LEAVING CERTIFICATE 2010

MARKING SCHEME

MATHEMATICS

FOUNDATION LEVEL
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GENERAL GUIDELINES FOR EXAMINERS – PAPER 1

1. Penalties of three types are applied to candidates’ work as follows:
   - Blunders - mathematical errors/omissions (-3)
   - Slips - numerical errors (-1)
   - Misreadings (provided task is not oversimplified) (-1).

   Frequently occurring errors to which these penalties must be applied are listed in the scheme. They are labelled: B1, B2, B3,…, S1, S2,…, M1, M2,…etc. These lists are not exhaustive.

2. When awarding attempt marks, e.g. Att(3) note that
   - any correct, relevant step in a part of a question merits at least the attempt mark for that part
   - if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
   - a mark between zero and the attempt mark is never awarded.

3. Worthless work is awarded zero marks. Some examples of such work are listed in the scheme and they are labelled as W1, W2,…etc.

4. The phrase “hit or miss” means that partial marks are not awarded – the candidate receives all of the relevant marks or none.

5. The phrase “and stops” means that no more work is shown by the candidate.

6. Special notes relating to the marking of a particular part of a question are indicated by an asterisk. These notes immediately follow the box containing the relevant solution.

7. The sample solutions for each question are not intended to be exhaustive lists – there may be other correct solutions. Any examiner unsure of the validity of the approach adopted by a particular candidate to a particular question should contact his/her advising examiner.

8. Unless otherwise indicated in the scheme, accept the best of two or more attempts – even when attempts have been cancelled.

9. The same error in the same section of a question is penalised once only.

10. Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks at most.

11. A serious blunder, omission or misreading results in the attempt mark at most.

12. Do not penalise the use of a comma for a decimal point, e.g. €5.50 may be written as €5,50.
QUESTION 1

Each Part 10 marks Att 4

Part (i) 10 marks Att 4

Find $\sqrt{93.4}$, correct to one decimal place.

(i) 10 marks Att 4

\[
\sqrt{93.4} = 9.66... = 9.7
\]

* Accept correct answer with no work

Blunders (-3)

B1 \(\sqrt{934} = [30.561413...] = 30.6\)

B2 \(\sqrt{9.34} = [3.056141...] = 3.1\)

B3 \(\sqrt{0.934} = [0.966436...] = 1.0\)

B4 Root other than square root indicated and correctly worked e.g. \(\sqrt[3]{93.4} = 4.5\)

Slips (-1)

S1 Incorrect or omitted rounding off

Misreadings (-1)

M1 \(\sqrt{94.3} = [9.710818...] = 9.7\)

M2 \(\sqrt{39.4} = [6.276941...] = 6.3\)

Attempts (4 marks)

A1 \((93.4)^2 = 8723.56\)

A2 \(\frac{93.4}{2} = 46.7\)

A3 \((93.4) \times 2 = 186.6\)

A4 Work at estimating answer: \(\sqrt{93.4} = 9 \text{ or } 10\)

A5 Any work at finding or estimating another root with work shown

A6 An incorrect figure correctly rounded off to one decimal place

A7 Any other answers as B1, B2, B3 and B4 but with misplaced point and no work shown.

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme
Find the exact value of \(15.5 - 3.8 \times 2.6\).

\[
15.5 - 3.8 \times 2.6 = 15.5 - 9.88 = 5.62
\]

* Accept correct answer with no work

**Blunders (-3)**

B1 Errors in precedence: \(15.5 - 3.8 = 11.7 \times 2.6 = 30.42\)

B2 A step omitted [may also occur in B1]

B3 The use of the wrong operator or operators is indicated (once only)

B4 A different order of the numbers indicated and worked out correctly

**Slips (-1)**

S1 Numerical slips to a maximum of 3

**Misreadings (-1)**

M1 A clear and obvious numerical misreading not involving the decimal point

**Attempts (4 marks)**

A1 Work at estimating the answer e.g. \(16 - 4 \times 3\)

A2 Work towards some correct step e.g. long multiplication begun

A3 30 only

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
Part (iii) 10 marks Att 4

Find \( \frac{5}{\sqrt{2}} + (1.6)^2 \), correct to the nearest whole number.

(iii) 10 marks Att 4

\[
\frac{5}{\sqrt{2}} + (1.6)^2 = 3.53 + 2.56 = 6.09 = 6
\]

* Accept correct answer with no work

**Blunders (-3)**

B1 \( \frac{5}{\sqrt{2}} + (1.6)^2 = 3.5355... + 256 = 259.5355 = 260 \)

B2 \( \frac{5}{\sqrt{0.2}} + (1.6)^2 = 11.1803 + 2.56 = 13.7403 = 14 \)

B3 \( \frac{5}{\sqrt{2}} + (0.16)^2 = 3.5355... + 0.0256 = 3.56 = 4 \)

B4 Square root not found

B5 Square not found

B6 Division omitted

B7 No addition

B8 Error in precedence e.g. \( (5 + (1.6)^2) \div \sqrt{2} = 5.345 = 5 \)

B9 \( 5 + (1.6)^2 \div \sqrt{2} = 6.81 = 7 \)

B10 \( \sqrt{2} = 1 \Rightarrow \frac{5}{1} + 2.56 = 7.56 = 8 \)

**Slips (-1)**

S1 Numerical slips to a maximum of 3

S2 Incorrect or omitted rounding off

**Misreadings (-1)**

M1 \( \frac{5}{\sqrt{2}} + (6.1)^2 = 3.5355... + 37.21 = 40.7455 = 41 \)

M2 \( \frac{2}{\sqrt{5}} + (1.6)^2 = 0.8944 + 2.56 = 3.4544 = 3 \)

**Attempts (4 marks)**

A1 Work at estimating the answer

A2 Any other answers as B1, B2 and B3 but with misplaced decimal point and no work shown.

A3 No square root or square evaluated

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
Part (iv) 10 marks Att 4

The price of a jacket is €60.80.
This price is reduced by 15%.
Find the reduced price.

<table>
<thead>
<tr>
<th>Reduced price</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(60.80 \times 0.15) = €9.12 or (60.80 \times 0.85 = €51.68)</td>
<td>Reduced price = (60.80 \times 0.85) = €51.68 OR (60.80 \times 85) = €51.68</td>
<td></td>
</tr>
<tr>
<td>Reduced price = €60.80 (-) €9.12 = €51.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Accept correct answer with no work
* An answer of 71.53 is found from \(60.80 \div 85\) followed by use of percentage key ⇒ 7 marks
* An answer of 0.72 is found from \(60.80 \div 85\) followed by use of percentage key and the “=” key ⇒ 4 marks
* 5168 (no units) ⇒ 10 marks

Blunders (-3)
B1 \(\frac{60.80 \times 85}{100}\) or \(60.80 \times 0.85\) and stops
B2 Gets €9.12 and stops or adds to 60.80
B3 \(60.80 \times 1.15 = 69.92\)
B4 Errors in establishing \(\frac{60.80 \times 85}{100}\) (all three elements must be present otherwise attempt marks only)

Attempts (4 marks)
A1 Gets 1% (= 0.6) and stops
A2 60.80 \(-\) 15

Worthless (0 marks)
W1 60.80 \(+\) 15

Page 6
### Part (v) 10 marks

Find the value in euro of 700 AUD (Australian Dollars) given that €1 = 1.72 AUD.

\[
\frac{700}{1.72} = €406.976 = €406.98
\]

\[
\frac{700}{0.0172} = \frac{40697.67443}{40697.67} = €406.98
\]

* Accept correct answer with no work e.g. 406 or 407
* Accept candidates degree of rounding
* 40 698 cent – 9 marks

**Blunders (-3)**

B1 \[700 \times 1.72 = 1204\]

B2 \[\frac{1.72}{700} = 0.002457\]

B3 Division not finished or finished incorrectly

**Slips (-1)**

S1 Answer given in cents

**Attempts (4 marks)**

A1 Some use of the given data

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
Write \( \frac{7}{19} + \frac{2}{9} \) as a decimal, correct to three decimal places.

\[
\frac{7}{19} + \frac{2}{9} = \frac{63 + 38}{171} = \frac{101}{171} = 0.591
\]

B1 Error(s) in converting fraction to decimal (only once)
B2 No addition
B3 Use of wrong operator indicated \((\times, \div, -)\) giving answers (0.0818 / 0.082, 1.6578 / 1.658, 0.1461 / 0.146)

S1 Numerical slips to a maximum of 3
S2 Incorrect or no rounding off

A1 Effort at converting either of the given fractions to a decimal
A2 Correctly converts a fraction (written) to a decimal and stops
A3 A correct calculation
A4 0 < answer < 1 (in decimal form)
A5 An incorrect number correctly rounded off

W1 Incorrect answer with no work other than those in scheme
A bus journey begins at 11:30 and ends at 13:15.
The bus travels at an average speed of 80 km per hour.
What distance does the bus travel?

