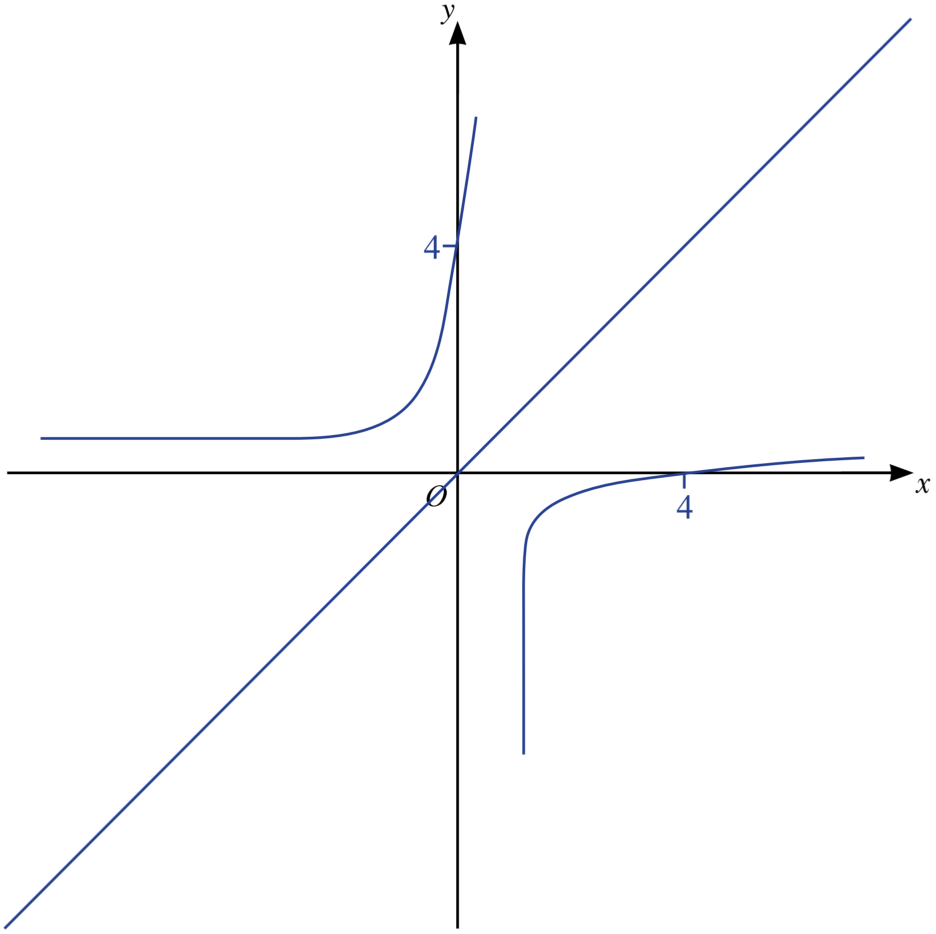
$g^2(0) = gg(0)$
$= g(1)$
$= 2$

(iii) Hence find $fg^2(0)$. [2]

$fg^2(0) = f(g^2(0))$
$= g(2)$
$= 3e^4 + 1$

(iv) On the axes below, sketch the graphs of $y = \mathrm{f}(x)$ and $y = \mathrm{f}^{-1}(x)$.

State the intercepts with the coordinate axes and the equations of any asymptotes. [4]



For $y = \mathrm{f}(x)$, when $x = 0$, $y = 4$
For $y = \mathrm{f}(x)$, the equation of the asymptote is $y = 1$
The graph of $y = \mathrm{f}^{-1}(x)$, is a reflection of the graph of $y = \mathrm{f}(x)$, in the line $y = x$
For $y = \mathrm{f}^{-1}(x)$, when $y = 0$, $x = 4$
For $y = \mathrm{f}^{-1}(x)$, the equation of the asymptote is $x = 1$

Examiner comment

Each question part was answered clearly and correctly, using the correct notation, with the order of the composite functions being correctly applied. The word 'Hence' implied that the work done in part **(ii)** was required for part **(iii)** and this was reflected in the response given. As this is a non-calculator paper, an exact answer was expected and given correctly.

