



Coimisiún na Scrúduithe Stáit
State Examinations Commission

**JUNIOR CERTIFICATE
EXAMINATION**

2010

MARKING SCHEMES

MATHEMATICS

ORDINARY LEVEL



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MARKING SCHEME

**MATHEMATICS
ORDINARY LEVEL
PAPER 1**

GENERAL GUIDELINES FOR EXAMINERS

1. Penalties of three types are applied to candidates' work as follows:

- Blunders - mathematical errors/omissions (-3)
- Slips- numerical errors (-1)
- Misreadings (provided task is not oversimplified) (-1).

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

2. When awarding attempt marks, e.g. Att(3), note that

- any *correct, relevant* step in a part of a question merits at least the attempt mark for that part
- if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
- a mark between zero and the attempt mark is never awarded.

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

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

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

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

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

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

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

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

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

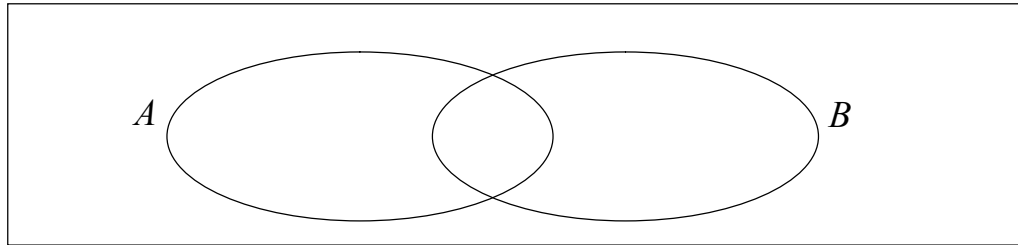
12. Do not penalise the use of a comma for a decimal point, e.g. €5.50 may be written as €5,50.

QUESTION 1

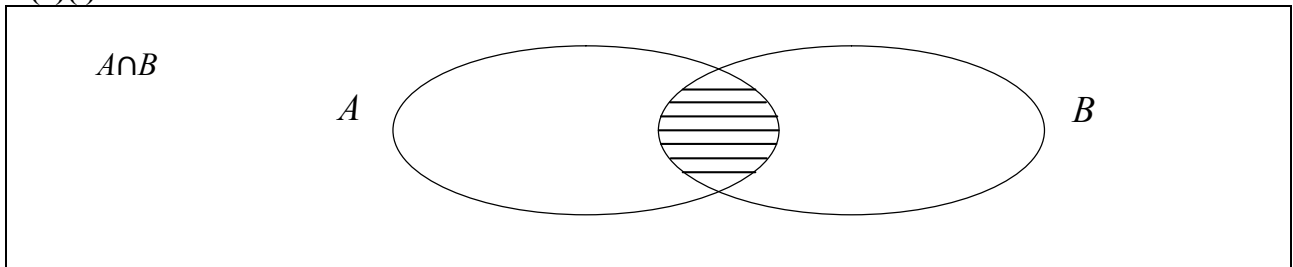
Part (a)	10(5, 5) marks	Att(2, 2)
Part (b)	25(10, 5, 5, 5) marks	Att(3, 2, 2, 2)
Part (c)	15(5, 5, 5) marks	Att(2, 2, 2)

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

- (i) Using the Venn diagram below, shade in the region that represents $A \cap B$.
 (ii) Using the Venn diagram below, shade in the region that represents $A \setminus B$



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



Blunders (-3)

B1 Any incorrect indication other than the misreading below

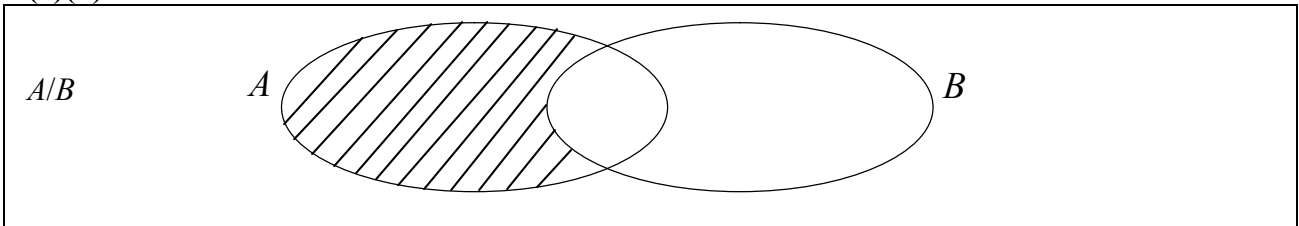
Misreadings (-1)

M1 $A \cup B$ indicated.

Worthless(0)

W1 No filling in of the Venn Diagram

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



Blunders (-3)

B1 Any incorrect indication other than misreading below

Misreadings (-1)

M1 B/A indicated

Worthless(0)

W1 No filling in of the Venn diagram

Part (b)

25(10, 5, 5, 5)

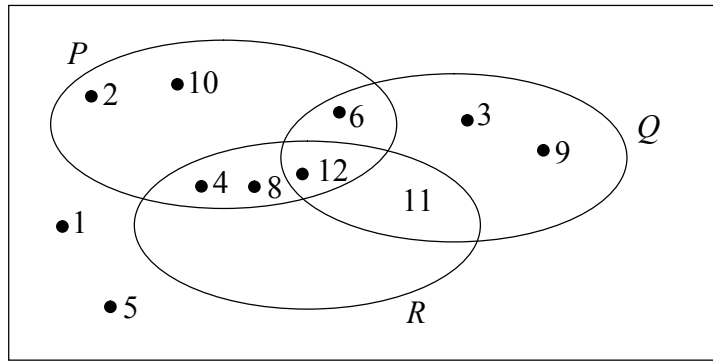
Att(3, 2, 2, 2)

 U is the universal set

$P = \{2, 4, 6, 8, 10, 12\}$

$Q = \{3, 6, 9, 11, 12\}$

$R = \{4, 8, 11, 12\}$

**(b)(i)****10 marks****Att 3****(i)** List the elements of $P \cap Q \cap R$.**(b)(i)****10 marks****Att 3**

$$P \cap Q \cap R = \{12\}$$

*Blunders (-3)*B1 Any incorrect set of the elements of P and Q and R other than the misreading below*Misreadings (-1)*M1 $P \cup Q \cup R$ giving $\{2, 3, 4, 6, 8, 9, 10, 11, 12\}$ (all needed)*Attempts (3 marks)*

A1 1 or 5 appear in the answer

(b)(ii)**5 marks****Att 2****(ii)** List the elements of R' , the complement of the set R .**(ii)**

$$R' = \{1, 2, 3, 5, 6, 9, 10\}$$

*Blunders (-3)*B1 Any incorrect set of elements of R' other than the misreadings below.*Misreadings (-1)*M1 $R \setminus Q$ giving $\{4, 8\}$, $R \setminus P$ giving $\{11\}$, $R \setminus (P \cup Q)$ giving $\{ \}$ M2 $P' = \{3, 9, 11, 5\}$ or $Q' = \{1, 2, 4, 5, 8, 10\}$ *Attempts (2 marks)*

A1 1, 2, 3, 5, 6, 9, or 10 appear in the answer.

A2 R or any proper subset of R .

(b) (iii)

5 marks

Att 2

(iii) List the elements of $P \setminus (Q \cap R)$.

(iii)

$$P \setminus (Q \cap R) = \{2, 4, 6, 8, 10\}$$

Blunders (-3)

B1 Any incorrect set of elements of P and Q and R other than the misreadings below

Misreadings (-1)

M1 $P \setminus (Q \cup R)$ giving $\{2, 10\}$ or $(Q \cap R) \setminus P$ giving $\{11\}$

Attempts (2 marks)

A1 1 or 5 appear in the answer

(b) (iv)

5 marks

Att 2

(iv) Write down $\#(Q \cup R)$.

(iv)

$$\#(Q \cup R) = 7$$

Blunders (-3)

B1 Any incorrect cardinal number $\#(Q \cup R) \leq 11$ other than the misreadings as below

Misreadings (-1)

M1 $Q \cup R$ giving $\{3, 4, 6, 8, 9, 11, 12\}$

M2 $\#(Q \cup R)' = 4$

M3 $\#(Q \cap R) = 2$

Attempts (2 marks)

A1 Some understanding of notation e.g. Cardinal numbers or number of elements

Worthless (0)

W1 Any number greater than 11

(c)

15(5, 5, 5) marks

Att(2, 2, 2)

In a survey, a group of 72 students were asked if they played basketball or tennis

37 of these students said they played basketball (B)

30 of these students said they played tennis (T)

28 of these students said they played basketball but not tennis

(c)(i)

5 marks

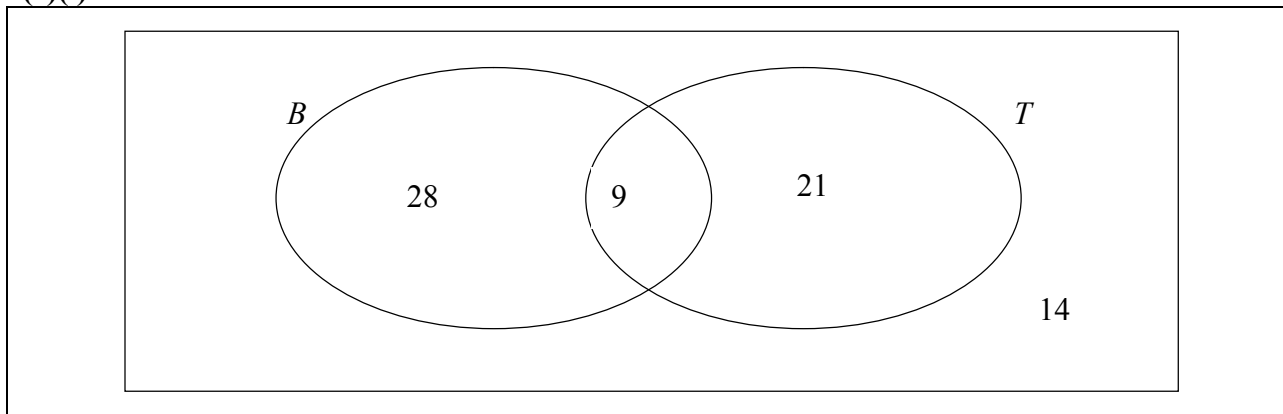
Att2

(i) Represent this information in the Venn diagram below.

(c)(i)

5 marks

Att2



Blunders (-3)

B1 Each incorrect or omitted entry but see S1 and M1 below

Slips (-1)

S1 Numerical errors, where work is clearly shown, to a max of 3

Misreadings (-1)

M1 Interchanges Basketball and Tennis

Attempts (2 marks)

A1 Any one relevant entry

A2 $\#B = 37$ or $\#T = 30$ or $\#U = 72$

(c)(ii)

5 marks

Att2

(ii) How many students played neither basketball nor tennis?

(c)(ii)

5 marks

Att2

c(ii) $28+21+9 = 58$ $72-58 = 14$

* Any **correct** answer written here in the space provided **takes precedence over an incorrect Venn diagram** (Subject to S1)

* Accept candidate's work from previous part **c(i)**

Blunders (-3)

B1 Any incorrect use of the given numbers or the numbers from an incorrect Venn diagram (Subject to S1)

Slips (-1)

S1 Numerical errors where work is clearly shown, to a max of 3

Attempts (2 marks)

A1 Any one relevant sum where work is clearly shown

Worthless (0)

W1 Incorrect answer with no work shown

(c)(iii)

5 marks

Att2

(iii) What percentage of the students surveyed played both basketball and tennis?

(c)(iii)

5 marks

Att2



$$\frac{9}{72} \times 100 = 12.5\% \quad \text{or} \quad \frac{100}{8} = 12.5\%$$

- * **Any correct answer** written here in the space provided **takes precedence over an incorrect Venn diagram** (Subject to S1)
- * Accept candidate's work from previous part **c(i)**

Blunders (-3)

- B1 Any incorrect use of the given numbers or the numbers from an incorrect Venn diagram (Subject to S1)
- B2 Correct answer without work ✍

Slips (-1)

- S1 Numerical errors, where work is clearly shown, to a max of 3

Attempts (2 marks)

- A1 Mention of 9 or candidate's work from c(i)
- A2 Some use of 100

Worthless (0)

- W1 Incorrect answer with no work shown

QUESTION 2

Part (a)	10 marks	Att 3
Part (b)	25(10, 5, 10)marks	Att(3, 2, 3)
Part (c)	15(5, 5, 5)marks	Att(2, 2, 2)
Part (a)	10 marks	Att 3

There is €1200 in a prize fund. The first prize is $\frac{7}{10}$ of the fund.

Find the value of the first prize.

(a) **10 marks** **Att 3**

Method (1)	Method (2)	Method (3)	Method (4)
$\frac{10}{10}=1200$	10 parts=1200	$\frac{1200}{10} \times 7$	10 parts=1200
$\frac{1}{10} = \frac{1200}{10} = 120$	$\rightarrow 1 \text{ part} = \frac{1200}{10} = 120$	120×7	3 parts=120 \times 3=360
$\frac{7}{10} = 120 \times 7 = 840$ = €840	$\rightarrow 7 \text{ parts} = 120 \times 7$ = €840	€840	7 parts=1200-360 = € 840

- * Correct answer without work \Rightarrow 7 marks ~~✗~~
- * **Special Case** $\frac{1200}{7} \times 10 = 1714.28 \Rightarrow$ 7 marks
- * Stops at $\frac{1200}{10}$ or 120 \Rightarrow 4 marks
- * Stops at $1200 \times 7 [= 8400] \Rightarrow$ 4 marks
- * Incorrect answer without work \Rightarrow 0 marks, except for answers given in A2 below

Blunders (-3)

- B1 Divisor \neq 10 and continues but see 2nd *
- B2 Incorrect multiplier i.e. \neq 7 and continues but see 2nd *
- B3 Gets $\frac{3}{10}$ of 1200 only

B4 Decimal error (once only)

B5 Fails to finish

Slips (-1)

S1 Numerical errors where work is clearly shown to a max of 3

Attempts (3 marks)

- A1 Indicates 0.7, or 7: 10, or $\frac{10}{10}$, or $\frac{1}{10}$, or $\frac{3}{10}$, or .3 only, and stops
- A2 120 or 8400 or 360 or 1714.29 **only**, appears (no work shown)
- A3 $\frac{1200}{7}$ or 1200×10 and stops
- A4 1200 is multiplied or divided by any wrong number correctly

Worthless(0)

W1 $1200 + 7 = 1207$ or similar

Part (b)**25(10, 5, 10) marks****Att (3, 2, 3)**

- (i)**
- By rounding each of these numbers to the nearest whole number,

$$\frac{9.15 \times 2.196}{5.5815}$$


estimate the value of

- (ii)**
- Using a calculator, or otherwise, find the exact value of
- $\frac{9.15 \times 2.196}{5.5815}$