(vii) 10 marks

<table>
<thead>
<tr>
<th>Time</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.75 hours</td>
<td>$80 \times 1.75 = \mathbf{140 \text{ km}}$</td>
</tr>
</tbody>
</table>

* Accept correct answer with no work

**Blunders (-3)**

B1 Error in evaluation of journey time
B2 Treating 1 hour 45 mins as 1.45 hours $\rightarrow$ 116 km as answer
B3 Misuse of $S = \frac{D}{T}$ e.g. $80 \div 1.75 = 45.71$ km
B4 $80 \times 1.75$ and stops

**Slips (-1)**

S1 Numerical slips to a maximum of 3

**Attempts (4 marks)**

A1 Evaluation of journey time and stops
A2 Some use of given data
A3 $S = \frac{D}{T}$ or $D = S \times T$ written down and no more

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
Part (viii) 10 marks Att 4

Find the total cost of
3 loaves of bread at €1.20 each
4 litres of milk at 89 cent per litre
2.5 kg of oranges at 78 cent per kg.

(viii) 10 marks Att 4

Cost = 1.20 \times 3 + 0.89 \times 4 + 0.78 \times 2.5 = 3.60 + 3.56 + 1.95 = €9.11

* Accept correct answer with no work
* Accept 911 cent as correct answer

Blunders (-3)
B1 4 \times 89 = 356 and fails to convert to euro if working in euro
B2 2.5 \times 78 = 195 and fails to convert to euro if working in euro
B3 3 \times 1.20 = 3.60 and fails to convert to cents if working in cents
B4 Divides instead of multiplying (once)
B5 Written 3 \times 1.20 + 4 \times 0.89 + 2.5 \times 0.78 and stops

Slips (-1)
S1 Numerical slips to a maximum of 3

Attempts (4 marks)
A1 Writes 3 \times 1.20 or similar and stops
A2 Writes 3.60 or similar and stops

Worthless (0 marks)
W1 Incorrect answer with no work other than those in scheme
Find \( \frac{(2.78 \times 10^3) + (2.96 \times 10^2)}{1.42 \times 10^2} \), correct to three significant figures.

\[
\begin{align*}
\frac{(2.78 \times 10^3) + (2.96 \times 10^2)}{1.42 \times 10^2} &= \frac{2780 + 296}{142} = \frac{3076}{142} = 21.6619 = 21.7 \\
\frac{3.076 \times 10^3}{1.42 \times 10^2} &= 2.166197183 \times 10^1 = 21.66197183 = 21.7
\end{align*}
\]

\* Accept correct answer with no work

**Blunders (-3)**

B1 Error in precedence
B2 Each omitted or incorrect step if steps not clear
B3 Misplaced decimal or wrong order of magnitude each time
B4 Inverts final fraction giving 0.04616... as answer
B5 Any incorrect rounding off within the working (once only)
B6 21.6619 and stops.

**Slips (-1)**

S1 Numerical slips to a maximum of 3
S2 Answer not correct to three significant figures

**Attempts (4 marks)**

A1 \( 10^2 \) treated as 30, \( 10^3 \) treated as 20
A2 Some work towards estimation
A3 \( 10^4 \) written as \( 10 \times 10 \times 10 \times 10 \) and / or likewise with \( 10^2 \)
A4 An incorrect number correctly rounded off to three significant figures

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
Find \( \frac{27.9 + 15.4}{(3.4)^3} \), correct to two decimal places.

\[
\begin{align*}
\frac{27.9 + 15.4}{(3.4)^3} &= \frac{43.3}{39.304} \\
&= 1.101 = 1.10
\end{align*}
\]

* Accept correct answer with no work

**Blunders (-3)**
- B1 Error in precedence (once only)
- B2 \( \frac{39.304}{43.3} = 0.907713625 \)
- B3 The use of a wrong operator (or operators) is indicated (once only)
- B4 Any step omitted e.g. \( \frac{43.3}{39.304} \) and stops
- B5 Any incorrect rounding off within the working (once only)
- B6 Any error involving working out \((3.4)^3\)

**Slips (-1)**
- S1 Numerical slips to a maximum of 3
- S2 Incorrect or no rounding off

**Misreading (-1)**
- M1 Clear and obvious misreading not involving the decimal point

**Attempts (4 marks)**
- A1 Work at estimating the answer
- A2 An incorrect number correctly rounded off to two decimal places

**Worthless (0 marks)**
- W1 Incorrect answer with no work other than those in scheme
QUESTION 2

| Part (a) | 10 (5, 5) marks | Att (2, 2) |
| Part (b) | 20 (10, 5, 5) marks | Att (4, 2, 2) |
| Part (c) | 20 (10, 5, 5) marks | Att (4, 2, 2) |

**Part (a) 10 (5, 5) marks Att (2, 2)**

(a) (i) Change 8.57 kg to grams.
(ii) Change 7904 cm to metres.

(a) 10 (5, 5) marks Att (2, 2)

\[
\begin{align*}
(i) & \quad 8.57 \times 1000 = \text{8570 grams} \\
(ii) & \quad \frac{7904}{100} = \text{79.04 metres}
\end{align*}
\]

* Accept correct answer with no work
* Accept answers given without units

**Blunders (-3)**

B1 Incorrect conversion factor
B2 Misuse of conversion factor e.g. \(8.57 \div 1000 = 0.00857\)
B3 Misuse of conversion factor e.g. \(7904 \times 100 = 790 400\)

**Slips (-1)**

S1 Numerical slips to a maximum of 3
S2 Answer given as 79 m 4 cm

**Attempts (2 marks)**

A1 Any use of given data (covers both parts)
A2 8057 without work.

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
Part (b) 20 (10, 5, 5) marks  Att (4, 2, 2)

(b) Henry works for 40 hours in a particular week.
    He is paid €12.50 per hour for the first 35 hours.
    He is paid €18.50 per hour for the remaining hours.
    (i) Find Henry’s gross pay for the week.
    (ii) Henry’s tax rate is 20% and he has tax credits of €72 per week.
         Calculate the tax payable by Henry.
    (iii) Find Henry’s take-home pay.

(b) (i) 10 marks  Att 4

<table>
<thead>
<tr>
<th></th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross pay = €12.50 × 35 + €18.50 × 5 = 437.50 + 92.5 = <strong>€530.00</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Accept correct answer with no work

**Blunders (-3)**
B1 Fails to add the two calculated part wages
B2 Subtracts the two calculated part wages
B3 No multiplier of €18.50 giving €437.50 + €18.50 = €456

**Slips (-1)**
S1 Decimal error
S2 Numerical slips to a maximum of 3

**Attempts (4 marks)**
A1 Any one of the multiplications and stops
A2 12.50 × 40 = 500 or 18.50 × 40 = €740
A3 Any use of €12.50 + €18.50 = €31

**Worthless (0 marks)**
W1 Incorrect answer with no work other than those in scheme
(b) (ii)  5 marks  
\[
\text{Tax payable} = €530.00 \times 0.20 - €72 = €106 - €72 = €34. \\
\]
* Accept correct answer with no work
* Accept candidates answer from part (i)
* Marks lost by giving gross tax as answer to part (ii) can be recouped in (iii) if (iii) is worked correctly

Blunders (-3)
B1 Error in calculating % e.g. €530 \times 1.20
B2 Adds tax credits to gross tax (€178)

Slips (-1)
S1 Decimal error
S2 Numerical slips to a maximum of 3

Attempts (2 marks)
A1 Any mishandling or ignoring of the tax credit other than B2
A2 Some effort at getting a %

Worthless (0 marks)
W1 Incorrect answer with no work other than those in scheme

(b) (iii)  5 marks  
\[
\text{Take home pay} = €530 - €34 = €496. \\
\]
* Accept correct answer with no work
* Accept candidates answer from parts (i) and (ii)
* €34 will recoup marks if necessary from part (ii)
* €496 without €34 will recoup marks if necessary for part (ii)

Blunders (-3)
B1 Uses a tax other than that calculated in (b) (ii) above
B2Adds tax
B3 Subtraction not completed

Slips (-1)
S1 Numerical slips to a maximum of 3

Attempts (2 marks)
A1 Some spurious number subtracted from gross wage.

Worthless (0 marks)
W1 Incorrect answer with no work other than those in scheme
(c) A train travels a distance of 281 km from Cork to Dublin.

The train travels at an average speed of 80 km/h for the first 90 minutes of the journey.

