Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scéim Mharcála  Scrúduithe Ardteistiméireachta, 2005
Matamaitic  Bonnleibhéal

Marking Scheme  Leaving Certificate Examination, 2005
Mathematics  Foundation Level
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MARKING SCHEME

LEAVING CERTIFICATE EXAMINATION 2005

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.
QUESTION 1

- Arithmetic slips S(-1) if calculations by hand shown, to a maximum of –3 in each operation (excluding decimal errors).
- Decimal errors: B(-3).
- Misreadings must be clear and obvious.

<table>
<thead>
<tr>
<th>Each part</th>
<th>10 marks</th>
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<td>Part (i)</td>
<td>10 marks</td>
<td>Att 4</td>
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</table>

(i) Find $\sqrt{87}$, correct to two decimal places.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>$\sqrt{87} = 9.327... = 9.33$</td>
</tr>
</tbody>
</table>

*Accept correct answer with no work

Blunders(-3)
B1 Incorrect or omitted rounding-off.
B2 $\sqrt{8.7} = [2.949] = 2.95$
B3 $\sqrt{8.7} = [0.9327...\ldots] = 0.93$

Misreadings(-1)
M1 Find $\sqrt{78} = [8.8317] = 8.83$

Attempts(4 marks)
A1 $87^2 = 7569$
A2 $\frac{87}{2} = 43.5$
A3 Work at estimating answer : $\sqrt{87} = 9 \, \text{or} \, \sqrt{87} = 10$
A4 Rounds off an incorrect figure correctly
A5 Any other answers without work, containing sequence 2949... or 295..., 9327... or 933..

Worthless(0 marks)
W1 Incorrect answers with no work, other than those in scheme.
(ii) Find \((2.15)^3\), correct to the nearest whole number.

<table>
<thead>
<tr>
<th>(ii) ((2.15)^3) = 9.93... = 10</th>
</tr>
</thead>
</table>

*Accept correct answer with no work

**Blunders (-3)**
B1 Incorrect or omitted rounding-off.
B2 \((2.15)^2 = 4.6225 = \ldots\)

**Misreadings (-1)**
M1 Power \(\in N\) other than 1, 2 or 3 correctly worked.
M2 Finds \((2.51)^3 = [15.81] = 16\) or \((21.5)^3 = [9938.37] = 9938\)

**Attempts (4 marks)**
A1 \((2.15)^3 = 6.45\)
A2 \(\sqrt[3]{2.15} = 1.290...\) rounded/not rounded off
A3 \(2.15 \times 10^3 = 2150\)
A4 Work at estimation e.g. 8
Part (iii) 10 marks

(iii) Find the exact value of $45.5 - 3.5 \times 6.25$.

\[
45.5 - 21.875 = 23.625
\]

*Accept correct answer with no work.
* Allow for obvious misreading, but it must be clear.

**Blunders (-3)**
B1 Error in precedence: $(45.5 - 3.5)6.25 = 262.5$
B2 Rounds or truncates 21.875 and/or 45.5 and continues
B3 Subtraction omitted

**Attempts (4 marks)**
A1 Work at estimating answer e.g. $4 \times 6$
A2 Some correct operation with two or three of the given numbers.
(iv) Find the exact value of $\frac{2}{0.5} = \frac{2}{0.625}$

\[
2 - 3.2 = -1.2
\]

\[
or\quad \frac{0.625 - 1}{0.5 \times 0.625} = \frac{-0.375}{0.3125} = -1.2
\]

*Accept correct answer with no work

**Blunders (-3)**

- B1 Commutative error: Ans. = 1.2
- B2 Error in calculating fraction (each time if different error) e.g. \(2/0.625 = 0.3125\)
- B3 No subtraction
- B4 Adds (Ans 5.2)
- B5 Misplaced decimal, unless an obvious misread

**Attempts (4 marks)**

- A1 Works towards estimate
- A2 1 correct step e.g. \(\frac{1}{0.5} = 2\) or \(\frac{10}{5}\)
- A3 Gets common denominator: \(0.5 \times 0.625\)
- A4 Correctly evaluates an incorrect fraction e.g. \(\frac{1}{0.125} = 8\)

** Worthless (0 marks)**

- W1 Subtracts numerator or denominator or similar e.g. \(\frac{1}{0.125}\)
A holiday costs €650.
The booking deposit is 15% of this cost.
Find the booking deposit

\[
\frac{650 \times 15}{100} = €97.50
\]

*Accept correct answer with no work*

**Blunders (-3)**
B1 \(650 \times 1.15 = 747.50\)
B2 \(650 \times 0.85 = 552.50\)
B3 Gets 1% (= 6.50) or 5% (=32.50) without work. For any other % need work shown.
B4 Decimal error
B5 \(\frac{650 \times 15}{100}\) or similar and stops.

**Attempts (4 marks)**
A1 \(\frac{650}{15}\) or \(\frac{15}{650}\) or \(\frac{650}{100}\) or similar
A2 \(\frac{15}{100}\) or 0.15 written and stops.

**Worthless (0 marks)**
W1 \(650 \pm 15\) (665 or 635).
(vi) Given that €1 is worth $1.25, find the value of €767, correct to the nearest dollar.

\[
1.25 \times 767 = 958.75 = \$959
\]

*Accept correct answer with no work*

**Blunders (-3)**

B1 Answer not given to the nearest dollar.

B2 \(767 \div 1.25 = 613.6 = 614\)

B3 Decimal error

**Attempts**

A1 \(1 \times 1.25\) written

A2 \(1.25 \div 767\)
(vii) Express \( \frac{1}{2} + \frac{3}{13} \) as a decimal, correct to two decimal places.

\[
\begin{align*}
&1.5 + 0.2307… = 1.7307… = 1.73 \\
or \\
\frac{3}{2} + \frac{3}{13} &= \frac{39 + 6}{26} = \frac{45}{26} = \frac{19}{26} = 1.7307… = 1.73
\end{align*}
\]

*Accept correct answer with no work

**Blunders (-3)**
- B1 Incorrect or no rounding off.
- B2 Error in converting fraction to decimal
- B3 No addition
- B4 Decimal error
- B5 Uses wrong operator \((\times, \div, -)\)

**Attempts (4 marks)**
- A1 Effort at converting either of the given fractions to a decimal
- A2 Converts a fraction (written) to a decimal correctly eg \( \frac{1}{7} / 15 = 1.266… \)
- A3 A correct calculation
- A4 1< Ans.<2 (in either decimal or fraction form.)