- (iii)**
- Using a calculator, or otherwise, write
- $\frac{3}{8}$
- and
- $\frac{9}{25}$
- as decimals

Hence, or otherwise, put the following numbers in order, starting with the smallest
And finishing with the largest

$$\frac{3}{8}, \quad \frac{9}{25}, \quad 0.37$$

Part (b)(i)**10 marks****Att 3**


$\frac{9.15 \times 2.196}{5.5815}$ is approximately equal to:

$$\frac{\boxed{9} \times \boxed{2}}{\boxed{6}} = \frac{\boxed{18}}{\boxed{6}} = \boxed{3}$$
* $\frac{9}{6} \times 2$ and stops \Rightarrow 7 marks.* No penalty if the intermediate step between approximations and correct final answer is not shown i.e. $\frac{18}{6}$ not shown* Special Case: $\frac{9.15 \times 2.196}{5.5815} = 3.6$ or $\left(\frac{18}{5}\right)\left(3\frac{3}{5}\right)$ in this part \Rightarrow Attempt 3 marks.* $\frac{18}{6}$ and stops \Rightarrow 7 marks. (-3)**Blunders (-3)**

B1 Error(s) in rounding off to the nearest whole number (once only if consistent)

B2 Decimal error in calculation of final value

B3 An arithmetic operation other than indicated

B4 Error(s) in the manipulation of the denominator e.g. $\frac{9}{6} \times \frac{2}{6} = \frac{18}{36}$

B5 Incorrect cancellation

Slips (-1)

S1 Numerical errors to a max of 3

Attempts (3 marks)

A1 Only one approximation made to the given numbers and stops

A2 Ans. 3 with no preceding rounding off

Worthless (0)

W1 Incorrect answer without work

(b)(ii)

5 marks

Att 2

$$9.15 \times 2.196 = 20.0934 \div 5.5815 = \mathbf{3.6} \text{ or } \frac{18}{5} \text{ or } 3\frac{3}{5} \quad \text{or} \quad \frac{9.15 \times 2.196}{5.5815} \\ \Rightarrow \frac{20.0934}{5.5815} = \mathbf{3.6}$$

Blunders (-3)

B1 Decimal error or early rounding off

B2 Treats as $\frac{9.15}{5.5815} \times \frac{2.196}{5.5815} = 1.639344262 \times 0.393492623 = \mathbf{0.644987906}$

B3 Reads as $\frac{9.15 - 2.196}{5.5815} = \frac{6.954}{5.5815} = \mathbf{1.245901639}$

B4 Reads as $\frac{9.15 + 2.195}{5.5815} = \mathbf{2.032786885}$

B5 Treats as $\frac{5.5815}{9.15 \times 2.196} = \frac{5.5815}{20.0934} = \mathbf{0.277777777\dots}$

B6 Treats as $\frac{5.5815}{9.15 + 2.196} = \frac{5.5815}{11.346} = \mathbf{0.491935483}$

B7 Treats as $\frac{5.5815}{9.15 - 2.195} = \frac{5.5815}{6.954} = \mathbf{0.802631578}$

B8 Leaves as $\frac{20.0934}{5.5815}$

Slips (-1)

S1 Numerical errors to a max of 3

Attempts (2 marks)

A1 Any correct relevant calculation and stops.

e.g. $9.15 \times 2.196 = 20.0934$ or $\frac{9.15}{5.5815} = 1.639344262$ or $\frac{2.196}{5.5815} = 0.393442623$

A2 Any of the following; (see above) 0.644987906, 1.245901639, 2.032786885, 0.277777777..., 0.491935483 or 0.802631578 merit 2 marks (minimum 4 decimal places) (with or without work)

Worthless (0)

W1 Incorrect answer without work but see A2

(b)(iii)

10marks

Att 3

$\frac{3}{8} = 0.375$	$\frac{9}{25} = 0.36$	
$\frac{9}{25}$	0.37	$\frac{3}{8}$

* Accept: 0.36, 0.37, 0.375 for **10** marks.

* Note: $\frac{3}{8} = 0.375$ or $\frac{9}{25} = 0.36$ merits **4** marks

Blunders (-3)

- B1 Fails to write a fraction as a decimal (each time)
- B2 Writes fraction as incorrect decimal (each time)
- B3 Decimal error (once only if consistent)
- B4 Inverts fraction and continues. (each time)
- B5 Incorrect order or fails to order

Attempts (3 marks)

- A1 $0.37 = \frac{37}{100}$ and stops
- A2 Attempt at ordering using all 3 given numbers
- A3 Any 2 of the given numbers in the correct order i.e. $(\frac{9}{25}, 0.37)$, $(0.37, \frac{3}{8})$, $(\frac{9}{25}, \frac{3}{8})$

Worthless (0)

- W1 Nothing correct
- W2 $\frac{0.37}{8}$ or $\frac{0.37}{25}$ or similar

Part(c)

15(5, 5, 5)

Att(2, 2, 2)

(i) Using a calculator, or otherwise, divide 1120 by 0.035.

Express your answer in the form $a \times 10^n$, where $1 \leq a < 10$ and $n \in \mathbb{N}$

(ii) Simplify $\frac{a^5 \times a^2}{a \times a^3}$, Give your answer in the form a^n , where $n \in \mathbb{N}$

(iii) Using your answer to part (ii), or otherwise, find the value of $\frac{6^5 \times 6^2}{6 \times 6^3}$

(c)(i)

5 marks

Att2

$$\begin{aligned} \frac{1120}{0.035} &= 32000 \\ &= 3.2 \times 10^4 \end{aligned}$$

* 3.2×10^4 (without work) \rightarrow **4 marks**

Blunders (-3)

B1 Decimal error

B2 Inverts fraction $\frac{0.035}{1120} = 0.00003125$

B3 Multiplies fraction i.e. $1120 \times 0.035 = 39.2$ (3.92×10)

Slips (-1)

S1 Numerical errors to a max of 3

S2 Incorrect format, where $a < 1$ or $a \geq 10$

S3 32000 and stops

S4 Error in index when forming Scientific Notation

Attempts (2 marks)

A1 Any relevant step. e.g. Partial long division e.g. $\frac{1120}{0.0355} = 3$

A2 $\frac{1}{0.035} = \frac{1000}{35} = \frac{200}{7}$

A3 $\frac{1120000}{35}$

(c)(ii)

5 marks

Att2



$$\frac{a^5 \times a^2}{a \times a^3} = \frac{a.a.a.a.a.a}{a.a.a.a} = a.a.a = a^3$$

or $\frac{a^5 \times a^2}{a \times a^3} = \frac{a^7}{a^4} = a^{7-4} = a^3$ or $\frac{a^5 \times a^2}{a \times a^3} = a^4 \times \frac{1}{a} = a^3$

* $a \times a \times a$ (as answer) \Rightarrow **4 marks**

* $\frac{a^7}{a^4}$ and stops \Rightarrow **2 marks**

* a^7 and stops \Rightarrow **2 marks**

* $a^3 \times a$ and stops \Rightarrow **2 marks**

Blunders (-3)

B1 Correct answer, without work ~~✓~~

B2 Each error in calculation involving indices

B3 Each incorrect number of a 's in the extended form

B4 Each incorrect elimination of a 's in the extended form

Slips (-1)

S1 $\frac{a^7}{a^4} = 3$ or $\frac{1}{a^{-3}}$ as final answer

Attempts (2 marks)

A1 Some correct manipulation of indices

Worthless(0)

W1 Incorrect answer with no work shown

(c)(iii)

5 marks

Att2



$$\frac{6^5 \times 6^2}{6 \times 6^3} = 6^3 = 216$$

or $\frac{6^5 \times 6^2}{6 \times 6^3} = 6^4 \times \frac{1}{6} = 6^3 = 216$

or $\frac{7776 \times 36}{6 \times 216} = \frac{279936}{1296} = 216$

or **$6^3 = 216$**

or $\frac{6.6.6.6.6.6.6}{6.6.6.6} = 6.6.6 = 216$

*Accept candidate's answer from **c(ii)** unless it oversimplifies the question.

Blunders (-3)

B1 Correct answer, without work

B2 Each error in calculation involving indices

B3 Each incorrect number of 6's in the extended form

B4 Each incorrect elimination of 6's in the extended form

B5 Fails to finish

Attempts (2 marks)

A1 Some correct manipulation of indices

A2 Writes answer from c(ii) in c(iii)

Worthless(0)

W1 Incorrect answer with no work shown

QUESTION 3

Part (a)	15 marks	Att 5
Part (b)	20(10, 5, 5) marks	Att(3, 2, 2)
Part (c)	15(10, 5) marks	Att(3, 2)

Part (a) **15 marks** **Att 5**

Carol buys a magazine which costs €2.83.
In her purse she only has the following
Three 50 cent coins
Four 20 cent coins
Seven 10 cent coins
How much money will she have left after paying for the magazine?

(a) **15 marks** **Att 5**



$$\begin{aligned}50 \times 3 &= 150 \\20 \times 4 &= 80 \\10 \times 7 &= 70 \\ \text{Total amount } (150+80+70) &= 300 \\ \Rightarrow \text{Change} &\Rightarrow \text{€ } 3.00 - \text{€}2.83 \\ &= \text{€}0.17\end{aligned}$$

- * Accept 17c, (€0.17)
- * Final subtraction step subject to maximum deduction of 3 marks.
- * No penalty for the omission of € symbol.

Blunders (-3)

- B1 Correct answer without work
- B2 Fails to find the change.
- B3 Fails to find total cost i.e. no addition
- B4 Operation other than subtraction when finding the change
- B5 Operation other than addition when finding total cost
- B6 Decimal error (Note: 1st* above)
- B7 Each missing multiplication or addition

Slips (-1)

- S1 Numerical errors to a max of 3

Attempts (5 marks)

- A1 Any attempt at addition / subtraction / multiplication of the given numbers

Worthless (0)

- W1 Incorrect answer without work

Part (b)**20(10, 5, 5) marks****Att(3, 2, 2)**

- (i) A bicycle costs €305. There is a 15% discount on the cost during a sale
What is the sale price of the bicycle ?
- (ii) David wishes to get some bars for a party
A packet of 12 bars cost €4.08 in **Shop A**.
A packet of 7 bars costs €2.17 in **Shop B**.
Find the unit cost (cost of one bar) in each shop
- (iii) If David buys 84 bars, how much will he save by buying the bars in the shop offering the better value?

(b)(i)**10 marks****Att 3**

$305 \times \frac{15}{100} = €45.75$	$100\% - 15\% = 85\%$	$305 \times .85 = €259.25$
$305 - 45.75 = €259.25$	$305 \times \frac{85}{100} = €259.25$	

- * $305 - 15\% = 259.25 \rightarrow$ **10 marks**
- * $305 \times 15\% = 45.75$ and stops \rightarrow **7 marks**
- * $305 - 15\%$ and stops \rightarrow **4 marks** or $305 \times 15\%$ and stops \rightarrow **4 marks**
- * **€45.75** without work and stops merits **4** marks

Blunders (-3)

- B1 Correct answer without work ✍
- B2 Decimal error
- B3 Inverts as $\frac{100}{85}$ or $\frac{100}{15}$ and continues (giving answers 358.82 or 2033.33)
- B4 Mishandles 85% or 15% e.g. 305×85 or $305 \div 85$ or similar Note: {305 must be used}
- B5 305 taken as 85% or 15%
- B6 No subtraction (as per candidates work)
- B7 Addition of discount (as per candidates work)
- B8 $305 \times 1.15 = €350.75$

Slips (-1)

- S1 Numerical errors to a max of 3

Misreadings (-1)

- M1 Reads as €350 instead of €305

Attempts (3 marks)

- A1 $\frac{15}{100}$ or $\frac{85}{100}$ or $\frac{305}{100}$ and stops
- A2 $100\% = 305$ and stops
- A3 $100 \times \frac{85}{305}$ and stops
- A4 $\frac{305}{85}$ or similar and stops


Worthless (0)

- W1 Incorrect answer without work
- W2 $305 - 15 = 290$ and stops or continues

(b)(ii)


5 marks

Att 2

	Shop A.	unit cost $\rightarrow \frac{408}{12} = \mathbf{\text{€}0.34}$
	Shop B	Unit cost $\rightarrow \frac{2.17}{7} = \mathbf{\text{€}0.31}$

* Accept 34c and/or 31c

Blunders (-3)

- B1 Correct answers without work. 
- B2 Operation other than division when finding the unit cost (once only)
- B3 Finds only one unit cost
- B4 Decimal error

Slips (-1)

S1 Numerical errors to a max of 3

Attempts (2 marks)

A1 Any attempt at division

Worthless (0)


W1 Incorrect answer without work

W2 Addition or subtraction of the given numbers

(b)(iii)


5 marks

Att 2

	$34 - 31 = 3$	$84 \times 34 = 2856$
	$84 \times 3 = 252$ $= \text{€}2.52$	$84 \times 31 = 2604$ Savings = $2856 - 2604$ $= 252$ $= \text{€}2.52$

* Accept 2.52 or 252 or 252 c

Blunders (-3)

- B1 Correct answer without work 
- B2 Operation other than subtraction or multiplication where appropriate
- B3 Finds only one unit saving
- B4 Decimal error
- B5 Fails to subtract

Slips (-1)

S1 Numerical errors to a max of 3

Attempts (2 marks)

A1 Any attempt at subtraction or multiplication

A2 Any one correct step

Worthless (0)

W1 Incorrect answer without work

Part (c)

20(10, 10) marks

Att(3, 3)

- (i) €12000 is invested at 2% per annum
What is the amount of the investment at the end of the first year?
- (ii) Using central heating oil for 6 hours a day, a tank full of oil will last for 90 days
If the oil were used for only 5 hours a day, how much longer would it last?

(c)(i)

10 marks

Att 3

€12000 is invested at 2% per annum
What is the amount of the investment at the end of the first year?

(c)(i)

10 marks

Att 3



$$12000 \times 1.02 = \mathbf{€12240} \quad \text{or} \quad 12000 \times \frac{2}{100} = \mathbf{€240} \quad 12000 \times \frac{102}{100} = \mathbf{€12240} \quad I = \frac{P \times R}{100}$$
$$12000 + 240 = \mathbf{€12240} \quad = \frac{12000}{100} \times 2$$
$$= \mathbf{€240}$$
$$12000 + 240 = \mathbf{€12240}$$

- * Finds interest only, €240 and stops \Rightarrow 7 marks
- * €240 without work and stops \Rightarrow 4 marks
- * €12000 + 2% = €12240 \Rightarrow 10 marks
- * €12000 \times 2% = €240 and stops \Rightarrow 7 marks
- * €12000 + 2% and stops \Rightarrow 4 marks
- * €12000 \times 2% and stops \Rightarrow 4 marks

Blunders (-3)

- B1 Correct answer, without work $\not\Rightarrow$
- B2 Mishandles 2% of 12,000. {Must use 12,000}
- B3 Decimal error
- B4 Fails to finish

Slips (-1)

- S1 Numerical errors to a max of 3

Attempts (3 marks)

- A1 Some use of 100 in attempt to find percentage e.g. $2\% = \frac{2}{100}$ and stops
- A2 Correct formula (with or without substitution) and stops

Worthless (0)

- W1 Incorrect answer without work
- W2 12000+2 (=12002) and stops

(c)(ii)

5 marks

Att2

Using central heating oil for 6 hours a day, a tank full of oil will last for 90 days
If the oil were used for only 5 hours a day, how much longer would it last?