(i) Find the distance the train travels in this time.

The train travels the remaining distance at an average speed of 92 km/h.

(ii) Find the total time for the journey from Cork to Dublin

(iii) Find the average speed of the train over the whole journey, correct to the nearest km/h.

\[
\text{Distance} = 80 \times \frac{90}{60} = 120 \text{ km.}
\]

* Accept correct answer with no work

**Blunders (-3)**

B1 Error in evaluation of journey time

B2 Misuse of \( S = \frac{D}{T} \) e.g. \( 80 \div 1.5 = 53.33 \)

**Slips (-1)**

S1 Numerical slips to a maximum of 3

**Attempts (4 marks)**

A1 \( 80 \times 90 \) and stops

A2 \( \frac{80}{60} \) and stops

A3 Some use of given data

A4 \( S = \frac{D}{T} \) or \( D = S \times T \) written down and no more

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
(c) (ii) 5 marks

<table>
<thead>
<tr>
<th>Remaining distance = 281 – 120 = 161km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Taken = ( \frac{d}{s} \times 161 = 105 ) mins</td>
</tr>
<tr>
<td>Total time = 90 + 105 = <strong>195 mins</strong> or <strong>3 hours 15 mins</strong></td>
</tr>
</tbody>
</table>

* Accept correct answer with no work
* Accept candidates answer from part (i)

**Blunders (-3)**
B1 Adds instead of subtracts for distance
B2 Error in evaluation of journey time (fails to add 90)
B3 Misuse of \( S = \frac{D}{T} \) e.g. \( 161 \times 92 = 14812 \)

**Slips (-1)**
S1 Numerical slips to a maximum of 3

**Attempts (2 marks)**
A1 Adds 90 to any number
A2 Some correct step e.g. 281 – 120
A2 \( S = \frac{D}{T} \) or \( D = S \times T \) written down and no more

**Worthless (0 marks)**
W1 Incorrect answer with no work other than those in scheme

(c) (iii) 5 marks

| Average speed = \( \frac{281}{1.5 + 1.75} = 86.46 = 86 \text{ km/h} \) |

* Accept correct answer with no work
* Accept candidates answer from part (ii)

**Blunders (-3)**
B1 Error in evaluation of journey time e.g. 195 minutes = 3.15 hours
B2 Misuse of \( S = \frac{D}{T} \) e.g. \( 281 \times 3.25 = 913.25 \)

**Slips (-1)**
S1 Numerical slips to a maximum of 3
S2 Incorrect or omitted rounding off to nearest km/h

**Attempts (2 marks)**
A1 Some use of given data
A2 \( S = \frac{D}{T} \) or \( D = S \times T \) written down and no more
(a) A student estimated the height of a building as 5.4 m. The actual height of the building is 4.8 m. 

(i) Find the error in the estimate.

(ii) Find the percentage error.

(a) (i) 10 marks

(i) Error = 5.4 – 4.8 = 0.6 m

* Accept correct answer with no work

Blunders (-3)
B1 5.4 – 4.8 and stops

Slips (-1)
S1 Numerical slips to a maximum of 3

Attempts (4 marks)
A1 Some use of given data

Worthless (0 marks)
W1 Incorrect answer with no work other than those in scheme

(a) (ii) 5 marks

(ii) Percentage error = \( \frac{0.6}{4.8} \times 100 = 12.5\% \)

* Accept correct answer with no work

Blunders (-3)
B1 Errors in establishing \( \frac{0.6}{4.8} \times 100 \) [all three elements must be present otherwise attempt mark only]
B2 Incorrect or incomplete answer or no answer [use candidates answer from (a)(i)]

Slips (-1)
S1 Numerical slips to a maximum of 3

Attempts (2 marks)
A1 Some use of given data

Worthless (0 marks)
W1 Incorrect answer with no work other than those in scheme
Helen borrowed €4000 at 5.5% per annum compound interest. She paid back €1000 at the end of the first year. How much did she owe at the end of the second year?

<table>
<thead>
<tr>
<th>Amount Year 1</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Year 2</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>Amount Year 2</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
</tbody>
</table>

\[
A = 4000 \left(1 + \frac{5.5}{100}\right)^1 = 4000(1.055) = 4220 \quad \text{4220-1000=3220}
\]

\[
A = 3220 \left(1 + \frac{5.5}{100}\right)^1 = 3220(1.055) = \€3397.10
\]

* Accept correct answer with no work

* \[ A = 4000 \left(1 + \frac{5.5}{100}\right)^1 = 4220 \rightarrow 10 \text{ marks} \]

* 3220 \rightarrow 15 \text{ marks}

* \[ A = 3397.1 \rightarrow 20 \text{ marks} \]

**Blunders (-3)**

B1 Error in formula as written by student or incorrect formula e.g. depreciation

B2 Error in substituting into formula, once only e.g. \( n=2 \)

**Attempts (4 marks)**

A1 \[
\frac{4000}{5.5} = 727.27
\]

A2 \[
(4000)(5.5) = 22000
\]

A3 \[
\frac{4000}{0.055} = 72727.27
\]

**Principal Year 2**

| 5 marks | Att 2 |

**Blunders (-3)**

B1 Fails to subtract or mishandles €1000

**Amount Year 2**

| 5 marks | Att 2 |

* Use candidates answer to simplification of \( A = 4000 \left(1 + \frac{5.5}{100}\right)^1 \)

**Blunders (-3)**

B1 \[
\frac{4000}{1.055} = 3791.46 \quad \text{or} \quad \frac{4000}{0.9450} = 4232.80
\]

B2 \[
4000(0.945)^1 = 3780
\]

**Slips (-1)**

S1 Numerical slips to a maximum of 3

**Worthless (0 marks)**

W1 Incorrect answer with no work other than those in scheme
(b) Amount year 1 10 marks Att 4
Principal year 2 5 marks Att 2
Amount year 2 5 marks Att 2

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Amount =</th>
<th>4000 × 1.055 = €4220</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Repayment</td>
<td>=</td>
<td>4220 − 1000 = 3220 (Principal year 2)</td>
</tr>
<tr>
<td>Year 2</td>
<td>Amount =</td>
<td>3220 × 1.055 = €3397.10</td>
</tr>
</tbody>
</table>

OR

<table>
<thead>
<tr>
<th>Principal year 1</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound Interest year 1</td>
<td>220</td>
</tr>
<tr>
<td>Amount at end year 1</td>
<td>4220</td>
</tr>
<tr>
<td>Less Repayment</td>
<td>1000</td>
</tr>
<tr>
<td>Principal year 2</td>
<td>3220</td>
</tr>
<tr>
<td>Compound interest year 2</td>
<td>177.10</td>
</tr>
<tr>
<td>Amount at end year 2</td>
<td>3397.10</td>
</tr>
</tbody>
</table>

* Accept correct answer with no work
* Amount year 1 = 4220 → 10 marks
* Principal for year 2 = 3220 → 15 marks
* Amount year 2 = 3397.10 → 20 marks

**Amount Year 1** 10 marks Att 4

**Blunders (-3)**

B1  4000 × 1.55 = 6200
B2  Errors in establishing $\frac{4000 \times 5.5}{100}$ [all 3 elements must be present; otherwise attempt only]
B3  Stops at interest and fails to find amount
B4  Subtracts interest to find amount

**Slips (-1)**

S1  Numerical slips to a maximum of 3

**Attempts (4 marks)**

A1  Some use of 100 in attempt to find %

**Worthless (0 marks)**

W1  Incorrect answer with no work other than those in scheme

**Principal Year 2** 5 marks Att 2

* Use candidates answer for amount at end of year 1

**Blunders (-3)**

B1  Adds instead of subtracts €1000

**Slips (-1)**

S1  Numerical slips to a maximum of 3
**Amount Year 2**  
5 marks  
* Use candidates answer for principal for year 2

**Blunders (-3)**  
B1 Errors in calculating percentage  
B2 Using a principal other than that calculated in (ii)  
B3 Stops at interest and fails to find amount  
B4 Subtracts interest to find amount. Do not penalise if B4 in year 1.

**Slips (-1)**  
S1 Numerical slips to a maximum of 3

**Worthless (0 marks)**  
W1 Incorrect answer with no work other than those in scheme
Part (c) 15 (10, 5) marks Att (4, 2)

(c) A shop-owner agrees to contribute €7 for every €50 collected by his customers who are raising funds for facilities in a school.

(i) The customers raise €900 in the first week. How much does the shop-owner contribute?

(ii) At the end of the fund raising the total amount raised was €1995. How much of this was collected by the customers?

