Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2008

MARKING SCHEME

MATHEMATICS

FOUNDATION LEVEL
LEAVING CERTIFICATE 2008

MARKING SCHEME

MATHEMATICS

FOUNDATION LEVEL
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MARKING SCHEME

LEAVING CERTIFICATE EXAMINATION 2008

MATHEMATICS – FOUNDATION LEVEL – PAPER 1

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.
NOTES ON APPLYING THE SCHEME, A.T.B.L. MATHEMATICS PAPER 1.

Question 1

- Computational decimal error: Blunder (−3).
- Misplacement of decimal point when a number is being transferred onwards in a question. [Transfer decimal error]: Slip (−1).
- Arithmetic slips (−1), if calculation by hand is shown, to a maximum of (−3) in each operation.
- Incorrect or omitted rounding off: Blunder (−3).
- Misreading refers to a misreading of the question that does not oversimplify the problem. The misreading must be clear and obvious.
- Incorrect or omitted units (except monetary units): Slip (−1) per question.

All Other Questions

- Computational decimal error: Slip (−1).
- Misplacement of decimal point when a number is being transferred onwards in a question. [Transfer decimal error]: Slip (−1)
- Arithmetic slips (−1), if calculation by hand is shown, to a maximum of (−3) in each operation.
- Incorrect or omitted rounding off: Slip (−1)
- Misreading refers to a misreading of the question that does not oversimplify the problem. The misreading must be clear and obvious.
- Incorrect or omitted units (except monetary units): Slip (−1) per question.
- If a worthless answer in one part of a question is used in another part of that question, then that part’s mark is the attempt mark at most.

Note: Specified instances cited within the scheme take precedence over the above notes: e.g. taking $\sqrt{87.32}$ as $\sqrt{873.2}$ is treated as a Blunder (−3), not as a misreading (−1), within the scheme.
QUESTION 1

Each part 10 marks Att 4

Part (i) 10 marks Att 4

(i) Find $\sqrt{87.32}$, correct to two decimal places.

<table>
<thead>
<tr>
<th>(i) $\sqrt{87.32}$</th>
<th>= 9.34451... = 9.34</th>
</tr>
</thead>
</table>

* Accept correct answer with no work.

Blunders (-3)

B1 $\sqrt{8732} = [93.44517...] = 93.45$.
B2 $\sqrt{873.2} = [29.54995...] = 29.55$.
B3 $\sqrt{8.732} = [2.954995...] = 2.95$.
B4 $\sqrt{0.8732} = [0.934451...] = 0.93$.
B5 Root other than square root indicated and correctly worked. $\sqrt[3]{87.32} = 4.44$.
B6 Incorrect or omitted rounding-off.

Misreadings (-1)

M1 $\sqrt{87.23} = [9.33970...] = 9.34$.
M2 $\sqrt{78.23} = [8.84477...] = 8.84$.
M3 $\sqrt{78.32} = [8.84985...] = 8.85$.

Attempts (4 marks)

A1 $(87.32)^2 = 7624.78(24)$.
A2 $\frac{87.32}{2} = 43.66$.
A3 $(87.32) \times 2 = 174.64$.
A4 Work at estimating answer: $\sqrt{87.32} = 9$.
A5 Any effort at finding or estimating another root with work shown.
A6 An incorrect figure correctly rounded off, to two decimal places.
A7 Any other answers as B1, B2, B3 and B4 but with misplaced decimal point and no work shown.

Worthless (0 marks)

W1 Incorrect answers with no work, other than those in scheme.
(ii) Find the exact value of \((4 \cdot 2)^2 - (3 \cdot 6)^2\).

\[(4 \cdot 2)^2 - (3 \cdot 6)^2 = 17.64 - 12.96 = 4.68.\]

*(Accept correct answer with no work.)*

**Blunders (-3)**

B1 \(\sqrt{4 \cdot 2} - \sqrt{3 \cdot 6} = 2 \cdot 04939... - 1.897366... = 0.152023....\)

B2 \((42)^2 - (36)^2 = 1764 - 1296 = 468.\)

B3 \((0.42)^2 - (0.36)^2 = 0.1764 - 0.1296 = 0.0468.\)

B4 Blunder in precedence giving \((0 \cdot 6)^2 = 0.36..\)

B5 Square not found, each time.

B6 \((4 \cdot 2 \times 10^2) - (3 \cdot 6 \times 10^2) = 420 - 360 = 60.\)

B7 Any incorrect rounding off within the working. (Once only).

B8 Subtraction omitted.

B9 \(17 \cdot 64 + 12 \cdot 96 = 30 \cdot 6\)

**Misreadings (-1)**

M1 \((2.4)^2 - (3.6)^2 = 5.76 - 12.96 = -7.2.\)

M2 \((4.2)^2 - (6.3)^2 = 17.64 - 39.69 = -22.05.\)

M3 \((2.4)^2 - (6.3)^2 = 5.76 - 39.69 = -33.93.\)

**Slips (-1)**

S1 Numerical Errors.

**Attempts (4 marks)**

A1 \((4 \cdot 2 \times 2) - (3 \cdot 6 \times 2) = 8 \cdot 4 - 7 \cdot 2 = 1.2.\)

A2 \(\frac{4 \cdot 2 - 3 \cdot 6}{2} = 2.1 - 1.8 = 0.3.\)

A3 Work at estimating answer: e.g. 16 – 9 = 7.

A4 Any other answers as B1, B2, B3 and B4, B6 but with misplaced decimal point and no work shown

**Worthless (0 marks)**

W1 Incorrect answers with no work, other than those in scheme.
Part (iii) 10 marks

(iii) Find \((3.1)^2 - \frac{1}{3.1}\), correct to one decimal place.

\[
(3.1)^2 - \frac{1}{3.1} = 9.61 - 0.322580... = 9.28741... = 9.3
\]

* Accept correct answer with no work.

<table>
<thead>
<tr>
<th>Blunders (-3)</th>
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<tbody>
<tr>
<td>B1 (\sqrt{3.1} - \frac{1}{3.1}) = 1.7606... - 0.32258... = 1.43802... = 1.4</td>
<td></td>
</tr>
<tr>
<td>B2 ((3.1)^2 - \frac{1}{3.1}) = 961 - 0.32258... = 960.67742 = 960.7</td>
<td></td>
</tr>
<tr>
<td>B3 ((3.1)^2 - \frac{1}{31}) = 9.61 - 0.032258... = 9.5777 = 9.6</td>
<td></td>
</tr>
<tr>
<td>B4 ((3.1)^2 - \frac{1}{31}) = 961 - 0.032258... = 960.967... = 961</td>
<td></td>
</tr>
<tr>
<td>B5 ((0.31)^2 - \frac{1}{3.1}) = 0.0961 - 0.32258... = -0.22648... = -0.2</td>
<td></td>
</tr>
<tr>
<td>B6 ((0.31)^2 - \frac{1}{0.31}) = 0.0961 - 3.2258... = -3.1297 = -3.1</td>
<td></td>
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<tr>
<td>B7 Square not found.</td>
<td></td>
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<tr>
<td>B8 Reciprocal not found.</td>
<td></td>
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<tr>
<td>B9 No subtraction.</td>
<td></td>
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<tr>
<td>B10 Error in precedence e.g. ([3.1]^2 - 1 + 3.1 = 2.7774... = 2.8).</td>
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<tr>
<td>B11 Incorrect or omitted rounding-off.</td>
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<thead>
<tr>
<th>Misreadings (-1)</th>
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<tbody>
<tr>
<td>M1 ((1.3)^2 - \frac{1}{3.1}) = 1.69 - 0.32258... = 1.367... = 1.4</td>
<td></td>
</tr>
<tr>
<td>M2 ((3.1)^2 - \frac{1}{1.3}) = 9.61 - 0.7692... = 8.8408 = 8.8</td>
<td></td>
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<tr>
<td>M3 (0.322580 - 9.61 = -9.28741 = -9.3).</td>
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<tr>
<th>Slips (-1)</th>
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<tbody>
<tr>
<td>S1 Numerical errors.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Attempts (4 marks)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>A1 Work at estimating answer: e.g. 9 or 0.3333.</td>
<td></td>
</tr>
<tr>
<td>A2 Any other answers as B2, B3, B4, and B5 but with misplaced decimal point and no work shown.</td>
<td></td>
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Worthless (0 marks)

W1 Incorrect answers with no work, other than those in scheme.
Find the exact value of $17 \cdot 2 - 6.4 \times 2.81$

$$17 \cdot 2 - 6.4 \times 2.81 = 34.0 - 98.4 = -64.4$$

* Accept correct answer with no work.

**Blunders (-3)**

B1 Error in precedence: $10 \cdot 8 \times 2.81 = 30.348$.

B2 Any step omitted.

B3 The use of a wrong operator or operators is indicated. (Once only)

**Misreadings (-1)**

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

M2 Answer given as $-0.784$

**Attempts (4 marks)**

A1 A different ordering of the numbers indicated and correctly worked out.

A2 Work at estimating answer: e.g. $17 - 6 \times 3 = -1$ or $33$.

