Please note that where candidates enter for more than one qualification with the same accreditation number only one grade will count towards School and College Performance Tables. As a result, some schools and colleges regard the candidate as having only achieved one of the two qualifications.

The same view may be taken if candidates take two qualifications that have a significant overlap of content. Candidates with any doubts about their subject combinations should check with their chosen centre prior to starting their programmes.

In the case of a candidate taking two qualifications with the same accreditation number that are of the same size and level, eg, two full course GCSEs, the higher grade will count.

For updates and further information on any of our specifications, to find answers or ask us a question, register with Ask AQA at:
aqa.org.uk/askaqa

Download a copy of this specification from our website at:
aqa.org.uk/igcsemaths
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background Information</td>
<td>4</td>
</tr>
<tr>
<td>Introduction</td>
<td>4</td>
</tr>
<tr>
<td>Paper 1 (Non-Calculator)</td>
<td>5</td>
</tr>
<tr>
<td>Mark Scheme</td>
<td>19</td>
</tr>
<tr>
<td>Paper 2 (Calculator)</td>
<td>29</td>
</tr>
<tr>
<td>Mark Scheme</td>
<td>45</td>
</tr>
</tbody>
</table>
Background Information

Introduction

This Level 2 Certificate in Further Mathematics qualification fills the gap for high achieving students by assessing their higher order mathematical skills, particularly in algebraic reasoning, in greater depth without infringing upon AS Level mathematics, thus preparing them fully to maximise their potential in further studies at Level 3. It offers the opportunity for stretch and challenge that builds on the Key Stage 4 curriculum and is intended as an additional qualification to the GCSE Mathematics, rather than as a replacement.

The content assumes prior knowledge of the Key Stage 4 Programme of Study and covers the areas of algebra and geometry, which are crucial to further study in the subject, in greater depth and breadth. This new qualification places an emphasis on higher order technical proficiency, rigorous argument and problem solving skills. It also gives an introduction to calculus and matrices and develops further skills in trigonometry, functions and graphs.

The AQA Level 2 Certificate in Further Mathematics is an untiered Level 2 linear qualification for learners who

- either already have, or are expected to achieve grades A and A* in GCSE mathematics
- are likely to progress to A-Level study in mathematics and possibly further mathematics.

It will be graded on a five-grade scale: A* with Distinction (A^), A*, A, B and C.

The qualification is designed to be assessed as a full Level 2 mathematics qualification in its own right and is therefore not dependent on GCSE mathematics.

Therefore there are no prior learning requirements but there is the expectation that candidates have some assumed knowledge.

The specification content is set out in six distinct topic areas although questions will be asked that range across these topics.

- Number
- Algebra
- Co-ordinate Geometry (2 dimensions only)
- Calculus
- Matrix Transformations
- Geometry

Papers

These specimen papers have been designed to exemplify the question papers, to be set for our Level 2 Certificate in Further Mathematics Specification, for first qualification in June 2012. The associated mark scheme follows each paper.

The question papers should be read in conjunction with AQA Level 2 Certificate in Further Mathematics Specification 2011 onwards. This specification is available on the website http://web.aqa.org.uk/qual/igcse/maths.php

The question papers are intended to represent the length and balance of the papers that will be set for the examination and to indicate the types of questions that will be used. It must be emphasised, however, that the questions have not been subjected to the rigorous review that would take place with questions before use in examination.

Mark schemes

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.
Certificate in Further Mathematics
Level 2

Further Mathematics 8360/1
Level 2
Specimen Paper 1
Non-Calculator

For this paper you must have:
• mathematical instruments.
You may not use a calculator.

Time allowed
1 hour 30 minutes

Instructions
• Use black ink or black ball-point pen. Draw diagrams in pencil.
• Fill in the boxes at the top of this page.
• Answer all questions.
• You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
• Do all rough work in this book. Cross through any work that you do not want to be marked.
• In all calculations, show clearly how you work out your answer.

Information
• The marks for questions are shown in brackets.
• The maximum mark for this paper is 70.
• You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.
Volume of sphere $= \frac{4}{3} \pi r^3$

Surface area of sphere $= 4\pi r^2$

Volume of cone $= \frac{1}{3} \pi r^2 h$

Curved surface area of cone $= \pi rl$

In any triangle $ABC$

Area of triangle $= \frac{1}{2}ab \sin C$

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

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

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

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

Trigonometric Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\sin^2 \theta + \cos^2 \theta = 1$$
Answer all questions in the spaces provided.

1 (a) Solve $7(3x - 1) + 2(x + 7) = 3(6x - 1)$

Answer $x =$ ............................................................ $(4$ marks$)$

1 (b) Solve $\sqrt{3x + 10} = 4$

Answer $x =$ ............................................................ $(2$ marks$)$

Turn over for the next question
2 (a) The \( n \)th terms of two sequences are \( 4n + 13 \) and \( 6n - 21 \).

Which term has the same value in each sequence?

Answer .......................................................... (3 marks)

2 (b) The first five terms of a quadratic sequence are 4, 10, 18, 28, 40.

Work out an expression for the \( n \)th term.

Answer .......................................................... (5 marks)
3 (a) On the axes below sketch the graph of \( y = x^2 - 9 \)
Label clearly any points of intersection with the \( x \)-axis.