**Worthless (0 marks)**
- W1 Incorrect answer with no work shown, other than A4
(viii) Divide €112 in the ratio 2:5:7.

\[
\begin{align*}
2 + 5 + 7 &= 14 \\
112 \times \frac{2}{14} &= 16; \\
112 \times \frac{5}{14} &= 40; \\
112 \times \frac{7}{14} &= 56
\end{align*}
\]

or

\[
\begin{align*}
112 \div 14 &= 8 \\
8 \times 2 &= 16 \\
8 \times 5 &= 40 \\
8 \times 7 &= 56
\end{align*}
\]

Blunders (-3)

B1 \( \frac{112}{14} \text{ or } 8 \) and stops

B2 Three correct answers with no work shown.

Slips (-1)

S1 Each answer not calculated fully.

Attempts (4 marks)

A1 \( 2+5+7 \text{ or } 14 \) and stops

A2 One or two correct answers with no work shown

A3 \( 112 \div 2 \text{ and/or } 112 \div 5 \text{ and/or } 112 \div 7 \)
Part (ix)  

Find correct to two significant figures

\[
\frac{34.8 \times 2.05}{46.3 - 11.7}
\]

\[= \frac{71.34}{34.6} = 2.061\ldots = 2.1\]

*Accept correct answer with no work

Blunders (-3)
B1 Incorrect or no rounding off to significant figures
B2 Error in precedence
B3 Decimal error
B4 Each omitted step e.g. \(\frac{71.34}{34.6}\) and stops
B5 Inverted fraction: 0.485\ldots = 0.49

Slips (-1)
S1 Numerical errors

Misreadings (-1)
M1 Clear and obvious misreading

Attempts (4 marks)
A1 Any correct step e.g. 46.3 – 11.7 = 34.6
A2 Some work towards estimating answer
A3 10.159 or 10 or 23.23.. or 23 without work.
(x) Find the exact value of \[\frac{27.3 \times 10^5}{2.05 \times 10^6 + 0.25 \times 10^7}\].

\[
\begin{align*}
\text{(x)} & \quad \frac{27.3 \times 10^5}{4.55 \times 10^6} = 0.6 = 6 \times 10^{-1} \quad \text{or} \quad \frac{2730000}{2050000 + 2500000} = \frac{2730000}{4550000} = 0.6
\end{align*}
\]

*Accept correct answer with no work

Blunders (-3)
B1 Error in precedent
B2 Each omitted or incorrect step if slips not clear.
B3 Misplaced decimal or wrong order of magnitude each time.
B4 Inverts fraction 1.666… or 1.667

Attempts (4 marks)
A1 \(10^5 = 50\) and/or \(10^6 = 60\) and/or \(10^7 = 70\) used.
A2 Some work towards approximation.
A3 One or more powers cancelled correctly and stops
A4 One or more power expanded correctly e.g. \(10 \times 10 \times 10 \times 10 \times 10\)
The following apply to the remaining questions on this paper:
- In general, incorrect or no rounding off incurs S(-1).
- There will be no penalty for units not written or written incorrectly.
- A worthless answer in one part, will lead to an attempt at best in the next part, if used.

**QUESTION 2**

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<td>Part (b)</td>
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<td>Att 8</td>
</tr>
<tr>
<td>Part (c)</td>
<td>20 marks</td>
<td>Att 8</td>
</tr>
</tbody>
</table>

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

(a) A jug contains 1.5 litres of water.  
Another 750 cm$^3$ of water is poured into the jug.  
How much water is then in the jug? Give your answer in cm$^3$.

(a)  
1.5× 1000 = 1500;  
1500 + 750 = **2250 cm$^3$**.

* Accept correct answer with no work

**Blunders (-3)**
- Blunders (1) Adds without conversion
- B2 1000 ÷ 1.5
- B3 No addition.(1500+ 750 and stops)
- B4 Subtracts volumes (750 cm$^3$ with work)

**Slips (-1)**
- S1 Answer given (correctly) in litres. (2.25l)
- S2 Incorrect conversion factor eg 1.5 l = 150cm$^3$.

**Attempts (4 marks)**
- A1 Indication of addition (1.5 +750)
- A2 1500 and stops.
Each week a person earns €510 and has Tax Credits of €56. The rate of tax is 20%.

(i) Find the amount of tax paid by this person each week.

(ii) Find the person’s weekly take-home pay.

\[
\text{(b)(i)} \quad 510 \times 0.2 = 102 \quad 102 - 56 = \€ 46
\]

*Accept correct answer without work.

**Blunders (-3)**
- B1 Error in calculating % eg 510 × 1.20
- B2 Ignores tax credit
- B3 Adds on tax credit
- B4 Subtracts tax credit first (€90.80)

**Slips (-1)**
- S1 Misplaced decimal point

\[
(510 + 56) \times 0.2 = \€ 113.20
\]

2×B(-3) = 4 marks

**Attempts (4 marks)**
- A1 510 ± 56, worked, and stops
- A2 Some effort at getting%

\[
\text{(b)(ii)} \quad 510 - 46 = \€ 464
\]

* Accept candidates figures from (i)
* Accept correct answer without work.

**Blunders (-3)**
- B1 Uses wrong Gross wage e.g. 102 - 46
- B2 Uses wrong Tax (510-102)
- B3 Adds Tax
- B4 Subtraction not completed

**Attempts (4 marks)**
- A1 510 – a spurious number
A train travelled 110 km in 2 hours. The train travelled the first 60 km at an average speed of 45 km per hour. It travelled the next 30 km at an average speed of 90 km per hour.

(i) How long did it take the train to travel the first 60 km?
Give your answer in hours and minutes.

(ii) Calculate the average speed of the train for the last 20 km.
Give your answer in km per hour.

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<tr>
<th>(c)(i)</th>
<th>10 marks</th>
<th>Att 4</th>
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<tbody>
<tr>
<td>(c)(i)</td>
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<td></td>
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</tbody>
</table>

\[
\frac{60}{45} = 1 \frac{1}{3} = 1.333... = 1 \text{ h} 20 \text{ min}
\]

* Accept correct answer with no work.

Blunders (-3)
- B1 \( 60 \times 45 = 2700 \)
- B2 \( 45 \div 60 = 0.75 \)
- B3 Incorrect conversion or no conversion to hours and minutes

Attempts (4 marks)
- A1 Effort at calculating time
- A2 1 hour < Answer < 2 hours

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<th>10 marks</th>
<th>Att 4</th>
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<td>(c)(ii)</td>
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<td></td>
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</tbody>
</table>

\[
\frac{30}{90} = \frac{1}{3} = 20 \text{ min.}
\]

\[
2h - (1h20m + 20m) = 20m = \frac{1}{3}
\]

\[
\text{speed} = \frac{20}{\frac{1}{3}} = 60 \text{ km/h.}
\]

Blunders (-3)
- B1 Incorrect formula for time (if different error from (i))
- B3 1h20min – 20min
- B4 2h – (different time from worked figures)
- B5 Error in formula for speed
- B6 1h = 100min (if not penalised in (i))

Slips (-1)
- S1 Arithmetic errors
- S2 Answer not in km/h.

