JUNIOR CERTIFICATE 2008

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

Part (a) (i)	5 marks	Att 2

S = {*a*, *b*, c}

1(a) (i) Write down a subset of *S* that has one element

Part (a) (i)	5 marks	Att 2

{a} or {b} or {c}.

*   No penalty for the omission of brackets.
*   No penalty for use of Venn Diagram to show subsets.

Blunders (-3)
B1   Any incorrect set of elements of *S* other than the misreading below.

Misreadings (-1)
M1   Subset of S with two elements. e.g. $S = \{a, b\}$.

Attempts (2 marks)
A1   Draws a single bracket & stops.
A2   { } Null set.

Part (a) (ii)	5 marks	Att 2

S = {*a*, *b*, c}

1(a) (ii)   Write down a subset of *S* that has two elements

Part (a) (ii)	5 marks	Att 2

{a,b} or {a,c} or {b,c}

*   No penalty for omission of brackets.
*   No penalty for use of Venn Diagram to show subsets.

Blunders (-3)
B1   Any incorrect set of elements of *S* other than the misreading below.

Misreadings (-1)
M1   Subset of S with one element. e.g. $S = \{a\}$.

Attempts (2)
A1   Draws a single bracket & stops.
A2   { } Null set.

**1(b)**
U is the universal set.

$P = \{2, 3, 6, 7, 8\}$

$Q = \{1, 6, 8, 10\}$

$R = \{2, 4, 6\}$
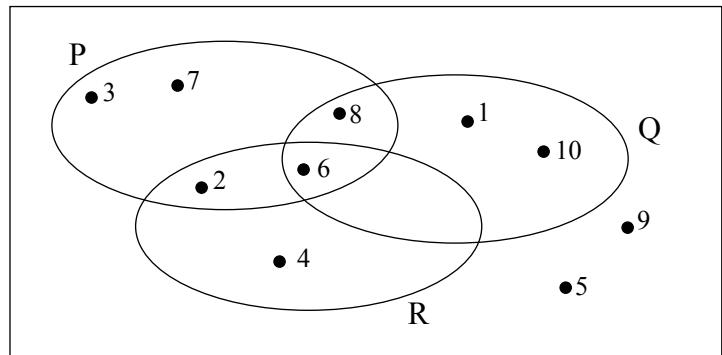
Part (b) (i)   5 marks   Att 2

1 (b) (i)   List the elements of: $P \cap Q$

Part (b) (i)   5 marks   Att 2

$$P \cap Q = \{6,8\}$$

Blunders (-3)
B1   Any incorrect set of elements of P and Q other than the misreading below.

Misreadings (-1)
M1 $P \cup Q = \{1,2,3,6,7,8,10\}$.

Attempts (2 marks)
A1   4 or 5 or 9 appear in the answer.

Part (b) (ii)   5 marks   Att 2

1 (b) (ii)   List the elements of: $Q \setminus R$

Part (b) (ii)   5 marks   Att 2

$$Q \setminus R = \{1,8,10\}$$

Blunders (-3)
B1   Any incorrect set of elements of Q and R other than the misreading below.

Misreadings (-1)
M1 $R \setminus Q = \{2,4\}$.

Attempts (2 marks)
A1   3 or 5 or 7 or 9 appear in the answer.

1 (b) (iii)   List the elements of: $\left(Q \cup R\right)^{/}$

$$\left(Q \cup R\right)^{/} = \{3,5,7,9\}$$

Blunders (-3)
B1   Any incorrect set of elements of Q and R other than the misreadings below.
B2 $\left(Q \cup R\right) = \{1,2,4,6,8,10\}$

Misreadings (-1)
M1 $\left(Q \cap R\right)^{/} = \{1,2,3,4,5,7,8,9,10\}$
M2 $Q^{/} \cup R^{/} = \{1,2,3,4,5,7,8,9,10\}$

Attempts (2 marks)
A1   Any incorrect listing of element(s) other than the misreadings above.

1 (b) (iv)   List the elements of: $\left(P \cap R\right) \backslash Q$

$$\left(P \cap R\right) \backslash Q = \{2\}$$

Blunders (-3)
B1   Any incorrect set of elements of P and Q and R other than the misreadings below.
B2 $P \cap R = \{2,6\}$

Misreadings (-1)
M1 $Q \backslash \left(P \cap R\right) = \{1,8,10\}$.
M2 $\left(P \cup R\right) \backslash Q = \{2,3,4,7\}$

Attempts (2 marks)
A1   5 or 9 appear in the answer.

Part(c)	20(5, 5, 5, 5)	Att 8 (2, 2, 2, 2)

M is the set of natural numbers from 1 to 36, inclusive

Part (c) (i)	5 marks	Att 2

1(c) (i) List the elements of M that are multiples of 6.

Part (c) (i)	5 marks	Att 2

6, 12, 18, 24, 30, 36.

Slips (-1)
S1   Each missing or incorrect element subject to a max of 3.

Attempts (2 marks)
A1   Any one correct element identified.
A2   Any correct factor(s) of 6.

Worthless (0)
W1   Elements listed are not multiples or factors of 6.

Part (c) (ii)	5 marks	Att 2

1(c) (ii)   List the elements of M that are multiples of 9.

Part (c) (ii)	5 marks	Att 2

9, 18, 27, 36.

Slips (-1)
S1   Each missing or incorrect element subject to a max of 3.

Attempts (2 marks)
A1   Any one correct element identified.
A2   Any correct factor(s) of 9.

Worthless (0)
W1   Elements listed are not multiples or factors of 9.

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

1(c) (iii)   Write down the lowest common multiple of 6 and 9.

*   Accept candidate's L.C.M. from incorrect answers in part (i) and part (ii) for full marks.
*   Accept indication of candidate's L.C.M.

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

L.C.M. = 18

Blunders (-3)
B1   An incorrect common multiple that is not the lowest.e.g. {36}.

Slips (-1)
S1   Answer written as $2 \times 3 \times 3$ and stops.

Misreadings (-1)
M1   Writes down H.C.F. = 3.

Attempts (2 marks)
A1   Any multiple of either 6, or 9 written in this part.

Worthless (0)
W1   Elements listed are not multiples of 6 or 9.

Part (c) (iv)   **5 marks**   **Att 2**

1(c) (iv)   Express 30 as the product of three prime numbers,

Part (c) (iv)   **5 marks**   **Att 2**

$30 = 2 \times 3 \times 5$

*   2, 3, 5, listed merits full marks.

Blunders (-3)
B1   Each correct prime constituent omitted and/or each incorrect prime constituent included.

Misreadings (-1)
M1   Write as sum of 3 primes (30 = 2 + 5 + 23) or (30 = 2 + 11 + 17).

Attempts (2 marks)
A1   Writes a prime number $\in$ M.

Worthless (0)
W1   No prime number appears.

QUESTION 2

Part (a)	10 marks	Att 3
Part (b)	20 (5, 10, 5)	Att 7 (2, 3, 2)
Part (c)	20 (10, 5, 5)	Att7 (3, 2, 2)

Part (a)	10 marks	Att 3

> **2(a)** €260 is shared between Mark and Una in the ratio 6:7.
> How much does each receive?

Part (a)	10 marks	Att 3

✍

6 parts : 7parts	$6x : 7x$	$6 + 7 = 13$
	$\Rightarrow 13x = 260$	$\dfrac{1}{13} = 20$
13 *Parts* $= 260$	$\Rightarrow \quad x = 20$	
$\Rightarrow 1 Part = \dfrac{260}{13} = 20$	$\Rightarrow \quad 6x = 120$	$\Rightarrow \dfrac{6}{13} = 120$ (Mark)
Mark $= 20 \times 6 = 120$	$\Rightarrow \quad 7x = 140$	$\Rightarrow 260 - 120 = 140$ (Una)
Una $= 20 \times 7 = 140$		
or $260 - 120 = 140$		**or** $\dfrac{7}{13} = 140$
$260 - 140 = 120$		$\Rightarrow 260 - 140 = 120$

Blunders (-3)

B1 Correct answers without work. ✍
B2 Divisor $\neq 13$ only and continues.
B3 Incorrect multiplier or fails to multiply. (each time).
B4 Error in transposition.
B5 Fails to find second amount.
B6 Adds instead of subtracts.e.g.260 + 120 = 380 or 260 +140 = 400.
B7 Finds 6% of 260 $(15 \cdot 6)$ and 7% of 260 $(18 \cdot 2)$

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

Misreadings (-1)
M1 Interchanges Mark and Una.