(2 marks)

3 (b) Write down all the integer solutions to \( x^2 - 9 < 0 \)

Answer ................................................................. (2 marks)

Turn over for the next question
A function $f(x)$ is defined as

$$f(x) = \begin{cases} 
3x & 0 \leq x < 1 \\
3 & 1 < x < 3 \\
12 - 3x & 3 \leq x < 4 
\end{cases}$$

Calculate the area enclosed by the graph of $y = f(x)$ and the $x$-axis.

Answer: .......................................................... units$^2$ (5 marks)
The graph shows two lines $A$ and $B$.
The equation of line $B$ is $y = 2x + 2$.

Work out the equation of line $A$.

Answer: ........................................................................................................... (4 marks)
6 Work out \(2 \frac{2}{3} - 1 \frac{3}{4} \div 1 \frac{1}{8}\). Give your answer as a fraction in its simplest form.

Answer ............................................................... (5 marks)

7 (a) Solve \(\frac{2}{x^3} = 9\)

Answer \(x = \) ......................................................... (2 marks)

7 (b) The reciprocal of \(\frac{1}{y^2}\) is 5

Work out the value of \(y\).

Answer ............................................................... (2 marks)
8 Make \(d\) the subject of \[ c = \frac{8(c - d)}{d} \]

9 The sketch shows \(y = \sin x\) for \(0^\circ \leq x \leq 360^\circ\)

The value of \(\sin 73^\circ = 0.956\) to 3 significant figures.

Use the sketch to find two angles between \(0^\circ\) and \(360^\circ\) for which \(\sin x = -0.956\)

Answer ........................................ and .................................. (2 marks)
10 (a) Write \( \sqrt{75} + \sqrt{12} \) in the form \( a\sqrt{b} \) where \( a \) and \( b \) are integers.

Answer .................................................................. (2 marks)

10 (b) Rationalise and simplify \( \frac{2\sqrt{2} + 1}{\sqrt{2} - 3} \)

Answer .................................................................. (5 marks)

11 The points \( A(-1, -7) \) and \( B(24, 23) \) are on a straight line \( ACB \).

\( AC : CB = 2 : 3 \)

Work out the coordinates of \( C \).

Answer ( ..................., .................... ) (4 marks)
12 Prove that \( \tan^2 x - 1 \equiv \frac{1 - 2\cos^2 x}{\cos^2 x} \)

(3 marks)

13 (a) Work out the coordinates of the stationary point for the curve \( y = x^2 + 3x + 4 \)

Answer ( \( \ldots, \ldots \) ) (4 marks)

13 (b) Explain why the equation \( x^2 + 3x + 4 = 0 \) has no real solutions.

(2 marks)
In the diagram, $DCB$ is a straight line.

Work out the length of $DC$, marked $x$ on the diagram.

Write your answer in the form $a - \sqrt{b}$

Answer $\ldots$ cm (4 marks)
A, B, C and D are points on the circumference of a circle such that $BD$ is parallel to the tangent to the circle at $A$.

Prove that $AC$ bisects angle $BCD$.
Give reasons at each stage of your working.

END OF QUESTIONS
Level 2 Certificate in Further Mathematics

Specimen Paper 1  8360/1

Mark Scheme
Mark Schemes

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

It is not possible to indicate all the possible approaches to questions that would gain credit in a ‘live’ examination. The principles we work to are given in the glossary on page 3 of this mark scheme.

- Evidence of any method that would lead to a correct answer, if applied accurately, is generally worthy of credit.
- Accuracy marks are awarded for correct answers following on from a correct method. The correct method may be implied, but in this qualification there is a greater expectation that method will be appropriate and clearly shown.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Set and published by the Assessment and Qualifications Alliance.
Glossary for Mark Schemes

These examinations are marked in such a way as to award positive achievement wherever possible. Thus, for these papers, marks are awarded under various categories.

M  Method marks are awarded for a correct method which could lead to a correct answer.

A  Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.

B  Marks awarded independent of method.

MDep A method mark dependent on a previous method mark being awarded.

BDep A mark that can only be awarded if a previous independent mark has been awarded.

ft  Follow through marks. Marks awarded following a mistake in an earlier step.

SC  Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.

oe  Or equivalent. Accept answers that are equivalent.

eg, accept 0.5 as well as $\frac{1}{2}$
## Paper 1 - Non-Calculator

<table>
<thead>
<tr>
<th>Q</th>
<th>Answer</th>
<th>Mark</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1(a)</strong></td>
<td>(21x - 7 + 2x + 14 = 18x - 3)</td>
<td>M1</td>
<td>Allow one error</td>
</tr>
<tr>
<td></td>
<td>Their (21x + 2x - 18x = -3 + 7 - 14)</td>
<td>M1</td>
<td>Allow one rearrangement error</td>
</tr>
<tr>
<td></td>
<td>(5x = -10)</td>
<td>A1ft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(x = -2)</td>
<td>A1ft</td>
<td>Must have gained M2 for ft</td>
</tr>
<tr>
<td><strong>1(b)</strong></td>
<td>(3x + 10 = 16)</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(x = 2)</td>
<td>A1</td>
<td></td>
</tr>
</tbody>
</table>

| **2(a)** | \(4n + 13 = 6n - 21\) | M1 | List terms in both sequences with 81 appearing in both lists |
| | \(6n - 4n = 13 + 21\) | M1 | \(4n + 13 = 81\) or \(6n - 21 = 81\) |
| | 17 | A1 | |