A3 Work towards some correct step: e.g. long multiplication begun.

**Worthless (0 marks)**

W1 Incorrect answers with no work, other than those in scheme.
Part (v) 10 marks Att 4

(v) A cinema has 500 seats. One night 200 seats were empty. What percentage of seats were occupied?

<table>
<thead>
<tr>
<th>Method 1</th>
<th>Method 2</th>
</tr>
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<tbody>
<tr>
<td>(v) 500 – 200 = 300 ⇒ 300 (\frac{300}{500}) (\times 100) = <strong>60%</strong></td>
<td>200 (\frac{200}{500}) (\times 100) = 40% ⇒ 100% – 40% = <strong>60%</strong></td>
</tr>
</tbody>
</table>

* Accept correct answer with no work.

Blunders (-3)

**Method 1**

B1 Incorrect or no subtraction.
B2 Error(s) in establishing \(\frac{300}{500}\) \(\times 100\). [All three elements must be present otherwise attempt only].
B3 Incorrect or incomplete answer or no answer. [Use candidate’s answer from above].

**Method 2**

\(\frac{200}{500}\) \(\times 100\)

B1 Error(s) in establishing \(\frac{500}{500}\). [All three elements must be present otherwise attempt only]
B2 Incorrect or incomplete answer or no answer. [Use candidate’s answer from above].
B3 Incorrect or no subtraction. [Use candidate’s answer from above].

Attempts (4 marks)

A1 Gives \(\frac{300}{500}\) or \(\frac{500}{300}\) only.
A2 Gives \(\frac{200}{500}\) or \(\frac{500}{200}\) only.
A3 500 – 200 = 300 and stops.

Worthless (0 marks)

W1 Incorrect answers with no work, other than those in scheme.
Part (vi) 10 marks Att 4

(vi) Given an exchange rate of €1 = 9·272 Swedish Kronor, find the value in euro of 700 Swedish Kronor.

\[
\frac{700}{9.272} = 75.4961734 = \boxed{€75.5}
\]

* Accept correct answer with no work.
* Accept candidate’s degree of rounding.

Blunders (-3)
B1 700×9·272 = 6490·4
B2 \(\frac{700}{0.09272}\) = 7549·611734, except if answer is given as 7549·611734 cents.

Slips (-1)
S1 Answer given in cents.

Attempts (4 marks)
A1 Some use of the given data.

Worthless (0 marks)
W1 Incorrect answers with no work, other than those in scheme.
A prize of €300 is divided between 1st and 2nd place in the ratio of 3:2. How much does each person get?

\[
\begin{align*}
\text{(vii)} & \\
3 : 2 & \\
\Rightarrow \frac{300}{5} = 60 & \\
1'' = 60 \times 3 = €180 & \\
2'' = 60 \times 2 = €120 & \\
\Rightarrow 300 - 180 = €120 (2'').
\end{align*}
\]

*Accept correct answer with no work.

Blunders (-3)
B1 Divisor ≠ 5 only and continues.
B2 Incorrect multiplier or fails to multiply. (Each time).
B3 Error in transposition.
B4 Fails to find second amount.
B5 Addition instead of subtraction e.g. 300 + 180 = 480.

Attempts (4 marks)
A1 Divisor ≠ 5 e.g. \(\frac{300}{3}\) and/or \(\frac{300}{2}\) and stops.
A2 Indicates 5 parts or 3 parts or 2 parts or \(\frac{3}{5}\) or \(\frac{2}{5}\) or \(3 + 2 = 5\) and stops.
A3 Indicates multiplication of 300 by 3 and/or 2 and stops.

Worthless (0 marks)
W1 Incorrect answer with no work shown, other than those in scheme.
### Part (viii) 10 marks

**(viii)** Find the exact value of \( \frac{167.3}{\sqrt{12.25}} \).

\[
\begin{align*}
(viii) & \quad \frac{167.3}{\sqrt{12.25}} = \frac{167.3 \div 3.5}{3.5} = 47.8
\end{align*}
\]

* Accept correct answer with no work.

**Blunders (-3)**

- **B1** \( \frac{167.3}{\sqrt{12.25}} = \frac{167.3}{12.25} = 1.37968... \)
- **B2** \( 167.3 \times 3.5 = 585.55 \)
- **B3** \( 167.3 \div 3.5 \) and stops.

**Misreadings (-1)**

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

**Attempts (4 marks)**

- **A1** \( \sqrt{12.25} = 12.25 \times 2 = 24.5 \)

**Worthless (0 marks)**

- **W1** Incorrect answer with no work shown, other than those in scheme.
(ix) Find \( \frac{(5.78 \times 10^9) - (3.46 \times 10^5)}{4.32 \times 10^4} \), correct to three significant figures.

\[
\begin{align*}
(\text{ix}) \quad \frac{5.779654 \times 10^9}{4.32 \times 10^4} &= 1.33788287 \times 10^5 = 133788.287 = 134000 \\
\text{Or} \quad \frac{5780000000 - 346000}{43200} &= \frac{5779654000}{43200} = 133788.287 = 134000
\end{align*}
\]

* Accept correct answer with no work.

**Blunders (-3)**
B1 Error in precedence.
B2 Each omitted or incorrect step if slips not clear.
B3 Misplaced decimal or wrong order of magnitude each time.
B4 Inverts final fraction giving 0.000007474… as answer.
B5 Any incorrect rounding off within the working. (Once only).
B6 The use of a wrong operator or operators is indicated. (Once only).
B7 \( \frac{5779654000}{43200} \) and stops.
B8 Answer not correct to three significant figures.

**Slips (-1)**
S1 Numerical slips

**Attempts (4 marks)**
A1 \( 10^9 \) treated as 90, \( 10^5 \) treated as 50 and/or \( 10^4 \) treated as 40.
A2 Some work towards estimation.
A3 \( 10^9 \) as \( 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \), and/or likewise with \( 10^5 \) and \( 10^4 \).
A4 An incorrect number correctly rounded off to three significant figures.

**Worthless (0 marks)**
W1 Incorrect answer with no work shown, other than those in scheme.
Part (x) 10 marks

Find \( \frac{47 \cdot 3 - 8.9}{3.25 \times 1.47} \), correct to two decimal places.

\begin{align*}
\text{(x)} & \quad \frac{47 \cdot 3 - 8.9}{3.25 \times 1.47} = \frac{38.4}{4.7775} = 8.037676609 = 8.04. \\
\end{align*}

*Accept correct answer with no work.

**Blunders (-3)**
B1 Error(s) in precedence. (Once only)
B2 \( \frac{4.7775}{38.4} = 0.124414062 \)
B3 The use of a wrong operator or operators is indicated. (Once only)
B4 Any step omitted e.g. \( 38.4/4.7775 \) and stops.
B5 Any incorrect rounding off within the working. (Once only)
B6 Incorrect or no rounding off.

**Slips (-1)**
S1 Numerical errors.

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

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

**Worthless (0 marks)**
W1 Incorrect answer with no work shown, 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, 10) marks Att (4, 4)

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

(a) (i) Change 750 cm to metres.

(ii) Change 2·56 kg to grams.

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

(i) \(750 \text{ cm} = \frac{750}{100} = 7.5 \text{ metres.}\)

(ii) \(2.56 \text{ kg} = 2 \cdot 56 \times 1000 = 2560 = 2560 \text{ grams.}\)

* Accept correct answer with no work.

Blunders (-3)
B1 Incorrect conversion factor
B2 Misuse of conversion factor: e.g. \(750 \times 100 = 75000\)
B3 Misuse of conversion factor: e.g. \(\frac{2.56}{1000} = 0.00256\).

Slips (-1)
S1 Incorrect units, e.g. 7·5 cm.
S2 Numerical errors.
S3 Answer given as 7m 50 cm.

Attempts (2 marks)
A1 \(750 \times 2.56 = 1920\)

Worthless (0 marks)
W1 Incorrect answer with no work shown, other than those in scheme.
Part (b)  20 (10, 5, 5) marks

(b) The charges for Helen’s bill-pay phone per month are as follows:

Fixed charge: €10
Call charges:
First 40 minutes: 25 cent per minute
Additional minutes: 15 cent per minute
Text messages: 12 cent each

During March, Helen used 60 minutes call time and sent 30 text messages.

(i) Calculate the total charge for all her phone calls.
(ii) Calculate the charge for her text messages.
(iii) Calculate Helen’s bill, after VAT at 21% is added to all the above charges.
Give your answer correct to the nearest cent.

(b)(i)  10 marks

\[
\begin{align*}
(b)(i) & \quad 60 = 40 + 20 \Rightarrow 40 \times 25 + 20 \times 15 = 1000 + 300 = 1300 \text{ cent} = €13
\end{align*}
\]

* Accept correct answer without work.

Blunders (-3)
B1 \(40 \times 25 + 20 \times 15\) and stops.
B2 Any error(s) in calculation of \(40 \times 25 + 20 \times 15\). (to a max \(-3\))
B3 Incorrect break up of 60 minutes. e.g. \(60 = 40 + 30\)

Slips (-1)
S1 Decimal error.
S2 Numerical errors.
S3 Adds fixed charge.