(c)(ii)

5 marks

Att2



$$6 \times 90 = 540$$

$$6 : 5 = x : 90$$

$$6 - 5 = 1$$

$$\frac{540}{5} = 108$$

$$5x = 6(90) = 540 \rightarrow x = 108$$

$$1 \times 90 = 90$$

$$108 - 90 = 18$$

$$108 - 90 = 18$$

$$90 \div 5 = 18$$

* Answer $\frac{90}{5} = 18$ att. only \Rightarrow **2 marks** i.e.(no mention of 6)

* Answer 108 (work shown) \Rightarrow **4 marks**

Blunders (-3)

B2 Adds instead of subtracts

B3 Incorrect ratio

B4 Incorrect division or similar

B5 Fails to finish (method 3)

Slips (-1)

S1 Numerical errors to a max of 3

Attempts (2 marks)

A1 Some indication of subtraction or ratio

A2 Some correct use of 6 or 5 but see W2

A3 Answer 108 or 18 (no work shown)

A4 $6 - 5 [=1]$

Worthless (0)

W1 Incorrect answer without work


W2 $\frac{90}{6} [=15]$ and stops

QUESTION 4

Part (a)	10 marks	Att(2, 2)
Part (b)	20(10, 10) marks	Att(3, 3)
Part (c)	20(5, 5, 10) marks	Att(2, 2, 3)

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

If $a = 3$ and $b = 5$, find the value of

-  (i) $a + 2b$
(ii) $ab - 6$

(a)(i) 5 marks Att2


$$\begin{aligned} a + 2b \\ = 3 + 2(5) \\ = 3 + 10 \\ = 13 \end{aligned}$$

- * $3 + 10 \rightarrow 4$ marks
* $5 + 2(3) = 5 + 6 = 11 \rightarrow 4$ marks

Blunders (-3)

- B1 Correct answer, without work
B2 Leaves $2(5)$, in the answer
B3 Incorrect substitution and continues
B4 Breaks order i.e. $3 + 2(5) = (5)(5) = 25$
B5 Treats $2(5)$ as 7 or 25

Slips (-1)

- S1 Numerical errors to a max of 3
S2 Treats as $a - 2b$

Misreadings (-1)

- M1 a and b interchanged see 2nd * above

Attempts (2 marks)

- A1 Any number substituted for a or b and stops e.g. $2(8)$
A2 Writes 5 or 3 in this part
A3 Any correct step

Worthless (0)

- W1 Incorrect answer with no work

(a)(ii)

5 marks

Att2

~~✍~~

$$\begin{aligned} & ab - 6 \\ & 3(5) - 6 \\ & = 15 - 6 \\ & = 9 \end{aligned}$$

* $15 - 6 \rightarrow$ 4 marks

Blunders (-3)

- B1 Correct answer without work ~~✍~~
- B2 Leaves $3(5)$ in the answer
- B3 Incorrect substitution and continues
- B4 Breaks order e.g. $3(5 - 6)$
- B5 Treats $3(5)$ as 8 or 35

Slips (-1)

- S1 Numerical errors to a max of 3
- S2 Treats as $ab + 6$

Misreadings (-1)

- M1 a and b interchanged but no penalty here if already penalised in **a(i)**

Attempts (2 marks)

- A1 Any substitution for either a or b and stops
- A2 writes 5 or 3 in this part
- A3 Any correct step

Worthless (0 marks)

- W1 Incorrect answer, with no work

Part (b)

20(10, 10) marks

Att(3, 3)

- | | |
|------|---|
| (i) | Write in it's simplest form $(3x + 2y) - 2(x + 3y - 4)$ |
| (ii) | Solve $3x - 2 \leq 7, x \in \mathbb{N}$ |

(b)(i)

10 marks

Att 3

$\not\leftarrow$ (i)	$(3x + 2y) - 2(x + 3y - 4)$ $= 3x + 2y - 2x - 6y + 8$ $= x - 4y + 8$
----------------------	--

* $3x + 2y - 2x - 6y + 8$ (stops or continues) \rightarrow 7 marks (at least)

Blunders (-3)

- B1 Correct answer without work $\not\leftarrow$
- B2 Error in distributive law and continues (each time)
- B3 Fails to finish

Slip (-1)

- S1 Numerical errors to a max of 3

Attempts (3 marks)

- A1 Any correct step.
- A2 Combines "x's" to numbers and continues with any correct step

Worthless (0 marks)


- W1 Combines "x's" to numbers and stops
- W2 Incorrect answer, with no work

(b)(ii)

10 marks

Att3

$\begin{aligned} 3x - 2 &\leq 7 \\ \Rightarrow 3x &\leq 7 + 2 \\ \Rightarrow 3x &\leq 9 \\ \Rightarrow x &\leq 3 \\ \{1, 2, 3\} &\text{ (not necessary)} \end{aligned}$



* Do not penalize for inclusion of 0 in answer

Blunders (-3)

- B1 Correct answer without work
- B2 Error in transposition
- B3 No plotting on number line
- B4 Mishandles the direction of inequality e.g. $3x \geq 9$
- B5 Treats inequality as equality and continues

Slips (-1)

- S1 Numerical errors to a max of 3
- S2 \leq taken as $<$
- S3 Missing elements or incorrect elements on the number line (each time), but see S4
- S4 Correct range but shaded in

Misreadings (-1)

- M1 $3x + 2 \leq 7$, and continues
- M2 $x \in \mathbf{Z}$ or $x \in \mathbf{R}$ correctly mapped

Attempts (3 marks)

- A1 Attempt at transposition and stops
- A2 0 or 1 or 2 or 3 substituted for x
- A3 Number line drawn with one of the correct elements only clearly indicated
- A4 Combines “ x ’s” to “numbers” e.g. $x \leq 7$ and continues

Worthless (0)

- W1 Incorrect answer with no work e.g. $\{1, 2, 3, 4, 5, 6, 7, 8, \dots\}$.

Part (c)**20(5, 5, 10) marks****Att(2, 2, 3)**

(i) Eoin is t years of age
 Katie is 4 years older than Eoin
 Laura is twice as old as Eoin
 Write Katie's age and Laura's age in terms of t

(ii) From part(i), the sum of Eoin's age, Katie's age and Laura's age is 52
 Write down an equation in t to represent this information
 Solve your equation to find Eoin's age in years

(iii) Solve for x and for y : $7x + 2y = 11$
 $4x + y = 7$

(c)(i)**5 marks****Att2**

Katie's age = $t + 4$

Laura's age = $2t$

Blunders (-3)

B1 Each incorrect expression

*Misreading (-1)*M1 Substitutes x (or similar) for t M2 Treats Laura's age as twice Katie's age i.e. $2(t + 4)$ *Attempts (2 marks)*A1 Any attempt at forming an expression **but** numbers written on their own are **worthless****(c)(ii)****5marks****Att2**

$t + t + 4 + 2t = 52$ 

$4t + 4 = 52$


$4t = 52 - 4$

$4t = 48$

$t = 12$

i.e. (Eoin's age = 12) (not necessary)

* Accept candidates' expression from previous work.

*Blunders (-3)*B1 Correct answer without work ($t = 12$ stated or substituted) 

B2 Errors in transposition

B3 Stops at $4t = 48$

B4 error in forming equation

B5 Fails to solve equation

Slip (-1)

S1 Numerical errors to a max of 3

S2 Leaves as $\frac{48}{4}$ or similar*Attempts (2 marks)*

A1 Answer from part c(i) written down and stops

A2 Any correct step

Worthless (0 marks)

W1 Incorrect answer, with no work

(c)(iii)

10 marks

Att3

Solve for x and y :

$$7x + 2y = 11$$

$$4x + y = 7$$

(c)(iii)

10 marks

Att3

I

$$5x - 4y = 16$$

$$\underline{2x + 3y = 11}$$

$$15x - 12y = 48$$

$$\underline{8x + 12y = 44}$$

$$23x = 92$$

$$x = \frac{92}{23} = 4$$

$$\rightarrow y = 1$$

$$5x - 4y = 16$$

$$\underline{2x + 3y = 11}$$

$$10x - 8y = 32$$

$$\underline{-10x - 15y = -55}$$

$$-23y = -23$$

$$y = \frac{-23}{-23} = 1$$

$$\rightarrow x = 4$$

II

$$4y = 5x - 16$$

$$y = \frac{5x - 16}{4}$$

$$2x + 3\left(\frac{5x - 16}{4}\right) = 11$$

$$8x + 15x - 48 = 44$$

$$23x = 92$$

$$x = 4$$

$$\rightarrow y = 1$$

- * Apply only **one** blunder deduction (B2 or B3) to any error(s) in establishing the first equation; in terms of x only or the first equation in terms of y only.
- * Finding the second variable is subject to a maximum deduction of (-3).

Blunders (-3)

- B1 Correct answers without work (**stated or substituted**)
- B2 Error or errors in establishing the first equation in terms of x only ($-x = -3$) or the first equation in terms of y only ($y = -5$) through elimination by cancellation (**but see S1**)
- B3 Error or errors in establishing the first equation in terms of x only ($-x = -3$) or the first equation in terms of y only ($y = -5$) through elimination by substitution (**but see S1**)
- B4 Errors in transposition when finding the first variable
- B5 Errors in transposition when finding the second variable
- B6 Incorrect substitution when finding second variable
- B7 Finds one variable only

Slip (-1)

- S1 Numerical errors to a max of 3

Attempt (3 marks)

- A1 Attempt at transposition and stops
- A2 Multiplies either equation by some number and stops
- A3 Incorrect value of x or y substituted correctly to find his correct 2nd variable

Worthless (0 marks)

- W1 Incorrect values for x or y substituted into the equations

QUESTION 5

Part (a)	10 marks	Att 3
Part (b)	20(5, 5, 10) marks	Att(2, 2, 3)
Part (c)	20(5, 5, 10) marks	Att(2, 2, 3)

Part (a) **10 marks** **Att 3**

(a) Solve the equation $3(x - 2) = 2x + 5$.

(a) **10 marks** **Att 3**

~~✍~~

$$3x - 6 = 2x + 5$$

$$3x - 2x = 6 + 5$$

$$x = 11$$

Blunders (-3)

- B1 Correct answer without work ✍
- B2 Error(s) in distribution (each time)
- B3 Combining unlike terms (each time) and continues
- B4 Fails to group like terms
- B5 Error(s) in transposition (each time)
- B6 Fails to finish

Slips (-1)

- S1 Numerical errors to a max of 3

Misreadings (-1)

- M1 $3(x + 2)$ and continues.

Attempts (3 marks)

- A1 Any correct multiplication.
- A2 Any correct step

Worthless (0)

- W1 combining unlike terms before attempting multiplication and stops e.g. $3(-2x) = 2x + 5$

- (i) Factorise $x^2 - 25$
- (ii) Factorise $ab - 2ax + mb - 2mx$
- (iii) Factorise $x^2 + 4x - 12$.
Hence solve the equation $x^2 + 4x - 12 = 0$.

(b) (i)

5 marks

Att 2

$$x^2 - 25$$

$$x^2 - 5^2$$

$$(x - 5)(x + 5)$$

- * Accept also (with or without brackets) for 5 marks any of the following
 $(x - 5)$ and $(x + 5)$ [The word **and** is written down.]
 $(x - 5)$ or $(x + 5)$ [The word **or** is written down.]
 $(x - 5)$, $(x + 5)$ [A comma is used]
- * Quadratic equation formula method is subject to slips and blunders.
- * $(x - \sqrt{25})(x + \sqrt{25})$ merits 5 marks

Blunders (-3)

- B1 Incorrect two term linear factors of $x^2 - 25$ formed from correct (but inapplicable) factors of x^2 and ± 25 .e.g $(x - 25)(x + 1)$
- B2 Incorrect factors of 25
- B3 Incorrect factors of x^2
- B4 $(5 - x)(5 + x)$.
- B5 $(x - 25)(x + 25)$.
- B6 Answer left as roots. ($x = \pm 5$)

Slips (-1)

- S1 $(x - 5) \pm (x + 5)$

Attempts (2 marks)

- A1 Correct factors of x^2 only
- A2 Correct factors of ± 25 only
- A3 $\pm x$ or ± 5 appears.
- A4 $x^2 - 25 = x \times x - 5 \times 5$
- A5 Mention of the difference of two squares .e.g. $x^2 - 25^2$
- A6 Correct quadratic equation formula quoted and stops
- A7 $\sqrt{25}$

Worthless (0 marks)

- W1 Combines **xs** to “numbers” and continues or stops

(b) (ii)

5 marks

Att 2

$\not\leftarrow$	$ab - 2ax + mb - 2mx$ $b(a + m) - 2x(a + m)$ $(a + m)(b - 2x)$	or	$ab - 2ax + mb - 2mx$ $a(b - 2x) + m(b - 2x)$ $(a + m)(b - 2x)$
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- * Accept also (with or without brackets) for 5 marks any of the following
($a + m$) and ($b - 2x$) [The word **and** is written down.]
($a + m$) or ($b - 2x$) [The word **or** is written down.]
($a + m$), ($b - 2x$) [A comma is used]

Blunders (-3)

- B1 Correct answer without work $\not\leftarrow$
B2 Stops after first line of correct factorisation. e.g. $a(b - 2x) + m(b - 2x)$ or equivalent.
B3 Error(s) in factorising any pair of terms
B4 Correct first line of factorisation but ends as ($a + m$), $-2bx$ or equivalent

Slips (-1)

S1 $(a + m) \pm (b - 2x)$

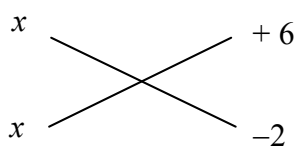
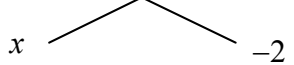
Attempts (2 marks)

- A1 Pairing off, or indication of common factors and stops
A2 Correctly factorises any pair and stops

(b) (iii)

10 marks

Att 3

$x^2 + 4x - 12 = 0$ $x^2 + 6x - 2x - 12 = 0$ $x(x + 6) - 2(x + 6) = 0$ $(x + 6)(x - 2) = 0$ $\Rightarrow x = -6 \text{ and } x = 2$ $\not\leftarrow$	x  $+6$ x  -2 $\Rightarrow (x + 6)(x - 2) = 0$ $\Rightarrow x = -6 \text{ and } x = 2$	$\frac{-(4) \pm \sqrt{(4)^2 - 4(1)(-12)}}{2(1)}$ $\frac{-4 \pm \sqrt{16 + 48}}{2} = \frac{-4 \pm 8}{2}$ $\frac{-12}{2} = -6 \text{ and } \frac{4}{2} = 2$ $\Rightarrow x = -6 \text{ and } x = 2$ $\Rightarrow (x + 6)(x - 2) = 0$
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* 2 correct roots without work or by substitution

4 MARKS

Factor Method

Blunders (-3)

- B1 Correct answers without work ✍
- B2 Incorrect two term linear factors of $x^2 + 4x - 12$ formed from correct (but inapplicable) factors of x^2 and/or ± 12 . e.g. $(x + 12)(x - 1)$
- B3 No roots given.
- B4 Incorrect factors of x^2 and/or ± 12
- B5 Correct cross method but factors not shown and stops [Note: B3 applies also].
- B6 $x(x+6) - 2(x+6)$ or similar and stops [Note: B3 applies also].
- B7 Error(s) in transposition

Slips (-1)

- S1 Numerical errors to a max of 3
- S2 One root only

Attempts (3 marks)

- A1 Some effort at factorisation
- A2 States one correct root without work

Worthless (0 marks)

- W1 $x^2 + 4x = 12$ or similar and stops
- W2 Incorrect Trial and error
- W3 Oversimplification, resulting in a linear equation

Formula Method

Blunders (-3)

- B1 Error in a, b, c substitution (apply once only)
- B2 Sign error in substituted formula (apply once only)
- B3 Error in square root or square root ignored
- B4 Stops at $\frac{-4 \pm 8}{2}$
- B5 Incorrect quadratic formula and continues
- B6 No factors from roots

Slips (-1)

- S1 Numerical errors to a max of 3
- S2 Roots left in the form $\frac{p}{q}$
- S3 One root only

Attempts (3 marks)

- A1 Correct formula and stops
- A2 One correct substitution and stops

Part (c)**20(5, 5, 10) marks****Att(2, 2, 3)**

- (i) Express $\frac{5x-1}{2} + \frac{4x-9}{3}$ as a single fraction.