Attempts (3 marks)

A1 Divisor $\neq 13$ e.g. $\dfrac{260}{6}$ and/or $\dfrac{260}{7}$ and stops.

A2 Indicates 6 parts or 7 parts or 13 parts or $\dfrac{6}{13}$ or $\dfrac{7}{13}$ or 6 + 7=13 and stops.

A3 Indicates multiplication of 260 by 6 and/or 7 and stops.
A4 Both answers added together equal €260. (No work shown).

Worthless (0)
W1 Incorrect answer without work. {Subject to A4}.

2(b) **(i)** On a day when €1 = £0·68, find the value in euro of £816.

✍	
€1 = £0·68 €? = £816 $? = \dfrac{816}{0·68} = €1200$	£0·68 = €1 $\Rightarrow £1 = €\dfrac{1}{0·68}$ $\left(\dfrac{25}{17}\right)$ $\Rightarrow £816 = 816 \times \dfrac{1}{0·68} = €1200$

* No penalty for the omission of € or £ symbols.

* Note: Natural Display calculator gives $\left(\dfrac{1}{0.68}\right) = \left(\dfrac{25}{17}\right)$, $816 \times 0·68 = \left(\dfrac{13872}{25}\right)$.

Blunders (-3)

B1   Correct answer without work. ✍

B2   Incorrect operation. i.e. $816 \times 0·68 = 554·88$

B3   Incorrect ratio $\dfrac{0·68}{816}$ or $\dfrac{68}{81600}$.

B4   Decimal error.

B5   Fails to finish, leaves as $\dfrac{816}{0·68}$ and stops.

Slips (-1)

S1   Numerical errors to a max of 3.

S2   Rounds off too early. e.g. $\dfrac{1}{0·68} = 1·470588235 = 1·47\,(€1199·52)$ or $1·5\,(€1224)$

Attempts (2 marks)

A1 $£1 = €\dfrac{1}{0·68}$ and stops.

Worthless (0)

W1   Adds or subtracts 816 to 0·68 and stops.

W2   Incorrect answer without work.

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

> **2(b) (ii)** By rounding each of these numbers to the nearest whole number,
>
> estimate the value of $\dfrac{5\cdot8\times8\cdot148}{11\cdot64}$.

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

✎ $\dfrac{5\cdot8\times8\cdot148}{11\cdot64}$ is approximately equal to

$$\frac{\boxed{6}\quad\times\quad\boxed{8}}{\boxed{12}} \quad=\quad \frac{\boxed{48}}{\boxed{12}} \quad=\quad \boxed{4}$$

* $\dfrac{6\times8}{12}$ and stops $\Rightarrow$ **4** marks.

*   No penalty if the intermediate step between approximations and final answer is not

         shown. i.e $\dfrac{48}{12}$ not shown.

*   Special Case: $\dfrac{5\cdot8\times8\cdot148}{11\cdot64}=4\cdot06$. $\left(\dfrac{203}{50}\right)$ presented in this part $\Rightarrow$ Attempt **3** marks.

Blunders (-3)
B1   Correct answer without work.   ✎
B2   Error(s) in rounding off to the nearest whole number. (once only)
B3   Decimal error in calculation of final value.
B4   An arithmetic operation other than indicated.

B5   Error(s) in the manipulation of the denominator. e.g. $\dfrac{6}{12}\times\dfrac{8}{12}=\dfrac{48}{144}$.

B6   Incorrect cancellation e.g. $\dfrac{6\times4}{12}=\dfrac{3\times4}{6}=\dfrac{12}{6}=2$

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

Attempts (3 marks)
A1   Only one or two approximations made to the given numbers and stops.

Worthless (0)
W1   Incorrect answer without work.

2(b) (iii)	Using a calculator, or otherwise, find the exact value of	$\dfrac{5\cdot 8 \times 8 \cdot 148}{11 \cdot 64}$.

$$\frac{5\cdot 8 \times 8 \cdot 148}{11\cdot 64} = \frac{47\cdot 2584}{11\cdot 64} = 4\cdot 06 \left(\frac{203}{50}\right)\left(4\frac{3}{50}\right)$$

*   Note: $\left(\dfrac{5.8}{11.64}\right) = \dfrac{145}{291}$, $\left(\dfrac{8.148}{11.64}\right) = \dfrac{7}{10}$.   .

Blunders (-3)

B1   Decimal error.

B2   Leaves answer as $\dfrac{47\cdot 2584}{11\cdot 64}$.

B3   Treats as $\dfrac{5\cdot 8}{11\cdot 64} \times \dfrac{8\cdot 148}{11\cdot 64} = 0\cdot 4982817869 \times 0\cdot 7 = 0\cdot 3487972509$. $\left(\dfrac{203}{582}\right)$.

B4   Reads as $\dfrac{5\cdot 8 + 8\cdot 148}{11\cdot 64} = \dfrac{13\cdot 948}{11\cdot 64} = 1\cdot 198281787$. $\left(\dfrac{3487}{2910}\right)$.

B5   Reads as $\dfrac{5\cdot 8 - 8\cdot 148}{11\cdot 64} = \dfrac{-2\cdot 348}{11\cdot 64} = -0\cdot 2017182131$. $\left(\dfrac{-587}{2910}\right)$.

B6   Treats as $\dfrac{11\cdot 64}{5\cdot 8 \times 8\cdot 148} = \dfrac{11\cdot 64}{47\cdot 2584} = 0\cdot 2463054187$. $\left(\dfrac{50}{203}\right)$.

B7   Treats as $\dfrac{11\cdot 64}{5\cdot 8 + 8\cdot 148} = \dfrac{11\cdot 64}{13\cdot 948} = 0\cdot 8345282478$. $\left(\dfrac{2910}{3487}\right)$.

B8   Treats as $\dfrac{11\cdot 64}{5\cdot 8 - 8\cdot 148} = \dfrac{11\cdot 64}{-2\cdot 348} = -4\cdot 957410562$. $\left(\dfrac{-2910}{587}\right)$.

Slips (-1)

S1   Numerical errors to a max of 3.

S2   Any rounding off.

Attempts (2 marks)

A1   Any correct relevant calculation and stops.

e.g. $5\cdot 8 \times 8\cdot 148 = 47.2584$, $\left(\dfrac{5\cdot 8}{11\cdot 64}\right) = \dfrac{145}{291} = 0\cdot 4982817869$, $\left(\dfrac{8\cdot 148}{11\cdot 64}\right) = \dfrac{7}{10} = 0\cdot 7$.

Worthless (0)

W1   Incorrect answer without work.

2(c) (i) Using a calculator, or otherwise, write $\dfrac{1}{5}$ and $\dfrac{11}{50}$ as decimals.

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

$$0 \cdot 25, \ \dfrac{1}{5}, \ \dfrac{11}{50}.$$
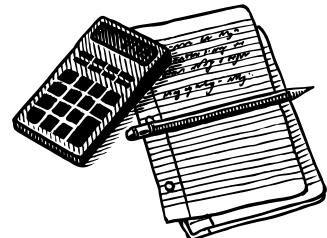
$\dfrac{1}{5} = 0 \cdot 2$		$\dfrac{11}{50} = 0 \cdot 22$
$\dfrac{1}{5}$,	$\dfrac{11}{50}$,	$0 \cdot 25$,

*   Accept: 0·2,   0·22,   0·25, merits **10** marks.