For the graph, the candidate both stated the coordinates of the intercepts, although not in bracketed form. This would have been sufficient for the marks for the intercepts but stating them on the sketch was also acceptable. The equations of the asymptotes were stated correctly. The candidate was not required to draw in the asymptotes but would not have been penalised if this had been done. The candidate has drawn in the line $y = x$ and there is a clear attempt at reflection of the graph of the original function to obtain the graph of the inverse function. It should be noted that the candidate would have gained the marks even if the line $y = x$ had not been drawn in as the symmetry is implied by the shape and the intercept of each graph. The correct positions of the asymptotes are also implied.

Common errors and general guidance for candidates

- Candidates should ensure that they use the correct notation when stating a domain and/or the range of a function.
- The understanding of the order of application of functions when dealing with composite functions. An incorrect order will usually result in a candidate being unable to obtain any related marks.
- An appreciation and understanding of the use of the word ‘Hence’ is essential. It means that work done in a previous part or parts of a question is to be used.
- Intercepts of graphs with the coordinate axes may be stated within the body of the solution and/or marked in on any graph that is required.
- Candidates should note carefully what is required when making sketches of graphs.

Question 8(b)(i)

Specimen answer

8 **(b)** **(i)** Find $\frac{\mathrm{d}}{\mathrm{d}x}(6\sin^3 kx)$, where k is a constant. [2]

$$\frac{\mathrm{d}}{\mathrm{d}x}(6\sin^3 kx) = \frac{\mathrm{d}}{\mathrm{d}x}(6(\sin kx)^3)$$
$$= 6 \times 3 \times (k\cos kx)(\sin kx)^2$$
$$= 18k\cos kx\sin^2 kx$$

Examiner comment

The question was re-written in order to apply the chain rule more easily. Each step was clearly shown with the appropriate simplification taking place after the differentiation.

Common errors and general guidance for candidates

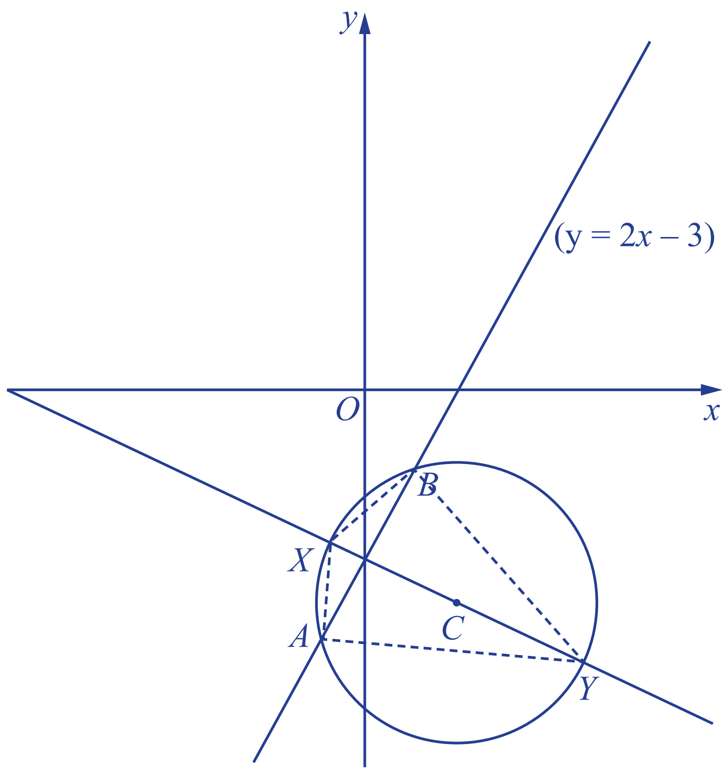
- Powers of trigonometric functions such as the one in this question, are differentiated by making use of the chain rule.
- Candidates should be familiar with the chain rule and also the derivatives of trigonometric functions involving a multiple angle.
- Sign errors are quite common, so familiarity with both the derivatives and integrals of the basic trigonometric functions is essential.
- Recognising that the power of a trigonometric function such as $\sin^3 kx$ may be written in the form $(\sin kx)^3$ will help with the application of the chain rule.
- Recognising that the application of the chain rule is better done in stages as in the solution is essential.