| **2(b)** | Attempt at first differences (at least three) \(6 \quad 8 \quad 10 \quad 12\) | M1 | Alternative - Works with \(an^2 + bn + c\) |
| | Attempt at second differences (at least two) and divides their second difference by 2 to obtain coefficient of \(n^2\) \(2 \quad 2 \quad 2\) and \(1n^2\) | M1 | Eliminates one letter from any two of their equations |
| | Subtracts \(n^2\) from original sequence \(4 - 1 \quad 10 - 4 \quad 18 - 9 \quad 28 - 16 \quad 40 - 25\) \((= 3 \quad 6 \quad 9 \quad 12 \quad 15)\) | M1 | Eliminates the same letter from a different pair of their equations |
| | Attempt at differences of their \(3 \quad 6 \quad 9 \quad 12 \quad 15\) or \(3n\) | M1 | Attempt at solving their two equations in two variables |
| | \(n^2 + 3n\) | A1 | \((a = 1, b = 3, c = 0)\) |

\[n^2 + 3n\]
<table>
<thead>
<tr>
<th>Q</th>
<th>Answer</th>
<th>Mark</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(a)</td>
<td>U shape crossing $x$-axis in two places</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-3$ and $3$ marked</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>3(b)</td>
<td>$-2, -1, 0, 1, 2$</td>
<td>B2</td>
<td>Any 3 of these B1</td>
</tr>
<tr>
<td></td>
<td>These 5 plus -3 and 3 B1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Graph drawn</td>
<td>B3</td>
<td>B1 For each part</td>
</tr>
<tr>
<td></td>
<td>Accept vertices of trapezium clearly marked</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{1}{2} \times (4 + 2) \times 3$</td>
<td>M1</td>
<td>Attempt to find their area</td>
</tr>
<tr>
<td></td>
<td>$9$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Attempt to work out the scale on the $y$-axis</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>eg, $0, 2, 4$, seen as labels or statement that $y$-axis goes up</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in 2s or evidence that $y$ intercept is 2 for given line</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attempt to work out the scale on the $x$-axis</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>eg, $0, 1, 2$, seen as labels or evidence of using gradient of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2$ for given line and scale on $y$-axis to work out horizontal scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evidence of working out gradient</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>eg, triangle drawn on graph or $2 \div 2$ or $1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$y = x - 3$</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
</tr>
<tr>
<td>---</td>
<td>--------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>6</td>
<td>Attempts division before subtraction</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>$\frac{7}{4} \div \frac{9}{8}$</td>
<td>M1</td>
<td>Allow one error in numerators</td>
</tr>
<tr>
<td>8</td>
<td>$\frac{14}{9}$</td>
<td>A1</td>
<td>oe fraction</td>
</tr>
<tr>
<td>9</td>
<td>$\frac{24}{9} - \frac{14}{9}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$\frac{10}{9}$</td>
<td>A1ft</td>
<td>oe</td>
</tr>
<tr>
<td>7(a)</td>
<td>$x = \frac{3}{9^{\frac{1}{2}}}$</td>
<td>M1</td>
<td>oe</td>
</tr>
<tr>
<td>8</td>
<td>$27$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>7(b)</td>
<td>$\frac{1}{5^{2}}$ or $y^{-1} = 25$ or $\frac{1}{y^{2}} = \frac{1}{5}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>or $\frac{1}{y^{2}} = 5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>$\frac{1}{25}$</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td>8</td>
<td>$cd = 8(c - d)$</td>
<td>M1</td>
<td>or $c = \frac{8c - 8d}{d}$</td>
</tr>
<tr>
<td>9</td>
<td>$cd = 8c - 8d$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$cd + 8d = 8c$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>$d = \frac{8c}{(c + 8)}$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>$270 - 17 (= 253)$ or $270 + 17 (= 287)$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$253$ and $287$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>10(a)</strong></td>
<td>$5\sqrt{3} \text{ (to)} 2\sqrt{3}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$7\sqrt{3}$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td><strong>10(b)</strong></td>
<td>$rac{(2\sqrt{2} + 1)(\sqrt{2} + 3)}{(\sqrt{2} - 3)(\sqrt{2} + 3)}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Num $2 \times 2 + \sqrt{2} + 6\sqrt{2} + 3$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$7 + 7\sqrt{2}$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Denom $2 - 9$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-1 - \sqrt{2}$</td>
<td>A1ft</td>
<td>Allow $- (1 + \sqrt{2})$ ft If both Ms awarded</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>$24 - (-1) = 25$ or $23 - (-7) = 30$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{2}{5} \times \text{their 25} (= 10)$</td>
<td>M1</td>
<td>$\frac{3}{5} \times \text{their 25} (= 15)$</td>
</tr>
<tr>
<td></td>
<td>or $\frac{2}{5} \times \text{their 30} (= 12)$</td>
<td></td>
<td>or $\frac{3}{5} \times \text{their 30} (= 18)$</td>
</tr>
<tr>
<td></td>
<td>$-1 + \text{their 10} (= 9)$</td>
<td>M1</td>
<td>$24 - \text{their 15} (= 9)$</td>
</tr>
<tr>
<td></td>
<td>or $-7 + \text{their 12} (= 5)$</td>
<td></td>
<td>or $23 - \text{their 18} (= 5)$</td>
</tr>
<tr>
<td></td>
<td>$(9, 5)$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td><strong>12</strong></td>
<td>$\frac{\sin^2 x}{\cos^2 x} - 1$</td>
<td>M1</td>
<td>Use of $\tan x \equiv \frac{\sin x}{\cos x}$</td>
</tr>
<tr>
<td></td>
<td>$\frac{\sin^2 x - \cos^2 x}{\cos^2 x}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$1 - \frac{\cos^2 x - \cos^2 x}{\cos^2 x}$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
</tr>
<tr>
<td>---</td>
<td>--------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>13(a)</strong></td>
<td>( \frac{dy}{dx} = 2x + 3 )</td>
<td>M1</td>
<td>((x + \frac{1}{2})^2 - \frac{1}{2} + 4)</td>
</tr>
<tr>
<td></td>
<td>( x = -1 \frac{1}{2} )</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td></td>
<td>( y = (-1 \frac{1}{2})^2 + 3(-1 \frac{1}{2}) + 4 )</td>
<td>M1</td>
<td>((x + \frac{1}{2})^2 + 1.75)</td>
</tr>
<tr>
<td></td>
<td>( y = 1 \frac{3}{4} )</td>
<td>A1ft</td>
<td>oe turning points at ((-1 \frac{1}{2}, 1 \frac{3}{4})) Allow follow through if first M1 awarded</td>
</tr>
<tr>
<td><strong>13(b)</strong></td>
<td>Sketch showing turning point above (x)-axis and statement that curve never crosses (x)-axis so no solution (B1 For sketch showing turning point above (x)-axis with statement not made)</td>
<td>B2</td>
<td>B2 A complete valid explanation using correct mathematical language eg, stating that (b^2 - 4ac = -7) which is &lt; 0 so implies no real solution due to a negative number not having a real square root B1 For a partially correct explanation using correct mathematical language eg, stating that (b^2 - 4ac = -7) which is &lt; 0 so implies no real solution</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td>( BD = 3\sqrt{2} \cos 45 ) (= 3) or ( AB = 3\sqrt{2} \sin 45 ) (= 3)</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( BC = \text{their} \frac{AB}{\tan 60} = \left( \frac{3}{\sqrt{3}} \right) )</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( BC = \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} )</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( 3 - \sqrt{3} )</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| 15 | \( \angle BCA = \angle BAE \)  
Alternate segment theorem | B1 | oe  
Correct geometrical reasons must be given |
| | \( \angle BAE = \angle DBA \)  
Alternate angles equal | B1 | oe  
Correct geometrical reasons must be given |
| | \( \angle DBA = \angle ACD \)  
Angles in the same segment are equal | B1 | oe  
Correct geometrical reasons must be given |
| | So \( \angle BCA = \angle ACD \)  
AC bisects \( \angle BCD \) | B1 | SC2  
For correct argument without reasons |
Further Mathematics 8360/2