*   Accept: No penalty for writing 0·25 as $\dfrac{1}{4}$.

*   Note: $\dfrac{1}{5} = 0 \cdot 2$ or $\dfrac{11}{50} = 0 \cdot 22$ merits **4** marks

Blunders (-3)
B1   Fails to write a fraction as a decimal.
B2   Writes fraction as incorrect decimal.
B3   Decimal error.
B4   Inverts fraction and continues.
B5   Incorrect order or fails to order.

Attempts (3 marks)

A1 $0 \cdot 25 = \dfrac{1}{4}$ and stops.

Worthless(0)

W1 $\dfrac{0 \cdot 25}{5}$,   or . $\dfrac{0 \cdot 25}{50}$ or similar.

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

2(c) (ii)

Using a calculator, or otherwise, divide 1170 by $0 \cdot 45$ and express your answer in the form $a \times 10^n$, where $1 \leq a < 10$ and $n \in \mathbb{N}$

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

✎ $\qquad 1170 \div 0 \cdot 45 = 2600 = 2 \cdot 6 \times 10^3$

Blunders (-3)

B1 Correct answer without work. ✎

B2 Decimal error.

B3 Inverts $0 \cdot 45 \div 1170 = 0 \cdot 00038 \left(\dfrac{1}{2600} \right)$.

B4 Multiplies $1170 \times 0 \cdot 45 = 526 \cdot 5 = 5 \cdot 256 \times 10^2 \left(\dfrac{1053}{2} \right)$.

Slips (-1)

S1 Numerical errors to a max of 3.

S2 Incorrect format, where $a < 1 \; or \; a \geq 10$ and $n \notin \mathbb{N}$.

S3 2600 and stops.

Attempts (2 marks)

A1 Any relevant step. e.g. Partial long division.e.g. $\dfrac{1170}{0 \cdot 45} = 2$

A2 $\dfrac{1}{0 \cdot 45} = \dfrac{20}{9}$

2(c) (iii)   Using a calculator, or otherwise, evaluate

$$= (3 \cdot 9)^2 - \frac{5 \cdot 32}{\sqrt{0.64}} \times 1 \cdot 81$$

Give your answer correct to two decimal places

✍

$$= 15 \cdot 21 - \frac{5 \cdot 32}{0 \cdot 8} \times 1 \cdot 81$$

$$= 15 \cdot 21 - 6 \cdot 65 \times 1 \cdot 81$$

$$= 15 \cdot 21 - 12 \cdot 0365$$

$$= 3 \cdot 1735 \left(\frac{6347}{2000} \right)$$

$$= 3 \cdot 17$$

*   Correct answer (without work) incorrectly rounded off $\Rightarrow$ **2** marks.
         e.g. $= 3 \cdot 1735$, $= 3 \cdot 174$

*   Note: Natural Display calculator gives $(3 \cdot 9)^2 = \left(\frac{1521}{100} \right)$, $\frac{5.32}{\sqrt{0 \cdot 64}} = \left(\frac{133}{20} \right)$,

Blunders (-3)

B1   Correct answer without work. ✍

B2   Mishandles $(3 \cdot 9)^2$.

B3   Mishandles $\sqrt{0 \cdot 64}$.

B4   Error in $5 \cdot 32 \div 0 \cdot 8$ or $9 \cdot 6292 \div 0 \cdot 8$.

B5   Error in $5 \cdot 32 \times 1 \cdot 81$ or $6 \cdot 65 \times 1 \cdot 81$.

B6   Decimal error.

B7   Subtracts before Division $(15 \cdot 21 - 5 \cdot 32) \div 0 \cdot 8 \times 1 \cdot 81 = 9 \cdot 89 \div 0 \cdot 8 \times 1 \cdot 81 = 22 \cdot 376125$.

B8   Subtracts before Multiplication $(15 \cdot 21 - 6 \cdot 65) \times 1 \cdot 81 = 8 \cdot 56 \times 1 \cdot 81 = 15 \cdot 4936$.

B9   Use of mathematical operator other than that which is indicated.

B10   Works as $15 \cdot 21 \times 1 \cdot 81 - \frac{5 \cdot 32}{0 \cdot 8} = 27 \cdot 5301 - 6 \cdot 65 = 20 \cdot 8801 = 20 \cdot 88$.

B11   Works as $\left(\frac{5 \cdot 32}{0 \cdot 8} \times 1 \cdot 81 \right) - 15 \cdot 21 = 12 \cdot 0365 - 15 \cdot 21 = -3 \cdot 1735 = -3 \cdot 17$.

Slips (-1)

S1   Numerical errors to a max of 3.

S2   Each premature rounding off that effects the final answer to a max of 3.

S3   Fails to round off or rounds off incorrectly when giving final answer.

S4   Leaves as $\frac{6347}{2000}$.

Attempts (2 marks.)

A1   Any correct relevant step e.g. $(3 \cdot 9)^2 = 15 \cdot 21$, $\sqrt{0 \cdot 64} = 0 \cdot 8$.

Worthless (0)

W1   Incorrect answer without work. (Note 1st *).

QUESTION 3

Part (a)	10 marks	Att 3
Part (b)	20 (10, 10) marks	Att 6(3, 3)
Part (c)	20 (5, 5, 5,) marks	Att 8(2, 2, 2, 2)

Part (a)	10 marks	Att 3

3(a)   Kate went to the cinema. She bought a ticket at €8·50 and then bought popcorn costing €4·40. How much change did Kate get from a €20 note?

Part (a)	10 marks	Att 3

✍		
*	**	***
€8·50 + €4·40 = €12·90	€20·00 − €8·50 = €11·50	€20·00 − €4·40 = €15·60
€20·00 − €12·90 = €7·10	€11·50 − €4·40 = €7·10	€15·60 − €8·50 = €7·10

*   Accept 710c, (7·10)
*   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   Calculates the cost of the ticket and the popcorn but 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 e.g. €1·29 (Note: 1st* above).

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

Attempts (3 marks)
A1   Any attempt at addition /subtracation.

Worthless (0)
W1   Incorrect answer without work.
W2   Multiplication or division of the given numbers.

3(b) (i)	VAT at $13 \cdot 5\%$ is added to a bill of €860	
	Calculate the total bill.	

✑		
$100\% = 860$	$13 \cdot 5\% = \dfrac{13 \cdot 5}{100}$	$860 \times 1 \cdot 135$
$1\% = \dfrac{860}{100}$	$VAT = \dfrac{13 \cdot 5}{100} \times 860$	Total Bill = €976·10
$113 \cdot 5\% = \dfrac{860}{100} \times 113 \cdot 5$	$= 116 \cdot 10 \left(\dfrac{1161}{10}\right)$	
$= 8 \cdot 60 \times 113 \cdot 5$	Total Bill $= 860 + 116 \cdot 10$	
Total Bill = €976·10	Total Bill = €976·10	

*   €116·10 without work and stops merits **4** marks.

Blunders (-3)

B1   Correct answer without work. ✑

B2   Decimal error.

B3   Inverts as $\dfrac{100}{113 \cdot 5}$ or $\dfrac{100}{13 \cdot 5}$ and continues (giving answers $757 \cdot 71$ or $6370 \cdot 37$).

B4   Mishandles $13 \cdot 5\%$ e.g. $860 \times 13 \cdot 5$ or $860 \div 13 \cdot 5$. Note: {860 must be used}.

B5   860 taken as $113 \cdot 5\%$.

B6   No addition of VAT (as per candidates work) to the bill.

B7   Subtraction of VAT (as per candidates work) from the bill.

Slips (-1)

S1   Numerical errors to a max of 3.

Misreadings (-1)

M1   Reads as 15·3% or €680.

Attempts (3 marks)

A1 $\dfrac{13 \cdot 5}{100}$ and stops.   or $\dfrac{860}{100}$ and stops.

A2 $100\% = 860$ and stops.