Attempt (4 marks)
- A1 If \( \frac{30}{90} \) ignored: Attempt (6 marks) at best
- A2 \( \frac{1}{3} \) or 20 min. with no work shown.
- A3 Effort at calculating time
- A4 Effort at calculating speed
- A5 Correct answer without work.
QUESTION 3

Part (a) 10 marks -
Part (b) 20 marks -
Part (c) 20 marks -

Note: The marking of Question 3 is not based on slips, blunders and attempts. In the case of each part, descriptions or typical examples of work meriting particular numbers of marks are given. The mark awarded must be one of the marks indicated. For example, in part (a)(ii), descriptions are given for work meriting 0, 3 or 5 marks. It is therefore not permissible to award 1, 2 or 4 marks for this part.

Part (a) 10 (5, 5) marks -

(a) A student estimates the time taken to go to school was 35 minutes. The actual time was 38 minutes. Find
   (i) the error in the estimate.
   (ii) the percentage error, correct to two decimal places.

(a)(i) 5 marks -

(a) (i) Error = 38 – 35 = 3 minutes

5 marks: [38 – 35] = 3
0 marks: otherwise.

(a)(ii) 5 marks -

(ii) Percentage error = \( \frac{3}{38} \times 100 = 7.894.. = 7.89\% \)

5 marks: \( \frac{3 \times 100}{38} = [7.894] = 7.89 \)
Correct answer without work.

3 marks: Correct expression, finished incorrectly, or
Incorrect expression, finished correctly.

0 marks: otherwise
A shop sells loose sweets by weight. Peter bought 250 grammes of sweets for €1.75.

(i) Ann bought 300 grammes of the sweets. How much did she pay?

(ii) Brian spent €3.15 on sweets. How many grammes did he get?

(b)(i) 10 marks

$$\frac{1.75 \times 300}{250} = €2.10$$

10 marks: Correct expression, completed correctly. Correct answer without work.

7 marks: Correct expression not completed, or completed with substantial error
Expression with one error correctly completed e.g. $$\frac{1.75}{250} = 0.007$$ or $$\frac{300}{250} = 1.2$$
Correct cost of 1g or 50g or any common factor evaluated

4 marks: Any correct, relevant step e.g. $$\frac{250}{300}$$

(b)(ii) 10 marks

$$\frac{250 \times 3.15}{1.75} = 450g \quad \text{or} \quad \frac{300 \times 3.15}{2.10} = 450g$$

10 marks: Correct expression, completed correctly. Correct answer without work.

7 marks: Correct expression not completed, or completed with substantial error
Expression with one error correctly completed e.g. $$\frac{3.15}{1.75} = 1.8$$

4 marks: Any correct, relevant step e.g. $$\frac{250}{300}$$
(c) A car was bought for €20 000. After one year it had depreciated in value to €17 000.

(i) What was the annual percentage rate of depreciation?

(ii) At this rate of depreciation, how much will the car be worth 4 years after it was bought? Give your answer correct to the nearest euro.

<table>
<thead>
<tr>
<th>(c)(i)</th>
<th>10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c)(i)</td>
<td>$20000 - 17000 = 3000; \frac{3000}{20000} \times 100 = 15%$</td>
</tr>
<tr>
<td>or</td>
<td>$17000 = 20000(1-\frac{r}{100})^1$ =&gt; $\frac{r}{100} = \frac{3}{20}$ =&gt; $r = 15$ =&gt; $15%$</td>
</tr>
</tbody>
</table>

10 marks: Correct expression completed correctly $\frac{3000}{20000} \times 100 = 15\%$

Correct answer without work.

7 marks: Correct expression, incomplete or completed with substantial error $\frac{3000 \times 100}{17000}$ and completed correctly $\frac{17000 \times 100}{20000}$ and completed correctly

4 marks: one correct relevant step e.g. writes 3000 or $\frac{17000}{20000}$

<table>
<thead>
<tr>
<th>(c)(ii)</th>
<th>10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) (ii)</td>
<td>$A = 20000(1-\frac{15}{100})^4$ =&gt; $20000(0.85)^4$ =&gt; $10440.125$ =&gt; €10440</td>
</tr>
<tr>
<td>or</td>
<td>End 1st yr: 17000 =&gt; End 2nd yr: 17000x0.85 = 14450 =&gt; End 3rd yr: 14450x0.85 = 12282.5 =&gt; End 4th yr: 12282.5x0.85 = 10440.125 = €10440</td>
</tr>
</tbody>
</table>

*Accept candidate’s answer from (c)(i)*

10 marks: Fully correct solution

9 marks: Fails to round an otherwise correct solution.

7 marks: Correct depreciation method but error in completing e.g. calculation error or expression finished correctly but number of years out by one.

4 marks: Any other work of merit e.g. appreciation or €8000
## QUESTION 4

<table>
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<td>Part (b)</td>
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<td>Part (c)</td>
<td>20 marks</td>
<td>Att 8</td>
</tr>
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</table>

### Part (a) 10 marks  Att 4

(a) Solve \(4x + 3 = 18 - x\)

\[
\begin{align*}
4x + x &= 18 - 3 \\
5x &= 15 \\
x &= 3
\end{align*}
\]

* Award full marks for a correct answer with no work shown

### Blunders (-3)

- B1 Blunders in grouping terms e.g. \(4x + 3 = 7x\)
- B2 Transposition errors each time, if different error
- B3 Each step omitted

### Attempts (4 marks)

- A1 Some correct work
- A2 Effort at \(T+E\) by substitution

### Part (b) 20 marks  Att 8

(b) Solve the simultaneous equations

\[
\begin{align*}
x + 2y &= -4 \\
2x - y &= 7
\end{align*}
\]

1st variable found 15 marks  Att 6
2nd variable found 5 marks  Att 2

\[
\begin{align*}
x + 2y &= -4 \\
4x - 2y &= 14 \\
5x &= 10 \\
2y &= -4 \\
x &= 2
\end{align*}
\]

### Blunders (-3)

- B1 Blunder in multiplying by 2 or \(-2\) (once per line)
- B2 Blunder in cancelling (once)
- B3 Blunder in substitution e.g. \(y\) value for \(x\)
- B4 Transposition errors

Random \(x\) picked, \(y\) calculated (or vice-versa) – award 5 marks
Substitution of correct values in both equations and verification shown – Award 20 marks

### 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 (8 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 (Att6 or Att6 + Att2)

Worthless (0 marks)
W1 Incorrect answer(s), no work shown.