Level 2

Specimen Paper 2

Calculator

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
2 hours

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 105.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

Volume of cone = $\frac{1}{3}\pi r^2 h$
Curved surface area of cone = $\pi rl$

In any triangle $ABC$

Area of triangle = $\frac{1}{2}ab \sin C$

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

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

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

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Trigonometric Identities

$\tan \theta = \frac{\sin \theta}{\cos \theta}$
$\sin^2 \theta + \cos^2 \theta = 1$
Answer all questions in the spaces provided.

1. *a, b, c and d are consecutive integers.*
   
   Explain why *ab + cd* is always even.
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   *(3 marks)*

2. Work out the distance between the point A(1, 4) and the point B(7, 12).
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   Answer ............................................................................ units *(2 marks)*

3. The *n*th term of a sequence is given by *\( \frac{3n + 1}{6n - 5} \)*
   
   3 (a) Write down the first, tenth and hundredth terms of the sequence.
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   Answer .................................................., ......................, ...................... *(2 marks)*

3 (b) Show that the limiting value of *\( \frac{3n + 1}{6n - 5} \)* is *\( \frac{1}{2} \)* as *n \rightarrow \infty*.
   
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   *(2 marks)*
4 The function $f(x)$ is defined as $f(x) = x^2 + x$

4 (a) Write down the value of $f(7)$

..................................................................................................................... (1 mark)

4 (b) Solve $f(x) = 0$

..................................................................................................................... (2 marks)

4 (c) Write an expression for $f(x + 1) - f(x)$

Give your answer in its simplest form.

..................................................................................................................... (3 marks)
5 The diagram shows triangle $ABC$ with $AB = AC$.

Show that triangle $ABC$ is equilateral.

...........................................................................................................................................
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(5 marks)

6 $x$, $y$ and $z$ are three quantities such that

$x : y = 3 : 2$ and $y : z = 5 : 4$

Express the ratio $x : z$ in its simplest form.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................

Answer ........................................ : .......................................... (3 marks)
7 \(ABCD\) is a quadrilateral.

Prove that \(AB\) is parallel to \(DC\).

\[
\begin{align*}
\angle A & = x \\
\angle B & = 2x \\
\angle C & = 3x \\
\angle D & = 4x
\end{align*}
\]

(5 marks)
8 The function \( f(x) \) is defined as \( f(x) = \frac{1}{x^2 - 3x - 10} \)

\( f(x) \) has domain all \( x \) except \( x = a \) and \( x = b \)

Work out \( a \) and \( b \).