Give your answer in its simplest form.

- (ii) Verify your answer to part (i) by substituting $x = 3$ into $\frac{5x-1}{2} + \frac{4x-9}{3}$

and into your answer to part (i).

- (iii) Multiply $(x-2)$ by $(x^2-3x+11)$

Write your answer in its simplest form

(c)(i)**5 marks****Att2**

$$\begin{aligned} \text{(i)} \quad & \frac{3(5x-1) + 2(4x-9)}{6} \\ \Rightarrow & \frac{15x-3+8x-18}{6} = \frac{23x-21}{6} \end{aligned}$$

* $\frac{5x-1}{2} + \frac{4x-9}{3} = \frac{9x-10}{5}$ Zero marks

Blunders (-3)

B1 Correct answer without work ✍

B2 Error(s) in distribution e.g. $3(5x-1) = 15x-1$

B3 Mathematical error e.g. $-3-18 = +21$

B4 Incorrect common denominator and continues

B5 Incorrect numerator from candidate's denominator e.g. $\frac{2(5x-1) + 3(4x-9)}{6}$

B6 No simplification of numerator

B7 Omitting denominator

Slips (-1)

S1 Drops denominator

S2 Numerical errors to a max of 3

S3 Answer not in simplest form. e.g. $\frac{46x-42}{12}$

Attempts (2 marks)

A1 6 only or a multiple of 6 only appears

A2 Any correct step

Worthless (0)

W1 $\left(\frac{5x-1}{2}\right)\left(\frac{4x-9}{3}\right)$ and stops

(c) (ii)

5 marks

Att2

$\begin{aligned} & \frac{5(3)-1}{2} + \frac{4(3)-9}{3} \\ &= \frac{15-1}{2} + \frac{12-9}{3} \\ &= \frac{14}{2} + \frac{3}{3} \\ &= 7+1 \\ &= 8 \end{aligned}$	and	$\begin{aligned} & \frac{23(3)-21}{6} \\ &= \frac{69-21}{6} \\ &= \frac{48}{6} \\ &= 8 \end{aligned}$
--	-----	---

* Accept candidates answer from previous section [May result in inequality].

* Accept usage of a value other than 3 for verification.

Blunders (-3)

- B1 Correct answer without work ✍
- B2 Substitutes into one expression only
- B3 Manipulation to force equality

Slips (-1)

- S1 Numerical errors to a max of 3
- S2 Conclusion missing if unequal

Attempts (2 marks)

- A1 Writes answer from previous part in this section
- A2 Substitutes a value into one expression and stops

(c) (iii)

10 marks

Att 3

$\begin{aligned} & (x-2)(x^2-3x+11) \\ & x(x^2-3x+11) - 2(x^2-3x+11) \\ & x^3-3x^2+11x-2x^2+6x-22 \\ & \mathbf{x^3-5x^2+17x-22} \end{aligned}$
--

* If $x^3-3x^2+11x-2x^2+6x-22$ is correct (minimum 7 MARKS)

Blunders (-3)

- B1 Errors in distribution each time
- B2 Errors in multiplication of powers
- B3 Errors in grouping of terms (apply once)
- B4 Mathematical errors eg $-2 \cdot -3x = -6x$
- B5 Correct answer without work ✍

Slips (-1)

- S1 Numerical errors to a max of 3

Attempts (3 marks)

- A1 One correct multiplication

QUESTION 6

Part(a)	10(5, 5) marks	Att(2, 2)
Part (b)	30(15, 15) marks	Att(5, 5)
Part (c)	10(5, 5) marks	Att(2, 2)

Part(a) (5, 5)marks att(2,2)

$P = \{(1, 5), (2, 8), (2,9), (3, 10)\}$
Write out the domain and range of P

(a)(i) 5marks att2

Domain = {1, 2, 3}

* Accept {1, 2, 2, 3} for full marks.

Slips (-1)

S1 Each incorrect element omitted / included other than the misreading below

Misreadings (-1)

M1 Correct range {5, 8, 9, 10} given

Attempts (2 marks)

A1 Any one correct element of the Domain

Worthless (0)

W1 No element of the domain appears, but note M1.

(a)(ii) 5marks att2

Range = {5, 8, 9, 10}

Slips (-1)

S1 Each incorrect element omitted / included other than the misreading below

Misreadings (-1)

M1 Correct domain {1, 2, 3} or {1, 2, 2, 3} given

Attempts (2 marks)

A1 Any one correct element of the Range

A2 Range $5 \rightarrow 10$

Worthless (0)

W1 No element of the range appears but note M1

Draw the graph of the function

$$f : x \rightarrow 3 + 2x - x^2$$

in the domain $-1 \leq x \leq 3$, where $x \in R$.

Table ✍

15 marks

Att 5

A

$f(-1)$	=	3	+2(-1)	$-(-1)^2$	=	0
$f(0)$	=	3	+2(0)	$-(0)^2$	=	3
$f(1)$	=	3	+2(1)	$-(1)^2$	=	4
$f(2)$	=	3	+2(2)	$-(2)^2$	=	3
$f(3)$	=	3	+2(3)	$-(3)^2$	=	0

B

x	-1	0	1	2	3
3	3	3	3	3	3
+2x	-2	0	+2	+4	+6
$-x^2$	-1	0	-1	-4	-9
$f(x)$	0	3	4	3	0

* Error(s) in each row/column calculation attracts a **maximum** deduction of 3marks

Blunders (-3)

- B1 Correct answer, without work i.e. 5 correct couples only and no graph ✍
- B2 $-x^2$ taken as $+x^2$ all the way but see M1
- B3 “+2x” taken as “2” all the way. [In the row headed “+2x” by candidate]
- B4 “3” calculated as “3x” all the way. [In the row headed “3” by candidate]
- B5 Adds in top row when evaluating $f(x)$ in **B**
- B6 Omits “3” row
- B7 Omits “+2x” row
- B8 Omits a value in the domain (each time).
- B9 Each incorrect image without work i.e. calculation through the function method (**A**)

Slips (-1)

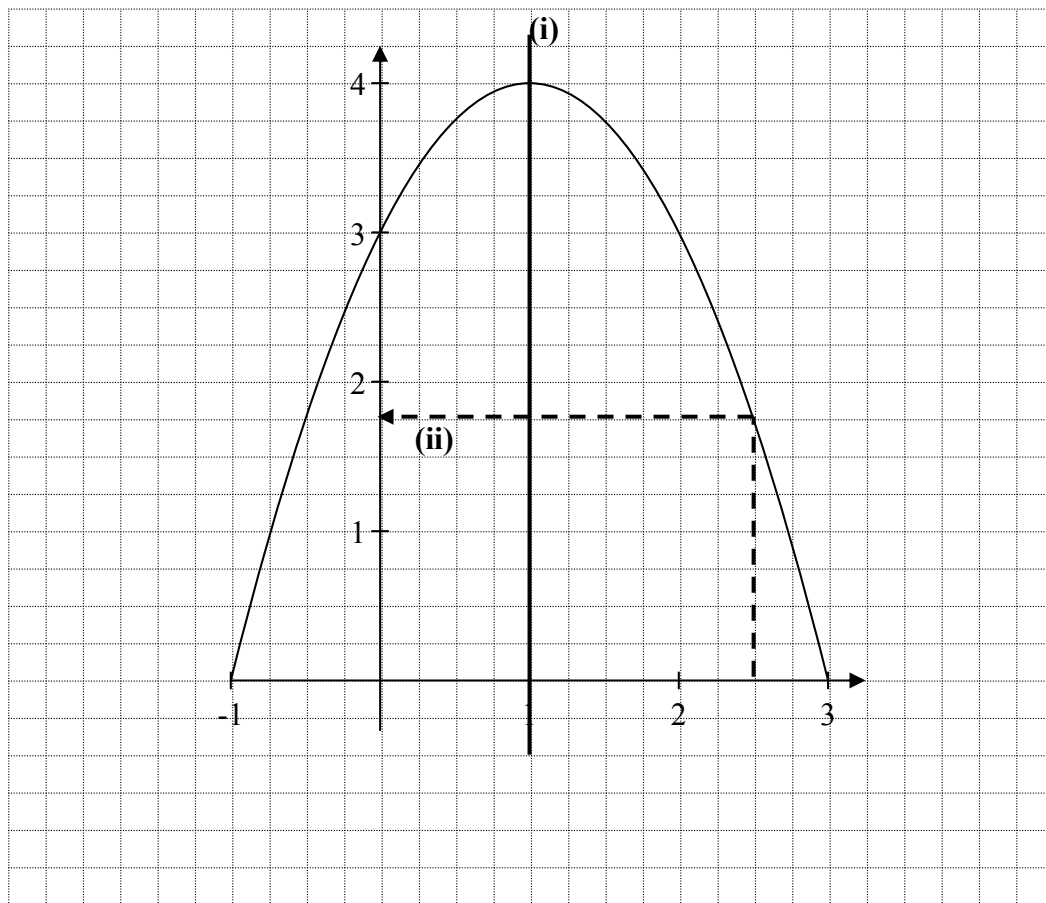
- S1 Numerical errors to a max of 3 in any row / column

Misreadings (-1)

- M1 Misreads “ $-x^2$ ” as “ $+x^2$ ” and places “ $+x^2$ ” in the table or function
- M2 Misreads “+2x” as “ $-2x$ ” and places “ $-2x$ ” in the table or function
- M3 Misreads “3” as “-3” and places “-3” in the table or function

Attempts (5 marks)

- A1 Omits “ $-x^2$ ” row from table or treats “ $-x^2$ ” as $\pm x$ or $\pm 2x$
- A2 Any effort at calculating point(s)
- A3 Only one point calculated and stops



- * accept candidates values from previous work (**5 co-ordinates needed**) but see S2
- * Only **one** correct point **graphed correctly** \Rightarrow Att 5 + Att 5
- * Correct graph but no table \Rightarrow full marks i.e. (15 + 15) marks.

Blunders (-3)

- B1 Reversed co-ordinates plotted against non-reversed axes (once only) {See S3 below}.
- B2 Scale error (once only)
- B3 Points not joined or joined in incorrect order (once only).

Slips (-1)

- S1 Each point of candidate graphed incorrectly. {Tolerance ± 0.25 }
- S2 Each point { **5 points needed** } from table not graphed [See 2nd * above]
- S3 reversed co-ordinates if
 - (i) axes not labelled or (ii) axes are reversed to compensate (see B1 above)

Attempts (5 marks)

- A1 Graduated axes (need not be labelled)
- A2 Some effort to plot a point { See 2nd * above }

- (c) ✍ (i) Draw the axis of symmetry of the graph you have drawn in part (b) above.

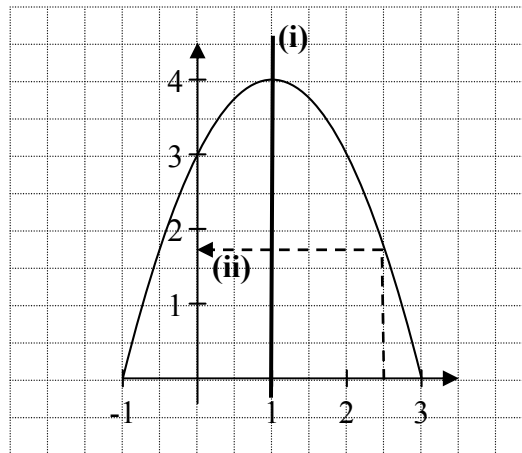
Work to be shown on the graph.

- (ii) Use the graph you have drawn in part (b) to estimate the value of $3 + 2x - x^2$ when $x = 2.5$

(c) (i)

5 marks

Att 2



* Accept any vertical line (parallel to candidate's y-axis) within tolerance of ± 0.25 .

Blunders (-3)

B1 Any vertical line (parallel to the candidate's y-axis) outside of the tolerance.

B2 Marks $x = 1$ on the x-axis and stops.

B3 States $x = 1$ but no line is indicated on the graph

Attempts (2 marks)

A1 Any attempt at axial symmetry of $f(x)$.

A2 y-axis indicated as the axis of symmetry (See B1).

(c) (ii)

5 marks

Att 2

Work to be shown on the graph and answer to be written here.

1.8

* Correct answer (clearly consistent with student's graph) inside the tolerance without graphical indication \Rightarrow 2 marks.

Blunders (-3)

B1 Correct answer without work ✗

B2 Answer on the diagram but outside of tolerance (± 0.25)

B3 Fails to write down the answer, when indicated correctly on graph

Slips (-1)

S1 Answer not written in box when written on graph

Attempts (2 marks)

A1 Attempt at algebraic evaluation or calculator.

A2 Marks 2.5 in any way on either axis and stops.

Worthless (0)

W1 Answer outside of tolerance without graphical indication.