A3 $100 \times \dfrac{13 \cdot 5}{860}$ and stops.   or $\dfrac{860}{13 \cdot 5}$ and stops.

A4 $860 + 13 \cdot 5\%$ and stops.

Worthless (0)

W1   Incorrect answer without work.

W2 $860 + 13 \cdot 5 = 873 \cdot 5$ and stops or continues.

3(b) (ii)	€4750 is invested at $3 \cdot 7$ % per annum
	What is the amount of the investment at the end of one year?

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

✐		
$1 \% = \dfrac{4750}{100}$	$I = \dfrac{P \times R}{100}$	Amount $= 4750 \times 1 \cdot 037$
$3 \cdot 7 \% = \dfrac{4750}{100} \times 3 \cdot 7$	$I = \dfrac{4750 \times 3 \cdot 7}{100}$	Amount $= €4925 \cdot 75 \left(\dfrac{19703}{4} \right)$
Interest $= 175 \cdot 75 . \left(\dfrac{703}{4} \right)$	Interest $= 175 \cdot 75$	
Amount $= 4750 + 175 \cdot 75$	Amount $= €4925 \cdot 75$	
Amount $= €4925 \cdot 75$		

*   € $175 \cdot 75$ (without work) and stops $\Rightarrow$ **4** marks.

Blunders (-3)

B1   Correct answer without work. ✐

B2   Mishandles $3 \cdot 7$ %. e.g. $\dfrac{4750 \times 100}{3 \cdot 7}$ {No penalty if already penalised in b (i)}

B3   Decimal error (once only).
B4   Stops at interest i.e. fails to calculate amount.
B5   Subtracts to calculate amount.

B6   Mathematical error(s) working with $\dfrac{4750}{100} \times 3 \cdot 7$.

B7 $1 \cdot 037$ treated as $1 \cdot 37$.

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

Misreadings (-1)
M1   Reads as €4570.
M2 $3 \cdot 7$% written as $7 \cdot 3$%.

Attempts (3 marks)
A1   Correct formula with or without substitution and stops.

A2   Some use of 100 in attempt to find percentage e.g. $3 \cdot 7 \% = \dfrac{3 \cdot 7}{100}$ or $1 \cdot 037$ and stops.

A3 $4750 + 3 \cdot 7 \%$ and stops.

Worthless (0)
W1   Incorrect answer without work.
W2 $4750 + 3 \cdot 7 = 4753 \cdot 7$ and stops or continues.

Part (c)   **20 (5, 5, 5, 5) marks**   **Att 8 (2, 2, 2, 2)**

3(c)	Darragh's annual wage is €48 000. He pays income tax at the rate of 20% on the first €34000 of his wage and income tax at the rate of 41% on the remainder of his wage. Darragh has an annual tax credit of €3600.

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

3(c) (i)	Find the tax on the first €34000 of his wage, calculated at the rate of 20%.

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

✍

100% = 34000	Tax = $\dfrac{34000}{100} \times 20$	Tax = $34000 \times 0\cdot2$	$20\% = \dfrac{1}{5}$
1% = 340	Tax = €6800	Tax = €6800	$34000 \div 5$
20% = 6800			Tax = €6800
Tax = €6800			

*   No penalty for missing € symbol.

Blunders (-3)

B1   Correct answer without work. ✍
B2   Mishandles 20%, e.g. $34000 \times 20 = 680000$ or $34000 \div 20 = 1700$
B3   Uses €48000 instead of €34000.
B4   Decimal error.

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

Attempts (2 marks)

A1   Some use of 100 in attempt to find percentage e.g. $20\% = \dfrac{20}{100}$ *or* $0\cdot2$ and stops.

A2 $20\% = \dfrac{1}{5}$

A3   Writes 34000 + 20% and stops.

Worthless (0)
W1   Incorrect answer without work

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

3(c) (ii)	Find the tax on the remainder of his wage, calculated at the rate of 41%.

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

✍ **(ii)**	Remainder of wage = €48 000 – €34 000= €14,000	
100% = 14 000	$\text{Tax} = \dfrac{14\,000}{100} \times 41 = 5\,740$	$\text{Tax} = 14\,000 \times 0 \cdot 41$
1% = 140		Tax = 5 740
41% = 5740		
Tax = 5740		

*   No penalty for missing € symbol.

Blunders (-3)

B1   Correct answer without work. ✍
B2   Mishandles 41%, e.g. $14\,000 \div 41$ [<u>No</u> penalty if already penalised in (c) (i)].
B3   Does not use €14 000.
B4   Decimal error.

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

Attempts (2 marks)

A1   Some use of 100 in attempt to find percentage e.g. $41\% = \dfrac{41}{100} = 0 \cdot 41$ and stops.

A2   48 000 - 34 000 or 14 000 and stops.

Worthless (0)
W1   Incorrect answer without work.

Part (c) (iii)	5 marks	Att 2

3(c) (iii)   Hence calculate Darragh's gross tax.

✍ **(iii)**   Darragh's gross tax = €6800 + €5740 = €12 540

*   Allow candidates incorrect answers from parts (i) and (ii).
*   No penalty for missing € symbol.

Blunders (-3)

B1   Correct answer without work. ✍
B2   Subtracts to find gross tax e.g. €6800 – €5740 =   €1060
B3   Misuse of tax credit.

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

Attempts (2)
A1   Answer from c (i) and /or c (ii) written in this part.

Worthless (0)
W1   Incorrect answer without work

Part (c) (iv)	5 marks	Att 2

3(c) (iv)   Calculate Darragh's take home pay.

✍
Tax due = €12 540 - €3600
= €8940
Take home pay = €48 000 - €8940
Take home pay = €39 060

*   Allow candidate's incorrect gross tax figure from (c) (iii).
*   No penalty for missing € symbol.

Blunders (-3)

B1   Correct answer without work. ✍
B2   Misuse or no use of tax credit e.g. €12 540 + €3600
B3   Decimal error.

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

Attempts (2)
A1   Answer from c (iii) written in this part.

Worthless (0)
W1   Incorrect answer without work.

QUESTION 4

Part (a)	10 (5, 5) marks	Att 4(2, 2)
Part (b)	20 (10, 10) marks	Att 6(3, 3)
Part (c)	20 (5, 5, 5, 5) marks	Att 8(2, 2, 2, 2)

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

4(a)   If $a = 5$ and $b = 7$, find the value of:

✎   **(i)** $9a + b$

✎   **(ii)** $ab + 13$

| Part (a) (i) | 5 marks | Att 2 |

4(a) (i)   If $a = 5$ and $b = 7$, find the value of:
        (i) $9a + b$

| Part (a) (i) | 5 marks | Att 2 |

✎   **(i)** $9a + b = 9(5) + 7 = 45 + 7 = 52$

* $45 + 7 \Rightarrow \underline{\textbf{4}}$ marks.

Blunders (-3)

B1   Correct answer without work. ✎
B2   Leaves 9(5) in the answer.
B3   Incorrect substitution and continues
B4   Breaks order i.e. $[9(5+7)=9(12)=108]$.
B5   Treats 9(5) as 14 or 95.
B6   Combines $9a + b$ to give $9ab$ and continues.

Slips (-1)

S1   Numerical errors to a max of 3.
S2   Treats as $9a - b$.
S3   Treats as $9b + a$.

Attempts (2 marks)

A1   Substitutes for either a or b and stops e.g. 9(5).
A2   Writes 7 or 5 in this part.
A3   Any correct step.

Worthless (0)

W1   Incorrect answer with no work.
W2   Writes as $9ab$ and stops.

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

| 4(a) (ii) | If $a = 5$ and $b = 7$, find the value of: |
| | (ii) $ab + 13$ |

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

✍

$$ab + 13 = 5(7) + 13 = 35 + 13 = 48$$

* $35 + 13 \Rightarrow$ **4** marks.

