Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scéim Mharcála   *Scrúduithe Ardteistiméireachta, 2005*

Matamaitic   *Bonnleibhéal*

Marking Scheme   *Leaving Certificate Examination, 2005*

Mathematics   *Foundation Level*

Contents

MARKING SCHEME

LEAVING CERTIFICATE EXAMINATION 2005

MATHEMATICS – FOUNDATION LEVEL – PAPER 1

GENERAL GUIDELINES FOR EXAMINERS – PAPER 1

1. Penalties of three types are applied to candidates' work as follows:
    *   Blunders   - mathematical errors/omissions   (-3)
    *   Slips   - numerical errors   (-1)
    *   Misreadings   (provided task is not oversimplified)   (-1).

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

2. When awarding attempt marks, e.g. Att(3), note that
    *   any *correct, relevant* step in a part of a question merits at least the attempt mark for that part
    *   if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
    *   a mark between zero and the attempt mark is never awarded.

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

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

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

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

7. The sample solutions for each question are not intended to be exhaustive lists – there may be other correct solutions. Any examiner unsure of the validity of the approach adopted by a particular candidate to a particular question should contact his/her advising examiner.

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

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

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

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

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

QUESTION 1

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

Each part	**10 marks**	**Att 4**

Part (i)	**10 marks**	**Att 4**

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

(i)	$\sqrt{87}$ = 9.327… = **9.33**

*Accept correct answer with no work

Blunders(-3)
B1   Incorrect or omitted rounding-off.
B2 $\sqrt{8.7}$ = [2.949] = 2 .95
B3 $\sqrt{.87}$ = [0.9327…] = 0.93

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

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

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

(ii)   Find $(2.15)^3$, correct to the nearest whole number.

(ii) $(2.15)^3 = 9.93\ldots = \mathbf{10}$

*Accept correct answer with no work

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

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

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

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

(iii) $45.5 - 21.875$ $=$ **23.625**

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

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

Attempts(4 marks)
A1   Work at estimating answer e.g. 4×6
A2   Some correct operation with two or three of the given numbers.

(iv)   Find the exact value of $\dfrac{1}{0.5} - \dfrac{2}{0.625}$

(iv) $2 - 3.2 \;=\; \mathbf{-1.2}$

         or $\dfrac{0.625 - 1}{0.5 \times 0.625} = \dfrac{-0.375}{0.3125} = \mathbf{-1.2}$

*Accept correct answer with no work

Blunders (-3)
B1   Commutative error: Ans. = 1.2
B2   Error in calculating fraction (each time if different error) e.g. $2/0.625 = 0.3125$
B3   No subtraction
B4   Adds (Ans 5.2)
B5   Misplaced decimal, unless an obvious misread

$\dfrac{123}{625}$ *or* 0.1968 with/without work, merits 7marks

$\dfrac{123}{0.625}$ *or* 196.8 with/without work, merits 4 marks

Attempts (4marks)
A1   Works towards estimate

A2   1 correct step eg $^{1}/_{0.5} = 2$ or $= \; ^{10}/_{5}$
A3   Gets common denominator: 0.5×0.652

A4   Correctly evaluates an incorrect fraction e.g. $\dfrac{1}{0.125} = 8$

Worthless (0marks)

W1   Subtracts numerator or denominator or similar e.g. $\dfrac{1}{0.125}$

(v)   A holiday costs €650.
        The booking deposit is 15% of this cost.
        Find the booking deposit

(v) $\dfrac{650 \times 15}{100} = $ € **97.50**

*Accept correct answer with no work

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

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

Worthless (0marks)
W1 650 ± 15 (665 or 635).

Part (vi)   **10 marks**   **Att 4**

(vi)   Given that €1 is worth $1.25, find the value of €767, correct to the nearest dollar.

(vi) $1.25 \times 767 = 958.75 =$ **$ 959**

*Accept correct answer with no work

Blunders(-3)
B1   Answer not given to the nearest dollar.
B2 $767 \div 1.25 = 613.6 = 614$
B3   Decimal error

Attempts
A1   1×1.25 written
A2 $1.25 \div 767$

(vii)   Express $1\dfrac{1}{2} + \dfrac{3}{13}$ as a decimal, correct to two decimal places.