<table>
<thead>
<tr>
<th>Part (c)</th>
<th>20(5, 10, 5) marks</th>
<th>Att 8 (2, 4, 2)</th>
</tr>
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<tbody>
<tr>
<td>(c) (i)</td>
<td>Solve $2x + 1 \geq 9$.</td>
<td>5 marks Att 2</td>
</tr>
<tr>
<td>(ii)</td>
<td>Solve $3 - 4x \geq -17$.</td>
<td>10 marks Att 4</td>
</tr>
<tr>
<td>(iii)</td>
<td>Write down the whole numbers which satisfy both $2x + 1 \geq 9$ and $3 - 4x \geq -17$.</td>
<td>5 marks Att 2</td>
</tr>
</tbody>
</table>

(i) $2x + 1 \geq 9 \Rightarrow 2x \geq 8 \Rightarrow x \geq 4$

(ii) $3 - 4x \geq -17 \Rightarrow -4x \geq -20 \Rightarrow 4x \leq 20 \Rightarrow x \leq 5$

* Using equality instead of inequality in (i) ignore
* Using equality instead of inequality in (ii) B(-3)

(iii) 4, 5

* If equality dropped : ignore (>for $\geq$)

Blunders(-3)
B1 Blunder in grouping terms e.g. $2x + 1 = 3x$
B2 Blunder in direction of inequality sign
B3 Transposition errors

Attempts(2 or 4 marks)
A1 Some effort at rearranging terms
A2 Attempt at T+E parts (i)(2m) and (ii)(4m)
A3 Any correct value listed (iii)
### QUESTION 5

<table>
<thead>
<tr>
<th>Part (a)</th>
<th>10 (5, 5) marks</th>
<th>Att 4(2, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a)</strong></td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>(i)</td>
<td>List all the even numbers between 9 and 21.</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>List all the prime numbers between 9 and 21.</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>10, 12, 14, 16, 18, 20</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>11, 13, 17, 19</td>
<td></td>
</tr>
</tbody>
</table>

Slips(-1)
S1 Each omitted or incorrect entry, provided at least one is correct.

Attempts(2 marks)
A1 At least one correct entry, each part
A2 Defines prime number (ii)

<table>
<thead>
<tr>
<th>Part (b)</th>
<th>20(5, 15) marks</th>
<th>Att 8 (2, 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(b)</strong></td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>(i)</td>
<td>Solve the quadratic equation $x^2 + 3x + 2 = 0$.</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>Solve the quadratic equation $5x^2 - 11x - 3 = 0$, correct to one decimal place.</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>$x^2 + 3x + 2 = 0 \Rightarrow (x + 2)(x + 1) = 0 \Rightarrow x = -2$ $x = -1$</td>
<td></td>
</tr>
</tbody>
</table>

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

Attempts (2 marks)
A1 Effort at finding factors
A2 Attempt at T + E

<table>
<thead>
<tr>
<th>Part (b)</th>
<th>15 marks</th>
<th>Att 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii)</td>
<td>$5x^2 - 11x - 3 = 0 \Rightarrow x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(5)(-3)}}{2(5)} = \frac{11 \pm \sqrt{121 + 60}}{10} = \frac{11 \pm 11.5}{10}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\Rightarrow x = \frac{11 \pm 13.45}{10} = 2.44...or -0.24... \Rightarrow x = 2.4 \text{ or } x = -0.2$</td>
<td></td>
</tr>
</tbody>
</table>

*Maximum deductions beyond this point is 4 marks
### Blunders (-3)
- B1 Incorrect choice of constants \((a, b, c)\) applied once (consistent error)
- B2 Incorrect substitution into formula, subject to S2 below
- B3 Blunder in application of formula
- B4 Omits ± in formula
- B5 Each step omitted in completing work

### Slips (-1)
- S1 Slips in signs on substitution into formula
- S2 Incorrect sign on coefficient, applied each time
- S3 \(121 + 60 = 61\)
- S4 Incorrect or omitted round off, each time

### Attempts (6 marks)
- A1 Effort at substitution into formula
- A2 Incorrect formula with substitution
- A3 Attempt at finding factors e.g. \((5x)(x)\) or guide no. = -15
- A4 No quadratic: e.g. \(5x - 11x - 3 = 0\) and continues with some correct work.

### Part (c) 20(5,5,5,5) marks Att8(2,2.2.2)
(c) Laura, Barry and David use their mobile phones to send text messages. In one week they sent a total of 74 messages.

- Laura sent \(x\) messages.
- Barry sent twice as many as Laura.
- David sent 8 messages.

(i) Write the above information as an equation in \(x\).

(ii) Solve the equation to find the value of \(x\).

(iii) How many messages did Barry send?

(iv) Write the number of messages sent by Laura as a percentage of the total number of messages sent, correct to the nearest whole number.

### (c)(i) 5 marks Att 2
(i) 
\[
x + 2x + 8 = 74
\]

### Blunders (-3)
- B1 \(x + 2\) instead of \(2x\)
- B2 Blunder in linking elements e.g. \(x \times 2x\)
- B3 One term omitted from, or misplaced in equation.

### Attempts (2 marks)
- A1 \(2x\) identified
- A2 Two or more correct elements linked, but an equation not formed.
(c)(ii) 5 marks Att 2

| (ii)       | x + 2x + 8 = 74 \Rightarrow 3x = 74 - 8 = 66 \Rightarrow x = 22 |

*Use candidate’s equation from (i)
*Accept correct worked solution, even if the variable x is not used.

Blunders (-3)
B1 Errors in grouping terms
B2 Transposition errors

Attempts (2 marks)
A1 Effort at solving equation by T + E

(c)(iii) 5 marks Att 2

| (iii)       | 2(22) = 44 |

* Accept correct answer from candidate’s figures, without work

Blunders (-3)
B1 ½ (answer from (ii))

Attempts (2 marks)
A1 2(8) = 16 with/without work

(c)(iv) 5 marks Att 2

| (iv)       | \frac{22 \times 100}{74} = 29.7\ldots = 30\% |

*Use candidate’s answer from (ii)

Blunders (-3)
B1 Error in finding % e.g. 22 \times 0.74

Misreading (-1)
M1 Uses 44 or 8 in numerator (59.4\ldots = 59\% or 10.8\ldots = 11\%)

Slips (-1)
S1 Incorrect or no rounding off.
S2 Incomplete calculations i.e. \frac{22 \times 100}{74} and stops 3 marks (S1 + S2)

Attempts (2 marks)
A1 Any attempt at %
6. A shop rents out videos and DVDs. The graph below shows the breakdown of rentals over a week. For example, on Tuesday there were 5 video and 8 DVD rentals.

