# JUNIOR CERTIFICATE EXAMINATION

# 2010

# MARKING SCHEMES

# MATHEMATICS
# ORDINARY LEVEL

**Coimisiún na Scrúduithe Stáit**
**State Examinations Commission**

# JUNIOR CERTIFICATE EXAMINATION

# 2010

# 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.
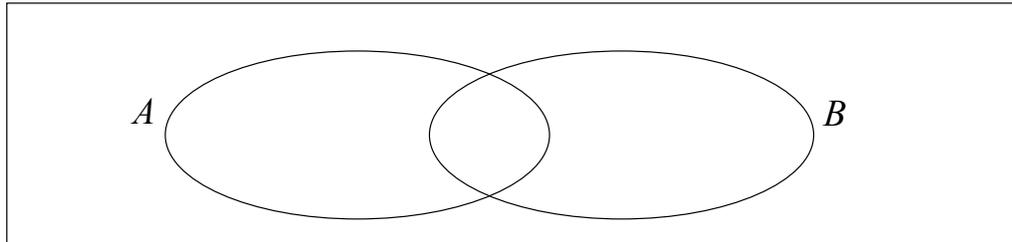
2.  When awarding attempt marks, e.g. Att(3), note that
    - any *correct, relevant* step in a part of a question merits at least the attempt mark for that part
    - if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
    - a mark between zero 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.
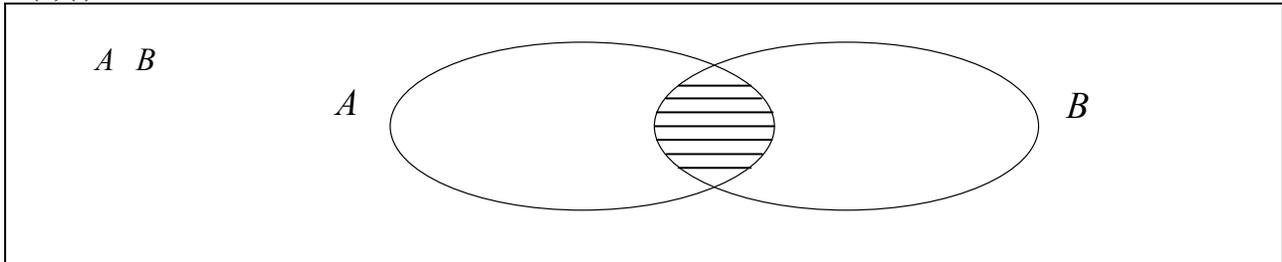
# QUESTION 1

| 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∩B.
**(ii)**    Using the Venn diagram below, shade in the region that represents $A \setminus B$



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



*Blunders (-3)*
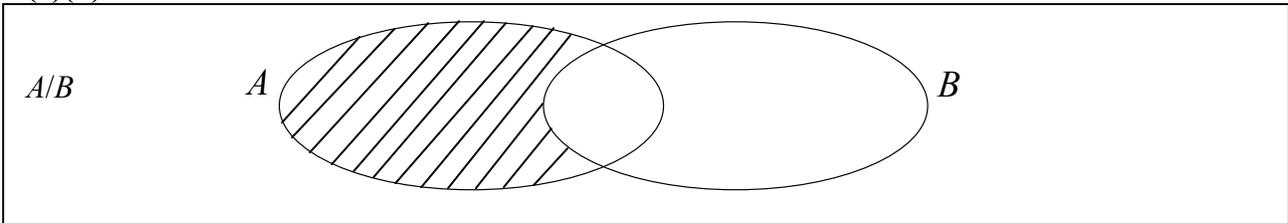B1    Any incorrect indication other than the misreading below
*Misreadings (-1)*
M1    $A \cup B$ indicated.
*Worthless(0)*
W1   No filling in of the Venn Diagram

| **(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)**
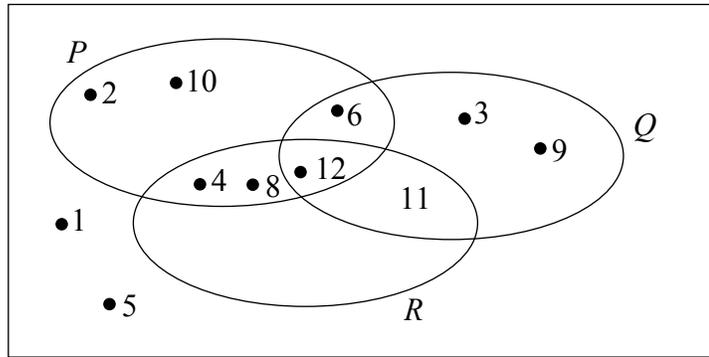
$U$ is the universal set

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

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

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



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

**(i)**    List the elements of $P \cap Q \cap R$.

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**(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 $R$.

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**(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    $R\backslash Q$ giving $\{4, 8\}$, $R\backslash P$ giving $\{11\}$, $R\backslash(P \cup Q)$ 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 $P \backslash (Q \cap R)$.

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**(iii)**                                   $P \backslash (Q \cap R)$ = **{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    $P\backslash(Q\cup R)$ giving {2,10}     or  $(Q \cap R)\backslash P$ giving {11}

*Attempts (2 marks)*
A1    1 or 5 appear in the answer

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

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

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**(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*)
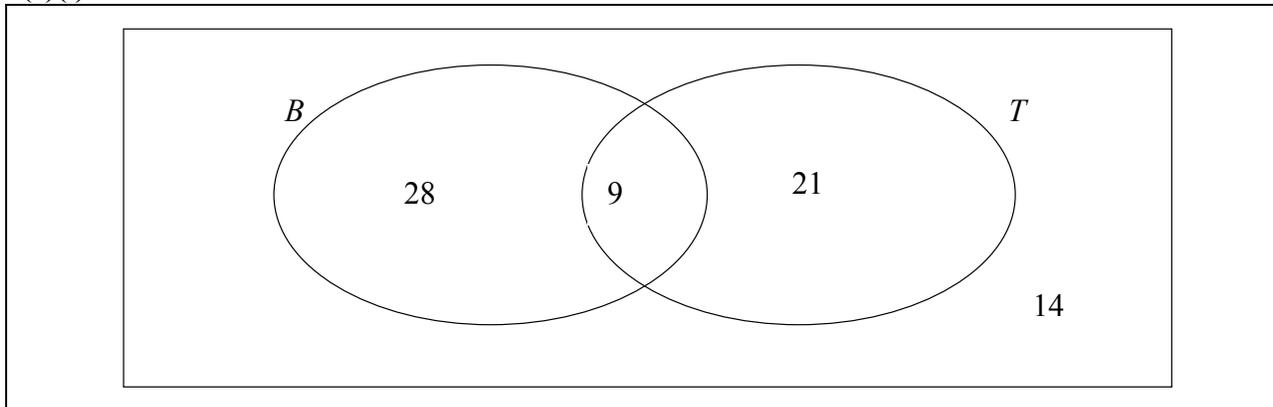        28 of these students said they played basketball but not tennis

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**(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

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**(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 <u>correct</u> answer** written here in the space provided **takes precedence over** an **<u>incorrect</u> 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**

✍

$$\frac{9}{72} \times 100 = \textbf{12.5\%} \qquad \textbf{or} \qquad \frac{100}{8} = \textbf{12.5\%}$$

\*      **Any <u>correct</u> answer** written here in the space provided **takes precedence over** an **<u>incorrect</u> 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 $\dfrac{7}{10}$ of the fund.