(c) (i) 10 marks Att 4

(i) \[
\frac{900}{50} \times 7 = €126
\]

* Accept correct answer without work

Blunders (-3)

B1 Errors in establishing \[
\frac{900}{50} \times 7
\] [all 3 elements must be present otherwise attempt mark]

Slips (-1)

S1 Numerical slips to a max of -3

Attempts (4 marks)

A1 Some use of given data e.g. \[
900 \div 50 = 18
\]

(c) (ii) 5 marks Att 2

(ii) \[
\frac{1995}{57} \times 50 = €1750
\]

* Accept correct answer without work

Blunders (-3)

B1 Errors in establishing \[
\frac{1995}{57} \times 50
\] [all 3 elements must be present otherwise attempt mark]

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (2 marks)

A1 Some use of given data e.g. \[
1995 \times 50
\]

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme
**QUESTION 4**

<table>
<thead>
<tr>
<th>Part (a)</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part (b)</td>
<td>20 (15, 5) marks</td>
<td>Att (6, 2)</td>
</tr>
<tr>
<td>Part (c)</td>
<td>20 (10, 5, 5) marks</td>
<td>Att (4, 2, 2)</td>
</tr>
</tbody>
</table>

**Part (a) 10 marks Att 4**

Solve for \( x \)

\[
4x - 9 = 7x + 15.
\]

\[
\begin{align*}
4x - 9 &= 7x + 15 \\
\Rightarrow 7x - 4x &= -9 - 15 \\
\Rightarrow 3x &= -24 \\
\Rightarrow x &= -8
\end{align*}
\]

* Award full marks for correct answer by trial and error with verification.

**Blunders (-3)**

- **B1** Blunders in grouping terms e.g. \( 4x - 9 = -5x \) [each time]
- **B2** Transposition errors [once only]
- **B3** \( -3x = 24 \Rightarrow x \neq -8 \) or \( -24 = 3x \Rightarrow x \neq -8 \)
- **B4** Each step omitted e.g. \( -3x = 24 \) and stops.
- **B5** \( x = -8 \) without work

**Slips (-1)**

- **S1** Numerical slips to a maximum of 3

**Attempts (4 marks)**

- **A1** Some correct work
- **A2** Effort at trial and error by substitution

**Worthless (0 marks)**

- **W1** Incorrect answer without work
Part (b) 20 (15, 5) marks  

(b) Solve the simultaneous equations:

\[ 3x + 2y = 1 \]
\[ 5x + 3y = 3. \]

(b) First Variable Found  

<table>
<thead>
<tr>
<th>Second Variable</th>
<th>15 marks</th>
<th>Att 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x + 2y = 1 ( \times 3 )</td>
<td>9x + 6y = 3</td>
<td></td>
</tr>
<tr>
<td>5x + 3y = 3 ( \times 2 )</td>
<td>10x + 6y = 6</td>
<td></td>
</tr>
</tbody>
</table>

\[ -x = -3 \Rightarrow x = 3 \]

\[ 3x + 2y = 1 \Rightarrow 3(3) + 2y = 1 \Rightarrow 2y = -8 \Rightarrow y = -4 \]

* Random \( x \) picked, \( y \) calculated (or vice versa) – Award 5 marks (second variable found)  
* Substitution of correct values in both equations shown – Award 15 + 5 marks

Blunders (-3)
B1 Error(s) in establishing the first equation in terms of \( x \) only (\( x = 3 \)) or the first equation in terms of \( y \) only (\( y = -4 \))
B2 \(-x = -3 \Rightarrow x \neq 3 \)
B3 Blunder in substitution e.g. \( y \) value for \( x \)
B4 Transposition error in finding second variable (once only)

Attempts – First Variable (6 marks)
A1 Effort at equalising coefficients of \( x \)’s or \( y \)’s
A2 Effort at cancelling one variable
A3 Effort at writing \( x \) in terms of \( y \) (or vice versa)

Attempts – Second Variable (2 marks)
A4 Effort at substituting first variable
A5 Effort at cancelling second variable

Attempts (6+2)
A6 Correct answer with no work shown

Worthless (0 marks)
W1 Incorrect answer without work
Part (c)  20 (10, 5, 5) marks  Att (4, 2, 2)

(c) (i) Solve \(3x - 1 \leq 14, \ x \in \mathbb{Z}.
\]
(ii) Solve \(5 - 4x < 13, \ x \in \mathbb{Z}.
\]
(iii) Plot on a number line the values of \(x\) which satisfy both of the above inequalities.

<table>
<thead>
<tr>
<th>(c) (i)</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3x - 1 \leq 14 \Rightarrow 3x \leq 15 \Rightarrow x \leq 5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Blunders (-3)**
B1 Blunders in grouping terms e.g. \(3x - 1 = 2x\) [each time]
B2 Transposition errors [once only]
B3 Each step omitted e.g. \(3x \leq 15\) and stops
B4 \(x \leq 5\) without work
B5 Replaces inequality with equality sign

**Slips (-1)**
S1 Numerical slips to a maximum of 3

**Misreadings (-1)**
M1 Uses \(<\) instead of \(\leq\)

**Attempts (4 marks)**
A1 Some correct work
A2 Effort at trial and error by substitution

**Worthless (0 marks)**
W1 Incorrect answer without work

<table>
<thead>
<tr>
<th>(c) (ii)</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5 - 4x &lt; 13 \Rightarrow -4x &lt; 8 \Rightarrow x &gt; -2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Blunders (-3)**
B1 Blunders in grouping terms e.g. \(5 - 4x = 1x\) [each time]
B2 Transposition errors [once only]
B3 Each step omitted e.g. \(-8 < 4x\) and stops
B4 Error in inequality sign \(4x < 8 \Rightarrow x < -2\)
B5 \(x > -2\) without work
B6 Replaces inequality with equality sign. Do not penalise if B5 incurred in (i)

**Slips (-1)**
S1 Numerical slips to a maximum of 3

**Misreadings (-1)**
M1 Uses \(\leq\) instead of \(<\)

**Attempts (2 marks)**
A1 Some correct work
A2 Effort at trial and error by substitution

**Worthless (0 marks)**
W1 Incorrect answer without work
(c) (iii) 5 marks

* Accept candidates answers from (i) and (ii)
* If equality used in (i) or (ii) then attempt mark at most here

Slips (-1)
S1 Each entry omitted or incorrect provided at least one is correct [to a maximum of 3]

Attempts (2 marks)
A1 At least one correct entry
A2 Listing of answers to (i) or (ii) or both.
QUESTION 5

| Part (a) | 10 (5, 5) marks | Att (2, 2) |
| Part (b) | 20 (10, 10) marks | Att (4, 4) |
| Part (c) | 20 (10, 5, 5) marks | Att (4, 2, 2) |

Part (a) 10 marks Att 3

(a) (i) Write down all the whole number factors of 30.
(ii) List which of these numbers are prime numbers.

(a) (i) 5 marks Att 2
(a) (ii) 5 marks Att 2

(i) 1, 2, 3, 5, 6, 10, 15, 30
(ii) 2, 3, 5

Slips (-1)
S1 Each omitted or incorrect entry provided at least one is correct [to a maximum of 3]

Attempts (2 marks)
A1 At least one correct entry, each part

Part (b) 20 (10, 10) marks Att (4, 4)

(b) (i) Solve the quadratic equation $x^2 + 6x + 8 = 0$.
(ii) Solve the quadratic equation $2x^2 - 5x - 4 = 0$, correct to two decimal places.

(b) (i) 10 marks Att 4

$x^2 + 6x + 8 = 0 \Rightarrow (x + 2)(x + 4) = 0 \Rightarrow x = -2$ or $x = -4$

Blunders (-3)
B1 Last step(s) omitted
B2 Sign error in factors (once only)
B3 Sign errors in solution (once only)
B4 Incorrect relevant factors and continues
B5 Errors in using formula as in (ii)

Attempts (4 marks)
A1 Effort at finding factors
A2 Attempt at trial and error

Worthless (0 marks)
W1 Quadratic reduced to linear
\[ 2x^2 - 5x - 4 = 0 \]

\[ \Rightarrow x = \frac{5 \pm \sqrt{(-5)^2 - 4(2)(-4)}}{2 \times 2} \]

\[ = \frac{5 \pm \sqrt{57}}{4} \]

\[ = \frac{5 \pm 7.5498}{4} \]

\[ \Rightarrow x = \frac{12.5498}{4} \text{ or } x = \frac{-2.5498}{4} \]

\[ \Rightarrow x = 3.13745 \text{ or } x = -0.63745 \]

\[ \Rightarrow x = 3.14 \text{ or } x = -0.64 \]

* Maximum deductions beyond point * is 3 marks

* \[ \frac{5 \pm \text{negative number}}{2 \times 2} \] cannot earn final 3 marks

**Blunders (-3)**

B1 Blunders in application of formula

**Slips (-1)**

S1 Slip in substitution into formula to a maximum of 3

S2 \[ 25 + 32 = -7 \]

S3 Incorrect or omitted rounding off, each time

**Attempts (4 marks)**

A1 Effort at substitution into formula

A2 Incorrect formula with substitution

A3 Attempt at finding factors e.g. \((x)(x)\)

A4 Appearance of the variable in the answer

A5 Identifies \(a\) or \(b\) or \(c\)

**Worthless (0 marks)**

W1 Quadratic reduced to linear
(c) At a restaurant an adult’s meal costs €8 more than a child’s meal. Let \( x \) be the price of a child’s meal.