Blunders (-3)

B1   Correct answer without work. ✍
B2   Leaves 5(7) in the answer.
B3   Incorrect substitution and continues
B4   Breaks order i.e. $[5(7+13) = 5(20) = 100]$.
B5   Treats 5(7) as 12 or 57.
B6   Combines $ab + 13$ to give $13ab$ and continues.

Slips (-1)
S1   Numerical errors to a max of 3.
S2   Treats as $ab - 13$.

Attempts (2 marks)
A1   Substitutes for either a or b and stops e.g. a (7).
A2   Writes 7 or 5 in this part.
A3   Any correct step.

Worthless (0)
W1   Incorrect answer with no work.
W2   Writes as $13ab$ and stops.

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

4(b) (i) Solve the equation $3(2x - 1) = 4x + 9$

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

✎

$$3(2x - 1) = 4x + 9$$
$$6x - 3 = 4x + 9$$
$$6x - 4x = 3 + 9$$
$$2x = 12$$
$$x = \frac{12}{2}$$
$$x = 6$$

Blunders (-3)

B1 Correct answer without work. ✎   ($x=6$ stated or substituted)
B2 Error in distributive law and continues. e.g. $6x - 1 = 4x + 9$
B3 Error in transposition. (each time).
B4 Combines "x's" to "numbers" and continues. e.g. $6x - 3 = 3x$ or $4x + 9 = 13$ or $2x - 1 = x$
B5 Stops at $2x = 12$ or similar.

Slips (-1)
S1 Numerical errors to a max of 3.
S2 Leaves as $x = \frac{12}{2}$ or similar.

Attempts (3 marks)
A1 Any substitution for values of x other than $x = 6$.

A2 Any correct step. e.g. $(2x - 1) = \frac{4x + 9}{3}$

Worthless (0)
W1 Combines "x's" to "numbers" and stops
W2 Incorrect answer with no work.

4(b) (ii)   Multiply $(5x-2)$ by $(3x+4)$.

                                 Write your answer in its simplest form.

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

✍

$(5x-2)(3x+4)$	$(3x+4)(5x-2)$	$(5x-2)(3x+4)$
$15x^2 + 20x - 6x - 8$	$15x^2 - 6x + 20x - 8$	$5x(3x+4) - 2(3x+4)$
$15x^2 + 14x - 8$	$15x^2 + 14x - 8$	$15x^2 + 20x - 6x - 8$
		$15x^2 + 14x - 8$

* $15x^2 + 20x - 6x - 8$ merits **7** marks.

Blunders (-3)

B1   Correct answer without work. ✍
B2   Error in distribution.
B3   Combines "x's" to "numbers" and continues. e.g. $5x - 2 = 3$ or $3x + 4 = 7x$.
B4   Fails to group or groups incorrectly.

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

Attempts (3 marks)
A1   Any correct multiplication. e.g. $15x$.
A2   Any correct grouping of terms.
A3   A correct step.
A4   Substitutes a value of "x" and continues correctly.
A5   Treats as $(5x-2) \pm (3x+4)$ to give $8x+2$ or $2x-6$.

Worthless (0)
W1   Combining unlike terms and stops.
W2   No distribution but A2 or A5 may apply to subsequent work e.g. gathering of terms.

Part (c)	**20 (5, 5, 5, 5) marks**	**Att 8 (2, 2, 2, 2)**

4(c) Shane is x years old. Eileen is three years younger than Shane.

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

4(c) (i) Find Eileen's age in terms of x.

Part (c) (i)	**5 marks**	**Att 2**
	$x-3$	

*   Algebraic work required to earn marks.

Blunders (-3)
B1   Incorrect expression of Eileen's age other than mireadings below.

Misreadings (-1)
M1   Answer given as $x+3$.
M2   Answer given as $3x$.

Attempts (2 marks)
A1   Any effort at forming an expression.e.g. Eileen's age $= y$.

Worthless (0 marks)
W1   Eileen's age given as a constant or x.
W2   Inequality appears.

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

4(c) (ii)   If the sum of Shane's age and Eileen's age is 47, write down an equation in x to represent this information.

Part (c) (ii)	**5 marks**	**Att 2**
	$x+x-3=47$	

*   Accept candidates answer from previous work.

Blunders (-3)
B1   Error in forming equation.

Attempts (2 marks)
A1   Answer from part c (i) written down and stops.
A2   Any effort at forming an expression.
A3   Writes Shane's age and stops. i.e. x

Part (c) (iii)	**5 marks**	**Att 2**
4(c) (iii)	Solve the equation that you formed in part **(ii)** above, for *x*.	

Part (c) (iii)	**5 marks**	**Att 2**
✍	$x + x - 3 = 47$ $2x = 47 + 3$ $2x = 50$ $x = \dfrac{50}{2}$ $x = 25$	

*   Accept candidates answer from previous work.

Blunders (-3)

B1   Correct answer without work. ✍   ($x = 25$ stated or substituted)
B2   Error in transposition.
B3   Error in grouping terms or fails to group.
B4   Combines "*x*'s" to "numbers" and continues. e.g. $x + x - 3 = -x$
B5   Stops at $2x = 50$ or similar.

Slips (-1)

S1   Numerical errors to a max of 3.

S2   Leaves as $x = \dfrac{50}{2}$ or similar.

Attempts (2 marks)

A1   Any substitution for values of *x* other than $x = 25$.
A2   Answer from part c(ii) written down and stops.
A3   Any effort at solving equation.
A4   Any correct step.

Worthless (0)

W1   Combines "*x*'s" to "numbers" and stops. (Note A3 above)
W2   Incorrect answer with no work.

Part (c) (iv)   **5 marks**   **Att 2**

4(c) (iv)   When Eileen is $2x+5$ years old, find the sum of Shane's age and Eileen's age

Part (c) (iv)   **5 marks**   **Att 2**

✐	Allow
Eileen's age $\rightarrow 2x+5=2(25)+5=50+5=55$	Eileen's age $=2x+5$
Shane's age $\rightarrow 55+3=58$	Shane's age $= 2x+8$
Sum of Shane's age and Eileen's age $=55+58=113$	Sum of Shane's age and Eileen's age $= 2x+5+2x+8= 4x+13$

*   Accept candidates answer from previous work.

Blunders (-3)

B1   Correct answer without work. ✐
B2   Error in grouping terms or fails to group.
B3   Combines "x's"to "numbers" and continues. e.g. $2x+5+2x+8= 7x+10$.
B4   Only one age calculated.

Misreadings (-1)
M1   Takes Shane's age as x and continues $2x+5+x =3x+5$.

Slips (-1)
S1   Numerical errors to a max of 3.
S2   Leaves as 55 + 58 or similar.

Attempts (2 marks)
A1   Any correct step.
A2   Writes answer from c (iii) and stops.

Worthless (0)
W1   Incorrect answer with no work.
W2   Works with $2x+5 =47$

QUESTION 5

Part (a)	5 marks	Att 2
Part (b)	20(5, 5, 5, 5) marks	Att 8(2, 2, 2, 2)
Part (c)	25(5, 5, 15) marks	Att 9(2, 2, 5)

Part (a)	5 marks	Att 2

5 (a)	Find the values of x for which $3x + 2 \leq 8, x \in \mathbf{N}$

Part (a)	5 marks	Att 2

✍

$$3x + 2 \leq 8$$
$$3x \leq 8 - 2$$
$$3x \leq 6$$ or
$$x \leq 2$$
$$\{0,1,2\}$$
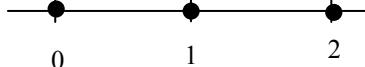
Blunders (-3)

B1   Correct answer without work. ✍
B2   Error in transposition.
B3   Combines "x's" to "numbers". e.g.. $5x \leq 8$ and continues.
B4   Mishandles the direction of inequality e.g. $3x \geq 6$
B5   Treats inequality as equality and continues.

Slips (-1)
S1   Numerical errors to a max of 3.
S2 $\leq$ taken as $<$
S3   Each missing or incorrect value of x subject to a max of 3.