Find the value of the first prize.

| (a) | | 10 marks | | Att 3 |
|---|---|---|---|---|

| Method (1) | Method (2) | Method (3) | Method (4) |
|---|---|---|---|
| $\dfrac{10}{10}=1200$ | 10 parts=1200 | $\dfrac{1200}{10}\times7$ | 10 parts=1200 |
| $\dfrac{1}{10}=\dfrac{1200}{10}=120$ | $\rightarrow$1 part=$\dfrac{1200}{10}=120$ | $120\times7$ | 3 parts=120 × 3=360 |
| $\dfrac{7}{10}=120\times7=840$ | $\rightarrow$7 parts=120×7 | €840 | 7 parts=1200-360 |
| = €840 | = €840 | | = € 840 |

* Correct answer without work $\Rightarrow$ 7 marks ✍

* **Special Case** $\dfrac{1200}{7}\times10 = 1714.28 \Rightarrow$ 7 marks

* Stops at $\dfrac{1200}{10}$ or 120 $\Rightarrow$ 4 marks

* Stops at 1200 ×7[= 8400] $\Rightarrow$ 4 marks
* Incorrect answer without work $\Rightarrow$ 0 marks, except for answers given in A2 below

*Blunders (-3)*
B1 Divisor ≠ 10 and continues but see 2nd *
B2 Incorrect multiplier i.e. ≠ 7 and continues but see 2nd *
B3 Gets $\dfrac{3}{10}$ 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 $\dfrac{10}{10}$, or $\dfrac{1}{10}$, or $\dfrac{3}{10}$, or .3 only, and stops
A2 120 or 8400 or 360 or 1714.29 **only,** appears (no work shown)
A3 $\dfrac{1200}{7}$ or 1200 ×10 and stops
A4 1200 is multiplied or divided by any wrong number correctly

*Worthless(0)*
W1 1200 +7 = 1207 or similar

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

estimate the value of $\dfrac{9 \cdot 15 \times 2 \cdot 196}{5 \cdot 5815}$

**(ii)**   Using a calculator, or otherwise, find the exact value of $\dfrac{9 \cdot 15 \times 2 \cdot 196}{5 \cdot 5815}$

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

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

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

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

$\dfrac{9 \cdot 15 \times 2 \cdot 196}{5 \cdot 5815}$  is approximately equal to**:**

$$\frac{\boxed{9} \times \boxed{2}}{\boxed{6}} = \frac{\boxed{18}}{\boxed{6}} = \boxed{3}$$

*           $\dfrac{9}{6} \times 2$ and stops $\Rightarrow$ 7 marks.

*           No penalty if the intermediate step between approximations and correct final answer is not
shown i.e. $\dfrac{18}{6}$ not shown

*           Special Case: $\dfrac{9 \cdot 15 \times 2 \cdot 196}{5 \cdot 5815} = 3.6$ or $\left(\dfrac{18}{5}\right)\left(3\dfrac{3}{5}\right)$ in this part $\Rightarrow$ Attempt 3 marks.

*           $\dfrac{18}{6}$ 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. $\dfrac{9}{6} \times \dfrac{2}{6} = \dfrac{18}{36}$

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** |
|---|---|---|

$$9.15 \times 2.196 = 20.0934 \div 5.5815 = \mathbf{3.6} \text{ or } \frac{18}{5} \text{ or } \mathbf{-} \qquad \text{or} \qquad \frac{9.15 \times 2.196}{5.5815}$$

$$\Rightarrow \frac{20.0934}{5.5815} = \mathbf{3.6}$$

*Blunders (-3)*

B1    Decimal error or early rounding off

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

B3    Reads as $\dfrac{9.15 - 2.196}{5.5815} = \dfrac{6,954}{5.5815} = \mathbf{1.245901639}$

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

B5    Treats as $\dfrac{5,5815}{9.15 \times 2.196} = \dfrac{5.5815}{20.0934} = \mathbf{0.27777777\ldots}$

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

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

B8    Leaves as $\dfrac{20.0934}{5,5815}$

*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 $\dfrac{9.15}{5.5815} = 1.639344262$ or $\dfrac{2.196}{5.5815} = 0.393442623$

A2    Any of the following;  (see above)        0.644987906 ,  1.245901639, 2.032786885
   0.27777777…, 0.491935483  or 0.802631578   <u>merit 2 marks</u>     (minimum 4 decimal
   places)      (with or  without work)

*Worthless (0)*

W1    Incorrect answer without work but see A2

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

| | | |
|---|---|---|
| $\dfrac{3}{8} = 0.375$ | $\dfrac{9}{25} = 0.36$ | |
| $\dfrac{9}{25}$ | $0.37$ | $\dfrac{3}{8}$ |

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

\*      Note:      $\dfrac{3}{8} = 0{,}375$   or          $\dfrac{9}{25} = 0.36$   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     $0.37 = \dfrac{37}{100}$ and stops

A2    Attempt at ordering using all 3 given numbers

A3    Any 2 of the given numbers in the correct order i.e.$\left( \dfrac{9}{25}, 0.37 \right)$, $\left( 0.37, \dfrac{3}{8} \right)$, $\left( \dfrac{9}{25}, \dfrac{3}{8} \right)$

*Worthless (0)*
W1    Nothing correct

W2    $\dfrac{0.37}{8}$   or   $\dfrac{0.37}{25}$   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 $1 \le a < 10$ and $n \in \mathbb{N}$

**(ii)** Simplify $\dfrac{a^5 \times a^2}{a \times a^3}$, 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 $\dfrac{6^5 \times 6^2}{6 \times 6^3}$

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

$\dfrac{1120}{0.035} = 32000$

$\qquad = \mathbf{3.2 \times}$

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\*        **3.2 ×** ( without work) $\rightarrow$**4 marks**

*Blunders (-3)*

B1    Decimal error

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

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

*Slips (-1)*

S1    Numerical errors to a max of 3
S2    Incorrect format, where $a < 1$ or $a \ge 10$
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. $\dfrac{1120}{0.0355} = 3$

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

A3    $\dfrac{1120000}{35}$

**(c)(ii)**                                                  **5 marks**                             **Att2**

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

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

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

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

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

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

*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       $\dfrac{a^7}{a^4} = 3$ or $\dfrac{1}{a^{-3}}$ 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**