(i) Write an expression in \( x \) for the price of an adult’s meal.

The total cost of the meals for 5 adults and 4 children is €103.

(ii) Write this information as an equation in \( x \).

(iii) Solve this equation to find the price of a child’s meal.

<table>
<thead>
<tr>
<th>(c) (i)</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult meal costs ( x + 8 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Blunders (-3)**

B1 \( x - 8 \) or \( 8 - x \)

B2 \( 8x \)

**Attempts (4 marks)**

A1 Assigns a numerical value to \( x \) that is then used to find a numerical value for the price of an adult’s meal.

A2 Some use of the data given e.g. \( \frac{x}{8}, \frac{8}{x} \)

**Worthless (0 marks)**

W1 No use of \( x \) or 8

W2 \( x = 8 \) and stops

<table>
<thead>
<tr>
<th>(c) (ii)</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 5(x + 8) + 4x = 103 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Accept candidates answer from part (i)

**Blunders (-3)**

B1 Each price omitted

B2 \( 9x + 40 \) only

**Attempts (2 marks)**

A1 A spurious equation in \( x \)
\[
5(x + 8) + 4x = 103 \Rightarrow 5x + 40 + 4x = 103 \Rightarrow 9x = 63 \Rightarrow x = 7
\]

- Accept candidates answer from parts (i) and (ii)
- 5x + 40 + 4x or 5x + 40 + 4x = 103 as starting work can earn marks for parts (i) and (ii)

**Blunders (-3)**
- B1 Incorrectly formed equation
- B2 Blunders in grouping terms e.g. 9x + 40 = 49x (each time)
- B3 Transposition error(s) (once only)
- B4 9x = 63 \(\Rightarrow\) \(x \neq 7\)
- B5 Each step omitted
- B6 Correct answer without work

**Slips (-1)**
- S1 Numerical slips to a maximum of 3

**Attempts (2 marks)**
- A1 Some correct work
- A2 Effort at trial and error by substitution

**Worthless (0 marks)**
- W1 Incorrect answer without work
The bar chart shows the number of newspapers sold from Monday to Saturday in a shop. For example, on Thursday, 25 newspapers were sold.

(i) On what day was the lowest number of newspapers sold?

**Answer:** Wednesday

**Blunders (-3)**
B1 Saturday, the greatest, given as the least

**Worthless (0 marks)**
W1 Incorrect answer without work, other than those in the scheme

(ii) On which two days were the same number of newspapers sold?

**Answer:** Tuesday and Friday

**Blunders (-3)**
B1 Only one of the correct days given

**Worthless (0 marks)**
W1 Incorrect answer without work
(iii) 10 marks

What was the difference between the number of newspapers sold on Saturday and on Monday?

45 – 20 = 25

* Accept correct answer without work

Blunders (-3)
B1 Each incorrect amount
B2 45 + 20 = 65

Slips (-1)
S1 Numerical slips to a maximum of 3

Attempts (4 marks)
A1 Value(s) with no further work

Worthless (0 marks)
W1 Incorrect answer without work, other than those in scheme

(iv) 10 marks

What was the average number of newspapers sold per day over the 6 days from Monday to Saturday?

\[
\frac{20 + 40 + 10 + 25 + 40 + 45}{6} = \frac{180}{6} = 30
\]

* Accept correct answer without work

Blunders (-3)
B1 Stops at \(\frac{180}{6}\)
B2 40 the mode given as the average

Slips (-1)
S1 Each omitted amount, or incorrect amount, provided at least one is correct
S2 Uses a divisor other than 6.
S3 Numerical slips to a maximum of 3

Attempts (4 marks)
A1 Stops at 180 or candidates answer

Worthless (0 marks)
W1 Incorrect answer without work, other than those in scheme
If the average number of newspapers sold per day over the 7 days (including Sunday) of that week was 35, how many newspapers were sold on Sunday?

<table>
<thead>
<tr>
<th></th>
<th>5 marks</th>
<th></th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(v)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sold that week $35 \times 7 = 245$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sold on Sunday $= 245 - 180 = 65$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>Accept correct answer without work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>Accept candidates work from part (iv)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Blunders (-3)
B1 Divides instead of multiplies e.g. $35 \div 7 = 5$
B2 Writes $245 - 180$ and stops
B3 Writes $245 + 180 = 425$

Slips (-1)
S1 Numerical slips to a maximum of 3

Attempts (2 marks)
A1 Some correct work
A2 Some use of 180
A3 $35 \times 7$ and stops

Worthless (0 marks)
W1 Incorrect answer without work, other than those in scheme
QUESTION 7

Graph Values Evaluation Graph

30 (20, 10) marks 20 (5, 5, 5, 5) marks 20 marks 10 marks

Att (8, 4) Att (2, 2, 2, 2) Att 8 Att 4

Draw the graph of the function

\( f : x \rightarrow 2x^2 - 6x - 7, \) for \(-1 \leq x \leq 4, \ x \in \mathbb{R}. \)

Table method

<table>
<thead>
<tr>
<th>( x )</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2x^2 )</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>18</td>
<td>32</td>
</tr>
<tr>
<td>(- 6x )</td>
<td>6</td>
<td>0</td>
<td>-6</td>
<td>-12</td>
<td>-18</td>
<td>-24</td>
</tr>
<tr>
<td>(- 7 )</td>
<td>-7</td>
<td>-7</td>
<td>-7</td>
<td>-7</td>
<td>-7</td>
<td>-7</td>
</tr>
<tr>
<td>( f(x) )</td>
<td>1</td>
<td>-7</td>
<td>-11</td>
<td>-11</td>
<td>-7</td>
<td>1</td>
</tr>
</tbody>
</table>

* Accept correct \( f(x) \) values without work

Blunders (-3)
B1 x values added on when calculating \( f(x) \) values
B2 Consistent errors across full line otherwise slips apply
B3 \( f(x) \) not evaluated for an \( x \) value in domain or some \( x \) value omitted

Slips (-1)
S1 Each incorrect or omitted value in the body of the table
S2 Each incorrect or omitted \( y / f(x) \) value from candidates work

Misreadings (-1)
M1 \(-7\) treated as 7 across the line

Attempts (8 marks)
A1 Any four values in the table
A2 Function treated as linear e.g. \( x^2 = 2x \) or \( x \) or \( 2x^2 = 4x \) or \( x \)
Function evaluation method \[\text{20 marks}\] \[\text{Att 8}\]

\[
\begin{align*}
    f(x) &= 2x^2 - 6x - 7 \\
    f(-1) &= 2(-1)^2 - 6(-1) - 7 = 1 \\
    f(0) &= 2(0)^2 - 6(0) - 7 = -7 \\
    f(1) &= 2(1)^2 - 6(1) - 7 = -11 \\
    f(2) &= 2(2)^2 - 6(2) - 7 = -11 \\
    f(3) &= 2(3)^2 - 6(3) - 7 = -7 \\
    f(4) &= 2(4)^2 - 6(4) - 7 = 1 \\
\end{align*}
\]

**Blunders (-3)**

B1  Consistent errors in the evaluation of \(2x^2\)
B2  \(-7\) omitted from the evaluation
B3  Each incorrect \(f(x)\) value when no work is shown to a maximum of 3 provided that at least one \(f(x)\) value is correct

All \(f(x)\) values incorrect without work \(\rightarrow 0\) marks. Otherwise slips applied when work is shown

**Slips (-1)**

S1  Each incorrect or omitted value from the evaluation after substitution
S2  Each incorrect or omitted \(f(x)\) value, calculated from candidates work

**Misreadings (-1)**

M1  \(-7\) consistently treated as 7 in the evaluation.
* Accept values from candidates work
* Fully correct graph drawn with no work shown: award 30 marks

**Blunders (-3)**
B1 Blunders in scales on axis or axes (once only)

**Slips (-1)**
S1 Each point from table plotted incorrectly
S2 Each pair of successive points not joined to a maximum of 3
S3 Not a smooth curve
S4 The graph of the function is not in the conventional position or orientation.