(vii) $1.5 + 0.2307\ldots = 1.7307\ldots = \mathbf{1.73}$

      or $\dfrac{3}{2} + \dfrac{3}{13} = \dfrac{39 + 6}{26} = \dfrac{45}{26} = 1\dfrac{19}{26} = 1.7307.. = \mathbf{1.73}$

*Accept correct answer with no work

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

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

Worthless (0marks)
W1   Incorrect answer with no work shown, other than A4

(viii)   Divide €112 in the ratio 2:5:7.

(viii) $2 + 5 + 7 = 14$ =>

$$112 \times \frac{2}{14} = \textbf{16}; \ 112 \times \frac{5}{14} = \textbf{40}; \ 112 \times \frac{7}{14} = \textbf{56}$$

   or $112 \div 14 = 8$ =>

      $8 \times 2 = \textbf{16}$ $8 \times 5 = \textbf{40}$ $8 \times 7 = \textbf{56}$

Blunders (-3)

B1 $\dfrac{112}{14}$ *or*   8   and stops

B2   Three correct answers with no work shown.

Slips (-1)

S1   Each answer not calculated fully.

Attempts (4 marks)

A1   2+5+7 *or* 14 and stops
A2   One or two correct answers with no work shown
A3   112 ÷ 2 and/or112 ÷ 5and/or112 ÷ 7

(ix)   Find correct to two significant figures

$$\frac{34.8 \times 2.05}{46.3 - 11.7}$$

.

(ix) $\dfrac{71.34}{34.6} =$ $2.061\ldots =$ **2.1**

*Accept correct answer with no work

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

Slips (-1)
S1   Numerical errors

Misreadings (-1)
M1   Clear and obvious misreading

Attempts (4 marks)
A1   Any correct step e.g. $46.3 - 11.7 = 34.6$
A2   Some work towards estimating answer
A3   10.159 or 10   or 23.23.. or 23 without work.

Part (x)   **10 marks**   **Att 4**

(x)   Find the exact value of $\dfrac{27.3\times10^5}{2.05\times10^6+0.25\times10^7}$.

(x) $\dfrac{27.3\times10^5}{4.55\times10^6}=\mathbf{0.6}=\mathbf{6\times10^{-1}}$ *or* $\dfrac{2730000}{2050000+2500000}=\dfrac{2730000}{4550000}=\mathbf{0.6}$

*Accept correct answer with no work

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

Attempts (4 marks)
A1 $10^5=50$ and/or $10^6=60$ and/or $10^7=70$ used.
A2   Some work towards approximation.
A3   One or more powers cancelled correctly and stops
A4   One or more power expanded correctly e.g. $10\times10\times10\times10\times10$

The following apply to the remaining questions on this paper:
- In general, incorrect or no rounding off incurs S(-1).
- There will be no penalty for units not written or written incorrectly.
- A worthless answer in one part, will lead to an attempt at best in the next part, if used.

QUESTION 2

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

Part (a)	10 m	Att 4

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

(a) $1.5 \times 1000 = 1500$; $1500 + 750 = \textbf{2250 cm}^\textbf{3}$.

* Accept correct answer with no work

Blunders (-3)
B1   Adds without conversion
B2 $1000 \div 1.5$
B3   No addition.(1500+ 750 and stops)
B4   Subtracts volumes (750 cm^3 *with work*)

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

Attempts (4 marks)
A1   Indication of addition (1.5 +750)
A2   1500 and stops.

Part (b)   **20 (10,10) marks**   **Att8(4,4)**

(b)   Each week a person earns €510 and has Tax Credits of €56.
The rate of tax is 20%.

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

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

(b)(i)   **10 marks**   **Att 4**

(b)(i) $510 \times 0.2 = 102$ $102 - 56 = $ **€46**

*Accept correct answer without work.

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

$(510 + 56) \times 0.2 = $ €113.20
$2 \times B(-3) = 4$ marks

Slips (-1)
S1   Misplaced decimal point

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

(b)(ii)   **10 marks**   **Att 4**

(b)(ii) $510 - 46 = $ **€464**

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

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

Attempts (4 marks)
A1   510 – a spurious number

Part (c)	**20(10,10) marks**	**Att 8(4,4)**

(c)	A train travelled 110 km in 2 hours. The train travelled the first 60 km at an average speed of 45 km per hour. It travelled the next 30 km at an average speed of 90 km per hour.
(i)	How long did it take the train to travel the first 60 km? Give your answer in hours and minutes.
(ii)	Calculate the average speed of the train for the last 20 km. Give your answer in km per hour.