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

or $\quad \dfrac{7776 \times 36}{6 \times 216} = \dfrac{279936}{1296} = 216 \qquad$ or $\quad \mathbf{6^3 = 216}$

or $\quad \dfrac{6.6.6.6.6.6.6}{6.6.6.6} = 6.6.6 = 216$

\*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 |
|---|---|---|

✍

$$50 \times 3 = 150$$
$$20 \times 4 = 80$$
$$10 \times 7 = 70$$

Total amount (150+80+70) = 300

$$\Rightarrow \text{Change} \Rightarrow € 3.00 - €2.83$$
$$= €0.17$$

\*     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: \* 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 <br>         What is the sale price of the bicycle? <br> **(ii)**   David wishes to get some bars for a party <br>                 A packet of 12 bars cost €4.08 in **Shop A**. <br>                 A packet of 7 bars costs €2·17 in **Shop B**. <br>         Find the unit cost (cost of one bar) in each shop <br> **(iii)** If David buys 84 bars, how much will he save by buying the bars in the shop offering the <br>         better value? |

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

| |
|---|
| ✍ <br><br> $$305 \times \frac{15}{100} = €45.75 \qquad\qquad 100\%\text{-}15\% = 85\% \qquad\qquad 305 \times .85 = €259.25$$ <br><br> $$305 - 45.75 = €259.25 \qquad\qquad 305 \times \frac{85}{100} = €259.25$$ |

\*      305 – 15% = 259.25 → **10 marks**
\*      305 × 15% = 45.75 and stops → **7 marks**
\*      305 – 15% and stops → **4 marks**     or     305 × 15% and stops → **4 marks**
\*      **€45.75** without work and stops merits **4** marks

*Blunders (-3)*

B1    Correct answer without work ✍
B2    Decimal error
B3    Inverts as $\dfrac{100}{85}$ or $\dfrac{100}{15}$ and continues (giving answers $358.82$ or $2033.33$)
B4    Mishandles $85\%$ or 15% e.g. $305 \times 85$ 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    305×1.15=€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    $\dfrac{15}{100}$ or $\dfrac{85}{100}$ or $\dfrac{305}{100}$ and stops
A2    100% = 305 and stops
A3    $100 \times \dfrac{85}{305}$ and stops
A4    $\dfrac{305}{85}$ 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**

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✎          **Shop A**.                 unit cost $\rightarrow \dfrac{408}{12} = $ **€0.34**

               **Shop B**                 Unit cost $\rightarrow \dfrac{2.17}{7} = $ **€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**

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          $34 - 31 = 3$                $84 \times 34 = 2856$

✎        $84 \times 3 = 252$             $84 \times 31 = 2604$
                $= $ **€2.52**         Savings $= 2856 - 2604$
                                              $= 252$
                                          $= $ **€2.52**

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\*          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

**(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 = $ **€12240**   or   $12000 \times \dfrac{2}{100} = $ **€240**    $12000 \times \dfrac{102}{100} = $ **€12240**    $I = \dfrac{P \times R}{100}$

$$12000 + 240 = \textbf{€12240}$$

$$= \dfrac{12000}{100} \times 2$$

$$= \textbf{€240}$$

$$12000 + 240 = \textbf{€12240}$$

---

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

*Blunders (-3)*
B1    Correct answer, without work
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% = $\dfrac{2}{100}$ 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?

✍

| | | |
|---|---|---|
| $6 \times 90 = 540$ | $6 : 5 = x : 90$ | $6-5 = 1$ |
| $\dfrac{540}{5} = 108$ | $5x = 6(90) = 540 \rightarrow x = 108$ | $1 \times 90 = 90$ |
| $108\text{-}90 = 18$ | $108\text{-}90 = 18$ | $90 \div 5 = 18$ |

\*  Answer $\dfrac{90}{5} = 18$ 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  $\dfrac{90}{6}$ [=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 |
|---|---|---|

✎
$$a + 2b$$
$$= 3 + 2(5)$$
$$= 3 + 10$$
$$= 13$$

\*     $3 + 1\,0$     ➔ 4 marks
\*     $5 + 2(3) = 5 + 6 = 11$ ➔ 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 \* 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** |
|---|---|---|
| ✍ | $$ab - 6$$ $$3(5) - 6$$ $$= 15 - 6$$ $$= 9$$ | |

\*     $15 - 6$ ➜ 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 $3x - 2 \leq 7$, $x \in N$

---

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

✍   **(i)**    $(3x + 2y) - 2(x + 3y - 4)$

               $= 3x + 2y - 2x - 6y + 8$

               $\boldsymbol{= x - 4y + 8}$

---

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

*Blunders (-3)*

B1    Correct answer without work ✍
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
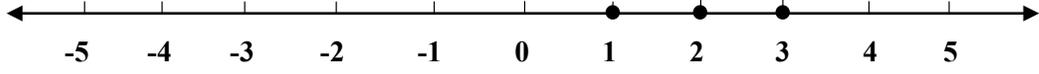
*Worthless (0 marks)*
W1    Combines "$x$'s" to numbers and stops
W2    Incorrect answer, with no work

**(b)(ii)**                                          **10 marks**                                          **Att3**

✍

$$3x - 2 \leq 7$$
$$\Rightarrow 3x \leq 7 + 2$$
$$\Rightarrow 3x \leq 9$$
$$\Rightarrow x \leq 3$$

{1, 2, 3} (not necessary)



\*      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,…..}.

**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 $y$:     $7x + 2y = 11$
                           $4x + y = 7$

| **I** | | **II** |
|---|---|---|
| $7x + 2y = 11$ | $7x + 2y = 11$ | $y = 7 - 4x$ |
| $\underline{4x + y = 7}$ | $\underline{4x + y = 7}$ | |
| | | |
| $7x + 2y = 11$ | $28x + 8y = 44$ | $7x + 2(7 - 4x) = 11$ |
| $\underline{-8x - 2y = -14}$ | $\underline{-28x - 7y = -49}$ | $7x + 14 - 8x = 11$ |
| $-x = -3$ | $y = -5$ | $-x = -3$ |
| $x = \dfrac{-3}{-1} = 3$ | | $x = \dfrac{-3}{-1} = 3$ |
| | | |
| ➔ $y = -5$ | ➔ $x = 3$ | ➔ $y = -5$ |

\*      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  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** |
|---|---|---|

$$3x - 6 = 2x + 5$$
$$3x - 2x = 6 + 5$$
$$\boldsymbol{x = 11}$$

*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 $-25$

**(ii)**    Factorise $ab - 2ax + mb - 2mx$

**(iii)**    Factorise $+ 4x - 12$.
Hence solve the equation $+ 4x - 12 = 0$.

---

**(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.
\*     $\left(x - \sqrt{25}\right)\left(x + \sqrt{25}\right)$ merits 5 marks

*Blunders (-3)*
B1    Incorrect two term linear factors of $-25$ formed from correct (but inapplicable) factors of
      $x^2$ and $\pm 25$ .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 $\pm 25$ only
A3    $\pm x \ or \ \pm 5$ 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 *x*s to "numbers" and continues or stops