**Attempts (4 marks)**
A1 At least two of the candidates points plotted
A2 Any U-shaped graph
A3 Axes drawn
Use your graph to estimate

(i) the minimum value of $f(x)$
(ii) the roots of $f(x) = 0$
(iii) the values of $x$ for which $f(x) = -9$
(iv) the range of values of $x$ for which $f(x)$ is decreasing.

(i) 5 marks  
(ii) 5 marks  
(iii) 5 marks  
(iv) 5 marks

(i) $-11.3$
(ii) $x = -0.9, x = 3.9$
(iii) $x = 0.4, x = 2.6$
(iv) $-1 \leq x < 1.5$

* Accept candidates values from graph
* Allow tolerance of $\pm 0.3$ units on x-axis, $\pm 0.5$ on y-axis

**Blunders (-3)**
B1 Value omitted or extra value applies in parts (i) and (ii)
B2 $f(x) = -9$ treated as $f(-9)$

**Slips (-1)**
S1 Answers indicated correctly on axis but not specified
S2 Decreasing part of graph indicated but no $x$ value written down

**Misreadings (-1)**
M1 Gives the value of $x$ corresponding to the minimum of $f(x)$ in part (i)

**Attempts (2 marks)**
A1 Effort at reading value(s) from graph
A2 Correctly solving equation algebraically; part (ii)
1. Penalties of three types are applied to candidates’ work as follows:
   - Blunders - mathematical errors/omissions (-3)
   - Slips - numerical errors (-1)
   - Misreadings (provided task is not oversimplified) (-1).

Frequently occurring errors to which these penalties must be applied are listed in the scheme. They are labelled: B1, B2, B3,…, S1, S2,…, M1, M2,… etc. These lists are not exhaustive.

2. When awarding attempt marks, e.g. Att(3), note that
   - any correct, relevant step in a part of a question merits at least the attempt mark for that part
   - if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
   - a mark between zero and the attempt mark is never awarded.

3. Worthless work is awarded zero marks. Some examples of such work are listed in the scheme and they are labelled as W1, W2,… etc.

4. The phrase “hit or miss” means that partial marks are not awarded – the candidate receives all of the relevant marks or none.

5. The phrase “and stops” means that no more work is shown by the candidate.

6. Special notes relating to the marking of a particular part of a question are indicated by an asterisk. These notes immediately follow the box containing the relevant solution.

7. The sample solutions for each question are not intended to be exhaustive lists – there may be other correct solutions.

8. Unless otherwise indicated in the scheme, accept the best of two or more attempts – even when attempts have been cancelled.

9. The same error in the same section of a question is penalised once only.

10. Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks at most.

11. A serious blunder, omission or misreading results in the attempt mark at most.

12. Do not penalise the use of a comma for a decimal point, e.g. €5.50 may be written as €5,50.
QUESTION 1

Part (a)  15 (10, 5) marks  Att (4, 2)
Part (b)  35 (30, 5) marks  Att (12, 2)

(150 m) 150 m

(a) A rectangular field is 150 m long and 90 m wide.

Find

(i)  the area of the field
(ii) the length of the perimeter of the field.

(i) Area = \( ab = 150 \times 90 = 13\ 500 \text{ m}^2 \)
(ii) Length = \( 2(a + b) = 2(150 + 90) = 480 \text{ m} \)

Blunders (-3)
B1 Incorrect substitution

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (4, 2 marks)
A1 Defines area
A2 Defines perimeter
Part (b)  

One side of an old garden fence is shown in the diagram.

The height of the fence is measured as 1.7, 1.3, 1.6, 2.5, 2.4, 2.2, and 2.3 metres at intervals of 1.8 metre along the base of the fence as shown.

(i) Use Simpson’s rule to calculate the area of the side of the fence in $m^2$.

(ii) The owner paints this side of his fence.
    One tin of paint covers 5.4 square metres.
    How many tins of paint does he use?

\[
\text{(i) Area} = \frac{1}{3} \left( \text{First} + \text{Last} + 4 \times \text{T.O.F.E} \right) \\
= \frac{1.8}{3} \left( 1.7 + 2.3 + 2(1.6 + 2.4) + 4(1.3 + 2.5 + 2.2) \right) = 0.6(4 + 8 + 24) = 21.6 \text{ m}^2.
\]

\[
\text{(ii) Number of tins} = \frac{21.6}{5.4} = 4 \text{ tins.}
\]

Blunders (-3)

B1 Uses four odd and twice even, $4(1.6 + 2.4) + 2(1.3 + 2.5 + 2.2)$
B2 Omits 2 or 4 in the formula or both
B3 Omits $h$ or uses an incorrect $h$ or does not divide $h$ by 3
B4 Multiplies by 5.4

Slips (-1)

S1 Numerical errors to a maximum of 3
S2 Each incorrect or omitted height

Attempts (12, 2 marks)

A1 Gives Simpson’s rule only
A2 Copies diagram
**QUESTION 2**

<table>
<thead>
<tr>
<th>Part (a)</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part (b)</td>
<td>20 (10, 10) marks</td>
<td>Att (4, 4)</td>
</tr>
<tr>
<td>Part (c)</td>
<td>20 (15, 5) marks</td>
<td>Att (6, 2)</td>
</tr>
</tbody>
</table>

### Part (a) 10 marks Att 4

(a) The diagram shows a rectangular block 70 cm long, 30 cm wide and 8 cm high. Calculate the volume of the rectangular block.

![Diagram of a rectangular block]

Volume = \( abc = 70 \times 30 \times 8 = 16800 \text{ cm}^3 \)

**Blunders (-3)**
- B1 Incorrect substitution
- B2 Addition for multiplication

**Slips (-1)**
- S1 Numerical errors to a maximum of 3

**Attempts (4 marks)**
- A1 Correct formula without substitution

### Part (b) 20 (10, 10) marks Att (4, 4)

(b) The diagram shows a circle inscribed in a square. The radius of the circle is 8 cm.

(i) Find the area of the circle. Give your answer correct to the nearest \( \text{cm}^2 \).

(ii) Find the area of the square.

![Diagram of a circle inscribed in a square]

(i) \[ \text{Area} = \pi r^2 = \pi \times 8^2 = 201.06 \approx 201 \text{ cm}^2 \]

(ii) \[ \text{Area} = a^2 = 16^2 = 256 \text{ cm}^2 \]

**Blunders (-3)**
- B1 Incorrect substitution

**Slips (-1)**
- S1 Numerical errors to a maximum of 3
- S2 Error in rounding or gives answer in terms of \( \pi \)

**Attempts (4, 4 marks)**
- A1 Defines area
(c) A container in the shape of an inverted cone is filled with water.

The diameter of the cone is 9 cm and the height is 12 cm.

(i) Find the volume of water in the container, in terms of $\pi$.

The water is then poured into a cylindrical can of diameter 6 cm.

(ii) Find $h$, the depth of water in the can.

---

<table>
<thead>
<tr>
<th>(c) (i)</th>
<th>15 marks</th>
<th>Att 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
</tbody>
</table>

(i) Volume $= \frac{1}{3} \pi r^2 h = \frac{1}{3} \pi \times 4.5^2 \times 12 = 81\pi \text{ cm}^3$

(ii) Volume $= \pi r^2 h = 81\pi \Rightarrow \pi \times 3^3 \times h = 81\pi \Rightarrow h = 9 \text{ cm}$

---

Blunders (-3)

B1 Incorrect substitution

B2 Error in balancing equation

Slips (-1)

S1 Numerical errors to a maximum of 3

S2 Omits $\pi$ or gives answer as 254.469 or 254.34 or similar

Attempts (6, 2 marks)

A1 Correct formula without substitution
QUESTION 3

Part (a) 10 (5, 5) marks Att (2, 2)
Part (b) 20 (5, 5, 5, 5) marks Att (2, 2, 2, 2)
Part (c) 20 (10, 5, 5) marks Att (4, 2, 2)

Part (a) 10 (5, 5) marks Att (2, 2)

(a) Find the value of $x$ and the value of $y$.