Attempts (4 marks)
A1 60 minutes call time not broken into 40 minutes and additional minutes.
A2 \(40 \times 25 = 1000\) and stops.
A3 \(20 \times 15 = 300\) and stops.
A4 \(60 = 40 + 20\) and stops.
A5 Some use of the given data.

(b)(ii) 5 marks

\[
\begin{align*}
(b)(ii) & \quad 30 \times 12 = 360 = €3.60
\end{align*}
\]

* Accept correct answer without work.

Blunders (-3)
B1 Incorrect multiplier.

Slips (-1)
S1 Decimal error.
S2 Numerical errors.
S3 Adds fixed charge, except if penalised S3 in part (i).

Attempts (2 marks)
A1 Some use of the given data.
(b)(iii) **5 marks**  

| 10 + 13 + 3·60 = 26·6: VAT = \( \frac{26·6}{100} \times 21 = 5·586 \) ⇒ Bill = \( 26·6 + 5·586 = €32·186 = €32·19 \)  
| or Bill with VAT = \( \frac{26·6}{100} \times 121 = 32·186 = €32·19 \)  

* Accept correct answer without work.  
* Use Candidate’s answers from previous parts.

**Blunders (-3)**  
- B1 Error(s) in establishing \( \frac{26·6}{100} \times 21 \) [All three elements must be present otherwise att only]  
- B2 Error(s) in establishing \( \frac{26·6}{100} \times 121 \) [All three elements must be present otherwise att only]  
- B3 Element of bill omitted.  
- B4 Calculates VAT as 21% but fails to add to find total bill.

**Slips (-1)**  
- S1 Numerical errors.  
- S2 Incorrect or no rounding off to nearest cent.

**Attempts (2 marks)**  
- A1 10 + 13 + 3·60 = 26·6 only.
Part (c) 20 (10, 10) marks

(c) John earns €11 per hour and works a 40 hour week. His rate of tax is 20% and he has tax credits of €50 per week.

(i) Calculate the tax payable by John.
(ii) John also pays PRSI at the rate of 4% of his gross weekly wage.

Calculate John’s weekly take-home pay.

(c)(i) 10 marks

Gross weekly wage = 11 × 40 = €440.

€440 × 0.2 = 88 ⇒ Tax payable = 88 − 50 = €38

* Accept correct answer without work.
* Accept candidate’s answer for gross wage when calculating tax.

Blunders (-3)
B1 Error in calculating % e.g. 440 × 1.20.
B2 Adds tax credit to gross tax. (138).
B3 €402 given as tax payable or take home (net) pay.

Slips (-1)
S1 Decimal error.
S2 Numerical errors.

Attempts (4 marks)
A1 Any mishandling or ignoring of the Tax Credit other than B2.
A2 Some effort at getting %.

Worthless (0 marks)
W1 Incorrect answer with no work shown, other than those in scheme.
(c)(ii) 10 marks

<table>
<thead>
<tr>
<th>(c)(ii) PRSI: $440 \times 0.04 = 17.6$</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Take-home pay: $440 - 38 - 17.6 = \text{€} 384.4$</td>
<td></td>
</tr>
</tbody>
</table>

* Accept correct answer without work
* Accept candidate’s answer from part (i).

**Blunders (-3)**

- **B1** Error in calculating % e.g. $€440 \times 0.4$.
- **B2** Error(s) in establishing $\frac{440}{100} \times 4$ [All three elements must be present, otherwise attempt only]
- **B3** Calculates 4% of gross tax or tax payable or pay after tax.
- **B4** Uses wrong Gross wage.
- **B5** Uses a Tax other than that calculated in (c) (i) above.
- **B6** Adds Tax.
- **B7** Uses a PRSI amount other than that calculated.
- **B8** Adds the PRSI amount.
- **B9** Subtraction not completed.

**Slips (-1)**

- **S1** Incorrect rounding off of answer.
- **S2** Numerical errors.

**Attempts (4 marks)**

- **A1** Some use of 100.
- **A2** Some spurious number subtracted from Gross wage

**Worthless (0 marks)**

- **W1** Incorrect answer with no work shown, other than those in scheme.
QUESTION 3

| Part (a) | 10 (5, 5) marks | Att (2, 2) |
| Part (b) | 20 marks | Att 8 |
| Part (c) | 20 (10, 10) marks | Att (4, 4) |

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

(a) The estimated building cost of a community hall was €600 000. The actual cost was €750 000.

(i) Find the error in the estimate.

(ii) Find the percentage error.

(a) 5 marks Att 2

(i) Error = 750 000 − 600 000 = €150,000

* Accept correct answer with no work.

**Blunders (-3)**

B1 750 000 − 600 000 and stops.

**Slips (-1)**

S1 Numerical errors.

**Attempts (2 marks)**

A1 Some use of the given data; e.g. 600 000 × 750 000.

**Worthless (0 marks)**

W1 Incorrect answer with no work shown, other than those in scheme.

(ii) Percentage error = \( \frac{150 000}{750 000} \times 100 = 20 = 20\% \)

* Accept correct answer with no work.

**Blunders (-3)**

B1 Error(s) in establishing \( \frac{150 000}{750 000} \times 100 \) [All three elements must be present; else attempt only].

B2 Incorrect or incomplete answer or no answer. [Use candidate’s answer from Part (a) (i)].

**Worthless (0 marks)**

W1 Incorrect answer with no work shown, other than those in scheme.
### Part (b) 20 (10, 5, 5) marks

€4000 is invested for three years at 2.5% per annum compound interest. Find the value of the investment at the end of the three years, correct to the nearest cent.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Marks</th>
<th>Attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitute into formula</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Simplify bracket</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Finish</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

#### (b) Substitute into formula 10 marks

**Simplify bracket 5 marks**

**Finish 5 marks**

\[
\text{(b) } A = 4000 \left(1 + \frac{2.5}{100}\right)^3 = 4000(1.025)^3 = 4000(1.076890625) = 4307.5625 = €4307.56
\]

* Accept correct answer with no work.
* \( A = 4000 \left(1 + \frac{2.5}{100}\right)^3 \Rightarrow 10 \text{ marks.} \)
* \( A = 4000(1.025)^3 \Rightarrow 15 \text{ marks.} \)
* \( A = €4307.56 \Rightarrow 20 \text{ marks} \)
* \( A = 4000 \left(1 + \frac{2.5}{100}\right)^3 \) incorrect answer, without further work \( \Rightarrow 14 \text{ marks.} (10 + 2 + 2) \)

#### Substitute into formula 10 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.

**Attempts (4 marks)**

- A1 \( 4000 / 2.5 \) or \( 4000 / 2.5 = 1600 \)
- A2 \( (4000) (2.5) \) or \( (4000) (2.5) = 10000. \)
- A3 \( 4000 / 0.025 = 160000. \)

**Simplify bracket 5 marks**

\( A = 4000 \left(1 + \frac{2.5}{100}\right)^3 \neq 4000(1.025)^3. \)

**Finish 5 marks**

\( A = 4000 \left(1 + \frac{2.5}{100}\right)^3 \)

* Use candidate’s answer to simplification of
  - B1 \( (1.025)^3 = (1.025) \times 3 = 3.075 \) or \( (1.025)^3 = (1.025)/3 = 0.341666…. \)
  - B2 \( \frac{4000}{(1.025)^3} = 3714.399… \) or \( \frac{4000}{(0.975)^3} = 4315.651… \)
  - B3 \( 4000 \times (0.975)^3 = 3707.4375 \)

**Slips (-1)**

- S1 Incorrect or omitted rounding off to nearest cent.
- S2 Numerical error

**Misreadings (-1)**

- M1 \( (1.025)^n, n = 2 \) or \( n \geq 4 \) used in formula

**Worthless (0 marks)**

- W1 Incorrect answer with no work shown, other than those in scheme.
(b) **Amount year 1**  
10 marks  
**Amount year 2**  
5 marks  
**Amount year 3**  
5 marks

**OR**

Amount at end of year 1: \(4000 \times 1.025 = 4100\)
Amount at end of year 2: \(4100 \times 1.025 = 4202.5\)
Amount at end of year 3: \(4202.5 \times 1.025 = 4307.5625 = €4307.56.\)

**Compound Interest**

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount at End of Year</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4100</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>4202.5</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>4307.56</td>
<td>20</td>
</tr>
</tbody>
</table>

* Accept correct answer with no work.

* Amount year 1 = 4100 \(\Rightarrow\) 10 marks
* Amount year 2 = 4202.5 \(\Rightarrow\) 15 marks
* Amount year 3 = 4307.56(25) \(\Rightarrow\) 20 marks
* Using Simple Interest only to give 300 \(\Rightarrow\) 8 marks (4 + 2 + 2), with or without work.

**Amount at end of year 1**  
10 marks  
**Att 4**

**Blunders (-3)**
B1 4000 \(\times 1.25 = 5000.\)
B2 Error(s) in establishing \(4000 \times \frac{2.5}{100}\) [All three elements must be present; else attempt only]
B3 Stops at interest and fails to find amount.
B4 Subtracts interest to find amount.