<table>
<thead>
<tr>
<th>Day of the week</th>
<th>Videos</th>
<th>DVDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tues</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Wed</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Thurs</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Fri</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Sat</td>
<td>25</td>
<td>22</td>
</tr>
</tbody>
</table>

Part (i)  15 marks  Att 6
(i) How many videos were rented on Friday?

(i)  15 marks  Att 6
(i) 21

Blunders (-3)
B1 DVD given (18)
B2 Total given (39)  but 21 + 18 = 39 (or otherwise) Full marks

Slips (-1)
S1 Gives 20 or 22

Attempts (6marks)
A1 10, 5, 15 or 23 given
Part (ii)  15 marks  Att 6

(ii) How many more videos than DVDs were rented on Wednesday?

(ii)  15 marks  Att 6

| (ii) | 10 - 6 = 4 |

*Accept correct answer without work

Blunders (-3)
B1 Subtraction indicated but not done
B2 Adds [10 + 6] = 16

Slips (-1)
S1 [10-5] = 5

Attempts (6 marks)
A1 10 or 6 given
A2 3 or 2 given.

Part (iii)  10 marks  Att 4

(iii) On which days of the week was the number of videos rented greater than the number of DVDs rented?

(iii)  10 marks  Att 4

| (iii) | Mon, Weds, Fri, Sat |

Blunders (-3)
B1 Tues, Thurs. only given
B2 Each day omitted
B3 Tues. or Thurs added to list

Attempts (4 marks)
A1 At least one correct day listed
Part (iv) 5 marks  Att 2

(iv) Find the average number of videos rented per day.

(iv) 5 marks  Att 2

\[
\frac{10 + 5 + 10 + 15 + 21 + 23}{6} = \frac{84}{6} = 14
\]

Blunders (-3)
B1 Uses DVD total: \( \frac{72}{6} = 12 \)
B2 Uses incorrect numerator
B3 Uses incorrect denominator
B4 Fraction inverted (0.071…)
B5 Blunder in precedence
B6 Calculation not complete
B7 Correct answer and no work.

Slips (-1)
S1 Numerical errors
S2 Each omitted or incorrect value in numerator to max –3

Attempts (2 marks)
A1 Some effort at finding average.
A2 12 without work
Worthless(0 marks)
W1 Other incorrect answer with no work.

Part (v) 5 marks  Att 2

(v) Over the six days, what percentage of rentals were DVDs?
Give your answer correct to the nearest whole number.

(v) 5 marks  Att 2

\[
\frac{6 + 8 + 6 + 17 + 18 + 17}{72} = \frac{72 \times 100}{156} = 46.15 = 46\%
\]

*Accept candidate’s total(s) from previous parts

Blunders (-3)
B1 Uses video total: (53.8…= 54%)
B2 84 or 72 used as denominator.
B3 100 omitted or incorrectly used
B4 Calculation not performed

Slips (-1)
S1 Incorrect or no rounding off

Attempts (2 marks)
A1 Finds 72 and/or 84 and/or156 and stops
QUESTION 7

Graph  30 marks  Att 12
Values  20 marks  Att 8
Table  20 marks  Att 8
Graph  10 marks  Att 4

Draw the graph of the function

\[ f : x \rightarrow 2x^2 + 3x - 4 \quad \text{for} \quad -3 \leq x \leq 2, \quad x \in \mathbb{R}. \]

<table>
<thead>
<tr>
<th>x</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x^2</td>
<td>18</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>+3x</td>
<td>-9</td>
<td>-6</td>
<td>-3</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>-4</td>
<td>-4</td>
<td>-4</td>
<td>-4</td>
<td>-4</td>
<td>-4</td>
<td>-4</td>
</tr>
<tr>
<td>f(x)</td>
<td>5</td>
<td>-2</td>
<td>-5</td>
<td>-4</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

Blunders (-3)
B1  x-values added
B2  Consistent errors across full line such as \(2x^2 = (2x)^2\), or \(-4 = 4x\) or \(x - 4\).
Otherwise slips applied

Misreadings (-1)
M1  +3x treated as –3x across the line
M2  -4 treated as 4 across the line

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

Attempts (8 marks)
A1  Any four correct calculated values in the table or function form.
A2  Graph treated as linear e.g. \(2x^2 = 4x\)

*Accept candidate’s values from table
*Fully correct graph drawn with no work shown: award 30 marks
Blunders (-3)
B1 Points joined in incorrect order
B2 Blunders in scales or axes, including reversing + and -.

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 Axes reversed.

Attempts (4 marks)
A1 At least two of candidate’s points plotted
A2 Any U-shaped graph
A3 Axes Drawn

Values

<table>
<thead>
<tr>
<th>Use your graph to estimate</th>
<th>(5, 5, 5)</th>
<th>Att 8(2, 2, 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) the roots of f(x) = 0</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>(ii) the minimum value of f(x)</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>(iii) the value of f(1.5)</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>(iv) The values of x for which f(x) = 1.</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
</tbody>
</table>

(i) 0.8 and −2.4
(ii) −5.1
(iii) 5
(iv) −2.5 and 1

*Accept candidate’s values from graph
*Allow tolerance ± 0.2 units on x-axis, ± 0.5 units on y-axis

Blunders (-3)
B1 Each value outside tolerance
B2 Value omitted, or extra value. Applies in parts (i) and (iv)
B3 Uses f(x) = 1.5 in part (iii)

Misreading (-1)
M1 Gives the value of x corresponding to the minimum of f(x) in part (ii)

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

Attempts (2 marks)
A1 Effort at reading value(s) from graph
A2 Correctly solving equation algebraically: parts (i) and (iv)
A3 Calculating f(1.5) part (iii)
MARKING SCHEME
LEAVING CERTIFICATE EXAMINATION 2005
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  Att 4
Part (b)  40 marks  Att 16

Part (a)  20 marks  Att 8

(a) The area of the triangle shown is 10 cm$^2$. The length of the base is 8 cm.
Find $h$ the perpendicular height of the triangle.

\[
\frac{1}{2}(8)h = 10
\]
\[
\Rightarrow h = 2.5 \text{cm}
\]

Blunders (-3)
B1 Fails to multiply or divide by 2
B2 Incorrect substitution in formula.