Answer …………………………………………………………………………………………… (3 marks)

9 (a) Expand and simplify \((x - 5)(x^2 + 4x - 2)\)

Answer …………………………………………………………………………………………… (4 marks)

9 (b) Factorise fully \((x^2 - 16) - (x - 4)(3x + 5)\)

Answer …………………………………………………………………………………………… (4 marks)
Here are a parallelogram and an isosceles triangle.

10 (a) The area of the triangle is greater than the area of the parallelogram. Show that \( x^2 - 4x > 0 \)

10 (b) Work out the least integer value for \( x \).

11 Write \( \frac{\frac{1}{a^2} \times a^2}{(a^3)^4} \) as a single power of \( a \).
12  \( n \) is an integer.
Prove that \((n - 2)^2 + n(8 - n)\) is always a multiple of 4.

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14 On the axes below is a circle centre \((0, 0)\) and passing through the point \((3, 0)\).

14 (a) Write down the equation of the circle.

Answer \…………………………………………………………. (1 mark)

14 (b) Decide whether the point \((2, 2)\) is inside or outside the circle.

Show how you decide.

\……………………………………………………………………………………………

\……………………………………………………………………………………………

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\……………………………………………………………………………………………

Answer \………………………………………………………… (2 marks)

14 (c) The circle above is translated so that the image of \((3, 0)\) is \((5, 4)\).

Write down the equation of the new circle.

\……………………………………………………………………………………………

Answer \………………………………………………………… (2 marks)
15 A triangle has sides 10.2 cm, 6.8 cm and 5.7 cm.

Work out the area of the triangle.

Answer ........................................ cm² (5 marks)

16 Work out the equation of the perpendicular bisector of P(3, −1) and Q(5, 7).

Give your answer in the form \( y = ax + b \)

Answer ......................................................... (5 marks)
VABCD is a rectangular based pyramid.
AB = 12 cm, BC = 10 cm and VC = 14 cm
The base ABCD is horizontal and the vertex V is directly above X, the centre of the base.

17 (a) Work out the height of the pyramid, VX.

Answer ................................................................ cm (4 marks)

17 (b) Calculate the angle between VC and the plane ABCD.

Answer ..................................................... degrees (2 marks)
17 (c) Calculate the angle between the planes $VBC$ and $ABCD$.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

Answer ....................................................... degrees (3 marks)

18 Solve the equation $\cos^2 x = 0.8$ for $0^\circ \leq x \leq 360^\circ$

........................................................................................................................................
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Answer ........................................................... (3 marks)

19 $y = x^4(2x + 5)$

Work out the rate of change of $y$ with respect to $x$ when $x = 2$

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

Answer ........................................................... (5 marks)
20 (a) Matrix \( \mathbf{A} = \begin{pmatrix} 4 & 3 \\ 1 & 1 \end{pmatrix} \)

Work out the image of point \( P(2, -1) \) using transformation matrix \( \mathbf{A} \).

Answer ( ................................, ................................ ) (2 marks)

20 (b) Point \( Q \) is (0, 1)

Line \( PQ \) is transformed to line \( P'Q' \) using matrix \( \mathbf{A} \).

Work out the length of \( P'Q' \).

Answer ........................................................... units (2 marks)
21 Factorise fully \( x^3 - 4x^2 - 11x + 30 \)

Answer ......................................................... (6 marks)

Turn over for the next question
The diagram shows the graph of \( y = x^2 - 4x + 3 \)
The curve cuts the \( x \)-axis at the points \( A \) and \( B \).
The tangent to the curve at the point \((5, 8)\) cuts the \( x \)-axis at the point \( C \).

Show that \( AB = 3BC \)

(7 marks)
Mark Schemes

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

It is not possible to indicate all the possible approaches to questions that would gain credit in a 'live' examination. The principles we work to are given in the glossary on page 3 of this mark scheme.

- Evidence of any method that would lead to a correct answer, if applied accurately, is generally worthy of credit.
- Accuracy marks are awarded for correct answers following on from a correct method. The correct method may be implied, but in this qualification there is a greater expectation that method will be appropriate and clearly shown.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Glossary for Mark Schemes

These examinations are marked in such a way as to award positive achievement wherever possible. Thus, for these papers, marks are awarded under various categories.

- **M** Method marks are awarded for a correct method which could lead to a correct answer.
- **A** Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
- **B** Marks awarded independent of method.
- **M Dep** A method mark dependent on a previous method mark being awarded.
- **B Dep** A mark that can only be awarded if a previous independent mark has been awarded.
- **ft** Follow through marks. Marks awarded following a mistake in an earlier step.
- **SC** Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
- **oe** Or equivalent. Accept answers that are equivalent.