**Slips (-1)**
S1 Numerical errors.

**Attempts (4 marks)**
A1 Some use of 100 in attempt to find percentage

**Worthless (0 marks)**
W1 Incorrect answer with no work shown, other than those in scheme.
Amount at end of year 2 5 marks  
* Use candidate’s answer for amount at end of year 1

Blunders (-3)
B1 Error(s) in calculating percentage.
B2 Uses a principal other than calculated above.
B3 Stops at interest and fails to find amount.
B4 Subtracts interest to find amount. Do not penalise if B4 above in Year 1.

Slips (-1)
S1 Numerical errors.
S2 Incorrect or omitted rounding off.

Worthless (0 marks)
W1 No effort at compounding.
W2 Incorrect answer with no work shown, other than those in scheme.

Amount at end of year 3 5 marks  
* Use candidate’s answer for amount at end of year 2.

Blunders (-3)
B1 Error(s) in calculating percentage.
B2 Uses a principal other than calculated above.
B3 Stops at interest and fails to find amount.
B4 Subtracts interest to find amount. Do not penalise if B4 above in Year 1 or Year 2.

Slips (-1)
S1 Numerical errors.
S2 Total compound interest only given.[307.56]
S3 Incorrect or omitted rounding off.

Worthless (0 marks)
W1 No effort at compounding.
W2Incorrect answer with no work shown, other than those in scheme.
(c) The value of a computer depreciates at the rate of 20% per year.
At the end of the first year a computer is worth €656.

(i) Find the value of the computer when it was new.

(ii) What will the computer be worth at the end of the third year?
Give your answer to the nearest euro.

\[ P = \frac{656}{1 - \frac{20}{100}} = \frac{656}{0.8} = €820 \] or \[ 656 = P \left(1 - \frac{20}{100}\right) \Rightarrow 656 = P(0.8) \Rightarrow P = €820 \]

or \[ \frac{4}{5} = 656 \Rightarrow \frac{4}{5} = 164 \Rightarrow \frac{5}{5} = €820 \] or \[ 80\% = €656 \]
\[ \Rightarrow 1\% = €8.20 \]
\[ \Rightarrow 100\% = €820 \]

* Accept correct answer with no work.

**Blunders (-3)**
B1 Error in formula as written by student or incorrect formula e.g. Compound Interest.
B2 Error in substituting into formula, once only.
B3 Error in transposition.
B4 \[ P = \frac{656}{1 - \frac{20}{100}} \neq \frac{656}{0.8} \]

**Slips (-1)**
S1 Numerical errors

**Attempts (4 marks)**
A1 \( \frac{656}{20} \) or \( 656/20 = 32.8 \)
A2 \((656)(20)\) or \((656)(20) = 13120\) or \(656/0.2 = 3280\).
A3 \( 656 \times \frac{20}{100} = 131.20 \) giving a total of €787.20
A4 €787.20 without work or 524.80 without work.

**Worthless (0 marks)**
W1 Incorrect answer with no work shown, other than those in scheme.
(c)(ii) (formula method) \hspace{1cm} 10 marks \hspace{1cm} Att 4

\[
\begin{align*}
\text{(c)(ii)} & \quad A = 820 \left(1 - \frac{20}{100}\right)^3 = 820(0.8)^3 = 419.84 = \€420 \quad \text{or} \quad A = 820 \left(\frac{4}{5}\right)^3 \\
& \quad A = 656 \left(1 - \frac{20}{100}\right)^2 = 656(0.8)^2 = 419.84 = \€420 \quad \text{or} \quad A = 656 \left(\frac{4}{5}\right)^2
\end{align*}
\]

* Accept correct answer with no work.
* Accept candidate’s answer from part (i).

Blunders (-3)
B1 Error in formula as written by student or incorrect formula e.g. Compound Interest.
B2 Error in substituting into formula, once only.
B3 Incorrect number of years for candidate’s chosen starting amount.
B4 \[A = 820 \left(1 - \frac{20}{100}\right)^3 \neq 820(0.8)^3.\]
B5 \((820)(1.2)^3 = 1416.96\)
B6 \[
\frac{820}{(0.8)^3} = 1601.5625 \quad \text{or} \quad \frac{820}{(1.2)^3} = 474.537
\]
B7 Above blunders apply to 656 when taken as starting amount.

Attempts (4 marks)
A1 \[
\frac{820}{20} \quad \text{or} \quad \frac{820}{20} = 41
\]
A2 \((820)(20) \text{ or } (820)(20) = 16400 \text{ or } \frac{820}{0.2} = 4100.\)
A3 Above attempts apply to 656 taken as starting amount.

Slips (-1)
S1 Incorrect or omitted rounding off to the nearest euro.
S2 Numerical errors.

Misreadings (-1)
M1 \((0.8)^n, \; n \geq 4\) used in formula.

Worthless (0 marks)
W1 Incorrect answer with no work shown, other than those in scheme.
(c)(ii) (year-by-year method)  

<table>
<thead>
<tr>
<th>Year</th>
<th>Value at the End</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>820 \times 0.8 = 656</td>
</tr>
<tr>
<td>2</td>
<td>656 \times 0.8 = 524.8</td>
</tr>
<tr>
<td>3</td>
<td>524.8 \times 0.8 = 419.84 = €420</td>
</tr>
</tbody>
</table>

*or*

<table>
<thead>
<tr>
<th>Year</th>
<th>Depreciation at End</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>656 \times \frac{20}{100} = 131.20 \Rightarrow Value 2 = 524.8</td>
</tr>
<tr>
<td>3</td>
<td>524.8 \times \frac{20}{100} = 104.96 \Rightarrow Value 3 = 419.84</td>
</tr>
</tbody>
</table>

\Rightarrow \text{final value} = €420.

* Accept correct answer with no work.
* Using Simple Interest only to give 492 \Rightarrow 4 marks, with or without work.

**Blunders (-3)**

B1 \((820) \times 0.08 = 65.6\)
B2 Error(s) in establishing \((820)(20)/100\) [All three elements must be present; else attempt only].
B3 Stops at depreciation and fails to find value. (Each time)
B4 Adds depreciation to find value. (Once only)
B5 Error(s) in calculating percentage.
B6 Uses a value other than calculated above.
B7 Each step omitted for the candidate’s chosen starting amount.

**Slips (-1)**

S1 Numerical errors.
S2 Incorrect or no rounding off to nearest euro.

**Attempts (4 marks)**

A1 Some use of 100 in attempt to find percentage.

**Worthless (0 marks)**

W1 Incorrect answer with no work shown, other than those in scheme.
# QUESTION 4

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

## Part (a)  10 marks  Att 4

(a) Solve for $x$

$$5x - 2 = 3x + 14$$

(a) 10 marks  Att 4

$$5x - 2 - 3x = 14 \Rightarrow 2x - 2 = 14 \Rightarrow 2x = 16 \Rightarrow x = 8.$$  

* Award full marks for a correct answer by T+E with verification.

**Blunders (-3)**
- B1 Blunders in grouping terms e.g. $5x - 2 = 3x$. (Each time).
- B2 Transposition error(s). (Once only).
- B3 Each step omitted e.g. $2x = 16$ and stops
- B4 $x = 8$ without work.

**Slips (-1)**
- S1 Numerical errors.

**Attempts (4 marks)**
- A1 Some correct work.
- A2 Effort at T+E by substitution.

**Worthless (0 marks)**
- W1 Incorrect answer without work.
**Part (b) 20 (15, 5) marks**

(b) Solve the simultaneous equations

\[
\begin{align*}
3x - 4y &= 8 \\
x + 2y &= 16
\end{align*}
\]

<table>
<thead>
<tr>
<th>First variable found</th>
<th>15 marks</th>
<th>Second variable</th>
<th>5 marks</th>
<th>Att 6</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3x - 4y = 8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(x + 2y = 16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3x - 4y = 8)</td>
<td>(8 + 2y = 16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2x + 4y = 32)</td>
<td>(2y = 8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5x = 40)</td>
<td>(y = 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(x = 8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Blunders (-3)**

B1 Error(s) in establishing the first equation in terms of \(x\) only \([5x = 40]\) or the first equation terms of \(y\) only \([-10y = -40]\).

B2 Blunder in substitution e.g. \(y\) value for \(x\).

B3 Transposition error(s). (Once only).

**Attempts - First variable – (6 marks)**

A1 Effort at equalising coefficients of \(x\)’s or \(y\)’s.

A2 Effort at cancelling one variable or combining variables.

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 or second effort at combining variables.

**Attempts (6+2 marks)**

A6 Attempt at finding a solution by T + E.

A7 Correct answers with no work shown.

A8 Any correct work, even in the context of an approach of no merit (Att 6, or Att 6 + Att 2).

**Worthless (0 marks)**

W1 Incorrect answer(s), no work shown.
Part (c) 20 (10, 5, 5) marks  Att (4, 2, 2)

Alan, Barry and Colm each bought a ticket for a concert. Barry paid €5 more than Alan for his ticket. Colm paid twice as much as Barry. Alan’s ticket cost €. 