BONUS MARKS FOR ANSWERING THROUGH IRISH

Bonus marks are applied separately to each paper as follows:

If the mark achieved is 225 or less, the bonus is 5% of the mark obtained, rounded *down*.
(e.g. 198 marks \times 5% = 9.9 \Rightarrow bonus = 9 marks.)

If the mark awarded is above 225, the following table applies:

Bunmharc (Marks obtained)	Marc Bónais (Bonus Mark)	Bunmharc (Marks obtained)	Marc Bónais (Bonus Mark)
226	11	261 – 266	5
227 – 233	10	267 – 273	4
234 – 240	9	274 – 280	3
241 – 246	8	281 – 286	2
247 – 253	7	287 – 293	1
254 – 260	6	294 – 300	0



Coimisiún na Scrúduithe Stáit
State Examinations Commission

**JUNIOR CERTIFICATE
EXAMINATION**

2010

MARKING SCHEME

**MATHEMATICS
ORDINARY LEVEL
PAPER 2**

GENERAL GUIDELINES FOR EXAMINERS

- 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.
- 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.
- Worthless work is awarded zero marks. Some examples of such work are listed in the scheme and they are labelled as W1, W2,...etc.
- The phrase "hit or miss" means that partial marks are not awarded – the candidate receives all of the relevant marks or none.
- The phrase "and stops" means that no more work is shown by the candidate.
- 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.
- 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.
- Unless otherwise indicated in the scheme, accept the best of two or more attempts – even when attempts have been cancelled.
- The *same* error in the *same* section of a question is penalised *once* only.
- Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks at most.
- A serious blunder, omission or misreading results in the attempt mark at most.
- 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 3
Part (b)	20(10, 5, 5) marks	Att (3, 2, 2)
Part (c)	20(10, 5, 5) marks	Att(3, 2, 2)

Part (a) **10 marks** **Att 3**

- (a) Find 20% of 4.6 kg.
Give your answer in grammes.

(a) **10 marks** **Att 3**

$$20\% = 1/5 \quad 4.6 \div 5 = 0.92 \text{ kg} \quad 0.92 \times 1000 = 920 \text{ g}$$

Blunders (-3)

- B1 Correct answer without work
- B2 Does not divide by 100
- B3 Decimal error
- B4 Treats 20% as $\frac{100}{20}$ and continues correctly
- B5 Incorrect mathematical operation with work and continues correctly e.g. adds instead of multiplies
- B6 Incorrect conversion or no conversion

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (3 marks)

- A1 Some correct step with work
- A2 States or recognises % is out of 100
- A3 States 1000 g = 1 kg. and stops
- A4 20×4.6 or $20 + 4.6$ or $20 - 4.6$ or $20 \div 4.6$ and stops
- A5 $\frac{4.6}{100}$ and stops or $\frac{20}{100}$ and stops or $\frac{4.6}{20}$ and stops

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

Part (b)

20 (10, 5, 5) marks

Att (3, 2, 2)

(b) (i)

10 marks

Att 3

(b) (i) Dara left Lucan by car at 09:25 and arrived in Sligo at 11:55. How long did it take Dara to travel from Lucan to Sligo? Give your answer in hours and minutes.

(b) (i)

10 marks

Att 3

11:55 - 9:25 = 2:30 2h 30 m 9:25 ->11:55 = 2 hours and 30 minutes
--

- * Accept correct answer without work
- * Do not penalise the same error twice in part (b)

Blunders (-3)

- B1 Error in converting hours to minutes or no conversion
- B2 Incorrect mathematical operation with work and continues

Slips (-1)

- S1 Numerical slips to a maximum of -3
- S2 Gives answer as 150 mins. or 2.5 hours

Attempts (3 marks)

- A1 Subtracts hours or minutes only

(b) (ii)

5 marks

Att 2

(ii) The distance from Lucan to Sligo is 195 km. Calculate Dara's average speed, in km/h.

(b) (ii)

5 marks

Att 2

(ii) Speed = Distance/Time = $195 \div 2.5 = 78$ km/h
--

- * Accept candidates' answer in part (i)
- * Accept ratio method

Blunders (-3)

- B1 Correct answer without work ✍
- B2 Incorrect relevant formula
- B3 Error in converting hours to minutes or no conversion (unless penalised in part (i))
- B4 No division i.e. leaves answer as $\frac{195}{2.5}$ and stops
- B5 Decimal error
- B6 30 minutes \neq 0.5 hours

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (2 marks)

- A1 Some correct step with work e.g. 2 hours 30 minutes = 2.5 hours
- A2 States 1 hour = 60 minutes and stops
- A3 Correct formula and stops

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

(b) (iii)

5 marks

Att 2

(iii)

On the return journey from Sligo to Lucan, Dara's average speed was 60 km/h.

How long, in hours and minutes, did the return journey take?

(b) (iii)

5 marks

Att 2

$$\text{Time} = \text{Distance} \div \text{Speed} = 195 \div 60 = 3.25 \text{ h} = 3\text{h } 15 \text{ m}$$

- * Formula need not be written down
- * Accept ratio method

Blunders (-3)

- B1 Correct answer without work ✗
- B2 Incorrect relevant formula
- B3 No division
- B4 Decimal error

Slips (-1)

- S1 Answer not in hours and minutes

Attempts (2 marks)

- A1 $195 + 60$ or $195 - 60$ and stops
- A2 Correct formula and stops

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

Part (c)

20(10, 5, 5) marks


Att(3, 2, 2)

(c) (i)

10 marks

Att 3

(c) (i) A rectangular piece of silver measures 4 cm by 24 cm.
Find, in cm^2 , the area of the piece of silver.



The diagram shows a shaded rectangle. A horizontal double-headed arrow above the rectangle is labeled '24 cm'. A vertical double-headed arrow to the left of the rectangle is labeled '4cm'.

(c) (i)

10 marks

Att 3

$$\text{Area} = lb = 24 \times 4 \text{ cm}^2 = 96 \text{ cm}^2$$

Blunders (-3)

B1 Correct answer without work $\cancel{\text{e}}$

B2 Incorrect mathematical operation with work and continues correctly

B3 Incorrect formula e.g. $\frac{1}{2} lb$ and continues

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (3 marks)

A1 $4 + 24$ or $\frac{24}{4}$ or $24 - 4$ and stops

A2 Some work with 24 and / or 4

A3 Gets perimeter of rectangle

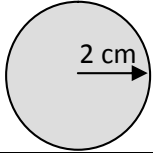
A4 Correct relevant formula and stops

(c) (ii)

5 marks

Att 2

(ii) Brian wants to cut circular discs of radius 2 cm from the piece of silver.
What is the greatest number of discs that he can cut from the piece?



The diagram shows a shaded circle with a horizontal arrow pointing from the center to the right edge, labeled '2 cm'.

(c) (ii)

5 marks

Att 2

$$\begin{aligned} \text{Width of disc} &= \text{radius} \times 2 = 4 \text{ cm} \\ \text{Number of Discs} &= 24 \div 4 = 6 \end{aligned}$$

Blunders (-3)

B1 Correct answer without work $\cancel{\text{e}}$

B2 Gets area of one disc and divides correctly into area of rectangle

B3 Takes diameter as 2 cm. and continues correctly

B4 Divides 96 by $4 = 24$

B5 Gives answer of 1 disc with work i.e. $\frac{4}{4}$

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (2marks)

A1 Gets area of one disc (12.566)

A2 States diameter = 4 and stops

Worthless (0)

W1 $\frac{96}{2} = 48$

(c) (iii)

5marks

Att 2

(iii) Taking π as 3.142, find in cm^2 , the area of the silver remaining after the discs have been cut out.
Give your answer correct to one decimal place.

(c) (iii)

5 marks

Att 2

$$\begin{aligned}\text{Silver remaining} &= \text{Area rectangle} - 6 \text{ discs} \\ &= 96 \text{ cm}^2 - 6 \times \pi r^2 \\ &= 96 \text{ cm}^2 - 6 \times 3.142 \times 2^2 \\ &= 96 \text{ cm}^2 - 75.408 \\ &= 20.592 \\ &= 20.6 \text{ cm}^2\end{aligned}$$

* Accept candidates' answer from parts (i) and (ii)

Blunders (-3)

B1 Correct answer without work \neq

B2 $\pi \neq 3.142$

B3 Decimal error

B4 Incorrect relevant formula and continues e.g. $2\pi r$ or a multiple of πr^2

B5 Does not multiply by 6

B6 Mathematical error

Slips (-1)

S1 Early rounding off that affects answer

S2 Answer not correct to one decimal place

S3 Numerical slips to a maximum of -3

Attempts (2 marks)

A1 Some correct step with work and stops

A2 Multiplies by 6

A3 Writes 2^2 and stops

A4 Correct formula and stops

Worthless (0)

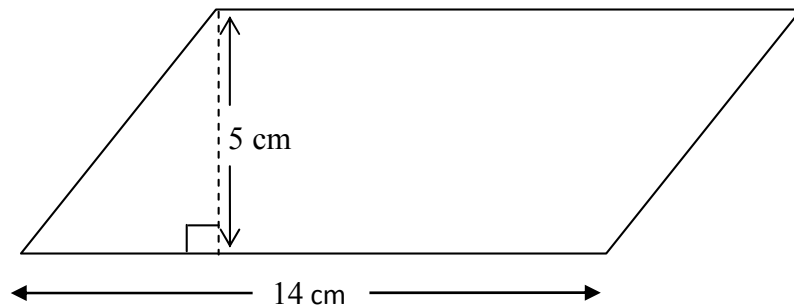
W1 Incorrect answer without work unless attempt mark applies

QUESTION 2

Part (a)	10 marks	Att 3
Part (b)	20(5, 10, 5) marks	Att (2, 3, 2)
Part (c)	20(5, 10, 5) marks	Att (2, 3, 2)

Part (a) 10 marks Att 3

1. (a) A parallelogram has dimensions as shown in the diagram.



(a) 10 marks Att 3

$$\text{Area } A = ah = 5 \text{ cm} \times 14 \text{ cm} = 70 \text{ cm}^2$$

Blunders (-3)

- B1 Correct answer without work ✍
- B2 Incorrect mathematical operation and continues
- B3 Incorrect relevant formula and continues
- B4 Mathematical error
- B5 Leaves answer as 5×14

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (3 marks)

- A1 Correct formula, i.e. base \times perpendicular height and stops
- A2 Incorrect product involving 14 and 5

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies
- W2 Use of formula involving π
- W3 $14^2 = 196$ or $5^2 = 25$ and stops

Part (b)

20(5, 10, 5)marks

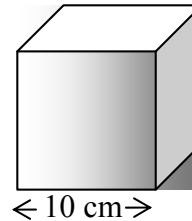
Att(2, 3, 2)

(b) (i)

5 marks

Att 2

- (i) A cube with side length 10 cm is shown.
Find, in cm^3 , the volume of the cube.



(b) (i)

5 marks

Att 2

$$\text{Volume} = l^3 = 10^3 = 10 \times 10 \times 10 \text{ cm}^3 = 1000 \text{ cm}^3$$

Blunders (-3)

- B1 Correct answer without work
- B2 Mathematical error
- B3 States $10 \times 10 = 100$ and stops
- B4 Incorrect relevant formula and continues e.g. surface area and continues
- B5 Incorrect substitution
- B6 Leaves answer as $10 \times 10 \times 10$

Slips (-1)

- S1 Numerical slips to a maximum of - 3

Attempts (2 marks)

- A1 States volume = $L \times B \times H$ and stops
- A2 $10 + 10 + 10 = 30$ or $10 + 10 + 10$
- A3 Writes 10×10 and stops
- A4 $10 \times 6 = 60$ and stops

Worthless (0)

- W1 Incorrect answer without unless attempt mark applies

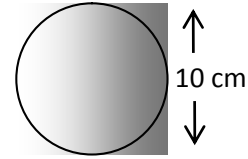
(b) (ii)

10 marks

Att 3

(ii)

A sphere with diameter 10 cm is shown.
Taking π as 3.142 find, in cm^3 , the volume
of the sphere.
Give your answer to the nearest whole number.



(b) (ii)

10 marks

Att 3

$$\begin{aligned} \text{Diameter} &= 10 \text{ cm} & \text{Radius} &= 5 \text{ cm} \\ \text{Volume} &= \frac{4}{3} \pi r^3 = \frac{4}{3} \times 3.142 \times 5^3 = \frac{4}{3} \times 3.142 \times 125 = \frac{1571}{3} = 523.6667 \\ &= 524 \text{ cm}^3 \end{aligned}$$

Blunders (-3)

- B1 Correct answer without work $\not\approx$
- B2 Incorrect relevant sphere formula
- B3 Incorrect substitution
- B4 Mathematical error e.g. $5^3 = 15$
- B5 $\pi \neq 3.142$ or answer in terms of π or π dropped in calculations
- B6 radius $\neq 5$

Slips (-1)

- S1 Numerical slips to a maximum of -3
- S2 Answer not to nearest whole number
- S3 Answer to incorrect whole number

Attempts (3 marks)

- A1 Gives volume as $\frac{4}{3} \pi r^3$ and stops
- A2 States radius is half of diameter and stops
- A3 π omitted with or without work
- A4 Product of two relevant numbers ($\frac{4}{3}$, 3.142 or 5)

(b) (iii)

5 marks

Att 2

(iii) Express the volume of the sphere in **(ii)**, as a percentage of the volume of the cube in **(i)**.

(b) (iii)

5 marks

Att 2

Vol cube = 1000cm^3 answer **(i)**

Vol sphere = 524 cm^3 answer **(ii)**

(ii) as a percentage of **(i)** = $\frac{524}{1000} \times 100 = 52.4\%$

* Accept candidates' answer from parts (i) and (ii)

Blunders (-3)

- B1 Correct answer without work
- B2 Numerator $\neq 524$
- B3 Denominator $\neq 1000$
- B4 Decimal error
- B5 Inverts fraction and continues

Attempts (2 marks)

- A1 Inverts fraction i.e. $\frac{1000}{524}$ and stops
- A2 Leaves answer as $\frac{524}{1000}$
- A3 States or recognises % is out of 100
- A4 Any correct step

Worthless (0)

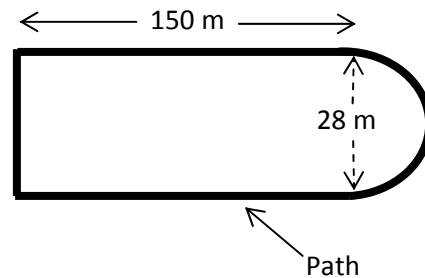
- W1 Incorrect answer without work unless attempt mark applies

Part (c)

20(5, 10, 5) marks

Att(2, 3, 2)

- (c) A park is in the shape of a rectangle with a semicircular end.
The rectangle is 150 m long and 28 m wide.
The diameter of the semicircular end is also 28 m.
There is a path around the park which is used for walking and jogging.



(c) (i)

5 marks

Att 2

- (i) Taking π as 3.142, calculate the length of the semicircular end.
Give your answer to the nearest metre.