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

Attempts (8 marks)
A1 Copies diagram
A2 Defines area
A3 Adds or subtracts or multiplies 10 and 8.
(b) A plot of land has a straight edge \([ab]\). Offsets of lengths 23, 28, 35, 32, and 30 metres are measured at intervals of 24 metres along \([ab]\) as shown. Calculate the area of the plot using Simpson’s Rule.

\[
\begin{align*}
\text{Area} &= \frac{1}{3} \text{width} \left[ \text{First} + \text{last} + 2(\text{odd}) + 4(\text{even}) \right] \\
\text{Area} &= \frac{24}{3} \left[ 0 + 0 + 2(28 + 32) + 4(23 + 35 + 30) \right] \\
\text{Area} &= 3776 \text{m}^2
\end{align*}
\]

**Blunders (-3)**
- B1 Uses four odd and twice even
- 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.

**Slips (-1)**
- S1 Each incorrect or omitted altitude
- S2 Numerical errors to a max of three.

**Attempts (12)**
- A1 Gives Simpson’s Formula only
- A2 Copies diagram
**QUESTION 2**

<table>
<thead>
<tr>
<th>Part (a)</th>
<th>20(10,5,5) marks</th>
<th>Att 8 (4,2,2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part (b)</td>
<td>30(10,10,10) marks</td>
<td>Att 12</td>
</tr>
</tbody>
</table>

Note: The marking of Question 2 is not based on slips, blunders and attempts. In the case of each part, descriptions or typical examples of work meriting particular numbers of marks are given. The mark awarded must be one of the marks indicated. For example, in part (a)(i), descriptions are given for work meriting 0, 4, 7 or 10 marks. It is therefore not permissible to award 1, 2, 3, 5, 6, 8 or 9 marks for this part.

### Part (a) 20(10,5,5) marks Att 8 (4,2,2)

2.(a) (i) Calculate the area of the square in the diagram.

(ii) Calculate the area of the circle, correct to one decimal place.

(iii) Calculate the area of the shaded region, correct to the nearest whole number.

Take \( \pi = 3.14 \).

<table>
<thead>
<tr>
<th>(i) 10 marks</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area = 10 \times 10 = 100m^2</td>
<td></td>
</tr>
</tbody>
</table>

10 marks: Correct area  
7 marks: For 10 by 10 not multiplied  
4 marks: Correct statement of area  
0 marks: No meaningful work

<table>
<thead>
<tr>
<th>(ii) 5 marks</th>
<th>-</th>
</tr>
</thead>
</table>
| Area = 3.14 \times 5^2 or  
Area = \frac{3.14(10)^2}{4}  
Area = 78.5cm^2 |

5 marks: Correct area  
3 marks: Writes down correct formula  
0 marks: No meaningful work

<table>
<thead>
<tr>
<th>(iii) 5 marks</th>
<th>-</th>
</tr>
</thead>
</table>
| Shaded = 100 - 78.5  
Ans = 22m^2 |

5 marks: Correct area  
3 marks: Areas written down, no subtraction  
0 marks: No meaningful work
(i) The radius of a cylinder is 6 cm and its height is 10 cm. Calculate the volume of the cylinder in terms of $\pi$.

(ii) A cone has a radius of 12 cm and a vertical height of $h$ cm. Calculate the volume of the cone in terms of $h$ and $\pi$.

(iii) The volume of the cone is the same as the volume of the cylinder. Calculate the vertical height of the cone.

(i)  

<table>
<thead>
<tr>
<th>10 marks</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Volume = \pi (6)^2 \times 10$</td>
<td></td>
</tr>
<tr>
<td>$Volume = 360\pi \text{cm}^3$</td>
<td></td>
</tr>
</tbody>
</table>

10 marks: correct volume
7 marks: Correct formula filled in, not worked out.
4 marks: Correct formula written down
0 marks: No meaningful work

(ii)  

<table>
<thead>
<tr>
<th>10 marks</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Volume = \frac{\pi r^2 h}{3}$</td>
<td></td>
</tr>
<tr>
<td>$Volume = 48\pi h \text{ cm}^3$</td>
<td></td>
</tr>
</tbody>
</table>

10 marks: Correct volume
7 marks: Correctly filled in formula not worked out
4 marks: Correct formula written down
0 marks: No meaningful work

(iii)  

<table>
<thead>
<tr>
<th>10 marks</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>$48\pi h = 360\pi$</td>
<td></td>
</tr>
<tr>
<td>$\Rightarrow h = \frac{360\pi}{48\pi}$</td>
<td></td>
</tr>
<tr>
<td>$\Rightarrow h = 7.5 \text{ cm}$</td>
<td></td>
</tr>
</tbody>
</table>

10 marks: $h$ correctly found
7 marks: Equation correctly set up, $h$ not evaluated
4 marks: Some incorrect equation written down
0 marks: No meaningful work
QUESTION 3

Part (a)  10(5,5) m  Att 4(2,2)
Part (b)  20(5,5,5,5) m  Att8(2,2,2,2)
Part (c)  20(5,10,5)  Att 8(2,4,2)
Part (a)  10(5,5) m  Att 4(2,2)

(a) The diagram shows a parallelogram.
Find the value of $x$ and the value of $y$.

![Parallelogram Diagram]

 Ans: $x = 130^\circ$, $y = 50^\circ$

Blunders (-3)
B1 Incorrect answer without work, for both values.

Slips (-1)
S1 Numerical errors

Attempts (2,2)
A1 Copies diagram

(b)  20 (5,5,5,5)  Att 8(2,2,2,2)

(b) The lines $K$ and $L$ are parallel. 
Find
(i) the measure of the angle $A$
(ii) the measure of the angle $B$
(iii) the measure of the angle $C$
(iv) the measure of the angle $D$.

![Parallel Lines Diagram]

 Ans: (i) $A = 125^\circ$, (ii) $B = 55^\circ$, (iii) $C = 85^\circ$, (iv) $D = 140^\circ$.

Blunders (-3)
B1 Incorrect answer without work, each time.
B2 Angle on line not equal to 180 degrees.
B3 Wrong alternative.

Slips(-1)
S1 Numerical errors

Attempts 8
A1 Copies diagram
The diagram shows a circle with centre $o$. $a$, $b$ and $c$ are points on the circle and $[ab]$ is a diameter.