(i) Write an expression in \(x\) for the price that Barry paid.
(ii) Write an expression in \(x\) for the price that Colm paid.
(iii) Given that the total paid out by the three friends was €95, how much did Alan pay?

(c) (i) 10 marks  Att 4

\[(c) \text{ (i)} \quad x + 5\]

Blunders (-3)
B1 \(x - 5\).
B2 \(5x\).

Attempts (4 marks)
A1 Assigns a numerical value to \(x\) that is then used to find a numerical value for Barry’s cost.
A2 Some use of the given data e.g. \(x\), \(\frac{5}{x}\), \(5 - x\)

Worthless (0 marks)
W1 No use of \(x\) or \(5\).
W2 \(x = 5\) and stops.

(c) (ii) 5 marks  Att 2

\[(c) \text{ (ii)} \quad 2(x + 5) \text{ or } 2x + 10\]

* Accept candidate’s answer from part (i).

Blunders (-3)
B1 \(x + 10\)
B2 \(2x + 5\)

Attempts (2 marks)
A1 \(2x - 5\)
A2 \(x - 10\)
A3 \(x^2\)

Worthless (0 marks)
W1 No use of 2 and/or 10
\[
\begin{align*}
(x + 5) + (2x + 10) &= 95 \\
4x + 15 &= 95 \\
4x &= 80 \\
4x &= 20 \\
\Rightarrow x &= 20.
\end{align*}
\]

* Accept candidate’s answer from part (i) and part (ii).

* \(4x + 15\) or \(4x + 15 = 95\) as starting work can earn marks for parts (i) and (ii).

Blunders (-3)
- B1 Incorrectly formed equation.
- B2 Blunders in grouping terms e.g. \(4x + 15 = 19x\). (Each time).
- B3 Transposition error(s). (Once only).
- B4 Each step omitted.
- B5 \(x = 20\) without work.

Slips (-1)
- S1 Numerical errors.

Attempts (2 marks)
- A1 Some correct work.
- A2 Effort at T+E by substitution.
- A3 No equation formed.

Worthless (0 marks)
- W1 Incorrect answer without work.
### QUESTION 5

<table>
<thead>
<tr>
<th>Part (a)</th>
<th>10 (5, 5) marks</th>
<th>Att (2, -)</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 (10, 1, 5) marks</td>
<td>Att (4, 2, 2)</td>
</tr>
</tbody>
</table>

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

**Question:** List the first five multiples of 3 and list the first five multiples of 4.

(i) Hence, or otherwise, write down the lowest common multiple of 3 and 4.

<table>
<thead>
<tr>
<th>(a)(i)</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>Hit/Hit</td>
<td></td>
</tr>
</tbody>
</table>

**Hints:**

- **Part (a)(i)**
  - 3, 6, 9, 12, 15.
  - 4, 8, 12, 16, 20.
- **Part (a)(ii)**
  - Lowest common multiple – hit or miss. Accept 12 or 3 × 4.

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

**Question:**

(i) Solve the quadratic equation \( x^2 + 4x + 3 = 0 \).

(ii) Solve the quadratic equation \( 2x^2 - 9x + 6 = 0 \), correct to two decimal places.

<table>
<thead>
<tr>
<th>(b) (i)</th>
<th>10 marks</th>
<th>Att 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) (i) ( x^2 + 4x + 3 = 0 ) ( \Rightarrow (x + 3)(x + 1) = 0 ) ( \Rightarrow x = -3, x = -1 )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hints:**

- **Part (b)(i)**
  - \( x^2 + 4x + 3 = 0 \) \( \Rightarrow (x + 3)(x + 1) = 0 \) \( \Rightarrow x = -3, x = -1 \)

---

**Blunders (-3)**

- B1 Last step omitted.
- B2 Sign error(s) in factors (Once only).
- B3 Sign error(s) 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 T + E.

**Worthless (0 marks)**

- W1 Quadratic reduced to linear.
(b) (ii) 10 marks Att 4

\[
\begin{align*}
(ii) \quad 2x^2 - 9x + 6 &= 0 \\
        &\Rightarrow x = \frac{9 \pm \sqrt{(-9)^2 - 4(2)(6)}}{2(2)} \\
        &\Rightarrow x = \frac{9 \pm \sqrt{81 - 48}}{4} \\
        &\Rightarrow x = \frac{9 \pm 3\sqrt{3}}{4} \quad [\dagger] \\
\end{align*}
\]

\[
\Rightarrow x = \frac{9 + 3\sqrt{3}}{4} = 3.686... \text{ or } x = 0.813... \\
\Rightarrow \text{or } x = 0.81.
\]

* Maximum deductions beyond point [\dagger] is 3 marks.

\*
\[
\frac{9 \pm \sqrt{\text{neg no.}}}{4} \quad \text{implies 6 marks.}
\]

**Blunders (-3)**

B1 Blunder in application of formula.

B2 Omits ± in formula.

**Slips (-1)**

S1 Slips in substitution into the formula (to a max of -5)

S2 81 - 48 = 129.

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. \((2x \cdot \cdot \cdot)(x \cdot \cdot \cdot)\) or guide no. = 12.

A4 Appearance of the variable in the answer.

**Worthless (0 marks)**

W1 Quadratic reduced to linear.

---

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

(c) (i) Solve \(3x - 2 \leq 17, x \in \mathbb{N}\).

(ii) Solve \(5 - 2x \leq 1, x \in \mathbb{N}\).

(iii) Write down the values of \(x\) which satisfy both of the above inequalities?

---

(c)(i) 10 marks Att 4

\[
\begin{align*}
(i) \quad 3x - 2 &\leq 17 \\
     &\Rightarrow 3x \leq 19 \\
     &\Rightarrow x \leq 6.33 \\
     &\Rightarrow \{1, 2, 3, 4, 5, 6\} \text{ OR } \{0, 1, 2, 3, 4, 5, 6\}
\end{align*}
\]

* Listing not required.

**Blunders (-3)**

B1 Blunders in grouping terms e.g. \(3x - 2 = x\). (Each time).

B2 Transposition error(s). (Once only).

B3 Each step omitted.

B4 \(x \leq 6.33\) or 19/3 without work.

B5 Replaces inequality sign with equality sign.
Misreadings (-1)
M1 Uses < for \(\leq\).

Attempts (4 marks)
A1 Some correct work.
A2 Effort at T+E by substitution.

Worthless (0 marks)
W1 Incorrect answer without work.

\[
\begin{array}{|c|c|}
\hline
\text{(c)(ii)} & \text{5 marks} \\
\hline
\text{(ii)} & 5 - 2x \leq 1 \Rightarrow 4 \leq 2x \Rightarrow 2 \leq x \Rightarrow \{2, 3, 4, \ldots\} \\
\hline
\end{array}
\]

* Listing of \{2, 3, 4, \ldots\} not required.

Blunders (-3)
B1 Blunders in grouping terms e.g. 5- 2x = 3x. (Each time).
B2 Transposition error(s). (Once only).
B3 Blunder in direction of inequality when multiplying by “minus”.
B4 Each step omitted.
B5 \(x \geq 2\) without work.
B6 Replaces \(\leq\) with equality sign. Do not penalise if B5 is incurred in (i).

Misreadings (-1)
M1 Uses < for \(\leq\).

Attempts (2 marks)
A1 Some correct work.
A2 Effort at T+E by substitution.
A3 \(5 + 2x \leq 1\).

Worthless (0 marks)
W1 Incorrect answer without work.

\[
\begin{array}{|c|c|}
\hline
\text{(c)(iii)} & \text{5 marks} \\
\hline
\text{(iii)} & \{2, 3, 4, 5, 6\} \\
\hline
\end{array}
\]

* Accept candidate’s answers from part (i) and part (ii).
* If equality used in (i) and (ii), then attempt mark at most here.

Slips (-1)
S1 Each omitted or incorrect entry, provided at least one is correct. (to a max of −3)

Attempts (2 Marks)
A1 At least one correct entry.
6. A student spends her free time at home watching television and listening to music. The following chart shows the amount of time spent in minutes by this student doing these activities in one particular week.
For example, on Friday, she spent 50 minutes watching television and 30 minutes listening to music.

(i) On what day did she spend the least amount of time watching television?
(ii) Which day shows the greatest difference between time spent watching television and time spent listening to music?
(iii) On which days did she spend more than two hours in total watching television and listening to music?
(iv) What is the average time per day she spent watching television during that week?
(v) During that week, how much more of her free time did she spend watching television than listening to music?

(i) Thursday

Blunders (-3)
B1 Music instead of television ⇒ Wednesday and Friday
B2 Saturday, the greatest, given as the least.

Attempts (4 marks)
A1 Wednesday only or Friday only given.

Worthless (0 marks)
W1 Incorrect answer without work, other than those in the scheme.
(ii) 10 marks

(ii) Wednesday

Blunders (-3)
B1 Tuesday, the least difference, given as greatest.

Attempts (4 Marks)
A1 Saturday given as the answer.

Worthless (0 marks)
W1 Incorrect answers with no work, other than those in scheme.