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

✍         $ab - 2ax + mb - 2mx$         or         $ab - 2ax + mb - 2mx$

            $b(a + m) - 2x(a + m)$                    $a(b - 2x) + m(b - 2x)$

                $(a + m)(b - 2x)$                           $(a + m)(b - 2x)$

\*     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 ✍

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**

| | | |
|---|---|---|
| $x^2 + 4x - 12 = 0$ | | $\dfrac{-(4) \pm \sqrt{(4)^2 - 4(1)(-12)}}{2(1)}$ |
| $x^2 + 6x - 2x - 12 = 0$ | | |
| $x(x + 6) - 2(x + 6) = 0$ | | $\dfrac{-4 \pm \sqrt{16 + 48}}{2} = \dfrac{-4 \pm 8}{2}$ |
| $(x + 6)(x - 2) = 0$ | | |
| $\Rightarrow x = -6$ *and* $x = 2$ | | $\dfrac{-12}{2} = -6$ *and* $\dfrac{4}{2} = 2$ |
| ✍ | $\Rightarrow (x + 6)(x - 2) = 0$ | $\Rightarrow x = -6$ *and* $x = 2$ |
| | $\Rightarrow x = -6$ *and* $x = 2$ | $\Rightarrow (x + 6)(x - 2) = 0$ |

In the middle column: $x$    $+6$ ; $x$    $-2$

\* 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 $+4x-12$ formed from correct (but inapplicable) factors of $x^2$ and/or $\pm 12$. e.g. $(x+12)(x-1)$

B3 No roots given.

B4 Incorrect factors of $x^2$ and/or $\pm 12$

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 $\dfrac{-4 \pm 8}{2}$

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 $\dfrac{p}{q}$

S3 One root only

*Attempts (3 marks)*

A1 Correct formula and stops

A2 One correct substitution and stops

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

Give your answer in its simplest form.

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

**and** into your answer to part **(i)**.

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

Write your answer in its simplest form

---

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

✎ **(i)**      $\dfrac{3(5x-1) + 2(4x-9)}{6}$

$\Rightarrow \dfrac{15x-3+8x-18}{6} = \dfrac{23x-21}{6}$

---

\*      $\dfrac{5x-1}{2} + \dfrac{4x-9}{3} = \dfrac{9x-10}{5}$    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. $\dfrac{2(5x-1) + 3(4x-9)}{6}$

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. $\dfrac{46x-42}{12}$

*Attempts (2 marks)*

A1      6 only or a multiple of 6 only appears

A2      Any correct step

*Worthless (0)*

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

**(c) (ii)**                                 **5 marks**                              **Att2**

$$\frac{5(3)-1}{2}+\frac{4(3)-9}{3}$$

$$=\frac{15-1}{2}+\frac{12-9}{3}$$

✎      $=\dfrac{14}{2}+\dfrac{3}{3}$     and     $\dfrac{23(3)-21}{6}$

$$=7+1 \qquad\qquad =\frac{69-21}{6}$$

$$=8 \qquad\qquad\qquad =\frac{48}{6}$$

$$=8$$

\*      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**

✎

$(x-2)(-3x+11)$

$x(-3x+11)-2(-3x+11)$

$-+11x-+6x-22$

$\mathbf{-+17x-22}$

\*      If     $-+11x-+6x-22$     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 $-2.-3x=-6x$

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 then 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 → 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   - taken as + all the way but see M1
B3   "+2$x$" taken as "2" all the way. [In the row headed "+2$x$" by candidate]
B4   "3" calculated as "3$x$" all the way. [In the row headed "3$x$" by candidate]
B5   Adds in top row when evaluating $f(x)$ in $B$
B6   Omits "3" row
B7   Omits "+2$x$" row
B8   Omits a value in the domain (each time).
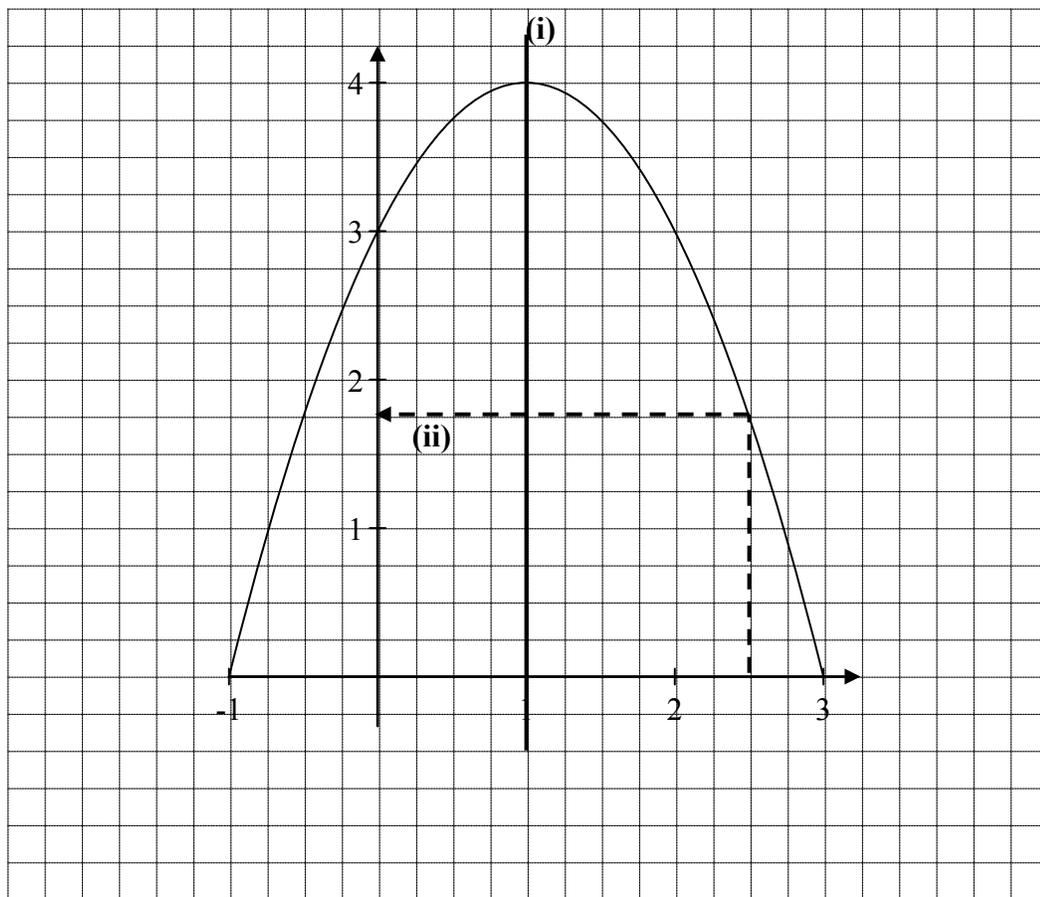B9   Each incorrect image without work i.e. calculation through the function method ($A$)

*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

**Graph** ✐                    **15 marks**                    **Att 5**



* accept candidates values from previous work ( **5 co-ordinates needed** ) but see S2
* Only **one** correct point **graphed correctly** $\Rightarrow$ Att <u>5</u> + Att <u>5</u>
* 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 $\pm\,0.25$ }
S2  Each point { **5 points needed** } from table not graphed [ See  * 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  * 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 $\pm 0.25$.