Misreadings (-1)
M1 $2x + 3 \leq 8$, and continues.

Attempts (2 marks)
A1   Attempt at transposition and stops.
A2   0, 1 or 2 substituted for x.
A3   Number line with one or more of the correct elements clearly indicated. (Ignore arrows)

Worthless (0)
W1   Incorrect answer with no work.e.g. $\{1, 2, 3, 4, 5, 6, 7, 8,.....\}$.

Part (b) (i)	**5 marks**	**Att 2**
5(b) (i)	Factorise: $\quad 4a + ab$	

Part (b) (i)	**5 marks**	**Att 2**
	$a(4 + b)$	

Blunders (-3)
B1   Removes factor incorrectly.

Attempts (2 marks)
A1   Indication of common factor. e.g. underline a's and stops.

Part (b) (ii)	**5 marks**	**Att 2**
5(b) (ii)	Factorise: $\quad 2x - 2y + cx - cy$	

Part (b) (ii)		**5 marks**		**Att 2**
✎	$2x - 2y + cx - cy$ $2(x - y) + c(x - y)$ $(2 + c)(x - y)$	or	$2x - 2y + cx - cy$ $x(2 + c) - y(2 + c)$ $(x - y)(2 + c)$	

*   Accept also (with or without brackets) for 5 marks any of the following
   $(2 + c)$ and $(x - y)$ [The word **and** is written down.]
   $(2 + c)$ or $(x - y)$ [The word **or** is written down.]
   $(2 + c),(x - y)$ [A comma is used]

Blunders (-3)

B1   Correct answer without work. ✎
B2   Stops after first line of correct factorisation. e.g. $2(x - y) + c(x - y)$ or equivalent.
B3   Error(s) in factorising any pair of terms.
B4   Incorrect common factor and continues. e.g. $\quad y(-2 - c) + x(2 + c)$

Slips (-1)
S1 $(2 + c) \pm (x - y)$
S2   Correct first line of factorisation but ends as $2c(x - y)$ or $xy(2 + c)$.

Attempts (2 marks)
A1   Pairing off, or indication of common factors and stops.
A2   Correctly factorises any pair and stops.

5(b) **(iii)**	Factorise:	$x^2 - 2x - 24$

$x^2 - 2x - 24$ $x^2 - 6x + 4x - 24$ $x(x-6) + 4(x-6)$ $(x+4)(x-6)$	x $+4$ x -6 $\Rightarrow (x+4)(x-6)$	$\dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-24)}}{2(1)}$ $\dfrac{2 \pm \sqrt{4+96}}{2} \;=\; \dfrac{2 \pm 10}{2}$ $\dfrac{12}{2} = 6 \quad and \quad \dfrac{-8}{2} = -4$ $\Rightarrow (x-6)(x+4)$
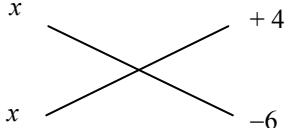
*   Accept also (with or without brackets) for 5 marks any of the following

     $(x - 6)$ and $(x + 4)$ [The word **and** is written down.]

     $(x - 6)$ or $(x + 4)$ [The word **or** is written down.]

     $(x - 6)$, $(x + 4)$ [A comma is used]

Blunders (-3)

B1   Incorrect two term linear factors of. $x^2 - 2x - 24$ formed from correct (but inapplicable) factors of x^2 and -24 .e.g $(x - 12)(x + 2)$.

B2   Incorrect factors of x^2.

B3   Incorrect factors of -24.

B4   Correct cross method but factors not shown and stops.

B5 $x(x-6) + 4(x-6)$ or similar and stops.

B6   Incorrect common factor and continues.

B7   Incorrect quadratic formula and continues.

B8   Error in quadratic formula.

B9   Answer left as roots.

B10   Sign error in substituted formula.

B11   Error in square root or square root ignored.

Slips (-1)

S1   Numerical errors to a max of 3.

S2 $(x+4) \pm (x-6)$.

Attempts (2 marks)

A1   Correct quadratic equation formula quoted and stops

A2   Correct factors of either x^2 or ± 24.

A3   Any correct step.

Worthless (0 marks)

W1 $x^2 - 2x = 24$ or similar and stops.

W2   Combines "x's"to "numbers" and continues or stops.

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

5(b)	**(iv)**	Factorise:	$144 - y^2$

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

$$(12 - y)(12 + y)$$

*   Accept also (with or without brackets) for 5 marks any of the following

         $(12 - y)$ and $(12 + y)$ [The word **and** is written down.]

         $(12 - y)$ or $(12 + y)$ [The word **or** is written down.]

         $(12 - y)$, $(12 + y)$ [A comma is used]

*   Quadratic equation formula method is subject to slips and blunders.

* $(\sqrt{144} - y)(\sqrt{144} + y)$ merits 5 marks.

Blunders (-3)

B1   Incorrect two term linear factors of $144 - y^2$ formed from correct (but inapplicable)

        factors of 144 and $-y^2$ .e.g $(144 - y)(1 + y)$.

B2   Incorrect factors of 144.

B3   Incorrect factors of $-y^2$.

B4 $(y - 12)(y + 12)$.

B5 $(144 + y)(144 - y)$.

B6   Answer left as roots. ($y = \pm 12$)

Slips (-1)

S1 $(12 - y) \pm (12 + y)$

Attempts (2 marks)

A1   Correct factors of 144 only.

A2   Correct factors of $\pm y^2$ only.

A3 ± 12 *or* $\pm y$ appears.

A4 $144 - y^2 = (12)(12) - (y)y$ and stops.

A5   Mention of the difference of two squares .e.g. $\{(144)^2 - y^2\}$

A6   Correct quadratic equation formula quoted and stops.

A7 $\sqrt{144}$

Worthless (0 marks)

W1   Combines "y's" to "numbers" and continues or stops.

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

5(c)(i)   Express $\dfrac{x-1}{5} - \dfrac{x-2}{7}$ as a single fraction

and give your answer in its simplest form.

✍

$$\frac{x-1}{5} - \frac{x-2}{7}$$

$$\frac{7(x-1) - 5(x-2)}{35}$$

$$\frac{7x - 7 - 5x + 10}{35}$$

$$\frac{2x + 3}{35}$$

Blunders (-3)

B1   Correct answer without work. ✍

B2   Error(s) in distribution. e.g. $7(x-1) = 7x - 1$

B3   Mathematical error e.g. $-7 + 10 = -3$. $2(-1) = 2$.

B4   Incorrect common denominator and continues.

B5   Incorrect numerator from candidate's denominator e.g. $\dfrac{5(x-1) - 7(x-2)}{35}$.

B6   No simplification of numerator.

B7   Omitting denominator.

Slips (-1)

S1   Drops denominator.

S2   Numerical error to a max of 3.

S3   Answer not in simplest form. e.g. $\dfrac{4x + 6}{70}$.

Attempts (2 marks)

A1   35 only or a multiple of 35 only appears.

A2   Any correct step.

Worthless (0)

W1 $\left(\dfrac{x-1}{5}\right)\left(\dfrac{x-2}{7}\right)$ and stops.

W2 $\dfrac{x-1}{5} - \dfrac{x-2}{7} = \dfrac{2x-3}{-2}$

5(c) (ii)   Hence, or otherwise, solve the equation $\dfrac{x-1}{5} - \dfrac{x-2}{7} = 1$

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

✍

$$\frac{2x + 3}{35} = 1$$
$$2x + 3 = 35$$
$$2x = 35 - 3$$
$$2x = 32$$
$$x = \frac{32}{2}$$
$$x = 16$$

*   Accept candidates answer from previous work.

Blunders (-3)

B1   Correct answer without work. ✍

B2   Error in transposition. (each time)

Slips (-1)

S1   Numerical error to a max of 3.

S2   Leaves as $\dfrac{32}{2}$.

Attempts (2 marks)

A1   Answer from (c) (i) written in this part or worked again in this part.