(a) (i) 5 marks Att 2
(a) (ii) 5 marks Att 2

\[
\begin{align*}
100 + y &= 180 \\
y &= 100
\end{align*}
\]

\[
\begin{align*}
x + 46 + 80 &= 180 \\
x &= 54
\end{align*}
\]

Blunders (-3)
B1 Geometrical error

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (2, 2 marks)
A1 Incorrect answer of some merit
Part (b) 20 (5, 5, 5, 5) marks
Att (2, 2, 2, 2)

(b) The diagram shows a parallelogram
(i) Find the value of \( p \).
(ii) Find the value of \( q \).
(iii) Find the value of \( r \).
(iv) Find the value of \( s \).

| (i) \( p + 70 = 180 \Rightarrow p = 110 \) | (ii) \( q = p = 110 \) |
| (iii) \( r = 38 \) | (iv) \( s + 38 = 70 \Rightarrow s = 32 \) |

Blunders (-3)
B1 Geometrical error

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (2, 2, 2, 2 marks)
A1 Incorrect answer of some merit

Part (c) 20 (10, 5, 5) marks
Att (4, 2, 2)

(c) The diagram shows a circle with centre at \( O \).
\( [AB] \) is a diameter of the circle.
\( |\angle AOC| = 104^\circ \) and \( |OC| = 6 \) cm.
(i) Find \( |\angle OBC| \).
(ii) Find \( |\angle CAO| \).
(iii) Find \( |AB| \).

| (i) \( |\angle OBC| + |\angle BCO| = 2 |\angle OBC| = 104^\circ \Rightarrow |\angle OBC| = 52^\circ \) | (ii) \( |\angle CAO| = 90^\circ - 52^\circ = 38^\circ \) | (iii) \( |AB| = 2 \times 6 = 12 \) cm. |

Blunders (-3)
B1 Geometrical error

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (4, 2, 2 marks)
A1 Incorrect answer of some merit
QUESTION 4

Part (a) 15 marks Att 6
Part (b) 20 (10, 5, 5) marks Att (4, 2, 2)
Part (c) 15 (5, 5, 5) marks Att (2, 2, 2)

Part (a) 15 marks Att 6

(a) Plot the points $A(4, 1)$ and $B(-2, 3)$ on graph paper. Show on your diagram the midpoint of $[AB]$. 

Blunders (-3)
B1 Error in scales
B2 Each point omitted
B3 Incorrect midpoint or no midpoint shown

Slips (-1)
S1 Each incorrectly plotted point

Attempts (6 marks)
A1 Draws axes
Part (b) 20 (10, 5, 5) marks  
Att (4, 2, 2)

(b)  
\(P(2, 4)\) and \(Q(-3, 1)\) are two points.

(i) Find the length of \([PQ]\).
(ii) Find the slope of \(PQ\).
(iii) Find the equation of the line \(PQ\).

<table>
<thead>
<tr>
<th></th>
<th>10 marks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td></td>
<td>Att 4</td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
<td>Att 2</td>
</tr>
<tr>
<td>(iii)</td>
<td></td>
<td>Att 2</td>
</tr>
</tbody>
</table>

(i) Length = \(\sqrt{(-3 - 2)^2 + (1 - 4)^2} = \sqrt{(-3)^2 + (-3)^2} = \sqrt{25 + 9} = \sqrt{34}\)

(ii) Slope = \(\frac{1 - 4}{-3 - 2} = \frac{-3}{-5}\) or \(\frac{3}{5}\)

(iii) Equation: \(y - 4 = \frac{3}{5}(x - 2)\) or \(3x - 5y + 14 = 0\)

Blunders (-3)
B1  No square root
B2  Incorrect substitution once only
B3  Mathematical error

Slips (-1)
S1  Numerical errors to a maximum of 3

Attempts (4, 2, 2 marks)
A1  Draws axes
(e) The line \( l \) has equation \( 2y = 3x + 1 \).

The point \( R \) has co-ordinates \((1, 2)\).

(i) Show that the point \( R \) lies on the line \( l \).

(ii) Write down the slope of \( l \).

(iii) Find the equation of the line \( k \), which passes through the point \((4, -1)\) and is parallel to \( l \).

\[
\begin{align*}
(i) & \quad 2y = 3x + 1 \Rightarrow 2(2) = 3(1) + 1 \Rightarrow 4 = 4 . \\
(ii) & \quad 2y = 3x + 1 \Rightarrow \text{slope} = \frac{3}{2} \\
(iii) & \quad y + 1 = \frac{3}{2}(x - 4) \quad \text{or} \quad 3x - 2y - 14 = 0
\end{align*}
\]

**Blunders (-3)**

B1 Incorrect substitution once only

B2 Incorrect slope of \( l \)

B3 Incorrect slope of \( k \)

B4 Error in balancing equation

**Slips (-1)**

S1 Numerical errors to a maximum of 3

**Attempts (2, 2, 2 marks)**

A1 Draws axes
**QUESTION 5**

| Part (a) | 20 (10, 10) marks | Att (4, 4) |
| Part (b) | 10 marks | Att 4 |
| Part (c) | 20 (10, 10) marks | Att (4, 4) |

(a) The diagram shows a right angled triangle with sides of length 3, 4 and 5 cm and angles named $A$ and $B$. Write as a fraction:

(i) $\tan A = \frac{3}{4}$

(ii) $\cos B = \frac{4}{5}$

**Blunders (-3)**
- B1 Uses incorrect numerator or denominator each time
- B2 Inversion of fraction

**Slips (-1)**
- S1 Calculates the angle approximately $A = 53^\circ$ or $B = 37^\circ$
- S2 Answer not in fraction form

**Attempts (4, 4 marks)**
- A1 Defines $\tan$ or $\cos$ and stops
(b) A ladder leans against the top of a wall.  
The ladder makes an angle of $71^\circ$ with the ground.  
The foot of the ladder is 2 m from the base of the wall.

Find the height, $h$, of the wall.  
Give your answer correct to one decimal place.

\[
\tan 71 = \frac{h}{2} \Rightarrow h = 2 \times \tan 71 = 5.808 \approx 5.8 \text{ m}
\]

Blunders (-3)
B1 Incorrect trigonometric ratio  
B2 Error in balancing equation  

Slips (-1)
S1 Numerical errors to a maximum of 3  
S2 Fails to round off  
S3 Wrong mode  

Attempts (4 marks)
A1 Measures from diagram  
A2 Evaluates $\sin 71^\circ$, $\cos 71^\circ$ or $\tan 71^\circ$ and stops
(c) (i) Find the length of the side \( d \) in the diagram.

\[ 6^2 + d^2 = 10^2 \Rightarrow 36 + d^2 = 100 \Rightarrow d^2 = 64 \Rightarrow d = 8 \]

(ii) Find the measure of the angle \( A \).
Give your answer to the nearest degree.

\[ \sin A = \frac{6}{10} = 0.6 \Rightarrow A = 36.8^\circ \approx 37^\circ \]

**Blunders (-3)**
B1 Any error in Pythagoras
B2 Incorrect trigonometric ratio
B3 Error in balancing equation

**Slips (-1)**
S1 Fails to round off
S2 Wrong mode

**Attempts (4, 4 marks)**
A1 Measures from diagram
QUESTION 6

Part (a) 10 marks Att 4

(a) Lucy is going to wear a top, a skirt and a jacket as her outfit to a school disco. She has
a choice of 3 tops, 4 skirts and 2 jackets. How many different outfits could she wear?

\[ 3 \times 4 \times 2 = 24 \]

Blunders (-3)
B1 Incorrect n(S) apply once only
B2 Incorrect n(E)
B3 Inverted fraction
B4 No division

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (4 marks)
A1 Incorrect answer of some merit

Part (b) 20 (5, 5, 5, 5) marks Att (2, 2, 2, 2)

(b) The blood groups of 95 people who donate blood at a clinic are as follows:
- 18 people belong to group A,
- 27 people belong to group B,
- 50 people belong to group O.

A person is selected at random from the donors. What is the probability that this person
(i) belongs to group A
(ii) belongs to group B
(iii) belongs to either group A or group O
(iv) does not belong to group O?

\[
\begin{align*}
\text{(i)} & \frac{18}{95} \\
\text{(ii)} & \frac{27}{95} \\
\text{(iii)} & \frac{68}{95} \\
\text{(iv)} & \frac{45}{95}
\end{align*}
\]

Blunders (-3)
B1 Incorrect n(S) apply once only
B2 Incorrect n(E)
B3 Inverted fraction
B4 No division

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (2, 2, 2, 2 marks)
A1 Incorrect answer of some merit

Ans:(i) 18 (ii) 27 (iii) 68 (iv) 45 merits 17 marks
or
Ans:(i) \( \frac{1}{18} \) (ii) \( \frac{1}{27} \) (iii) \( \frac{1}{68} \) (iv) \( \frac{1}{45} \) merits 17 marks
In a class of 80 students, each student studies one language. The information is given in the table below.

<table>
<thead>
<tr>
<th></th>
<th>French</th>
<th>Spanish</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>12</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Girls</td>
<td>16</td>
<td>24</td>
<td>3</td>
</tr>
</tbody>
</table>

A student is chosen at random. Find the probability that
(i) the student is a boy
(ii) the student studies French
(iii) the student is a girl studying Spanish
(iv) the student does not study German.