*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 ($\pm 0.25$)
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 × 5% = 9.9 ⇒ 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 |

# JUNIOR CERTIFICATE EXAMINATION

# 2010

# MARKING SCHEME

# MATHEMATICS
# ORDINARY LEVEL
# PAPER 2

# 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. 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 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    4·6 ÷5 = 0·92 kg    0·92×1000= 920 g |
|---|

*Blunders (-3)*
B1   Correct answer without work✍
B2   Does not divide by 100
B3   Decimal error
B4   Treats 20%  as —— 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 ÷ 4.6 and stops

A5   —— and stops or —— and stops or —— 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 = $195 \div 2\cdot5 =$  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 — 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
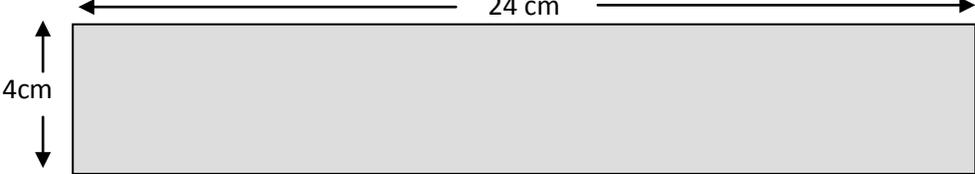
**(b) (iii)**                                    **5 marks**                                    **Att 2**

| (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**

| Time = Distance ÷ Speed = 195 ÷ 60 = 3·25 h = 3h 15 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 , the area of the piece of silver.

24 cm

4cm

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

Area $= lb$ $= 24 \times 4$ $= 96$

*Blunders ( -3 )*
B1    Correct answer without work ✍
B2    Incorrect mathematical operation with work and continues correctly
B3    Incorrect formula e.g. $- l\,b$ and continues

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

*Attempts ( 3 marks )*
A1    $4 + 24$ or $-$    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?

2 cm

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

Width of disc = radius $\times 2 = 4$ cm
Number of Discs $= 24 \div 4 = 6$

*Blunders ( -3 )*
B1    Correct answer without work ✍
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. $-$

*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  ⎯ = 48


| **(c) (iii)** | **5marks** | **Att 2** |

| **(iii)** | Taking $\pi$ as 3·142,  find in , 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** |

Silver remaining = Area rectangle - 6 discs
$$= 96 \text{ cm}^2 \text{ - } 6 \times \pi$$
$$= 96 \text{ cm}^2 \text{ - } 6 \times 3.142x$$
$$= 96 \quad \text{-75·408}$$
$$= 20 \cdot 592$$
$$= 20 \cdot 6$$

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

*Blunders (-3)*
B1    Correct answer without work ✍
B2    $\pi \neq 3.142$
B3    Decimal error
B4    Incorrect relevant formula and continues e.g. $2\pi r$ or a multiple of
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  and stops
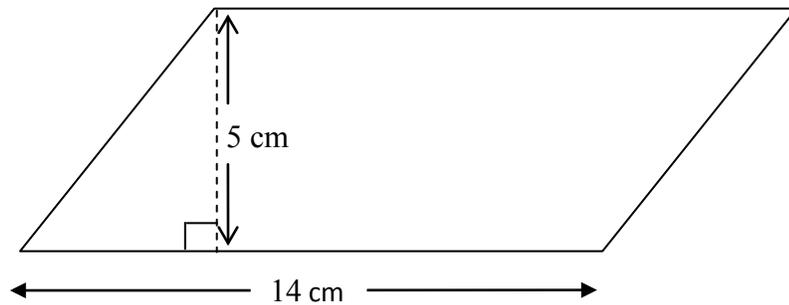A4    Correct formula and stops

*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 |
|---|---|---|

Area $A = ah = 5$ cm $\times$ 14cm $= 70$

*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 $5 \times 14$

*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 $\pi$
W3   $= 196$ or $= 25$ and stops

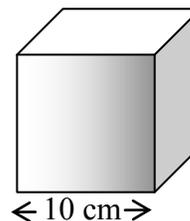**Part (b)**                              **20(5, 10, 5)marks**                              **Att(2, 3, 2)**

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

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

← 10 cm →

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

Volume = = = 10×10×10  =1000

*Blunders ( -3 )*
B1    Correct answer without work✍
B2    Mathematical error
B3    States 10 × 10 = 100 and stops
B4    Incorrect relevant formula and continues e.g. surface area and continues
B5    Incorrect substitution
B6    Leaves answer as 10 × 10 × 10

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

*Attempts (2 marks)*
A1    States volume = L× B × H and stops
A2    10 + 10 + 10 = 30 or 10 + 10 +10
A3    Writes 10 × 10 and stops
A4    10 × 6 = 60 and stops

*Worthless ( 0 )*
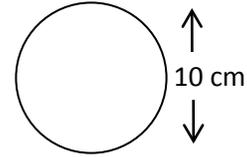W1   Incorrect answer without unless attempt mark applies

| **(b) (ii)** | **10 marks** | **Att 3** |
|---|---|---|

**(ii)** A sphere with diameter 10 cm is shown.
Taking $\pi$ as 3·142 find, in , the volume
of the sphere.
Give your answer to the nearest whole number.



10 cm

| **(b) (ii)** | **10 marks** | **Att 3** |
|---|---|---|

Diameter = 10 cm      Radius = 5 cm

Volume $= \dfrac{4}{3}\pi = \dfrac{4}{3}\times 3{\cdot}142 \times \; = \dfrac{4}{3}\times 3{\cdot}142\text{x}125 = \dfrac{1571}{3} = 523{\cdot}6667$

$= 524$

*Blunders ( -3 )*
B1    Correct answer without work ✍
B2    Incorrect relevant sphere formula
B3    Incorrect substitution
B4    Mathematical error e.g.  = 15
B5    $\pi \neq 3.142$ or answer in terms of $\pi$ or $\pi$ 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 $-\pi$ and stops
A2    States radius is half of diameter and stops
A3    $\pi$ omitted with or without work
A4   Product of two relevant numbers ( $-$ , 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 =      answer **(i)**

Vol sphere = 524      answer **(ii)**

**(ii)** as a percentage of **(i)** = $\dfrac{524}{1000} \times 100 = 52 \cdot 4\%$

\* 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. —— and stops

A2    Leaves answer as ——

A3    States or recognises % is out of 100
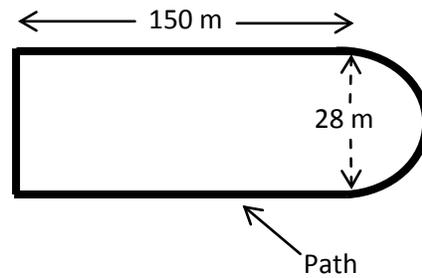
A4    Any correct step

*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 $\pi$ as 3·142, calculate the length of the semicircular end.
Give your answer to the nearest metre.