(iii) 10 marks

(iii) Saturday & Sunday

Blunders (-3)
B1 Each omitted or incorrect day.
B2 Gives Monday, Tuesday, Wednesday, Thursday and Friday as greater than two hours.

Worthless (0 marks)
W1 Incorrect answers with no work, other than those in scheme.

(iv) 10 marks

(iv) 35 + 50 + 80 + 30 + 50 + 100 + 75 = 420
\[ \Rightarrow 420/7 = 60 \text{ minutes.} \]

* Accept correct answer without work.
* For TV time on Monday, accept 35 or 35 ± 2 minutes. Likewise for Sunday.

Blunders (-3)
B1 Calculating average time listening to music.
B2 Stops at 420/7.
B3 50, the mode given as average.
B4 750/7 = 107.14

Slips (-1)
S1 Each omitted time, or incorrect time, provided at least one is correct.
S2 Uses a divisor other than 7.
S3 Numerical errors.

Attempts (4 Marks)
A1 Stops at 420, or candidates answer.

Worthless (0 marks)
W1 Incorrect answers with no work, other than those in scheme.
\[
420 - (60 + 55 + 30 + 50 + 30 + 55 + 50) \Rightarrow 420 - 330 = 90.
\]

* Accept correct answer without work.

* For Music time on Tuesday, accept 55 or 55 ± 2 minutes. Likewise for Saturday.

**Blunders (-3)**

B1 Fails to subtract 420 – 330 or adds 420 + 330.

**Slips (-1)**

S1 Numerical errors.

S2 Each omitted time, or incorrect time, provided at least one is correct. (to a max -3)

S3 Interchanges television and music giving -90 as answer.

**Attempts (4 marks)**

A1 Some effort at finding totals.

**Worthless (0 marks)**

W1 Incorrect answers with no work, other than those in scheme.
QUESTION 7

Graph 30 (20, 10) marks Att (8, 4)
Values 20 (5, 5, 5, 5) marks Att (2, 2, 2, 2)

Table / evaluation 20 marks Att 8
Graph 10 marks Att 4

Draw the graph of the function

\[ f: x \rightarrow 2x^2 - 3x - 5, \text{ for } -2 \leq x \leq 3, x \in \mathbb{R}. \]

Use your graph to estimate

Table method 20 marks Att 8

<table>
<thead>
<tr>
<th>x</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x^2</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>-3x</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>-3</td>
<td>-6</td>
<td>-9</td>
</tr>
<tr>
<td>-5</td>
<td>-5</td>
<td>-5</td>
<td>-5</td>
<td>-5</td>
<td>-5</td>
<td>-5</td>
</tr>
<tr>
<td>f(x)</td>
<td>9</td>
<td>0</td>
<td>-5</td>
<td>-6</td>
<td>-3</td>
<td>4</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 applied.

Misreadings (-1)
M1 \(-5\) treated as 5 across the line.

Slips (-1)
S1 Each incorrect or omitted value in body of table.
S2 Each incorrect or omitted \( y/ f(x) \) value, calculated from candidate’s work.

Attempt (8 marks)
A1 Any four correct calculated 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

<table>
<thead>
<tr>
<th>Value of x</th>
<th>Function value</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>2(-2)^2 - 3(-2) - 5 = 9</td>
</tr>
<tr>
<td>-1</td>
<td>2(-1)^2 - 3(-1) - 5 = 0</td>
</tr>
<tr>
<td>0</td>
<td>2(0)^2 - 3(0) - 5 = -5</td>
</tr>
<tr>
<td>1</td>
<td>2(1)^2 - 3(1) - 5 = -6</td>
</tr>
<tr>
<td>2</td>
<td>2(2)^2 - 3(2) - 5 = -3</td>
</tr>
<tr>
<td>3</td>
<td>2(3)^2 - 3(3) - 5 = 4</td>
</tr>
</tbody>
</table>

**Blunders (-3)**

- **B1** Consistent errors in the evaluation of $2x^2$.
- **B2** $-5$ omitted from the evaluation.
- **B3** Each incorrect $f(x)$ value when no work is shown to a max of $3(-3)$ 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.

**Misreadings (-1)**

- **M1** $-5$ consistently treated as 5 in the evaluation.

**Slips (-1)**

- **S1** Each incorrect or omitted value from the evaluation after substitution.
- **S2** Each incorrect or omitted $f(x)$ value, calculated from candidate’s work.

**Attempt (8 marks)**

- **A1** Any four correct calculated values in the function evaluation.
- **A2** Function treated as linear e.g. $x^2 = 2x$ or $x$ or $2x^2 = 4x$ or $x$.

**Worthless (0 marks)**

- **W1** Incorrect answers with no work, other than those in scheme.
* Accept values from candidate’s table.
* Fully correct graph drawn with no work shown: Award 30 marks.

Blunders (-3)
B1 Points joined in incorrect order.
B2 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 maximum −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 candidate’s points plotted.
A2 Any U-shaped graph.
A3 Axes Drawn.
Use your graph to estimate

(i) the minimum value of \( f(x) \)
(ii) the value of \( f(-0.5) \)
(iii) the roots of \( f(x)=0 \)
(iv) the range of values of \( x \) for which \( f(x) \) is decreasing.

<table>
<thead>
<tr>
<th>Part (i)</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part (ii)</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>Part (iii)</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>Part (iv)</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
</tbody>
</table>

(i) -6.125
(ii) -3
(iii) -1, 2.5
(iv) \(-2 \leq x < 0.75\)

* Accept candidate’s values from graph.
* Allow tolerance ±0.3 units on \( x \)-axis, ±0.5 units on \( y \)-axis.

**Blunders (-3)**
B1 Value omitted, or extra value. Applies in part (iii) and (iv)
B2 \( f(-0.5) \) treated as \( f(x) = -0.5 \)

**Misreading (-1)**
M1 Gives the value of \( x \) corresponding to the minimum of \( f(x) \) in part (i).

**Slips (-1)**
S1 Answers indicated correctly on axes, but not specified.

**Attempt (2 marks)**
A1 Effort at reading value(s) from graph.
A2 Correctly solving equation algebraically: part (iii).
LEAVING CERTIFICATE 2008

MARKING SCHEME

MATHEMATICS – PAPER 2

FOUNDATION LEVEL
MARKING SCHEME

LEAVING CERTIFICATE EXAMINATION 2008

MATHEMATICS – FOUNDATION LEVEL – PAPER 2

GENERAL GUIDELINES FOR EXAMINERS – PAPER 2

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

Part (a) 10 marks

The parallel sides of a trapezium measure 15 cm and 25 cm. The height is 7 cm. Calculate the area of the trapezium.

\[ \text{Area} = \frac{h(a+b)}{2} = \frac{7(25+15)}{2} = 140 \text{cm}^2 \]

Blunders (-3)
B1 Incorrect substitution
B2 Failure to divide by 2
B3 Multiplication for addition

Slips (-1)
S1 Numerical errors to a max of 3
S2 Omits units

Attempts (4)
A1 Defines length or area
(b) The diagram below shows a corner of a lawn that needs to be replanted with grass seed.

Offsets of lengths 6, 9, 10, 12, 14 and 17 metres are measured at intervals of 6 metres as shown.

(i) Use Simpson’s rule to calculate an estimate of the area of this corner of the lawn.

(ii) One box of lawn seed is needed for every 40 m$^2$ of the lawn.

How many boxes of seed will be needed?

\[
\text{Area} = \frac{1}{3} \text{width} \left[ \text{First} + \text{last} + 2(\text{odd}) + 4(\text{even}) \right]
\]

\[
\text{Area} = \frac{6}{3} \left[ 0 + 17 + 2(9 + 12) + 4(6 + 10 + 14) \right]
\]

\[
\text{Area} = 2[17 + 2(21) + 4(30)] = 2[17 + 42 + 120] = 2(179)
\]

\[
\text{Area} = 358 \text{ m}^2
\]

(ii) Number of boxes = \( \frac{358}{40} = 8.95 \) or 9

Blunders (-3)
B1 Uses four odd and twice even e.g. 2(30) + 4(21)
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 40

Slips (-1)
S1 Numerical errors to a max of 3
S2 Omits units
S3 Each incorrect or omitted altitude

Attempts (14, 2)
A1 Gives Simpson’s Formula 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>15 marks</td>
<td>Att 6</td>
</tr>
<tr>
<td>Part (c)</td>
<td>25 marks</td>
<td>Att 6, 4</td>
</tr>
</tbody>
</table>

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

2. **(a)** A rectangular chocolate bar is 9 cm long, 3 cm wide and 1 cm thick.
   
   Calculate the volume of chocolate in the bar.

   \[
   \text{Volume} = l \times b \times h = 9 \times 3 \times 1 = 27 \text{ cm}^3
   \]

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

   **Slips (-1)**
   - S1 Numerical errors to a max of 3
   - S2 Omits units

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

#### Part (b) 15 marks Att 6

(b) The diagram shows two circles inscribed in a rectangle.
   
   The radius of each circle is 6 cm.
   