Question 10

Specimen answer

10 A circle has a centre (2, –4) and radius 3.
The line $y = 2x - 3$ intersects the circle at points A and B.
The perpendicular bisector of line AB intersects the circle at points X and Y.

Find the area of kite $AXBY$. [8]



The area of the kite $AXBY = \frac{1}{2} \times AB \times XY$

Equation of the circle: $(x-2)^2 + (y+4)^2 = 9$
Intersection of the circle and the straight line: $y = 2x - 3$
$(x-2)^2 + 2x - 3 + 4)^2 = 9$
$x^2 - 4x + 4 + 4x^2 + 4x + 1 = 9$
$5x^2 = 4$

$x = \pm\frac{2}{\sqrt{5}}$

When $x = -\frac{2}{\sqrt{5}}$, $y = -\frac{4}{\sqrt{5}} - 3$ these are the coordinates of the point A

When $x = \frac{2}{\sqrt{5}}$, $y = \frac{4}{\sqrt{5}} - 3$ these are the coordinates of the point A

The length of $AB = \sqrt{\left(\frac{2}{\sqrt{5}} - \left(-\frac{2}{\sqrt{5}}\right)\right)^2 + \left(\left(\frac{4}{\sqrt{5}} - 3\right) - \left(-\frac{4}{\sqrt{5}} - 3\right)\right)^2}$

$= \sqrt{\left(\frac{4}{\sqrt{5}}\right)^2 + \left(\frac{8}{\sqrt{5}}\right)^2}$

$= \sqrt{\frac{16}{5} + \frac{64}{5}}$

$= \sqrt{\frac{80}{5}}$

$= \sqrt{16}$

$= 4$

The perpendicular bisector of the chord AB of the circle passes through the centre C (2, –4) of the circle.

Therefore, the line XY is a diameter of the circle and has a length of 6.

The area of the kite $AXBY = \frac{1}{2} \times AB \times XY$

$= \frac{1}{2} \times 4 \times 6$

$= 12$

Examiner comment

A clear diagram showing the given circle and the given straight line gave guidance as to what needed to be found. Assumed knowledge of the formula for the area of the kite and the geometric properties of the circle meant that the equation of the perpendicular bisector and hence the coordinates of the points *X* and *Y* need not be found. The positions of *A* and *B* could have been reversed and also the positions of *X* and *Y* as only the lengths of these lines needed to be found. Each step was clearly shown and calculations were made carefully especially as a calculator could not be used.

Common errors and general guidance for candidates

- In unstructured questions involving the geometry of straight lines and circle, a diagram of the situation will often help a candidate decide a plan of action and the order in which the solution should be done.
- In a non-calculator paper, it is very important to write down each calculation carefully and not try to make too many simplifications at a time. This will make calculation errors less likely.
- Candidates should expect to have some surds involved in the solutions on a non-calculator paper and not assume that an error has been made, although it is always essential to check working, if possible,
- Candidates should also be aware of the assumed knowledge from IGCSE Mathematics which may be used together with work from the Additional mathematics syllabus.
- There will very often be different acceptable methods of solution, for example, a quadratic equation in terms of *y* rather than *x*, could have been formed to find the coordinates of the points *A* and *B*.

For further information about common mistakes made by candidates, please refer to the examiner reports which are published after the first exam series in 2025 on the School Support Hub at **www.cambridgeinternational.org/support**

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