---

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

Semicircular end = –circumference = –×$\pi D$ = –×3.142×28 = 43·988 cm = 44 cm

or      –×$2\pi r$ = –×2 ×3.142×14 = 43·988 cm = 44 cm

---

*Blunders ( -3 )*
B1    Correct answer without work✍
B2    Incorrect mathematical operation and continues
B3    Incorrect relevant formula e.g. 2 $\pi r$ or $\pi$  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 |
|---|---|---|

Path = 2 long sides + semicircular end + 1 short side
= 2 ×150 + 44 + 28 = 372 m

\* Accept candidates' answer from part (i)

*Blunders (-3)*
B1 Correct answer without work ✍
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+ ……. and stops
A3 Recognises 44 as part of the answer e.g. 44 + ….. and stops
A4 Recognises 28 as part of the answer e.g. 28 + ….. 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 |
|---|---|---|

Number of Laps = 2500/length lap = 2500 ÷ 372 = 6·720
Must complete 7 laps

\* Accept candidates' answer from part (ii)

*Blunders (-3)*
B1 Correct answer without work ✍
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 km = 1000 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:

$$5\cdot1, \quad 5\cdot6, \quad 5\cdot8, \quad 5\cdot3, \quad 5\cdot6, \quad 5\cdot2$$

| (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
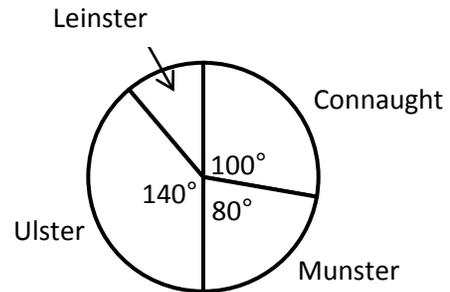W2   Copies order in question

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

**(b)**

Leinster

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.

Connaught

100°

140°

80°

Ulster

Munster

---

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

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

---

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

Leinster = 360° -  (100° + 140°  + 80 ° ) =  360° − 320° = 40°
     or      = 180° −140° = 40°

\* 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.<br>How many people were in the group that was surveyed? |
|---|---|

$100° = $ 35 people

$1° \quad = \dfrac{35}{100}$

$360° = \dfrac{35}{100} \times 360 = $ 126 people : number in group

*Blunders (-3)*
B1   Correct answer without work✍
B2   Incorrect ratio / fraction
B3   Decimal error
B4   Mathematical error
B5   $7 \times 18$ and stops

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

*Attempts ( 2 marks )*
A1   Writes 100° or 360° or — 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**

Ulster = 140°

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

\* 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 —— × 126 or —— × 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 —— or —— 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**
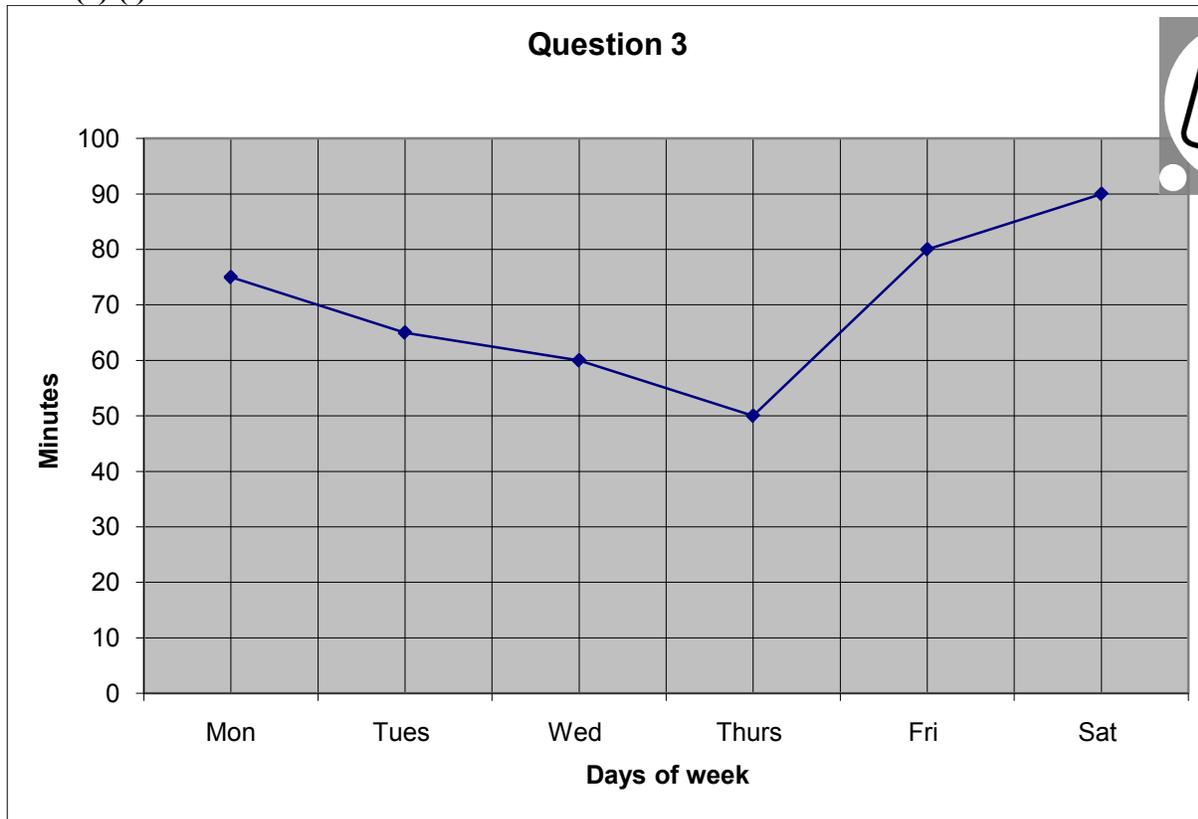
     **(i)**      Draw a trend graph of these results, putting days on the horizontal axis.

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

**Question 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    —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
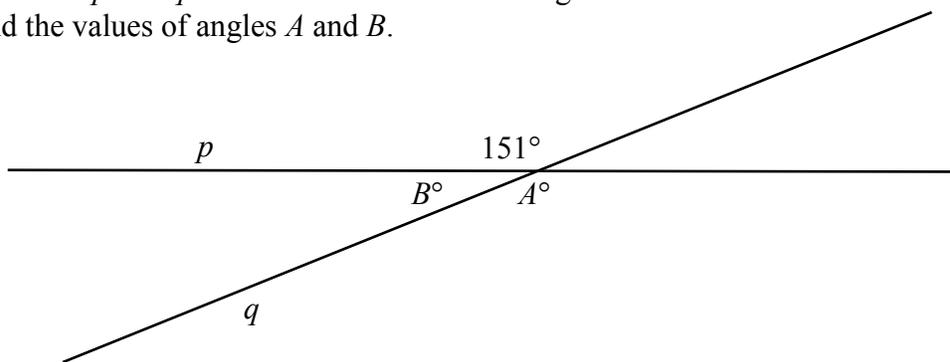A2    Divides or multiplies any number by 7

*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 |

| $A = 151°$ | $B = 180° - 151° = 29°$ |

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

*Blunders ( -3 )*
B1    Writes A = 29° and B = 151° (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

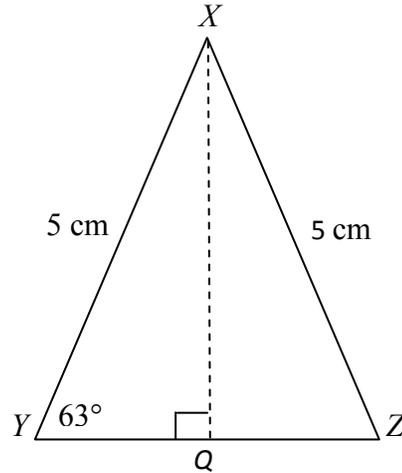**Part (b)**                 **20( 5, 5, 5, 5) marks**               **Att (2, 2, 2, 2)**

**(b)**         $XYZ$ is an isosceles triangle.

$|XY| = |XZ| = 5$ cm.