**eg**, accept 0.5 as well as $\frac{1}{2}$
## Paper 2 - Calculator

<table>
<thead>
<tr>
<th>Q</th>
<th>Answer</th>
<th>Mark</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Any consecutive pair contains an even (and an odd)</td>
<td>M1</td>
<td>(n(n + 1) + (n + 2)(n + 3))</td>
</tr>
<tr>
<td></td>
<td>Even (\times) odd = even</td>
<td>M1</td>
<td>(n^2 + n + n^2 + 3n + 2n + 6) Allow 1 error</td>
</tr>
<tr>
<td></td>
<td>Even + even = even</td>
<td>A1</td>
<td>(2(n^2 + 3n + 3)) so even</td>
</tr>
<tr>
<td>2</td>
<td>(\sqrt{(7 - 1)^2 + (12 - 4)^2})</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>3(a)</td>
<td>4</td>
<td>B2</td>
<td>B1 For two correct oe</td>
</tr>
<tr>
<td></td>
<td>(\frac{31}{55})</td>
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<tr>
<td></td>
<td>(\frac{301}{595})</td>
<td></td>
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<tr>
<td>3(b)</td>
<td>Reference to (3n + 1 \rightarrow 3n) or (6n - 5 \rightarrow 6n) when (n) is large</td>
<td>B1</td>
<td>oe Must include reference to (n) being large</td>
</tr>
<tr>
<td></td>
<td>(\frac{3n}{6n}) cancelled to (\frac{1}{2})</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>Alt 3(b)</td>
<td>(\frac{3n}{n} + \frac{1}{n}) (\frac{6n}{n} - \frac{5}{n})</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(\frac{3}{6}) since (\frac{1}{n}) and (\frac{5}{n}) (\rightarrow 0) as (n \rightarrow \infty)</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td>4(a)</td>
<td>56</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>4(b)</td>
<td>(x(x + 1) = 0)</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 and (-1)</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>4(c)</td>
<td>((x + 1)^2 + x + 1 - x^2 - x)</td>
<td>M1</td>
<td>Allow 1 sign error</td>
</tr>
<tr>
<td></td>
<td>(x^2 + x + x + 1 + x + 1 - x^2 - x)</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td></td>
<td>(2x + 2) or (2(x + 1))</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
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<tr>
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<tr>
<td>5</td>
<td>$4x - 5 = 2x + 3$</td>
<td>M1</td>
<td></td>
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<tr>
<td></td>
<td>$4x - 2x = 3 + 5$</td>
<td>M1</td>
<td>Allow one sign error</td>
</tr>
<tr>
<td></td>
<td>$x = 4$</td>
<td>A1ft</td>
<td></td>
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<tr>
<td></td>
<td>Substitute their $x$ into one of the equal sides</td>
<td>M1</td>
<td>eg, $4 \times 4 - 5$ or $2 \times 4 = 3 (=11)$</td>
</tr>
<tr>
<td></td>
<td>Shows BC is $3 \times 4 - 1 = 11$ and $11$ obtained for either AB or AC</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Attempt at common value for $y$ in order to eliminate $y$ eg, $3 \times 5 : 2 \times 5$ and $5 \times 2 : 4 \times 2$</td>
<td>M1</td>
<td>Attempt to find two equations in order to eliminate $y$ eg, $y = \frac{2x}{3}$ and $y = \frac{5z}{4}$</td>
</tr>
<tr>
<td></td>
<td>$15 : 10$ and $10 : 8$</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td></td>
<td>eg, $\frac{2x}{3} = \frac{5z}{4}$ or $8x = 15z$</td>
<td></td>
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<tr>
<td></td>
<td>$15 (; 10) : 8$</td>
<td>A1</td>
<td>$15 : 8$</td>
</tr>
</tbody>
</table>
Q | Answer | Mark | Comments
---|---|---|---
7 | \( x + 2x + 3x + 4x = 360 \) | M1 | oe
| \( 10x = 360 \ (x = 36) \) | M1 | |
| Their \( 36 \times 2 \) and their \( 36 \times 3 \) or their \( 36 \times 4 \) | M1 | |
| \( 36 + 144 = 180 \) or \( 72 + 108 = 180 \) | M1 | oe
| Concludes that \( AB \) is parallel to \( DC \) because allied/interior angles add up to \( 180^\circ \) | A1 | |

Alt 7 | \( x + 4x + 3x + 2x = 360 \) | M1 | oe
| \( 10x = 360 \ (x = 36) \) | M1 | |
| \( 5x = 180 \) | M1 | |
| \( x + 4x = 5x \), so angle \( A \) + angle \( D \) = \( 180^\circ \) or \( 3x + 2x = 5x \), so angle \( C \) + angle \( B \) = \( 180^\circ \) | M1 | oe
| Concludes that \( AB \) is parallel to \( DC \) because allied/interior angles add up to \( 180^\circ \) | A1 | oe