   Find the area of the rectangle

   \[
   \text{Length} = 4 \times 6 = 24 \text{ cm} \\
   \text{Width} = 2 \times 6 = 12 \text{ cm} \\
   \text{Area} = 24 \times 12 = 288 \text{ cm}^2
   \]

   **Blunders (-3)**
   - B1 Each incorrect dimension

   **Slips (-1)**
   - S1 Numerical errors to a max of 3
   - S2 Omits units

   **Attempts (6)**
   - A1 Defines length or area
   - A2 Finds area of circle
(c) A sphere and a cylinder have the same volume. The sphere has a radius of 9 cm.

(i) Calculate the volume of the sphere in terms of $\pi$.

(ii) The height of the cylinder is 27 cm. Calculate the radius of the cylinder.

(i) **15 marks**

$$Volume = \frac{4\pi r^3}{3} = \frac{4\pi \times 9^3}{3} = 972\pi \text{ cm}^3$$

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

**Slips** (-1)
S1 Numerical errors to a max of 3
S2 Omits units
S3 Omits $\pi$ or gives answer as 3053.6 or 3052.08 or similar

**Attempts** (6)
A1 Correct formula without substitution

(ii) **10 marks**

$$\pi \times r^2 \times 27 = 972\pi$$
$$\Rightarrow r^2 = \frac{972\pi}{27\pi} = 36 \Rightarrow r = 6\text{ cm}$$

**Blunders** (-3)
B1 Incorrect substitution
B2 Error in balancing equation

**Slips** (-1)
S1 Numerical errors to a max of 3
S2 Omits units

**Attempts** (4)
A1 Correct formula without substitution
A2 Correct volume of cylinder and stops
QUESTION 3

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

3. (a) Find the value of \(x\) and the value of \(y\):

\[
\begin{align*}
70^\circ & \\
110^\circ & \quad y^\circ \\
\end{align*}
\]

\[
\begin{align*}
70^\circ & \\
110^\circ & \quad x^\circ \\
\end{align*}
\]

**Ans:** \(x = 70^\circ, y = 40^\circ\)

Blunders (-3)
B1 Geometrical error

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

Attempts (2, 2)
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.

Find the measure of

(i) the angle \(A\)
(ii) the angle \(B\)
(iii) the angle \(C\)
(iv) the angle \(D\).

\[
\begin{align*}
40^\circ & \\
120^\circ & \quad A \\
\end{align*}
\]

\[
\begin{align*}
D & \\
B & \\
C & \quad 40^\circ \\
\end{align*}
\]

**Ans:** (i) \(A = 60^\circ\) (ii) \(B = 60^\circ\) (iii) \(C = 40^\circ\) (iv) \(D = 80^\circ\)

Blunders (-3)
B1 Geometrical error

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

Attempts (2, 2, 2, 2)
A2 Incorrect answer of some merit

Page 45
Part (c) 20(5, 5, 5) marks

The diagram shows a circle with centre $o$ and radius 6.5 cm.

(i) Write down the measure of the angle $\angle pqs$.

(ii) Write down the length of $[oq]$.

(iii) Write down the length of the diameter of the circle.

(iv) If $|oq| = 5$ cm, find the length of $[pq]$.

<table>
<thead>
<tr>
<th>Each part</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ans: (i) $</td>
<td>pq</td>
<td>= 90'$</td>
</tr>
</tbody>
</table>

Blunders (-3)
B1 Geometrical error
B2 Any error in Pythagoras

Slips (-1)
S1 Numerical errors to a max of 3
S2 Omits units

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

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

**Part(a) 15 (10, 5) marks Att (4, 2)**

(a) \( p(-2,1) \) and \( q(4,3) \) are two points.

(i) Plot the points \( p \) and \( q \) on graph paper.

(ii) Find the midpoint of \([pq]\).

\[
\text{Midpoint} = \left( \frac{-2 + 4}{2}, \frac{1 + 3}{2} \right) = \left( \frac{2}{2}, \frac{4}{2} \right) \quad \text{or} \quad (1, 2)
\]

**Blunders (-3)**

B1 Error in scales
B2 Omits 2 in midpoint formula
B3 Incorrect substitution once only
B4 Each point omitted

**Slips (-1)**

S1 Numerical errors to a max of 3
S2 Each incorrectly plotted point

**Attempts (4, 2)**

A1 Draws axes.
### Part (b) 15 (5, 5, 5) marks Att (2, 2, 2)

(a) \( a(-6, 6) \) and \( b(-3, 4) \) are two points

(i) Find the length of \( ab \).

(ii) Find the slope of \( ab \).

(iii) Find the equation of the line \( ab \).

### Each part 5 marks Att 2

(i) Length = \( \sqrt{(-3-(-6))^2 + (4-6)^2} = \sqrt{3^2 + (-2)^2} = \sqrt{13} \)

(ii) Slope = \( \frac{4-6}{-3-(-6)} = \frac{-2}{3} \)

(iii) \( y-6 = \frac{-2}{3}(x+6) \) or \( 2x + 3y - 6 = 0 \)

#### Blunders (-3)

B1 No square root

B2 Incorrect substitution once only

B3 Mathematical error

#### Slips (-1)

S1 Numerical errors to a max of 3

#### Attempts (2, 2, 2)

A1 Draws axes.

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

(c) The line \( L \) has equation \( 2y = 5x + 2 \).

The point \( r \) has co-ordinates \((0, 1)\).

(i) Show that the point \( r \) lies on the line \( L \).

(ii) Find the slope of \( L \).

(iii) Find the equation of the line \( K \), which is perpendicular to \( L \) and contains the point \( r \).

### Each part 5 marks Att 2

(i) \( 2y = 5x + 2 \) \( \Rightarrow 2(1) = 5(0) + 2 \) \( \Rightarrow 2 = 2 \)

(ii) \( \text{slope} = \frac{5}{2} \)

(iii) \( y-1 = \frac{-2}{5}(x-0) \) or \( 2x + 5y - 5 = 0 \)

#### 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 max of 3

#### Attempts (2, 2, 4)

A1 Draws axes.
QUESTION 5

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

5. (a) The diagram shows a right-angled triangle with sides of length 9, 12 and 15 and angles named $A$ and $B$.

(i) Write down $\cos A$ as a fraction.

(ii) Write down $\tan B$ as a fraction.

\[
\begin{align*}
\cos A &= \frac{12}{15} \\
\tan B &= \frac{12}{9}
\end{align*}
\]

Blunders (-3)
B1 Uses incorrect numerator or denominator each time

Slips (-1)
S1 Calculates the angle approx $A = 37^0$ or $B = 53^0$
S2 Answer not in fraction form.

Attempts (4, 4)
A1 Defines $\cos$ or $\tan$

Part (b) 15 marks Att 6

(b) Find the measure of the angle $X$ in the diagram, correct to the nearest degree.

\[
\sin X = \frac{5}{13} \quad \Rightarrow \quad X = \sin^{-1} \left( \frac{5}{13} \right) \quad \Rightarrow \quad X = 22.619^0 \approx 23^0
\]

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

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

Attempts (6)
A1 Measures from diagram.
Part (c) 15 marks  

(c) A boat that is anchored out at sea can be seen from the top of a vertical cliff.

The angle of depression from the top of the cliff to the boat is 59°, as shown in the diagram.

The boat is 100m from the foot of the cliff.

Find \( h \), the height of the cliff, correct to the nearest metre.

\[
\frac{h}{100} = \tan 59° \quad \Rightarrow \quad h = 100 \tan 59° \quad \Rightarrow \quad h = 166.42 = 166m
\]

Blunders (-3)

B1 Incorrect trig ratio
B2 Error in balancing equation

Slips (-1)

S1 Fails to round off
S2 Numerical errors to a max of 3
S3 Wrong mode

Attempts (6)

A1 Measures from diagram
A2 Evaluates \( \sin 59° \), \( \cos 59° \), or \( \tan 59° \) and stops
QUESTION 6

Part (a) 10 marks Att 4
(a) A factory produces a range of wigs, as follows:
- The wigs can have either short hair or long hair.
- The colour can be blond or black or red.
- The hair can either be straight or curly.

How many different wigs in this range can the factory produce?

Ans : \(2 \times 3 \times 2 = 12\)

Blunders (-3)
B1 \(2 + 3 + 2 = 7\) or 7 written down
B2 2! Etc
B3 2 by 2 + 3 by 3 + 2 by 2 or similar

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

Attempts (4)
A1 Incorrect answer of some merit

Part (b) 20(5, 5, 5, 5) marks Att (2, 2, 2, 2)
(b) A bag contains 5 apples, 4 pears, 3 oranges and 2 bananas.
A child chooses a piece of fruit at random from the bag.
Find the probability that the fruit chosen is
(i) a pear
(ii) an orange
(iii) an apple or an orange
(iv) not a banana.