$|\angle XYZ| = 63°$.

$Q$ 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**

      $|\angle XZY| = 63°$

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

*Blunders (-3)*
B1     States $|<YXZ| = 63°$ and continues to get $|<XZY| = 54°$
B2     States $|<XZY| = |<XYZ|$ but does not say $|<XZY| = 63°$

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

*Attempts ( 2 marks )*
A1     $|<YXQ| = 27°$ and stops
A2     Indicates clearly $<XZY$ 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. $= 10$
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     or   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 $\Delta\ XYZ$.

| (b) (iii) | 5 marks | Att 2 |
|---|---|---|

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

\* Accept candidates'answer from part (ii)

*Blunders (-3 )*
B1 Correct answer without work✍
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 $\left|\ YZ\ \right| = 6$ and stops
A2 States area $= -$ ( base )(height ) or similar and stops

| (b) (iv) | 5 marks | Att 2 |
|---|---|---|

> **(iv)** Find the perimeter of triangle $\Delta\ XYZ$.

| (b) (iv) | 5 marks | Att 2 |
|---|---|---|

Perimeter $= \left|XY\right|+\left|YZ\right|+\left|ZX\right| = 5 + 6 + 5 \quad = 16$

\* Accept candidates' answer from part b (ii)

*Blunders ( -3 )*
B1 Correct answer without work✍
B2 Takes $\left|YZ\right| = 3$
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 $\Delta\ XYQ$ or $\Delta\ XZQ$

*Attempts( 2 marks )*
A1 States perimeter $= \left|XY\right| +\left|YZ\right|+\left| XZ\right|$ and stops
A2 Attempt at addition of relevant numbers e.g. 5 + …… or 6 + …..
A3 States $\left|YZ\right| = 6$ and stops

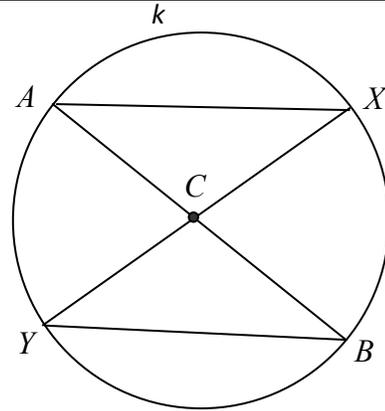**Part (c)**                       **20(10, 5, 5) marks**                       **Att(3, 2, 2)**

**(c)**

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



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**(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   $|AC| = \dfrac{-}{}|AB|$

*Worthless (0)*
W1   Diagram reproduced without modification

| (c) (ii) | 5 marks | Att 2. |
|---|---|---|

**(ii)** Name the image of Δ *AXC* by central symmetry in *C.*

| (c) (ii) | 5 marks | Att 2 |
|---|---|---|

Δ *AXC* image by   is Δ *BYC*

* Accept correct answer without work
* Accept Δ BYC with points in any order
* Accept *A → B , C → C , X → 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 → C or |XC| → |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 Δ *AXC* and Δ *BYC* are congruent.

| (c) (iii) | 5 marks | Att 2 |
|---|---|---|

Reasons:

| In Δ *AXC* | | In Δ *BYC* |
|---|---|---|
| [AC] | = | [CB] |
| XC | = | YC |
| $\lvert\angle ACX\rvert$ | = | $\lvert\angle BCY\rvert$ |

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

*Blunders(-3)*

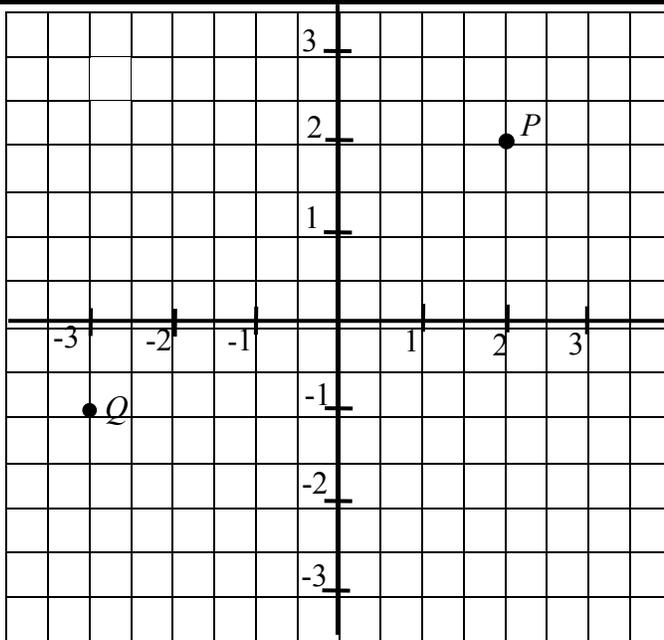B1 Each step omitted or incorrect

*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).<br>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 ( , ) and ( , ) 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. ( — , — ) and continues

S4    Takes ( 3 , 8 ) as midpoint and finds extremity e.g. ( 5 , -4 )    ( 3 , 8 )    ( 1 , 20 ) or
        Takes ( 5 , -4 ) as midpoint and finds extremity e.g. ( 3 , 8)    ( 5 ,-4 )    ( 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 ( , ) 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. $\tan A =$ ⎯⎯

*Blunders (-3)*
B1     Correct answer without work ✍
B2     Incorrect formula e.g. error in both signs, and continues
B3     Incorrectly treats couples as ( ˌ ) and ( , ) 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
<u>Note</u>   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. ⎯⎯

*Attempts ( 3 marks )*
A1     Some correct substitution
A2     Tan A = ⎯⎯⎯ or m = ⎯⎯⎯ and stops
A3     Some correct substitution into formula with   − and / or   − and stops
A4     Labels *C* and / or *D* with ( ˌ ) 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