(c) (i)

5 marks

Att 2

$$\text{Semicircular end} = \frac{1}{2} \text{circumference} = \frac{1}{2} \times \pi D = \frac{1}{2} \times 3.142 \times 28 = 43.988 \text{ cm} = 44 \text{ cm}$$

$$\text{or } \frac{1}{2} \times 2\pi r = \frac{1}{2} \times 2 \times 3.142 \times 14 = 43.988 \text{ cm} = 44 \text{ cm}$$

Blunders (-3)

- B1 Correct answer without work
- B2 Incorrect mathematical operation and continues
- B3 Incorrect relevant formula e.g. $2\pi r$ or πr^2 and continues
- B4 $\pi \neq 3.142$
- B5 radius $\neq 14$ or diameter $\neq 28$
- B6 Decimal error

Slips (-1)

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

Attempts (2 marks)

- A1 $r = 14$ and stops or 14 and stops
- A2 Correct formula or $2\pi r$ and stops
- A3 $r = 14$ marked in the diagram

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies
- W2 Incorrect irrelevant formula without work

(c) (ii)

10 marks

Att 3

(ii) Calculate the total length of the path around the park.

(c) (ii)

10 marks

Att 3

$$\begin{aligned} \text{Path} &= 2 \text{ long sides} + \text{semicircular end} + 1 \text{ short side} \\ &= 2 \times 150 + 44 + 28 = 372 \text{ m} \end{aligned}$$

* Accept candidates' answer from part (i)

Blunders (-3)

B1 Correct answer without work $\not\approx$

B2 Incorrect mathematical operation and continues e.g. multiplies instead of adds

B3 Omits a length (each time) or includes an extra length

B4 Leaves answer as $150 + 150 + 44 + 28$

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (3 marks)

A1 Some correct step with work e.g. $150 + 150$ and stops

A2 Recognises 150 as part of answer e.g. $150 + \dots$ and stops

A3 Recognises 44 as part of the answer e.g. $44 + \dots$ and stops

A4 Recognises 28 as part of the answer e.g. $28 + \dots$ and stops

A5 Finds area of park or part of with work

Worthless (0)

W1 Incorrect answer without work unless attempt mark applies

(c) (iii)

5 marks

Att 2

(iii) Barbara wishes to jog 2.5 km.
How many laps of the path must she complete to ensure that she jogs this distance?

(c) (iii)

5 marks

Att 2

$$\begin{aligned} \text{Number of Laps} &= 2500 / \text{length lap} = 2500 \div 372 = 6.720 \\ &\text{Must complete 7 laps} \end{aligned}$$

* Accept candidates' answer from part (ii)

Blunders (-3)

B1 Correct answer without work $\not\approx$

B2 Incorrect mathematical operation and continues

B3 Decimal error

B4 Error in converting km to m or no conversion

B5 Fraction inverted and continues

B6 No division

Slips (-1)

S1 Numerical slips to a maximum of -3

S2 Answer given as 6.72

Attempts (2 marks)

A1 States $1 \text{ km} = 1000 \text{ m}$ or changes 2.5 km to 2,500 m

Worthless (0)

W1 Incorrect answer without work unless attempt mark applies

QUESTION 3

Part (a)	10 marks	Att 3
Part (b)	20(10, 5, 5) marks	Att(3, 2, 2)
Part (c)	20(10, 5, 5) marks	Att(3, 2, 2)

Part (a) **10 marks** **Att 3**

(a) Find the mode of the numbers:
5.1, 5.6, 5.8, 5.3, 5.6, 5.2

(a) **10 marks** **Att 3**

Mode = 5.6

* Accept correct answer without work

Blunders(-3)

- B1 Gives 2 as the mode with explanation e.g. " because 5.6 occurs twice "
B2 Finds mean (5.433) or median of given numbers with work

Slips(-1)

- S1 Numerical slips to a maximum of -3

Attempts (3 marks)

- A1 Writes " mode means most " or similar and stops
A2 Writes $5.1 + 5.6 + 5.8 + 5.3 + 5.6 + 5.2$ whether added or not
A3 Writes 6 or 2 and stops
A4 Rearranges the numbers in order and stops

Worthless(0)

- W1 Incorrect answer without work unless attempt mark applies
W2 Copies order in question

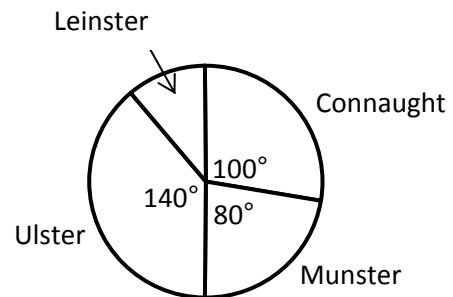
Part (b)

20(10, 5, 5) marks

Att(3, 2, 2)

(b)

A group of people was surveyed to find out which Irish province, Ulster, Munster, Connaught or Leinster, each came from. The pie chart represents the result of that survey.



(b) (i)

10 marks

Att 3

(i) What is the measure of the angle for Leinster?

(b) (i)

10 marks

Att 3

$$\begin{aligned} \text{Leinster} &= 360^\circ - (100^\circ + 140^\circ + 80^\circ) = 360^\circ - 320^\circ = 40^\circ \\ \text{or} &= 180^\circ - 140^\circ = 40^\circ \end{aligned}$$

* Do not penalise the same error twice in part (b)

Blunders(-3)

- B1 Correct answer without work (could be in diagram) ✘
- B2 Angle at centre not 360°
- B3 Straight line angle not 180°
- B4 Each angle omitted
- B5 Stops at 320° with work
- B6 Stops at 360° - 320° or 180° - 140°

Slips(-1)

- S1 Numerical slips to a maximum of -3

Attempts (3 marks)

- A1 Adds any two angles correctly
- A2 States " straight line angle = 180° " and stops
- A3 States " angle at centre of circle = 360° " or similar and stops

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

(b) (ii)

5 marks

Att 2

(ii) 35 people said they came from Connaught.
How many people were in the group that was surveyed?

(b) (ii)

5 marks

Att 2

$$100^\circ = 35 \text{ people}$$

$$1^\circ = \frac{35}{100}$$

$$360^\circ = \frac{35}{100} \times 360 = 126 \text{ people : number in group}$$

Blunders (-3)

- B1 Correct answer without work ~~✗~~
- B2 Incorrect ratio / fraction
- B3 Decimal error
- B4 Mathematical error
- B5 7×18 and stops

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (2 marks)

- A1 Writes 100° or 360° or $\frac{5}{18}$ or similar and stops
- A2 Division by 100

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

(b) (iii)

5 marks

Att 2

(iii)

How many people gave Ulster as their reply?

(b) (iii)

5 marks

Att 2

$$\text{Ulster} = 140^\circ$$

$$140^\circ = \frac{35}{100} \times 140 = 49 \quad \text{or} \quad \text{Ulster} = \frac{140}{360} \times 126 = 49$$

* Accept candidates' answer for part (ii)

Blunders (-3)

B1 Correct answer without work ~~✓~~

B2 Incorrect ratio

B3 Decimal error

B4 Mathematical error

B5 Stops at $\frac{140}{360} \times 126$ or $\frac{35}{100} \times 140$

Slips (-1)

S1 Numerical slips to a maximum of -3

Misreadings (-1)

M1 Gives correct answer for Munster or Leinster with work i.e. 28 and 14 respectively

Attempts (2 marks)

A1 Writes $\frac{140}{360}$ or $\frac{35}{100}$ and stops

A2 Multiplies 140×126 and stops

A3 Multiplies 35×140 and stops

A4 Mention of 140° or 360° and stops

Part (c)

20(10, 5, 5) marks

Att(3, 2, 2)

(c) Each day, during a particular week, Deirdre noted the number of minutes that she spent listening to music.
Her results from Monday to Saturday are in the table below.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Time in minutes	75	65	60	50	80	90

(c) (i)

10 marks

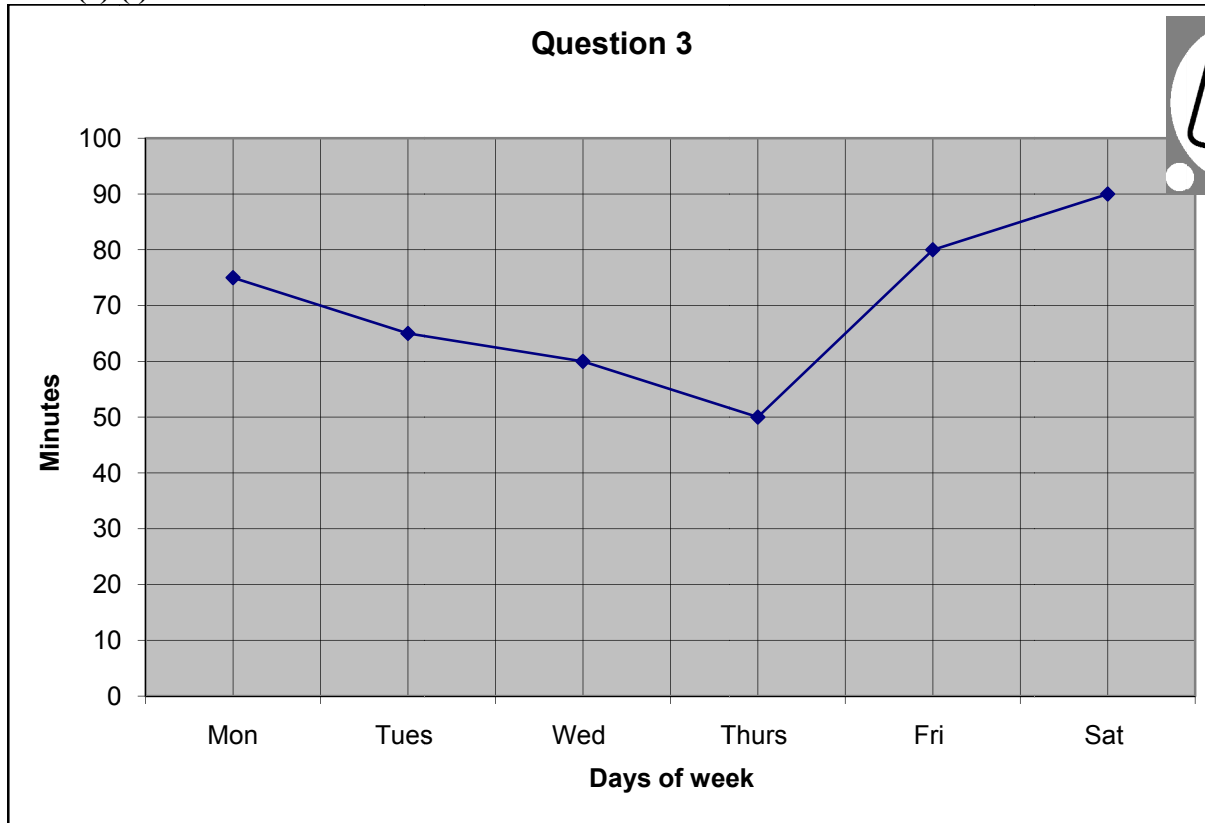
Att 3

(i) Draw a trend graph of these results, putting days on the horizontal axis.

Part (c) (i)

10 marks

Att 3



- * Accept correct graph with no labels
- * Be lenient with the plotting of points

Blunders (-3)

- B1 Axes not graduated uniformly (once)
- B2 Axes reversed
- B3 Points not joined or joined in incorrect order
- B4 Points joined by curve
- B5 Reorders days axis
- B6 Draws a bar chart or pie chart correctly

Slips (-1)

- S1 Each point plotted incorrectly
- S2 Each point omitted to a maximum of 4 points (otherwise A2)

Attempts (3 marks)

- A1 Graduated axis or axes
- A2 Plots one point only

(c) (ii)

5 marks

Att 2

(ii) Calculate the mean number of minutes per day, that Deirdre spent listening to music.

(c) (ii)

5 marks

Att 2

$$\text{Mean} = \frac{75 + 65 + 60 + 50 + 80 + 90}{6} = \frac{420}{6} = 70$$

Blunders (-3)

- B1 Correct answer without work ~~✓~~
- B2 Denominator not 6
- B3 Inverted fraction
- B4 Incorrect mathematical operation in numerator
- B5 $\frac{420}{6}$ and stops
- B6 Mathematical error

Slips (-1)

- S1 Numerical slips to a maximum of -3
- S2 Each value omitted in numerator up to a maximum of 4 (otherwise attempt at most)

Attempts (2 marks)

- A1 Some correct step with work and stops e.g. $75 + 65 + 60 + 50 + 80 + 90$ and stops
- A2 Mean = $\frac{\Sigma fx}{\Sigma f}$ and stops
- A3 A relevant addition and stops
- A4 6 and stops

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

(c) (iii)

5 marks

Att 2

(iii) When Sunday was included Deirdre's mean was 80 minutes.
How long did Deirdre listen to music on Sunday?

(c) (iii)

5 marks

Att 2

Total for 7 days (including Sunday) = $80 \times 7 = 560$
Total for 6 days (excluding Sunday) = 420
Time for Sunday = $560 - 420 = 140$

* Accept candidates' answer from part (ii)

Blunders (-3)

- B1 Correct answer without work
- B2 Multiplies by 6 instead of 7
- B3 $80 \times 7 = 560$ and stops
- B4 $560 - 420$ and stops

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (2 marks)

- A1 Any relevant use of 80 and / or 420
- A2 Divides or multiplies any number by 7

Worthless (0)

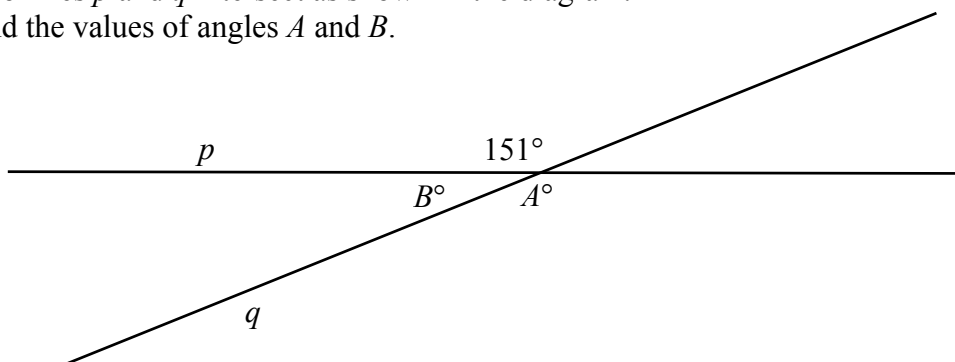
- W1 Incorrect answer without work unless attempt mark applies

QUESTION 4

Part (a)	10 marks	Att(2, 2)
Part (b)	20(5, 5, 5, 5) marks	Att(2, 2, 2, 2)
Part (c)	20(10, 5, 5) marks	Att(3, 2, 2)

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

4. (a) Two lines p and q intersect as shown in the diagram.
Find the values of angles A and B .