Each Part 5 marks Att 2

Answers: (i) \(\frac{4}{14}\) (ii) \(\frac{3}{14}\) (iii) \(\frac{8}{14}\) (iv) \(\frac{12}{14}\)

Blunders(-1)
B1 Incorrect n(S) apply once only
B2 Incorrect n(E)
B3 Inverted fraction
B4 No division

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

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

Answers:(i) \(\frac{4}{14}\) (ii) \(\frac{3}{14}\) (iii) \(\frac{8}{14}\) (iv) \(\frac{12}{14}\) merits 17 marks
or
Answers:(i) \(\frac{1}{4}\) (ii) \(\frac{1}{3}\) (iii) \(\frac{1}{8}\) (iv) \(\frac{1}{12}\) merits 17 marks
Part (c)  

**20 (5, 5, 5, 5) marks**  

**Att (2, 2, 2, 2)**  

The table below shows how a class of 90 students normally travel to school.

<table>
<thead>
<tr>
<th></th>
<th>Walk</th>
<th>Car</th>
<th>Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>9</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Boys</td>
<td>10</td>
<td>16</td>
<td>19</td>
</tr>
</tbody>
</table>

A student is chosen at random.  
What is the probability that the student  

(i) is a boy who comes to school by bus  
(ii) is a girl  
(iii) travels to school by car  
(iv) does not walk to school.

### Each part  

<table>
<thead>
<tr>
<th></th>
<th>5 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answers: (i)</td>
<td>$\frac{19}{90}$</td>
</tr>
<tr>
<td>(ii)</td>
<td>$\frac{45}{90}$</td>
</tr>
<tr>
<td>(iii)</td>
<td>$\frac{31}{90}$</td>
</tr>
<tr>
<td>(iv)</td>
<td>$\frac{71}{90}$</td>
</tr>
</tbody>
</table>

### Blunders (-1)  

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

### Slips (-1)  

S1 Numerical errors to a max of 3

### Attempts (2, 2, 2, 2)  

A1 Incorrect answer of some merit
QUESTION 7

Part (a) 5 marks Att 2

(a) Find the mode of the numbers
3, 2, 2, 3, 1, 3.

Mode = 3

Slips (-1)
S1 Calculates mean
S2 Finds median

Attempts (2)
A1 Incorrect answer of some merit

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

(b) The table below shows the time taken by 60 people to get ready for work in the
morning, correct to the nearest minute.

<table>
<thead>
<tr>
<th>Number of minutes</th>
<th>0 - 15</th>
<th>16 - 30</th>
<th>31 - 45</th>
<th>46 - 60</th>
<th>61 - 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people</td>
<td>3</td>
<td>15</td>
<td>26</td>
<td>14</td>
<td>2</td>
</tr>
</tbody>
</table>

Copy and complete the cumulative frequency table.

<table>
<thead>
<tr>
<th>Number of minutes</th>
<th>≤ 15</th>
<th>≤ 30</th>
<th>≤ 45</th>
<th>≤ 60</th>
<th>≤ 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Draw the cumulative frequency curve. Use your curve to estimate
(i) the median number of minutes taken to get ready
(ii) the number of people who took more than 20 minutes to get ready.

Cumulative Frequency Table 5 marks Att 2

<table>
<thead>
<tr>
<th>Time Taken (in Minutes)</th>
<th>≤ 15</th>
<th>≤ 30</th>
<th>≤ 45</th>
<th>≤ 60</th>
<th>≤ 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Employees</td>
<td>3</td>
<td>18</td>
<td>44</td>
<td>58</td>
<td>60</td>
</tr>
</tbody>
</table>

Slips (-1)
S1 Each incorrect or omitted value in the table

Attempts (2)
A1 Copies table
* Tolerance of ± 2 units

**Blunders (-3)**
- B1 Plots on the midpoints
- B2 Error in scales, one blunder
- B3 Points not joined

**Slips (-1)**
- S1 Each incorrectly plotted point
- S2 Reverses axes
- S3 Joins points with straight lines.

**Attempts (4)**
- A1 Draws axes only

<table>
<thead>
<tr>
<th></th>
<th>5 marks</th>
<th></th>
<th>5 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Median = 35</td>
<td>(ii)</td>
<td>More than 20 minutes = 60 – 7 = 53</td>
</tr>
</tbody>
</table>

**Blunders (-3)**
- B1 Uses wrong axis for median.

**Slips (-1)**
- S1 Median not specified
- S2 Fails to subtract reading in (ii)
(c) (i) Find the mean of the numbers 3, 4, 6, 8, 9.

(ii) Find the standard deviation of the numbers 3, 4, 6, 8, 9, correct to two decimal places.

<table>
<thead>
<tr>
<th>Mean</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Deviation</th>
<th>15 marks</th>
<th>Att 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(i) Mean \[ \frac{\sum x}{n} = \frac{3 + 4 + 6 + 8 + 9}{5} = \frac{30}{5} \] or 6

(ii) Standard Deviation

\[ \sqrt{\frac{\sum d^2}{n}} \]

\[ = \sqrt{\frac{(3 - 6)^2 + (4 - 6)^2 + (6 - 6)^2 + (8 - 6)^2 + (9 - 6)^2}{5}} \]

\[ = \sqrt{\frac{9 + 4 + 0 + 4 + 9}{5}} \]

\[ = \sqrt{\frac{26}{5}} \]

\[ = 2.2803 \]

\[ = 2.28 \]

Blunders (-3)
B1 3 + 4 + 6 + 8 + 9 or 30 and stops
B2 Incorrect substitution

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

Attempts (2, 6)
A1 Any addition
A2 Work on SD or defines SD
QUESTION 8

Part (a) 10 marks  Att 4

(a) Construct a triangle \(\triangle xyz\) where \(\lvert xy\rvert = 7\ \text{cm}, \lvert yz\rvert = 5\ \text{cm}, \angle xyz = 30^\circ\).

Blunders (-3)
B1 Each omitted side.
B2 Incorrect angle ± 5°

Slips (-1)
S1 Each given side outside tolerance of ± 1 cm
Part (b) \[20 \text{ (5, 5, 5) marks}\] [Att (2, 2, 2, 2)]

(b) The rectangle \( ab'c'd' \) is an enlargement of the rectangle \( abcd. \)

The centre of the enlargement is \( a. \)

\[ |ac| = 4 \text{ cm}, \; |bc| = 3 \text{ cm}, \; |d'c'| = 10 \text{ cm}. \]

\[
\begin{array}{c}
\quad a \\
\quad b \\
\quad d \\
\quad c \\
\quad c' \\
\quad d' \\
\quad b' \\
\end{array}
\]

(i) Find the scale factor.

(ii) Find the length of \([b'c']\).

(iii) Find the length of \([bb']\).

(iv) Find the area of the rectangle \( ab'c'd' \).

(i) scale factor $= \frac{10}{4}$ or 2.5.

(ii) \( |b'c'| = 3 \times 2.5 = 7.5 \text{ cm} \)

(iii) \( |bb'| = 10 - 4 = 6 \text{ cm} \)

(iv) Area \( ab'c'd' = 7.5 \times 10 = 75 \text{ cm}^2, \; \text{or} \; \text{area} = 4 \times 3 \times 2.5^2 = 75 \text{ cm}^2. \)

**Blunders (-3)**

- B1 Incorrect scale factor
- B2 Error in area formula
- B3 Does not square scale factor

**Slips (-1)**

- S1 Numerical errors to a max of 3
- S2 Multiplication for division or vice versa

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

- A1 Incorrect answer of some merit
(c) The diagram shows a patterned hexagonal tile.

(i) State whether the tile has a central symmetry (that is, a point of symmetry).

(ii) How many axial symmetries does the tile have?

(iii) How many rotational symmetries does the tile have?

(iv) List the angles of the rotational symmetries.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>5 marks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td></td>
<td>Att 2</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
<td>Att 2</td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td></td>
<td>Att 2</td>
<td></td>
</tr>
<tr>
<td>(iv)</td>
<td></td>
<td>Att 2</td>
<td></td>
</tr>
</tbody>
</table>

Ans: (i) No (ii) 3 (iii) 3 (iv) $0^0, 120^0, 240^0$

Blunders (-3)
B1 Answer greater than 3

Slips (-1)
S1 Each symmetry omitted.
S2 Each angle omitted
S3 Each additional angle in list
MARCANNA BREISE AS UCHT FREAGAIRT TRÍ GHAELGE

(Bonus marks for answering through Irish)

Ba chóir marcanna de réir an ghnáthráta a bhronnadh ar iarrrthóirí nach gnóthaíonn níos mó ná 75% d’iomlán na marcanna don pháipéar. Ba chóir freisin an marc bónais sin a shlánú sféas.

Déantar an cinneadh agus an riomhaireacht faoin marc bónais i gcás gach páipéir ar 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 iarrrthóirí a gnóthaíonn 225 marc nó níos lú, e.g. 198 marc $\times 5\% = 9\cdot9 \Rightarrow$ bónas = 9 marc.

Má gnóthaíonn an t-iarrthóir níos mó ná 225 marc, ríomhtar an bónas de réir na foirmle $[300 – \text{bunmharc}] \times 15\%$, agus an marc bónais sin a shlánú sféas. In ionad an riomhaireacht sin a dhéanamh, is féidir úsáid a bhaínt 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>