        **(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 ( , ) and ( , ) 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
<u>Note</u>  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 $-$ and / or $-$
A3    States Pythagoras' Theorem and stops
A4    Labels $C$ and / or $D$ with ( , ) 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 $l$.<br>Verify the point (1, 2) is on $l$. | |

| **(c) (i)** | **5 marks** | **Att 2** |
|---|---|---|

| | |
|---|---|
| $y = 5x - 3$ | $2 = 5(1) - 3 = 5 - 3 = 2$ 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<br>of $l$ and the $y$ -axis. | |

| **(c) (ii)** | **5 marks** | **Att 2** |
|---|---|---|

| |
|---|
| $y = 5x - 3$ |
| $y = 5(0) - 3$ |
| $y = -3$ |
| $A = (0, -3)$ |

\* 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
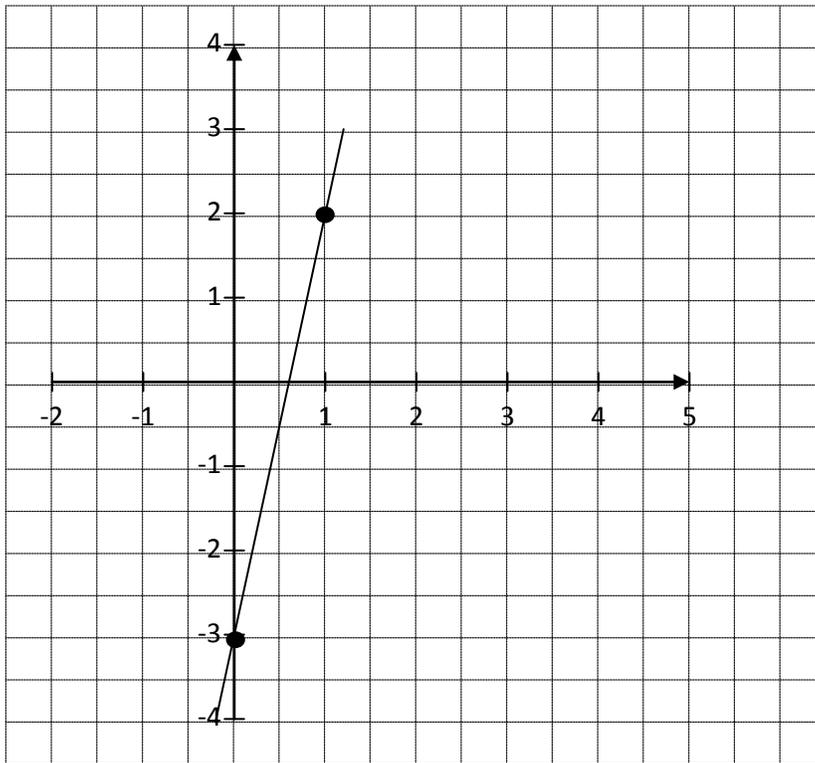A3 Substitutes $x = 0$ into equation and stops
*Worthless (0)*
W1 Incorrect answer without work unless attempt mark applies

**(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
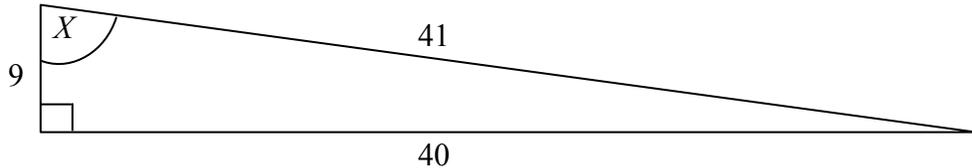
*Slips ( -1 )*
S1    Switches *X* and *Y* axes

*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** |
|---|---|---|

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

\* Accept correct answer without work

\* Accept candidates' hypotenuse from part (i)

\* Accept cos — for full marks

*Blunders ( -3 )*

B1   Incorrect ratio e.g. — or —          B2     Inverted ratio i.e. —

*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 — )

*Worthless(0)*

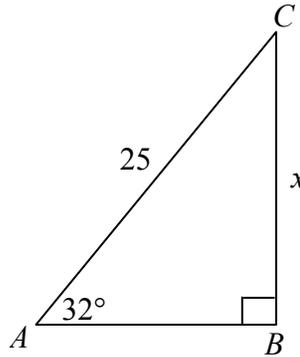W1   Incorrect answer without work unless attempt mark applies

W2   Answer given as — or —

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

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



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

     **(i)**      Using your calculator find sin 32°.
               Write your answer correct to two decimal places.

**(b)(i)**             **5 marks**             **Att2**

     sin 32° = 0·52991
            = 0·53

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

*Blunders ( -3 )*
B1    Finds cos 32° ( 0.8480 ) or tan 32° ( 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° = — and stops ( or — )
A2    Gets sin $|< ACB|$ correctly
A3    Gets $|< ACB|$ = 58 ° and stops

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

**(ii)**    Using the diagram of the triangle *ABC* write sin 32° as a fraction.

$$\sin 32° = \frac{x}{25}$$

\*   Accept correct answer without work for full marks

\*   Accept sin ― 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 ° = ——————— 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 $|CB|$.

$$\sin 32° = \frac{x}{25} = 0{\cdot}53$$
$$x = 0{\cdot}53 \times 25$$
$$x = 13{\cdot}25$$

\*   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
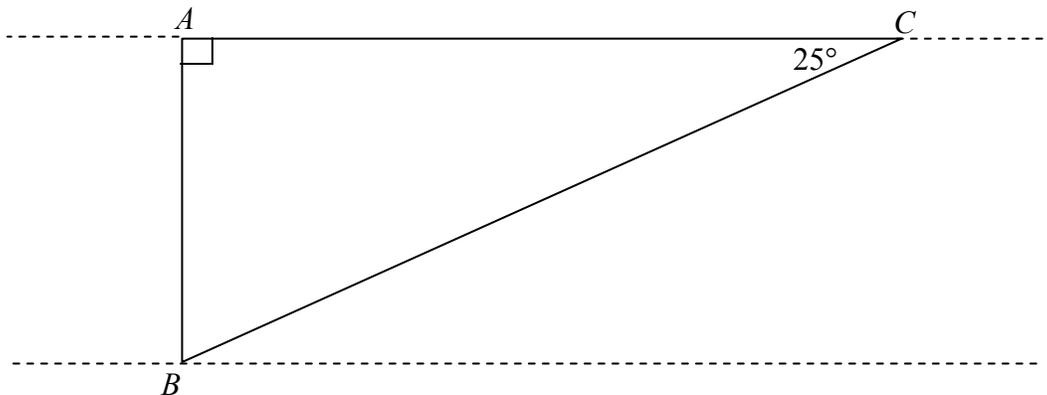
A4    Any correct step

*Worthless( 0 )*

 W1  Measures *CB* from diagram ( 3.8 cm )

**(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**

$|AC| = 50 \times 0.7$ m.$= 35$ 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 $| < ABC | = 65°$

*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 $= x$

$$\frac{x}{|AC|} = \tan 25°$$

$$\frac{x}{35} = 0{\cdot}466307$$

$x = 0{\cdot}466307 \times 35$

$x = 16{\cdot}3207$

$x = 16$ 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° or cos 25°
B3    Tan 25° 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 $|\;ABC| = 65°$

*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 marks × 5% = 9.9 ⇒ 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 |