(i) \( \frac{37}{80} \)
(ii) \( \frac{28}{80} \)
(iii) \( \frac{24}{80} \)
(iv) \( \frac{72}{80} \)

**Blunders (-3)**
- B1 Incorrect n(S) apply once only
- B2 Incorrect n(E)
- B3 Inverted fraction
- B4 No division

**Slips (-1)**
- S1 Numerical errors to a maximum of 3

**Attempts (2, 2, 2 marks)**
- A1 Incorrect answer of some merit

**Ans:**
(i) 37
(ii) 28
(iii) 24
(iv) 72
or
(i) \( \frac{1}{37} \)
(ii) \( \frac{1}{28} \)
(iii) \( \frac{1}{24} \)
(iv) \( \frac{1}{72} \)
QUESTION 7

Part (a) 10 marks Att 4
Part (b) 25 (5, 10, 5, 5) marks Att (2, 4, 2, 2)
Part (c) 15 marks Att 6

Part (a) 10 marks Att 4

(a) The mean of the five numbers

$$\frac{1 + 5 + x + 8 + 9}{5} = 6 \Rightarrow 23 + x = 30 \Rightarrow x = 7$$

Blunders (-3)
B1 Error in forming equation
B2 Error in balancing equation

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (4 marks)
A1 Incorrect answer of some merit

Part (b) 25 (5, 10, 5, 5) marks Att (2, 4, 2, 2)

(b) A survey of the time spent by 50 teenagers on their mobile phones over a certain weekend gave the following information:

<table>
<thead>
<tr>
<th>Number of minutes</th>
<th>0 – 10</th>
<th>10 – 20</th>
<th>20 – 30</th>
<th>30 – 40</th>
<th>40 – 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teenagers</td>
<td>7</td>
<td>8</td>
<td>22</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: 10 – 20 means 10 minutes or more but less than 20 minutes.

(i) Copy and complete the cumulative frequency table:

<table>
<thead>
<tr>
<th>Number of minutes</th>
<th>&lt; 10</th>
<th>&lt; 20</th>
<th>&lt; 30</th>
<th>&lt; 40</th>
<th>&lt; 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teenagers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Draw the cumulative frequency curve.
Use your cumulative frequency curve to estimate

(iii) the median number of minutes spent on the phone
(iv) the number of teenagers who spent more than 35 minutes on the phone.
(b) (i) 5 marks  
(b) (ii) 10 marks  
(b) (iii) 5 marks  
(b) (iv) 5 marks  

(i) 

<table>
<thead>
<tr>
<th>Number of minutes</th>
<th>&lt; 10</th>
<th>&lt; 20</th>
<th>&lt; 30</th>
<th>&lt; 40</th>
<th>&lt; 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teenagers</td>
<td>7</td>
<td>15</td>
<td>37</td>
<td>47</td>
<td>50</td>
</tr>
</tbody>
</table>

(ii) 

(iii) Median = 25 minutes  
(iv) Number of teenagers = 50 – 44 = 6

Blunders (-3)
B1 Plots on the midpoints  
B2 Error in scales, one blunder  
B3 Points not joined  
B4 Uses wrong axis for median

Slips (-1)
S1 Each incorrect or omitted value in the table  
S2 Each incorrectly plotted point  
S3 Joins points with straight lines  
S4 Median not specified  
S5 Fails to subtract reading in (iv)

Attempts (2, 4, 2 marks)
A1 Incorrect answer of some merit
(c) Find the standard deviation of the numbers 5, 7, 8, 12, correct to two decimal places.

\[
\text{Mean} = \frac{\sum x}{n} = \frac{5 + 7 + 8 + 12}{4} = \frac{32}{4} = 8
\]

\[
\text{Standard Deviation} = \sqrt{\frac{\sum d^2}{n}}
\]

\[
= \sqrt{\frac{(5-8)^2 + (7-8)^2 + (8-8)^2 + (12-8)^2}{4}}
\]

\[
= \sqrt{\frac{9 + 1 + 0 + 16}{4}} = \sqrt{\frac{26}{4}} = 2.549 \approx 2.55
\]

Blunders (-3)
B1 Incorrect substitution

Slips (-1)
S1 Numerical errors to a maximum of 3

Attempts (6 marks)
A1 Any addition
A2 Work on SD or defines SD
QUESTION 8

Part (a) 10 (5, 5) marks  Att (2, 2)
Part (b) 20 (10, 5, 5) marks  Att (4, 2, 2)
Part (c) 20 (5, 15) marks  Att (2, 6)

Part (a) 10 (5, 5) marks  Att (2, 2)

(a) (i) Draw a rectangle in your answer book.
(a) (ii) Draw the two axes of symmetry of the rectangle.

Blunders (-3)
B1 Each omitted side
B2 Incorrect angle
B3 Opposite sides not equal

Slips (-1)
S1 Each incorrect or omitted symmetry
The triangle $OHK$ is the image of the triangle $OAB$ under an enlargement of centre $O$. $|OA| = 8\, \text{cm}$, $|AH| = 12\, \text{cm}$ and $|HK| = 11\, \text{cm}$.

(i) Find the scale factor of the enlargement.

(ii) Find $|AB|$.

(iii) The area of the triangle $OAB$ is $18\, \text{cm}^2$. Find the area of the triangle $OHK$.

\[
\text{(b) (i) Scale factor } = \frac{|OH|}{|OA|} = \frac{8 + 12}{8} = 2.5
\]

\[
\text{(ii) } |AB| = |KH| = \frac{11}{2.5} = 4.4\, \text{cm}
\]

\[
\text{(iii) Area } \triangle OHK = 18 \times 2.5^2 = 112.5\, \text{cm}^2
\]

**Blunders (-3)**

B1 Incorrect scale factor
B2 Error in area formula
B3 Does not square scale factor
B4 No division

**Misreadings (-1)**

M1 Treats $OAB$ as the image triangle

**Slips (-1)**

S1 Numerical errors to a maximum of 3

**Attempts (4, 2, 2 marks)**

A1 Incorrect answer of some merit
Part (c) 20 (5, 15) marks  Att (2, 6)

(e) (i) Draw any triangle in your answer book.
(ii) Construct the circumscribed circle of this triangle.

(e) (i) 5 marks  Att 2
(e) (ii) 15 marks  Att 6

**Blunders (-3)**
B1 Each omitted side
B2 Each bisector omitted
B3 Draws bisectors only
B4 Draws the incircle

**Slips (-1)**
S1 Each vertex not on circle
Marcanna Breise as ucht freagairt trí Ghaeilge

(Bonus marks for answering through Irish)

Ba chóir marcanna de réir an ghnáthráta a bhronadh ar iar-thóirí nach ngnóthaíonn níos mó ná 75% d’iomlán na marcanna don pháipéar.  Ba chóir freisin an marc bónais sin a shlánú sios.

Déantar an cinneadh agus an riomhairacht faoin marc bónais i gcás gach páipéar leithligh.

Is é 5% an gnáthráta agus is é 300 iomlán na marcanna don pháipéar.  Mar sin, bain úsáid as an gnáthráta 5% i gcás iar-thóirí a ghnóthaíonn 225 marc nó níos lú, e.g. 198 marc × 5% = 9·9 ⇒ bónas = 9 marc.

Má ghnóthaíonn an t-iarrthóir níos mó ná 225 marc, ríomhtar an bónas de réir na foirmle [300 – bunmharc] × 15%, agus an marc bónais sin a shlánú sios.  In ionad an riomhaireacht sin a dhéanamh, is féidir úsáid a bhaint as an tábla thíos.

<table>
<thead>
<tr>
<th>Bunmharc</th>
<th>Marc Bónais</th>
</tr>
</thead>
<tbody>
<tr>
<td>226</td>
<td>11</td>
</tr>
<tr>
<td>227 – 233</td>
<td>10</td>
</tr>
<tr>
<td>234 – 240</td>
<td>9</td>
</tr>
<tr>
<td>241 – 246</td>
<td>8</td>
</tr>
<tr>
<td>247 – 253</td>
<td>7</td>
</tr>
<tr>
<td>254 – 260</td>
<td>6</td>
</tr>
<tr>
<td>261 – 266</td>
<td>5</td>
</tr>
<tr>
<td>267 – 273</td>
<td>4</td>
</tr>
<tr>
<td>274 – 280</td>
<td>3</td>
</tr>
<tr>
<td>281 – 286</td>
<td>2</td>
</tr>
<tr>
<td>287 – 293</td>
<td>1</td>
</tr>
<tr>
<td>294 – 300</td>
<td>0</td>
</tr>
</tbody>
</table>