(a) 5, 5 marks Att 2,2

$$A = 151^\circ$$

$$B = 180^\circ - 151^\circ = 29^\circ$$

- * Accept correct answer without work
- * Accept correct answer marked or indicated in diagram

Blunders (-3)

B1 Writes $A = 29^\circ$ and $B = 151^\circ$ (only one blunder)

B2 Gets incorrect B with work and proceeds to get correct A (or vice versa)

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (2 marks)

A1 Some correct step and stops e.g. 180° (once)

A2 States "vertically opposite angles are equal" and stops (for A)

A3 States "straight line angle = 180° " and stops (for B)

Worthless (0)

W1 Incorrect answer without work unless attempt mark applies

Part (b)

20(5, 5, 5, 5) marks

Att (2, 2, 2, 2)

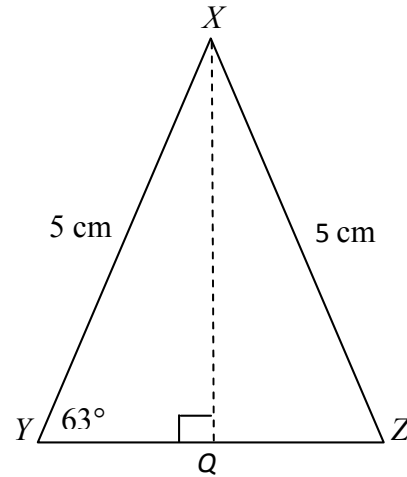
(b)

XYZ is an isosceles triangle.

$$|XY| = |XZ| = 5 \text{ cm.}$$

$$|\angle XYZ| = 63^\circ.$$

Q is the midpoint of $[YZ]$ and $XQ \perp YZ$.



(b) (i)

5 marks

Att 2

(i) Write down $|\angle XZY|$.

(b) (i)

5 marks

Att 2

$$|\angle XZY| = 63^\circ$$

- * Accept correct answer without work
- * Accept correct answer marked in diagram
- * Accept use of Sine Rule to get answer

Blunders (-3)

- B1 States $|\angle YXZ| = 63^\circ$ and continues to get $|\angle XZY| = 54^\circ$
B2 States $|\angle XZY| = |\angle XYZ|$ but does not say $|\angle XZY| = 63^\circ$

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (2 marks)

- A1 $|\angle YXQ| = 27^\circ$ and stops
A2 Indicates clearly $\angle XZY$ on the diagram
A3 Marks $|YQ| = |QZ|$ on diagram
A4 Some reference to angles at the base of an isosceles triangle being equal

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

(b) (ii)

5 marks

Att 2

(ii) Given that $|XQ| = 4$ cm, use the theorem of Pythagoras to find $|YQ|$.

* Accept any correct trigonometric method for finding $|YQ|$. Note that the answer will not be equal to 3

(b) (ii)

5 marks

Att 2

$$|YQ|^2 + |XQ|^2 = |XY|^2$$

$$|YQ|^2 + 4^2 = 5^2$$

$$|YQ|^2 = 25 - 16$$

$$|YQ|^2 = 9$$

$$|YQ| = \sqrt{9} = 3$$

Blunders (-3)

- B1 Correct answer without work
- B2 Incorrect use of Pythagoras' Theorem
- B3 Mathematical error e.g. $5^2 = 10$
- B4 Error in transposing
- B5 $|YQ|^2 = 9$ and stops

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (2 marks)

- A1 States Pythagoras' Theorem
- A2 5^2 or 4^2 and stops
- A3 Some correct step e.g. $|YQ|^2$

Worthless (0)

- W1 Incorrect answer without work unless attempt mark applies

(b) (iii)

5 marks

Att 2

(iii) Hence find the area of the triangle ΔXYZ .

(b) (iii)

5 marks

Att 2

$$A = \frac{1}{2}ah = \frac{1}{2}(6)(4) = 12$$

* Accept candidates' answer from part (ii)

Blunders (-3)

- B1 Correct answer without work $\not\approx$
- B2 Incorrect base
- B3 Incorrect height
- B4 Incorrect relevant formula e.g. (base)(height)
- B5 Incorrect mathematical operation and continues

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (2 marks)

- A1 States $|YZ| = 6$ and stops
- A2 States area = $\frac{1}{2}$ (base)(height) or similar and stops

(b) (iv)

5 marks

Att 2

(iv) Find the perimeter of triangle ΔXYZ .

(b) (iv)

5 marks

Att 2

$$\text{Perimeter} = |XY| + |YZ| + |ZX| = 5 + 6 + 5 = 16$$

* Accept candidates' answer from part b (ii)

Blunders (-3)

- B1 Correct answer without work $\not\approx$
- B2 Takes $|YZ| = 3$
- B3 Omits one side
- B4 One side incorrect (subject to M1)
- B5 Each extra side included

Slips (-1)

S1 Numerical slips to a maximum of -3

Misreading (-1)

M1 Gets perimeter of ΔXYQ or ΔXZQ

Attempts (2 marks)

- A1 States perimeter = $|XY| + |YZ| + |XZ|$ and stops
- A2 Attempt at addition of relevant numbers e.g. $5 + \dots$ or $6 + \dots$
- A3 States $|YZ| = 6$ and stops

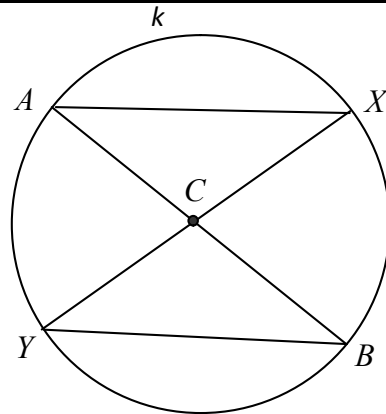
Part (c)

20(10, 5, 5) marks

Att(3, 2, 2)

(c)

C is the centre of the circle k .
[AB] and [XY] are diameters of k .



(c) (i)

10 marks

Att 3

- (i) Name another line segment equal in length to [AC].
Give a reason for your answer.

(c) (i)

10 marks

Att 3

Answer: [XC] or [YC] or [BC] is the same length as [AC]

Reason: Radius of the circle k

* Accept indications on diagram

Slips (-1)

S1 Incorrect or no reason

Attempts (3 marks)

A1 States radius is half of diameter

A2 States $|AX| = |YB|$

A3 Mention of vertically opposite angles are equal

A4 $|AC| = \frac{1}{2} |AB|$

Worthless (0)

W1 Diagram reproduced without modification

(c) (ii)

5 marks

Att 2.

(ii) Name the image of ΔAXC by central symmetry in C .

(c) (ii)

5 marks

Att 2

ΔAXC image by S_C is ΔBYC

- * Accept correct answer without work
- * Accept ΔBYC with points in any order
- * Accept $A \rightarrow B, C \rightarrow C, X \rightarrow Y$
- * Accept reproduced diagram with correct indication / shading

Blunders (-3)

B1 Each point whose image is not found or found incorrectly

Attempts (2 marks)

A1 States the image is a triangle

A2 Finds the image of one or two points correctly e.g. $C \rightarrow C$ or $|XC| \rightarrow |CY|$

A3 Shows some knowledge of central symmetry and stops

A4 If Y, C or B appears in any group of letters

Worthless (0)

W1 Diagram reproduced without modification

(c) (iii)

5 marks

Att 2

(iii) Complete the following reasons for the fact that the triangles ΔAXC and ΔBYC are congruent.

(c) (iii)

5 marks

Att 2

Reasons:	In ΔAXC		In ΔBYC	
	$[AC]$	=	$[CB]$	
	XC	=	YC	
	$ \angle ACX $	=	$ \angle BCY $	

- * Accept correct answer without work
- * Accept correct answer marked or indicated in a reproduced diagram
- * Accept other reasons

Blunders(-3)

B1 Each step omitted or incorrect

Attempts(2 marks)

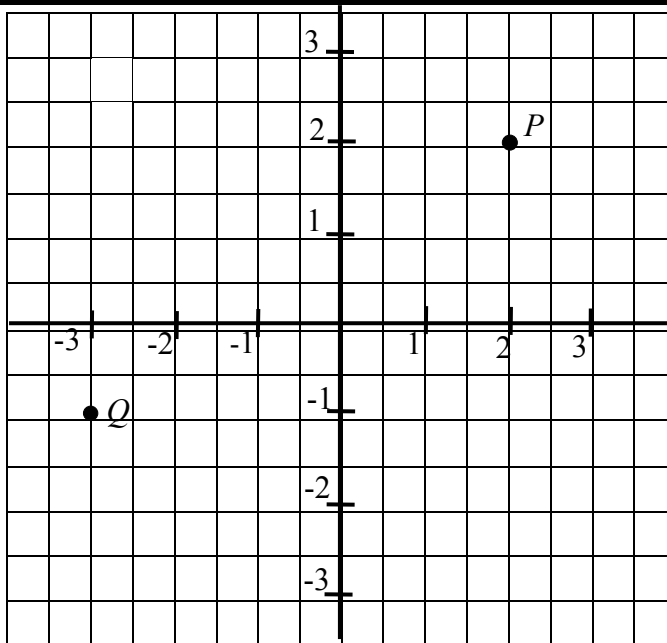
A1 States same shape or SSS or ASA or SAS or RHS

A2 States triangles fold onto each other

QUESTION 5

Part (a)	10 marks	Att 2, 2
Part (b)	25(10, 10, 5) marks	Att(3, 3, 2)
Part (c)	15(2, 2, 2) marks	Att(2, 2, 2)
(a)	5,5 marks	Att2, 2

(a) Write down the co-ordinates of the points P and Q



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

$P = (2, 2)$ $Q = (-3, -1)$

- * Accept without brackets for full marks e.g. 2,2 and -3,-1
- * Accept $x = 2$ and $y = 2$ and $x = -3$ and $y = -1$ for full marks

Blunders (-3)

- B1 Incorrect order of ordinates in Q
- B2 Incorrect x ordinate, if not sign error, subject to B1
- B3 Incorrect y ordinate, if not sign error, subject to B1
- B4 $x = 2$ and stops or $y = 2$ and stops (for P) or $x = -3$ and stops or $y = -1$ and stops (for Q)

Slips (-1)

- S1 Sign error in x ordinate
- S2 Sign error in y ordinate

Misreadings (-1)

- M1 $Q = (2 , 2)$ and $P = (-3 , -1)$

Attempts (2 marks)

- A1 Draws a line through $x = 2$ or $y = 2$ (for P)
- A2 Draws a line through $x = -3$ or $y = -1$ (for Q)
- A3 $Q = (1 , 3)$

Notes

For P : $(2 , -2)$ S2 , $(-2 , 2)$ S1 , $(-2 , -2)$ S1 and S2

For Q : $(3 , -1)$ S1 , $(-3 , 1)$ S2 , $(3 , 1)$ S1 and S2 but $(-1 , -3)$ B1

(b)

25(10, 10, 5) marks

Att(3, 3, 2)

(b) C is the point (5, -4) and D is the point (3, 8).

Find each of the following:

(b)(i)

10marks

Att 3

(i) the midpoint of $[CD]$

(b)(i)

10marks

Att 3

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left(\frac{5+3}{2}, \frac{-4+8}{2} \right) = \left(\frac{8}{2}, \frac{4}{2} \right) = (4, 2)$$

* Accept translation method

* No penalty on brackets

Blunders (-3)

B1 Correct answer without work

B2 Incorrect formula, e.g. error in both signs, and continues

B3 Incorrectly treats couples as (x_1, x_2) and (y_1, y_2) and continues

B4 Two or more signs incorrect in substitution with work

B5 Uses one of the given points and some arbitrary point e.g. (1, 2) and continues

B6 Mathematical error

Slips (-1)

S1 Numerical slips up to a maximum of -3

S2 Error in one sign in formula and continues

S3 One incorrect substitution or sign e.g. $\left(\frac{5+3}{2}, \frac{4+8}{2} \right)$ and continues

S4 Takes (3, 8) as midpoint and finds extremity e.g. $(5, -4) \rightarrow (3, 8) \rightarrow (1, 20)$ or
Takes (5, -4) as midpoint and finds extremity e.g. $(3, 8) \rightarrow (5, -4) \rightarrow (7, -16)$

Attempts (3 marks)

A1 Some correct substitution

A2 Correct midpoint on diagram and not named (if named B1 applies)

A3 Point C and/or D plotted reasonably well for this part

A4 Labels C and/or D with (x_1, y_1) and stops

Worthless (0)

W1 Writes any formula and stops

(b)(ii)

10 marks

Att 3

(ii) the slope of CD

(b)(ii)

10 marks

Att 3

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - (-4)}{3 - 5} = \frac{12}{-2} = -6$$

* Accept the candidates' midpoint from part (i) as a point for finding the slope

* Accept correct trigonometric method i.e. $\tan A = \frac{-12}{2}$

Blunders (-3)

B1 Correct answer without work

B2 Incorrect formula e.g. error in both signs, and continues

B3 Incorrectly treats couples as (x_1, x_2) and (y_1, y_2) and continues

B4 Two or more signs incorrect in substitution with work

B5 Uses one of the given points and some arbitrary point e.g. $(1, 2)$ and continues

B6 Mathematical error

Note Do not apply B3 here if already penalised in previous part

Slips (-1)

S1 Numerical slips to a maximum of -3

S2 Error in one sign in formula and continues

S3 One incorrect substitution and continues e.g. $\frac{8-4}{3-5}$

Attempts (3 marks)

A1 Some correct substitution

A2 $\tan A = \frac{\textit{opposite}}{\textit{adjacent}}$ or $m = \frac{\textit{vertical}}{\textit{horizontal}}$ and stops

A3 Some correct substitution into formula with $x_2 - x_1$ and / or $y_2 - y_1$ and stops

A4 Labels C and / or D with (x_1, y_1) and stops

A5 Plots a diagram with C and D drawn reasonably well and the line CD drawn

Worthless (0)

W1 Writes any formula and stops

(b)(iii)

5marks

Att 2

(iii) the length of $[CD]$

(b)(iii)

5marks

Att 2

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(3 - 5)^2 + (8 - (-4))^2} = \sqrt{(-2)^2 + (12)^2} = \sqrt{4 + 144} = \sqrt{148}$$

* Accept correct use of Pythagoras

Blunders (-3)

B1 Correct answer without work ~~✓~~

B2 Incorrect formula and continues

B3 Incorrectly treats couples as (x_1, x_2) and (y_1, y_2) and continues

B4 Two or more signs incorrect in substitution with work

B5 Uses one of the given points and some arbitrary point e.g. $(1, 2)$ and continues

B6 Mathematical error

B7 No square root sign included with substitution and continues correctly to get 148

Note Do not apply B3 here if already penalised in previous parts

Slips (-1)

S1 Numerical slips to a maximum of -3

S2 Error in one sign in formula and continues

S3 One incorrect substitution or sign when substitution

S4 If square root sign is included with substitution and omitted in answer of 148

Attempts (2 marks)

A1 Some correct substitution

A2 Some correct substitution into a formula with $x_2 - x_1$ and / or $y_2 - y_1$

A3 States Pythagoras' Theorem and stops

A4 Labels C and / or D with (x_1, y_1) and stops

A5 Plots a diagram of C and D reasonably well

Worthless (0)

W1 Incorrect answer without work unless attempt mark applies

Part (c)

15(5, 5, 5) marks

Att(2, 2, 2)

(c) (i)

5 marks

Att 2

(c) (i) $y = 5x - 3$ is the equation of the line l .
Verify the point $(1, 2)$ is on l .