(i) Write down the measure of the angle $\angle acb$.
(ii) Name two line segments equal in length to $[oa]$.
(iii) The radius of the circle is 3.25 cm and $|[ac]| = 6$ cm. Calculate $|cb|$.

\[
\begin{array}{c|c|c}
\text{(i)} & \text{5 marks} & \text{Att 2} \\
\text{(ii)} & \text{5+5 marks} & \text{Att 2, 2} \\
\text{(iii)} & \text{5 marks} & \text{Att 2} \\
\end{array}
\]

\text{Ans: (i)90°, (ii)oc, ob, (iii)2.5cm.}

**Blunders (-3)**

B1 $|\angle acb| \neq 90°$

B2 Gives $ab$

B3 Any error in Pythagoras

**Slips (-1)**

S1 Numerical errors

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

A1 Copies diagram
### QUESTION 4

| Part (a) | 15 (10,5) marks | Att 6(4,2) |
| Part (b) | 20 (10,5,5) marks | Att 8(4,2,2) |
| Part (c) | 15 (5,5,5) marks | Att 6(2,2,2) |

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

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

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

(ii) Find the co-ordinates of the midpoint of \(pq\).

(i) **10 marks** Att 4

(ii) **5 marks** Att 2

![Graph showing points and midpoint](image)

(ii) midpt. \(= \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left( \frac{-3 + 1}{2}, \frac{4 + 2}{2} \right) = (-1, 3)\)

* Accept co-ordinates of midpoint without work.

**Blunders (-3)**
- B1 No division
- B2 Coordinates of midpoint not written down

**Slips (-1)**
- S1 Each incorrectly plotted point.
- S2 Numerical errors

| Part (b) | 20(10,5,5) m | Att 8 |

\(a\) is the point \((-3, 5)\) and \(b\) is the point \((1, -3)\).

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

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

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

(i) **10 marks** Att 4

(ii) **5 marks** Att 2

(iii) **5 marks** Att 2

\(Ans: (i)\sqrt{80}, (ii) -2, (iii)2x + y + 1 = 0.\)

**Blunders (-3)**
- B1 No square root
- B2 Mathematical error

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

Attempts
- A1 Draws axes
(c) The line $K$ has equation $y = 3x - 5$.
The point $c$ has co-ordinates $(1, -2)$.

(i) Show that the point $c$ lies on the line $K$.
(ii) Write down the slope of $K$.
(iii) Find the equation of the line $M$, which passes through the point $(4, -3)$ and is parallel to $K$.

| (i) | 5 marks | Att 2 |
| (ii) | 5 marks | Att 2 |
| (iii) | 5 marks | Att 2 |

(i) $y = 3x - 5$
\[ \Rightarrow -2 = 3(1) - 5 \]
\[ \Rightarrow -2 = -2 \]
(ii) $3$
(iii) $y - (-3) = 3(x - 4)$
\[ \Rightarrow y + 3 = 3x - 12 \]
\[ \Rightarrow 3x - y - 15 = 0 \]

**Blunders (-3)**

B1 In (ii) gives slope as $-3, \pm \frac{1}{3}, \pm 5, \pm \frac{5}{3}, \pm \frac{3}{5}$

B2 Mathematical error

**Slips (-1)**

S1 Numerical errors

**Attempts**

A1 Draws a diagram
QUESTION 5

Part (a) 20(10,10) marks Att 8(4,4)
Part (b) 15 marks Att 6
Part (c) 15 (10,5) marks Att 6(4,2)

Part (a) 10(5,5) marks Att 4

(a) The diagram shows a right-angled triangle with sides of length 8, 15 and 17 and an angle named $A$.

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

(ii) Write down $\sin A$ as a fraction.

\[
\cos A = \frac{15}{17} \quad \sin A = \frac{8}{17}
\]

Blunders (-3)
B1 Uses incorrect numerator or denominator each time, unless error is consistent.

Slips (-1)
S1 Calculates the angle approx 28 degrees

Atts.(2,2)
A1 Defines $\cos$ or $\sin$

Part (b) 15 marks Att 6

(b) Calculate the value of $x$ in the diagram.
Give your answer correct to one decimal place.

\[
\cos 54^\circ = \frac{x}{8}
\Rightarrow x = 8 \cos 54^\circ
\Rightarrow x = 4.7 \text{(to 1 dec. place)}
\]

Blunders (-3)
B1 Incorrect trig ratio
B2 Transposition error
(c) A cable 13 m long joins the top of a pole to a point on level ground 5 m from the foot of the pole as shown.

(i) Calculate the height of the pole.

(ii) Find the measure of the angle $A$, correct to the nearest degree.

\[ h = \sqrt{13^2 - 5^2} \]
\[ = \sqrt{144} \]
\[ = 12 \]

\[ \sin^{-1} A = \frac{12}{13} \]
\[ A = 67^\circ \]
QUESTION 6

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

(a) A certain car is available as a saloon or a hatchback. Each of these is available with three different engine sizes and five different colours. How many different versions of the car are available?

(a) 10 marks Att 4

Ans : 30

Blunders (-3)
B1 2 +3 + 5 = 10
B2 2! Etc
B3 2 by 2 +3 by 3 +5 by 5 or similar.
B4 2 by 3 or 2 by 5

Slips (-1)
S1 Numerical errors

Part (b) 20(10,5,5)m Att 8 (4, 2, 2)

(b) A box contains 12 tickets. Six of the tickets are white, 4 are red and 2 are yellow. A person takes one ticket at random from the box.

Find the probability that it is
(i) a white ticket
(ii) a red or a yellow ticket
(iii) not a red ticket.

(i) 10 marks Att 4
(ii) 5 marks Att 2
(iii) 5 marks Att 2

\[
\text{Ans : (i) } \frac{6}{12}, \text{ (ii) } \frac{6}{12}, \text{ (iii) } \frac{8}{12}.
\]

Blunders(-1)
B1 Any incorrect fraction less than 1
B2 Inverts correct fraction
B3 No division indicated

Slips (-1)
S1 Numerical errors
A school has 60 students sitting the Junior Certificate and Leaving Certificate examinations this year. The table below gives the numbers of boys and girls sitting each level.

One student is chosen at random.
Find the probability that the student is
(i) a Junior Certificate girl
(ii) a boy
(iii) not a Leaving Certificate boy.

\[ \text{Ans: (i) } \frac{20}{60} \quad \text{ (ii) } \frac{27}{60} \quad \text{ (iii) } \frac{48}{60}. \]

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

**Slips (-1)**
S1 Numerical errors
QUESTION 7

<table>
<thead>
<tr>
<th>Part (a)</th>
<th>5 marks</th>
<th>Att 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part (b)</td>
<td>25(5,10,5,5) marks</td>
<td>Att10(2,4,2,2)</td>
</tr>
<tr>
<td>Part (c)</td>
<td>20(10,10) marks</td>
<td>Att 8(4,4)</td>
</tr>
</tbody>
</table>

Part (a) 10 m  Att 4

(a) Find the mode of the following list of numbers: 2, 3, 5, 4, 2, 5, 6, 2, 8, 5, 2.