A2   Any correct step and stops.

Part(c) (iii)   **15 marks**   **Att 5**

5(c) (iii)   Solve for x and for y:

$$3x + 2y = 73$$
$$4x + y = 59$$

.

Part(c) (ii)   **15 marks**   **Att 5**

✍

I		II
$3x + 2y = 73$	$3x + 2y = 73$	$2y = 73 - 3x$
$\underline{4x + y = 59}$	$\underline{4x + y = 59}$	$y = \dfrac{73 - 3x}{2}$
$3x + 2y = 73$	$12x + 8y = 292$	
$\underline{-8x - 2y = -118}$	$\underline{-12x - 3y = -177}$	$4x + \left(\dfrac{73-3x}{2}\right) = 59$
$-5x = -45$	$5y = 115$	$8x + 73 - 3x = 118$
$5x = 45$	$y = \dfrac{115}{5} = 23$	$5x = 118 - 73$
$x = \dfrac{45}{5} = 9$	$\Rightarrow x = 9$	$5x = 45$
$\Rightarrow y = 23$		$x = \dfrac{45}{5} = 9$
		$\Rightarrow y = 23$

*   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. ✍

B2   Error(s) in establishing the first equation in terms of x only $[\,5x = 45\,]$ or the first equation in terms of y only $[\,5y = 115\,]$ through elimination by cancellation.

B3   Error(s) in establishing the first equation in terms of x only $[\,5x = 45\,]$ or the first equation in terms of y only $[\,5y = 115\,]$ through elimination by substitution.

B4   Errors in transposition in solving the first one variable equation.

B5   Errors in transposition when finding the second variable.

B6   Incorrect substitution when finding second variable.

B7   Finds one variable only.

Slips (-1)

S1   Numerical errors to a max of 3

Attempts (5 marks)

A1   Attempt at transposition and stops.

A2   Multiplies either equation by some number and stops .

Worthless (0 marks)

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

QUESTION 6

Part (a)	10 (5, 5) marks	Att 4(2, 2,)
Part (b)	25 (15, 10) marks	Att 8(5, 3)
Part (c)	15 (5, 5, 5) marks	Att 6(2, 2, 2)

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

6 (a)

$f(x) = 3x - 1.$ Find:
(i) $f(5)$
(ii) $f(-4)$

Part (a) (i)	5 marks	Att 2

6(a) (i) $f(x) = 3x - 1.$ Find: $f(5)$

Part (a) (i)	5 marks	Att2

(i) $f(5) = 3(5) - 1 = 15 - 1 = 14$

Blunders (-3)
B1   Leaves $3(5)$ in the answer
B2   Combines "*x*'s"to "numbers" and continues e.g. $3x - 1 = 2x = 2(5) = 10$
B3   Mathematical error. e.g. $15 - 1 = -14$
B4   Breaks order i.e. $3(5 - 1) = 3(4) = 12$

Slips (-1)
S1   Numerical errors to a max of 3.
S2   Leaves x in the answer e.g. $14x$

Misreadings (-1)
M1   Correct substitution of any number other than 5 and continues.

Attempts (2marks)
A1   Substitutes for x and stops. i.e. $3(5)$
A2   Treats as equation and continues or stops. i.e. $3x - 1 = 5$

Worthless (0)
W1   Combines "*x*'s"to "numbers" and stops.
W2   Ignores x giving $3 - 1 = 2$.
W3 $5[f(x)] = 15x - 5$
W4   Replaces coefficient i.e. $3x \rightarrow 5x$.
W5   Incorrect answer without work.

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

6(a) (ii) $f(x) = 3x - 1$.   Find: $f(-4)$

Part (a) (ii)   **5 marks**   **Att2**

(ii) $f(-4) = 3(-4) - 1 = -12 - 1 = -13$

Blunders (-3)
B1   Leaves $3(-4)$ in the answer
B2   Combines "x's" to "numbers" and continues e.g. $3x - 1 = 2x = 2(-4) = -8$
B3   Mathematical error. e.g. $-12 - 1 = 13$
B4   Breaks order i.e. $3(-4-1) = 3(-5) = -15$

Slips (-1)
S1   Numerical errors to a max of 3.
S2   Leaves x in the answer e.g. $-13x$.

Misreadings (-1)
M1   Correct substitution of any negative number other than -4 and continues.

Attempts (2marks)
A1   Substitutes for x and stops. i.e. $3(-4)$
A2   Treats as equation and continues or stops i.e. $3x - 1 = -4$

Worthless (0)
W1   Combines "x's" to "numbers" and stops.
W2   Ignores x giving $3 - 1 = 2$.
W3 $-4[f(x)] = -12x - 4$.
W4   Replaces coefficient .i.e. $3x \rightarrow -4x$.
W5   Incorrect answer without work.

6(b)   Draw the graph of the function

$$f: x \rightarrow x^2 - 3x - 1$$

in the domain $-1 \le x \le 4$,   where $x \in \mathbf{R}$

Part (b) Table   **15 marks**   **Att 5**

							x	-1	0	1	2	3	4
$f(x)$	=	x^2	$-3x$	-1			x^2	1	0	1	4	9	16
$f(-1)$	=	$(-1)^2$	$-3(-1)$	-1	=	**3**	$-3x$	3	0	-3	-6	-9	-12
$f(0)$	=	$(0)^2$	$-3(0)$	-1	=	**-1**	-1	-1	-1	-1	-1	-1	-1
$f(1)$	=	$(1)^2$	$-3(1)$	-1	=	**-3**	$f(x)$	3	-1	-3	-3	-1	3
$f(2)$	=	$(2)^2$	$-3(2)$	-1	=	**-3**							
$f(3)$	=	$(3)^2$	$-3(3)$	-1	=	**-1**							
$f(4)$	=	$(4)^2$	$-3(4)$	-1	=	**3**							

*   **Error(s) in each row /column attract a maximum deduction of 3.**

Blunders (-3)
B1   " $-3x$ " taken as " -3 "all the way. [In row headed $-3x$ by candidate]
B2   " -1 " calculated as " $-x$ " all the way.[In row headed " -1 " by candidate]
B3   Adds in top row when evaluating $f(x)$.
B4   Omits " -1 " row.
B5   Omits" $-3x$ "row.
B6   Omits a value in the domain (each time).
B7   Each incorrect image without work.

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 " $-3x$ "as " $3x$ "and places " $3x$ "in the table or function.
M3   Misreads " -1 " as "1" and places "1" in the table or function