(c) (i)

5 marks

Att 2

$$y = 5x - 3 \qquad 2 = 5(1) - 3 = 5 - 3 = 2 \quad \text{True}$$

* Candidate needs to get $2 = 2$ for full marks (the "True" is not required)

Blunders (-3)

B1 Incorrect substitution and continues e.g. switches x and y

B2 Mathematical error

B3 $2 = 5(1) - 3$ and stops

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (2 marks)

A1 Substitutes one correct value and stops

A2 Identifies $x = 1$ and / or $y = 2$ or plots point

A3 Any correct transposition of equation and stops e.g. $y + 3 = 5x$

A4 States " Yes it is " and stops

(c) (ii)

5 marks

Att 2

(ii) By letting $x = 0$, find the co-ordinates of A , the point of intersection of l and the y -axis.

(c) (ii)

5 marks

Att 2

$$\begin{aligned} y &= 5x - 3 \\ y &= 5(0) - 3 \\ y &= -3 \\ A &= (0, -3) \end{aligned}$$

* Accept answer given as $y = -3$ with work shown for full marks

Blunders (-3)

B1 Correct answer without work ~~✓~~

B2 Substitutes $y = 0$ and continues

B3 Mathematical error

B4 Incorrect substitution and continues

B5 Transposition error

Slips (-1)

S1 Numerical slips to a maximum of -3

Attempts (2 marks)

A1 Substitutes $y = 0$ and stops

A2 Writes answer as $(0 , y)$ without work , where y is an arbitrary number , subject to B1

A3 Substitutes $x = 0$ into equation and stops

Worthless (0)

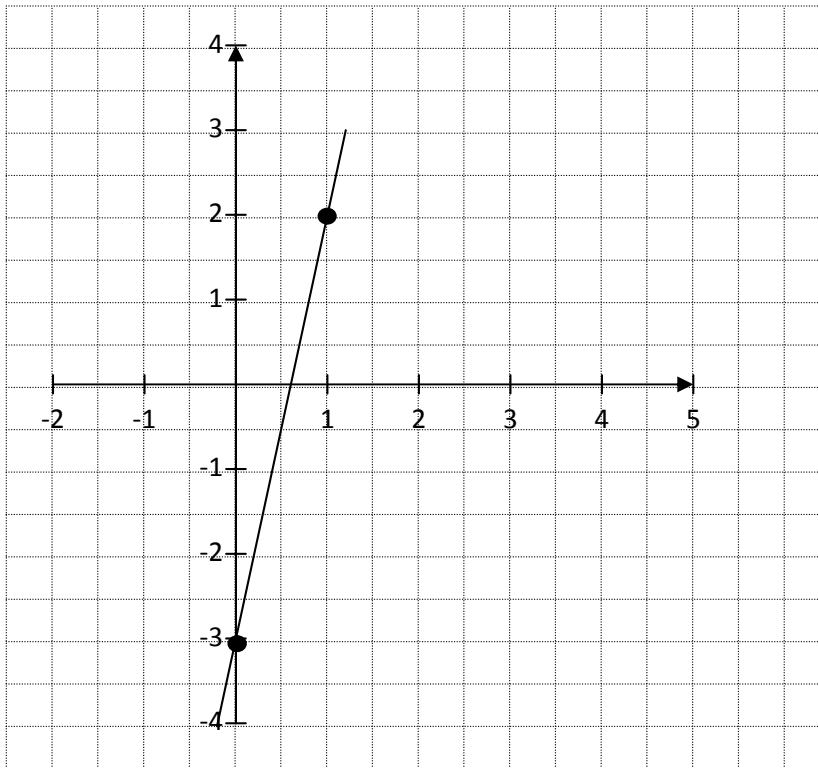
W1 Incorrect answer without work unless attempt mark applies

(c) (iii)

5marks

Att 2

(iii) Hence draw the line l , on the grid below.



* Accept candidates' answer from part c (ii)

Blunders (-3)

- B1 Points plotted correctly but line not drawn
- B2 x and y values of one / both point(s) switched
- B3 Each point plotted incorrectly

Slips (-1)

- S1 Switches X and Y axes

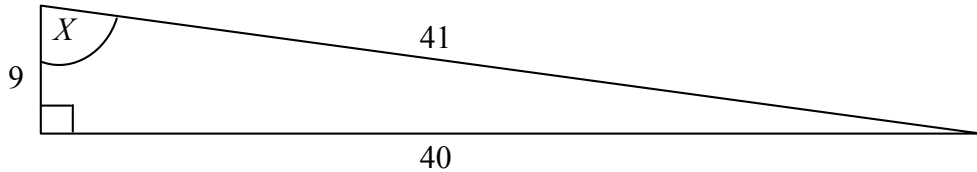
Attempts (2 marks)

- A1 One point drawn correctly
- A2 Scaled axis / axes drawn

QUESTION 6

Part (a)	10(5, 5) marks	Att(2, 2)
Part (b)	20(5, 5, 10) marks	Att(2, 2, 3)
Part (c)	20(10, 10) marks	Att(3, 3)
(a)	10(5, 5) marks	Att 2,2

(a) The diagram shows a right-angled triangle with measurements as shown.



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

(i) Write down the length of the hypotenuse of the triangle.

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

Length of the hypotenuse = 41

* Accept correct answer without work

* Indicates 41 or h or hypotenuse only in diagram, accept for full marks

Attempts (2 marks)

A1 Any mention of a trigonometric ratio

A2 Gives answer as 9 or 40

Worthless (0)

W1 Gives more than one answer

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

(ii) Write down the value of $\cos X$ as a fraction.

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

$$\cos X = \frac{9}{41}$$

* Accept correct answer without work

* Accept candidates' hypotenuse from part (i)

* Accept $\cos \frac{9}{41}$ for full marks

Blunders (-3)

B1 Incorrect ratio e.g. $\frac{9}{40}$ or $\frac{40}{41}$

B2 Inverted ratio i.e. $\frac{41}{9}$

Slips (-1)

S1 $\cos X$ not as a fraction (0.2195)

Attempts (2 marks)

A1 Any correct trigonometric ratio given as answer

A2 Gives answer as 77.3° (evaluates X) A3 Gives answer of 0.9999 ($\cos \frac{9}{41}$)

Worthless(0)

W1 Incorrect answer without work unless attempt mark applies

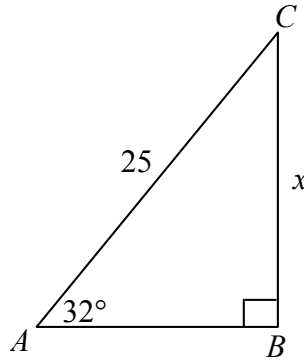
W2 Answer given as $\frac{40}{9}$ or $\frac{41}{40}$

Part(b)

20(5, 5, 10) marks

Att(2, 2, 3)

In the right-angled triangle ABC ,
 $|AC| = 25$, $|\angle BAC| = 32^\circ$.
Let $|CB| = x$.



(b)(i)

5 marks

Att 2

(i) Using your calculator find $\sin 32^\circ$.
Write your answer correct to two decimal places.

(b)(i)

5 marks

Att2

$$\sin 32^\circ = 0.52991$$
$$= 0.53$$

- * Accept correct answer without work
- * Accept $\sin 0.53$ for full marks

Blunders (-3)

- B1 Finds $\cos 32^\circ$ (0.8480) or $\tan 32^\circ$ (0.6248)
- B2 Uses rad or grad mode in calculator (rad = 0.55 , grad = 0.48)

Slips (-1)

- S1 Failure to round off or rounds off incorrectly

Attempts (2 marks)

- A1 $\sin 32^\circ = \frac{BC}{AC}$ and stops (or $\frac{x}{25}$)
- A2 Gets $\sin |\angle ACB|$ correctly
- A3 Gets $|\angle ACB| = 58^\circ$ and stops

(b) (ii) **5 marks** **Att 2**

(ii) Using the diagram of the triangle ABC write $\sin 32^\circ$ as a fraction.

(b) (ii) **5 marks** **Att 2**

$$\sin 32^\circ = \frac{x}{25}$$

* Accept correct answer without work for full marks

* Accept $\sin \frac{x}{25}$ for full marks

Blunders (-3)

B1 Inverted ratio

B2 Gets $\sin | < ACB |$ (check is not consistent error from (i))

Attempts (2 marks)

A1 Any correct trigonometric ratio written down in answer box

A2 States $\sin 32^\circ = \frac{\text{opposite}}{\text{hypoteneuse}}$ or similar and stops

A3 Correctly marks hypotenuse, adjacent, or opposite on the diagram and stops, for this part

A4 Gives answer as 0.53 or 0.52991

(b) (iii) **10 marks** **Att 3**

(ii) Hence, or otherwise, find x , the value of $|CB|$.

(b) (iii) **10 marks** **Att 3**

$$\sin 32^\circ = \frac{x}{25} = 0.53$$

$$x = 0.53 \times 25$$

$$x = 13.25$$

* Accept candidates' answer from previous parts

* Allow use of non round-off answer from part (i)

* Allow use of Sine Rule to get answer

Blunders (-3)

B1 Correct answer without work ✗

B2 Decimal error

B3 Mathematical error

B4 Uses rad or grad mode in the calculator (rad = 13.78 , grad = 12.04)

B5 Transposition error

Slips (-1)

S1 Numerical slips to a maximum of -3

Misreadings (-1)

M1 Finds $|AB|$

Attempts (3 marks)

A1 Uses Pythagoras' Theorem

A2 States Sine Rule

A3 Any correct trigonometric ratio written down

A4 Any correct step

Worthless (0)

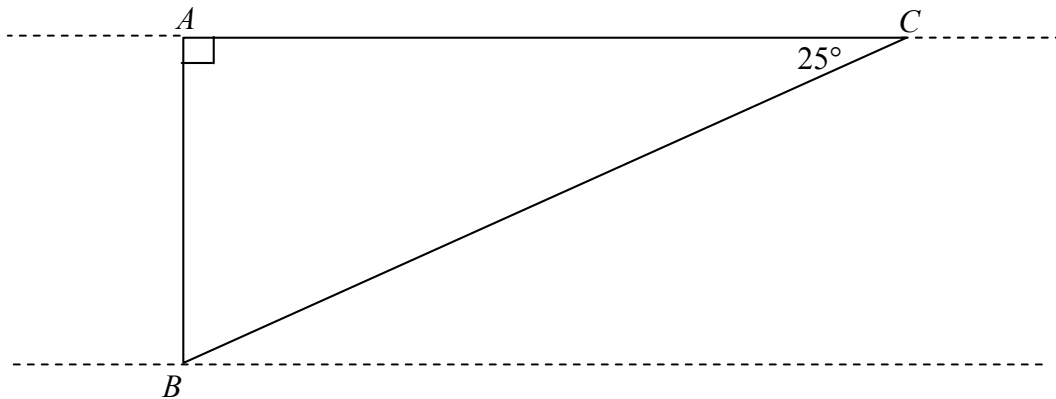
W1 Measures CB from diagram (3.8 cm)

Part(c)

20(10, 10) marks

Att(3, 3)

- (c) Seán wishes to measure the width of a canal.
He is at a point A directly opposite a landmark B on the opposite bank.
Seán walks 50 paces along the bank of the canal to point C .
He measures the angle ACB and finds it is 25° .



(c) (i)

10 marks

Att 3

- (i) Each of Seán's paces is 0.7 m.
Calculate $|AC|$.

(c) (i)

10 marks

Att 3

$$|AC| = 50 \times 0.7 \text{ m} = 35 \text{ m}$$

Blunders (-3)

- B1 Correct answer without work ~~✓~~
- B2 Mathematical error
- B3 Decimal error
- B4 Multiplies 0.7 by an incorrect relevant number

Slips (-1)

- S1 Numerical slips to a maximum of -3

Attempts (3 marks)

- A1 Gives answer of 0.7 or 50
- A2 Any correct trigonometric ratio
- A3 Gets $|\angle ABC| = 65^\circ$

Worthless (0)

- W1 Measures $|AC|$ from diagram (9.2 cm)

(c) (ii)

10 marks

Att 3

(ii) Hence calculate the width of the canal, $|AB|$.

Give your answer to the nearest metre

(c) (ii)

10 marks

Att 3

Let width = x

$$\frac{x}{|AC|} = \tan 25^\circ$$

$$\frac{x}{35} = 0.466307$$

$$x = 0.466307 \times 35$$

$$x = 16.3207$$

$$x = 16 \text{ m}$$

* Accept candidates' answer from part (i)

* Accept Sine Rule method to get answer

Blunders (-3)

B1 Correct answer without work ✗

B2 Incorrect trigonometric function i.e. gets $\sin 25^\circ$ or $\cos 25^\circ$

B3 $\tan 25^\circ$ is incorrect (note S2)

B4 Uses rad or grad mode in the calculator (rad = -4.67, grad = 14.49)

B5 Mathematical error

B6 Transposition error

B7 Incorrect use of Sine Rule

Slips (-1)

S1 Numerical slips to a maximum of -3

S2 Early rounding off that affects answer (0.46 and 0.466 does not affect answer)

S3 Answer not given to nearest metre or given to 17 m

S4 Finds $|BC|$

Attempts (3 marks)

A1 States any correct trigonometric ratio

A2 Attempt at using Sine Rule or Pythagoras' Theorem

A3 Gets $|\angle ABC| = 65^\circ$

Worthless (0)

W1 Measures $|AB|$ from diagram (4.2 cm)

BONUS MARKS FOR ANSWERING THROUGH IRISH

Bonus marks are applied separately to each paper as follows:

If the mark achieved is 225 or less, the bonus is 5% of the mark obtained, rounded *down*.
(e.g. $198 \text{ marks} \times 5\% = 9.9 \Rightarrow \text{bonus} = 9 \text{ marks.}$)

If the mark awarded is above 225, the following table applies:

Bunmharc (Marks obtained)	Marc Bónais (Bonus Mark)	Bunmharc (Marks obtained)	Marc Bónais (Bonus Mark)
226	11	261 – 266	5
227 – 233	10	267 – 273	4
234 – 240	9	274 – 280	3
241 – 246	8	281 – 286	2
247 – 253	7	287 – 293	1
254 – 260	6	294 – 300	0