(a) 10 m  Att 4

Ans:2

Blunders (-3)
B1 Calculates the mean

Attempt
A1 Incorrect answer with no work

Part (b) 25(5,10,5,5)m  Att 10

(b) The following table is a record of the amount of money that each of 100 students spent on concert tickets last year:

<table>
<thead>
<tr>
<th>Amount of money €</th>
<th>0 - 40</th>
<th>40 - 80</th>
<th>80 - 120</th>
<th>120 - 160</th>
<th>160 -200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>8</td>
<td>22</td>
<td>35</td>
<td>29</td>
<td>6</td>
</tr>
</tbody>
</table>

[Note : 40 – 80 means at least €40 but less than €80, etc.]

Copy and complete the cumulative frequency table below.

<table>
<thead>
<tr>
<th>Amount of money €</th>
<th>&lt; 40</th>
<th>&lt; 80</th>
<th>&lt; 120</th>
<th>&lt; 160</th>
<th>&lt; 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Draw the cumulative frequency curve with the number of students on the vertical axis.
Use your curve to estimate
(i) the median amount of money spent
(ii) the number of students who spent more than €140.

Cumulative Table 5 marks  Att 2
Curve 10 marks  Att 4
(i) 5 marks  Att 2
(ii) 5 marks  Att 2

<table>
<thead>
<tr>
<th>Amount of money €</th>
<th>&lt; 40</th>
<th>&lt; 80</th>
<th>&lt; 120</th>
<th>&lt; 160</th>
<th>&lt; 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>8</td>
<td>30</td>
<td>65</td>
<td>94</td>
<td>100</td>
</tr>
</tbody>
</table>
(i) median = 103
(ii) $100 - 82 = 18$

**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 Median not specified
- S3 Each incorrectly plotted point
- S4 Reverses axes
- S5 Joins points with straight lines

**Attempts (2, 4, 2)**
- A1 Draws axes only
- A2 Copies table
(i) Find the mean of the numbers 8, 9, 12, 15.

(ii) Find the standard deviation of the numbers 8, 9, 12, 15, correct to two decimal places.

### Mean

<table>
<thead>
<tr>
<th>x</th>
<th>Mean</th>
<th>d</th>
<th>d^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>11</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>11</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

\[ \Sigma x = 44 \]

\[ \Sigma d^2 = 30 \]

Mean = \[ \frac{\Sigma x}{n} = \frac{44}{4} = 11 \]

Standard deviation = \[ \sqrt{\frac{\Sigma d^2}{n}} = \sqrt{\frac{30}{4}} = 2.74 \]

* Accept correct answer with or without work.

**Blunders (-3)**
- B1 \( 8 + 9 + 12 + 15 = 44 \) and stops

**Slips (-1)**
- S1 Numerical errors
- S2 Each step omitted in SD

**Attempts**
- A1 Any addition
- A2 Work on SD table or defines SD.
### QUESTION 8

| Part (a) | 10 (5,5)m | Att 4 |
| Part (b) | 20(10,5,5)m | Att 8 |
| Part (c) | 20(5,15) | Att 8 |

#### Part (a) 10 (5,5)m Att 4

(a) (i) Draw any rectangle in your answer book.

(ii) Draw two axes of symmetry of the rectangle.

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

![Rectangle with axes of symmetry](image)

(i) 
*Slips (-1)*
S1 Draws a quadrilateral
S2 Draws a triangle merits 2 slips

(ii) 
*Slips (-1)*
S1 Each incorrect axis.
The triangle $a'b'c'$ is the image of the triangle $abc$ under an enlargement with centre $o$. The scale factor is 3.

$|b'c'| = 24$ cm and $|ac| = 5$ cm

(i) Find the length of $[bc]$.
(ii) Find the length of $[a'c']$.
(iii) The area of the triangle $a'b'c'$ is $153$ cm$^2$.
    Find the area of the triangle $abc$.

(i) 10 marks  
(ii) 5 marks  
(iii) 5 marks

|bc| = $\frac{24}{3} = 8$ cm

$|a'c'| = 15$ cm

$Area\ abc = \frac{153}{9} = 17$ cm$^2$

**Blunders (-3)**
- B1: Makes no use of scale factor or uses it incorrectly
- B2: Does not square scale factor
- B3: Error in area formula

**Slips (-1)**
- S1: Numerical errors
- S2: Multiplication for division?
Part (c) 20 (5, 15) marks Att 8 (2, 6)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) (i) Draw any triangle in your answer book.</td>
<td>5 marks</td>
<td>Att 2</td>
</tr>
<tr>
<td>(ii) Construct the incircle of the triangle. Show all construction lines clearly.</td>
<td>15 marks</td>
<td>Att 6</td>
</tr>
</tbody>
</table>

Draws any triangle is worth 5 marks.  
Draws any circle is worth Att 6 marks for (ii).
BONUS MARKS FOR ANSWERING THROUGH IRISH

Bonus marks are applied separately to each paper as follows:

If the mark achieved is less than 226, the bonus is 5% of the mark obtained, rounding down. (e.g. 198 marks × 5% = 9.9 ⇒ bonus = 9 marks.)

If the mark awarded is 226 or above, the following table applies:

<table>
<thead>
<tr>
<th>Marks obtained</th>
<th>Bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>226 – 231</td>
<td>11</td>
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<tr>
<td>232 – 238</td>
<td>10</td>
</tr>
<tr>
<td>239 – 245</td>
<td>9</td>
</tr>
<tr>
<td>246 – 251</td>
<td>8</td>
</tr>
<tr>
<td>252 – 258</td>
<td>7</td>
</tr>
<tr>
<td>259 – 265</td>
<td>6</td>
</tr>
<tr>
<td>266 – 271</td>
<td>5</td>
</tr>
<tr>
<td>272 – 278</td>
<td>4</td>
</tr>
<tr>
<td>279 – 285</td>
<td>3</td>
</tr>
<tr>
<td>286 – 291</td>
<td>2</td>
</tr>
<tr>
<td>292 – 298</td>
<td>1</td>
</tr>
<tr>
<td>299 – 300</td>
<td>0</td>
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</tbody>
</table>