Attempts (5 marks)
A1   Omits " x^2 " row from table or treats " x^2 " as $\pm 2x$.
A2   Any effort at calculating point(s).
A3   Only one point calculated and stops.
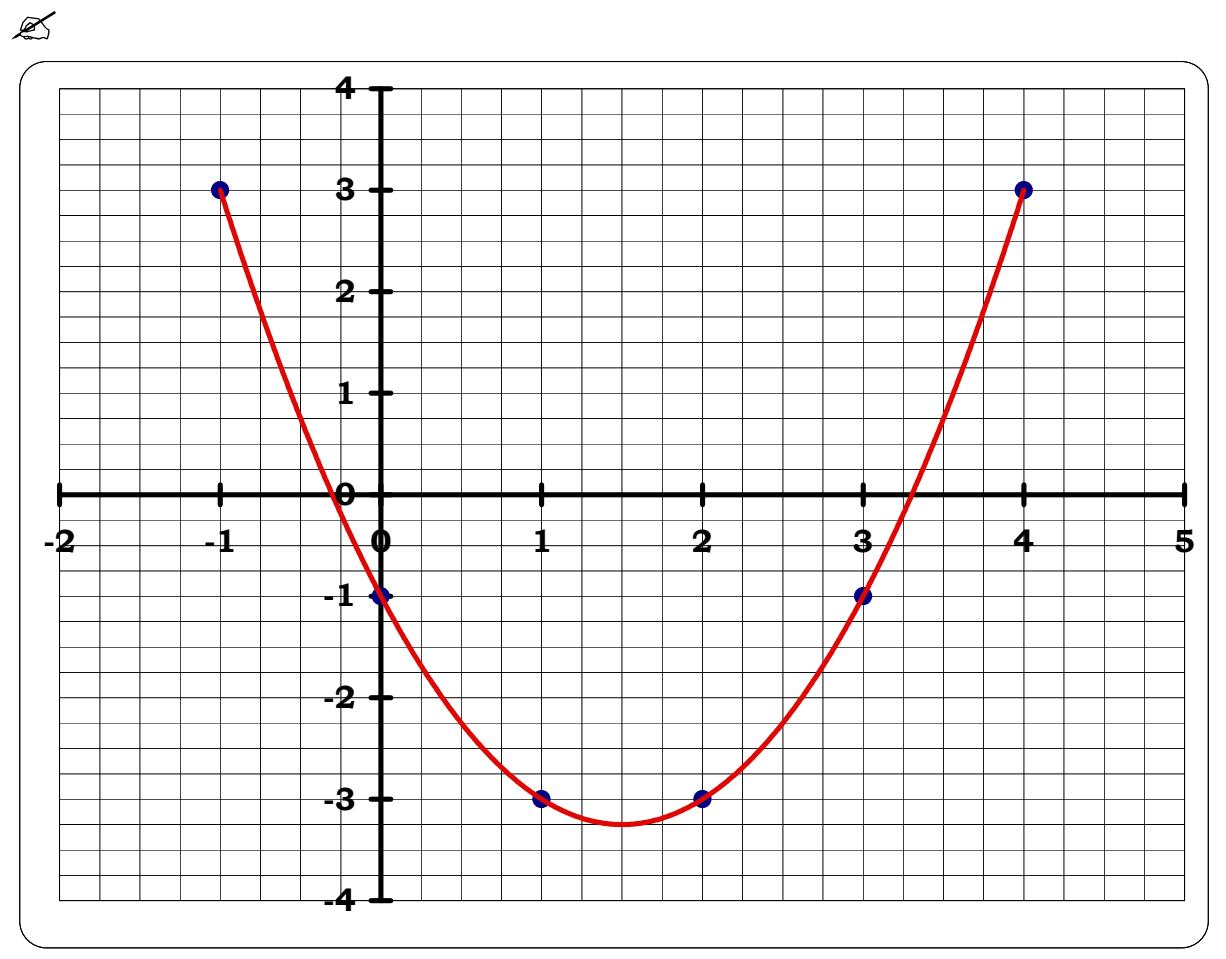
*   Accept candidate's values from previous work.

*   Only **one** correct point **graphed correctly** $\Rightarrow$ Att $\underline{5}$ + Att $\underline{3}$

*   **Correct graph but no table** $\Rightarrow$ full marks i.e. **(15+10)** marks.

*   Accept reversed co-ordinates if
     (i)   if axes not labelled or (ii) if axes are reversed to compensate (see B1 below)

Blunders (-3)

B1   Reversed co-ordinates plotted against non-reversed axes (once only) {See 4th * above}.

B2   Scale error (once only).

B3   Points not joined or joined in incorrect order (once only).

Slips (-1)

S1   Each point of candidate graphed incorrectly. {Tolerance ± 0.25 }

S2   Each point from table not graphed [See 2nd * above].

Attempts (3 marks)

A1   Axes drawn (need not be labelled).

A2   Some effort to plot a point{See 2nd * above}.

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

6(c) (i)   Given that $y = x + 2$, complete the table below

x	-1	0	1	2
y	1	2	3	4

*   Accept candidate's values without work.

Slips(-1)
S1   Each " y " value omitted or incorrect.

Misreadings (-1)
M1   Misreads $y = x + 2$ as $y = x - 2$.

Attempts(2marks)
A1   Any one correct " y " value.
A2   Any effort at calculating points.

Worthless (0)
W1   Copies x values into y row.
W2   All y values incorrect with no work shown. (See M1 above).

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

**6(c) (ii)**   On the grid below, the graph of the line $y = 4 - x$ is drawn.
                   Using your answers from **(i)**, draw the graph of $y = x + 2$ on the same grid.

Part(c) (ii) Graph   **5 marks**   **Att 2**
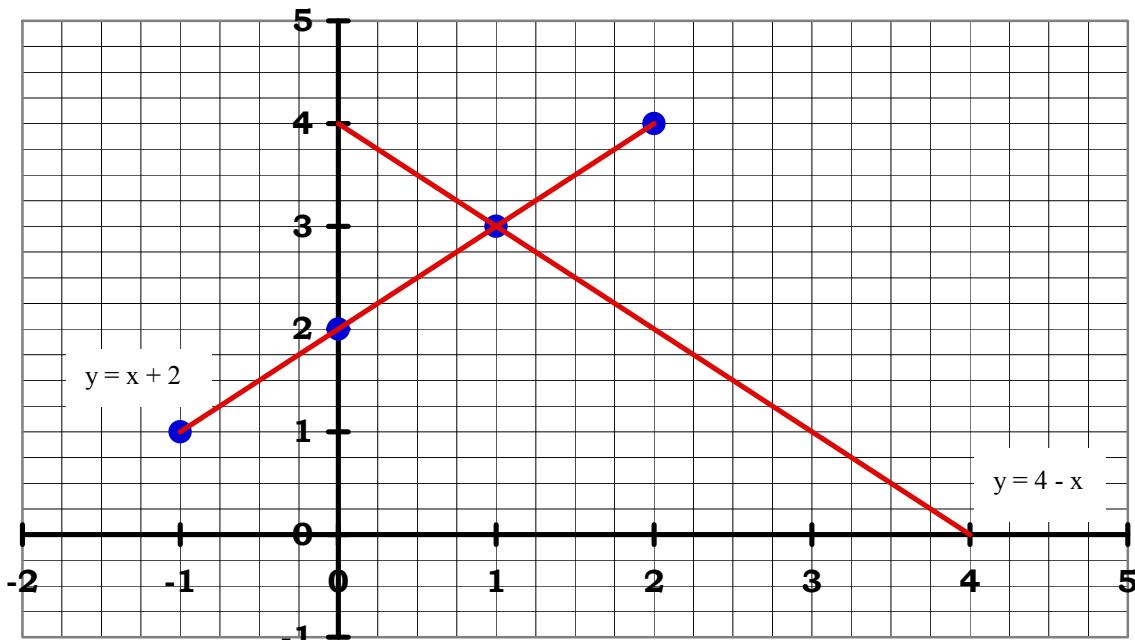
*   Accept candidate's values from previous work.

Blunders (-3)
B1   Reversed co-ordinates (y , x) plotted.
B2   Points not joined or joined in incorrect order.

Slips (-1)
S1   Each point of candidate graphed incorrectly. {See B1}
S2   Each point from table not graphed or not contained on the candidate's graph.

Attempts (2 marks)
A1   Any one correct point plotted.

Worthless (0)
W1   No correct point plotted. (See B1 above).

Part(c) (iii) Intersection   **5 marks**   **Att2**

6(c) (iii)	<u>Use the graphs drawn in **6 (c) (ii)**</u> to write down the coordinates of the point of intersection of the two lines $y = 4 - x$ and $y = x + 2$.

Part(c) (iii) Intersection   **5 marks**   **Att2**

✍	Point of intersection = (1, 3)

*   Accept correct answer based on candidate's graph fully plotted.
        i.e. 4 points correctly plotted from c(i) otherwise attempt marks at most.

Blunders(-3)
B1   Answer not presented in designated box.
B2   Answer beyond tolerance. {Tolerance ± 0.25 }.
B3   Reversed co-ordinates (y , x) plotted.

Attempts(2marks)
A1   Point of intersection highlighted on graph.

Worthless(0)
W1   Answers outside of tolerance without graphical indication.
W2   Incorrect answer from candidate's graph.