8 | Sets denominator to zero or attempts to factorise in the form \((x \pm a)(x \pm b)\) where \( ab = 10 \) | M1 | \( x^2 - 3x - 10 = 0 \)
| \( (x + 2)(x - 5) \) | A1 | |
| \( -2 \) (and) \( 5 \) | B1ft | ft From their factors
<table>
<thead>
<tr>
<th>Q</th>
<th>Answer</th>
<th>Mark</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>9(a)</td>
<td>$x^3 + 4x^2 - 2x$</td>
<td>M1</td>
<td>Allow 1 error</td>
</tr>
<tr>
<td></td>
<td>$-5x^2 - 20x + 10$</td>
<td>M1</td>
<td>Allow 1 error</td>
</tr>
<tr>
<td></td>
<td>$x^3 + 4x^2 - 2x - 5x^2 - 20x + 10$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x^3 - x^2 - 22x + 10$</td>
<td>A1</td>
<td>ft</td>
</tr>
<tr>
<td>9(b)</td>
<td>$(x + 4) (x - 4) - (x - 4) (3x + 5)$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(x - 4)(……………………….)$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(x - 4) (x + 4 - 3x - 5)$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(x - 4) (-2x - 1)$</td>
<td>A1</td>
<td>ft oe eg, $-(x - 4)(2x + 1)$</td>
</tr>
<tr>
<td>Alt 9(b)</td>
<td>$(-)(3x^2 - 12x + 5x - 20)$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-2x^2 + 7x + 4$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(x + a) (-2x + b) \ ab = 4$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(x - 4)(- 2x - 1)$</td>
<td>A1</td>
<td>ft oe eg, $-(x - 4)(2x + 1)$</td>
</tr>
<tr>
<td>10(a)</td>
<td>Attempt to work out both areas</td>
<td>M1</td>
<td>ie, $\frac{1}{2} (2x \times 2x)$ and $x(x + 4)$ Allow one error</td>
</tr>
<tr>
<td></td>
<td>Correct expression for both areas</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2x^2 &gt; x^2 + 4x$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>10(b)</td>
<td>$x(x - 4) &gt; 0$</td>
<td>M1</td>
<td>Attempts U-shaped sketch of $y = x^2 - 4x$ crossing $x$-axis at $x = 0$ and $x = 4$</td>
</tr>
<tr>
<td></td>
<td>$(x &lt; 0$ and) $x &gt; 4$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
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<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11</td>
<td>(numerator) (a^2)</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(denominator) (a^{12})</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a^{-10})</td>
<td>B1ft</td>
<td>ft If numerator and denominator seen as powers of (a)</td>
</tr>
<tr>
<td>12</td>
<td>(n^2 - 4n + 4 + 8n - n^2)</td>
<td>M1</td>
<td>Allow one error or omission</td>
</tr>
<tr>
<td></td>
<td>(4n + 4)</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4(n + 1))</td>
<td>A1</td>
<td>(4(n + 4) ÷ 4 = n + 1)</td>
</tr>
<tr>
<td>13</td>
<td>Attempt to eliminate one variable eg, ((2x)^2 = x + 3)</td>
<td>M1</td>
<td>(y^2 = \frac{y}{2} + 3)</td>
</tr>
<tr>
<td></td>
<td>(4x^2 - x - 3 = 0)</td>
<td>A1</td>
<td>(2y^2 - y - 6 = 0)</td>
</tr>
<tr>
<td></td>
<td>Attempt at solution eg, ((4x + 3)(x - 1))</td>
<td>M1</td>
<td>((2y + 3)(y - 2)) Allow correct use of formula</td>
</tr>
<tr>
<td></td>
<td>(x = -\frac{3}{4} \text{ (and) } x = 1)</td>
<td>A1</td>
<td>(y = 2 \text{ (and) } y = -1 \frac{1}{2})</td>
</tr>
<tr>
<td></td>
<td>(y = -1 \frac{1}{2} \text{ (and) } y = 2)</td>
<td>A1</td>
<td>(x = 1 \text{ (and) } x = -\frac{3}{4})</td>
</tr>
<tr>
<td>14(a)</td>
<td>(x^2 + y^2 = 9)</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>14(b)</td>
<td>(2^2 + 2^2 = 8)</td>
<td>M1</td>
<td>Inside and valid justification</td>
</tr>
<tr>
<td></td>
<td>eg, inside and 8 &lt; 9, inside and 2.8… &lt; 3</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>14(c)</td>
<td>((x - 2)^2 + (y - 4)^2 = \text{ their 9})</td>
<td>B2ft</td>
<td>((x + 2)^2 + (y + 4)^2 = \text{ their 9 B1}) ft Their part (a)</td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
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<td>----</td>
<td>------------------------------------------------------------------------</td>
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<td>---------------------------------</td>
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<tr>
<td>15</td>
<td>( \cos A = \frac{6.8^2 + 5.7^2 - 10.2^2}{2 \times 6.8 \times 5.7} )</td>
<td>M1</td>
<td>( \cos B = \frac{10.2^2 + 5.7^2 - 6.8^2}{2 \times 10.2 \times 5.7} ) or</td>
</tr>
<tr>
<td></td>
<td>( \cos C = \frac{10.2^2 + 6.8^2 - 5.7^2}{2 \times 10.2 \times 6.8} )</td>
<td></td>
<td>( \cos B = \frac{10.2^2 + 5.7^2 - 6.8^2}{2 \times 10.2 \times 5.7} ) or</td>
</tr>
<tr>
<td></td>
<td>(-0.32649(\ldots) \text{ or } -0.3265 )</td>
<td>A1</td>
<td>( \cos C = \frac{10.2^2 + 6.8^2 - 5.7^2}{2 \times 10.2 \times 6.8} )</td>
</tr>
<tr>
<td></td>
<td>( 109(.05\ldots)^\circ \text{ or } 109.06^\circ \text{ or } 109.1^\circ )</td>
<td>A1</td>
<td>( 39(.05\ldots) \text{ or } 39.1 )</td>
</tr>
<tr>
<td></td>
<td>( \frac{1}{2} \times 6.8 \times 5.7 \times \sin \text{ their } 109 )</td>
<td>M1</td>
<td>( \frac{1}{2} \times 10.2 \times 5.7 \times \sin \text{ their } 39 ) or</td>
</tr>
<tr>
<td></td>
<td>18.3</td>
<td>A1\text{ ft}</td>
<td>( \frac{1}{2} \times 10.2 \times 6.8 \times \sin \text{ their } 32 )</td>
</tr>
<tr>
<td>16</td>
<td>Gradient = 4</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gradient of perpendicular = ( -\frac{1}{4} )</td>
<td>B1\text{ ft}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Midpoint = (4, 3)</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( y - 3 = -\frac{1}{4} (x - 4) )</td>
<td>M1</td>
<td>oe</td>
</tr>
<tr>
<td></td>
<td>( y = -\frac{1}{4} x + 4 )</td>
<td>A1</td>
<td>oe</td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
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</tr>
<tr>
<td>17(a)</td>
<td>((AC^2) = 12^2 + 10^2) or ((AX^2) = 6^2 + 5^2)</td>
<td>M1</td>
<td>((VM^2) = 14^2 - 5^2) or ((VN^2) = 14^2 - 6^2)</td>
</tr>
<tr>
<td></td>
<td>((AX) = \frac{\sqrt{244}}{2} (\sqrt{61}))</td>
<td>A1</td>
<td>oe ((VM) = \sqrt{171}) or ((VN) = \sqrt{160})</td>
</tr>
<tr>
<td></td>
<td>((VX^2) = 14^2 - their AX^2)</td>
<td>M1</td>
<td>((VX^2) = their VM^2 - 6^2) or ((VX^2) = their VN^2 - 5^2)</td>
</tr>
<tr>
<td></td>
<td>11.6(2)</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>17(b)</td>
<td>(\sin VCX = \frac{their VX}{14})</td>
<td>M1</td>
<td>(\cos VCX = \frac{their \sqrt{61}}{14}) or tan (VCX = \frac{their VX}{their \sqrt{61}})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>56.1°</td>
</tr>
<tr>
<td>17(c)</td>
<td>Use of right-angled triangle (VMX) where (M) is the mid-point of (BC)</td>
<td>M1</td>
<td>So that (MV) and (MX) are both at right angles to (BC), thus defining the angle</td>
</tr>
<tr>
<td></td>
<td>(\tan VMX = \frac{their VX}{6})</td>
<td>M1</td>
<td>(\cos VMX = \frac{6}{\sqrt{14^2 - 5^2}}) or (\sin VMX = \frac{their VX}{\sqrt{14^2 - 5^2}})</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>62.7°</td>
</tr>
<tr>
<td>18</td>
<td>(\cos x = (\pm) 0.894427)</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26.6, 153.4, 206.6, 333.4</td>
<td>A2</td>
<td>A1 For 2 or 3 answers</td>
</tr>
<tr>
<td>19</td>
<td>(2x^5 + 5x^4)</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(10x^4 + 20x^3)</td>
<td>A2</td>
<td>ft Their two terms differentiated</td>
</tr>
<tr>
<td></td>
<td>(10(2)^4 + 20(2)^3)</td>
<td>M1</td>
<td>(x = 2) in their terms from differentiating</td>
</tr>
<tr>
<td></td>
<td>320</td>
<td>A1</td>
<td>ft If M2 awarded</td>
</tr>
<tr>
<td>Q</td>
<td>Answer</td>
<td>Mark</td>
<td>Comments</td>
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<td>---</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>20(a)</strong></td>
<td>(5, 1)</td>
<td>B2</td>
<td>B1 For (5, k) or (c, 1) or $\begin{pmatrix} 5 \ 1 \end{pmatrix}$</td>
</tr>
<tr>
<td><strong>20(b)</strong></td>
<td>(3, 1) or $\begin{pmatrix} 3 \ 1 \end{pmatrix}$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>&amp; 2</td>
<td>B1ft</td>
<td>ft Their two points</td>
<td></td>
</tr>
<tr>
<td><strong>21</strong></td>
<td>$f(2) = 8 - 16 - 22 + 30$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>&amp; $x - 2$ is a factor</td>
<td>A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; $(x - 2)(x^2 \ldots - 15)$</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; $(x - 2)(x^2 - 2x - 15)$</td>
<td>A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; $(x - 2)(x + a)(x + b) ~ ab = -15$</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; $(x - 2)(x - 5)(x + 3)$</td>
<td>A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td>$(x - 1)(x - 3)$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td>&amp; A (1, 0) and B (3, 0) or $AB = 2$</td>
<td>A1 oe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; Attempts to differentiate, evidenced by at least one term correct</td>
<td>M1</td>
<td>$\frac{dy}{dx} = 2x - 4$</td>
<td></td>
</tr>
<tr>
<td>&amp; Evidence of substituting $x = 5$ to find the gradient of the tangent</td>
<td>M1</td>
<td>When $x = 5$, $\frac{dy}{dx} = 2 \times 5 - 4 (= 6)$</td>
<td></td>
</tr>
<tr>
<td>&amp; Attempt to work out equation of tangent</td>
<td>M1</td>
<td>Tangent is $y - 8 = 6(x - 5)$ oe eg, $y = 6x - 22$</td>
<td></td>
</tr>
<tr>
<td>&amp; Substitutes $y = 0$ into their equation in an attempt to obtain $x = \frac{11}{3}$</td>
<td>M1 oe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; $3 \times (\frac{11}{3} - 3) = 2$</td>
<td>A1 oe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Every specification is assigned a national classification code indicating the subject area to which it belongs.

Centres should be aware that candidates who enter for more than one GCSE qualification with the same classification code will have only one grade counted for the purpose of the School and College Performance Tables. In the case of a candidate taking two qualifications with the same classification code that are of the same size and level, eg two full course GCSEs, the higher grade will count.

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