(c)(i)	**10 marks**	**Att 4**

(c) (i)	$\dfrac{60}{45} = 1\dfrac{1}{3} = 1.333... = $ **1h 20min**

* Accept correct answer with no work.

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

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

(c)(ii)	**10marks**	**Att 4**

(c)(ii) $\dfrac{30}{90} = \dfrac{1}{3} = 20\,\text{min.}$ $\qquad$ 2h – (1h20m + 20m) = 20min = $\dfrac{1}{3}$ $\text{speed} = \dfrac{20}{1/3} = $ **60 km/h.**

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

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

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

QUESTION 3

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

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

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

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

(a)(i)   **5 marks**   **-**

    (a)   **(i)**   Error = 38 – 35 = **3 minutes**

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

(a)(ii)   **5 marks**   **-**

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

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

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

0 marks: otherwise

Part (b)   **20(10,10) mark**   -

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

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

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

(b)(i)   **10 marks**   -

    (b) (i) $\dfrac{1.75 \times 300}{250} = €2.10$

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

7 marks: Correct expression not completed, or completed with substantial error

                Expression with one error correctly completed e.g. $\dfrac{1.75}{250} = 0.007$ or $\dfrac{300}{250} = 1.2$

                Correct cost of 1g or 50g or any common factor evaluated

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

(b)(ii)   **10 marks**   -

  (b)(ii) $\dfrac{250 \times 3.15}{1.75} = \textbf{450g}$ *or* $\dfrac{300 \times 3.15}{2.10} = \textbf{450g}$

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

7 marks: Correct expression not completed, or completed with substantial error

                Expression with one error correctly completed e.g. $\dfrac{3.15}{1.75} = 1.8$

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

Part (c)   **20 (10,10)marks**   **-**

(c)   A car was bought for €20 000. After one year it had depreciated in value to €17 000.

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

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

(c)(i)   **10 marks**   **-**

    (c)(i) $20000 - 17000 = 3000;\ \dfrac{3000}{20000} \times 100 = \mathbf{15\%}$

    or $17000 = 20000(1 - {}^{r}/_{100})^{1}\ \Rightarrow\ {}^{r}/_{100} = 3/20\ \Rightarrow\ r = 15\ \Rightarrow \mathbf{15\%}$

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

            Correct answer without work.

7marks: Correct expression, incomplete or completed with substantial error

     $\dfrac{3000 \times 100}{17000}$ and completed correctly

     $\dfrac{17000 \times 100}{20000}$ and completed correctly

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

(c)(ii)   **10 marks**   **-**

(c) (ii) $A = 20000(1 - {}^{15}/_{100})^{4}\ \Rightarrow\ 20000(0.85)^{4}\ \Rightarrow\ 10440.125 \Rightarrow \mathbf{€10440}$

    or   End 1st yr:17000 $\Rightarrow$ End 2nd yr: 17000x0.85 = 14450
                $\Rightarrow$End 3rd yr: 14450×0.85 = 12282.5
                $\Rightarrow$ End 4th yr: 12282.5×0.85 = 10440.125 = **€10440**

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

10 marks: Fully correct solution
9 marks: Fails to round an otherwise correct solution.
7 marks: Correct <u>depreciation</u> method but error in completing e.g. calculation error.
            or expression finished correctly but number of years out by one.
4 marks   Any other work of merit e.g. appreciation or €8000

QUESTION 4

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

Part (a)	10 marks	Att 4

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

(a)	10 marks	Att 4

(a) $4x + x = 18 - 3$ $\Rightarrow$ $5x = 15$ $\Rightarrow$ $x = 3$

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

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

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

Part (b)	20 marks	Att 8

(b)   Solve the simultaneous equations
$$x + 2y = -4$$
$$2x - y = 7$$

1st variable found	15 marks	Att 6
2nd variable found	5 marks	Att2

(b)

$x + 2y = -4$

$\dfrac{4x - 2y = 14}{}$

$5x \quad = 10$ $\Rightarrow x = 2$

$2 + 2y = -4 \Rightarrow 2y = -6 \Rightarrow y = -3$

Blunders(-3)
B1   Blunder in multiplying by 2 or –2 (once per line)
B2   Blunder in cancelling (once)
B3   Blunder in substitution e.g. *y* value for *x*
B4   Transposition errors

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

Attempts -First variable-(6 marks)
A1   Effort at equalising coefficients of *x*'s or *y*'s
A2   Effort at cancelling one variable or combining variables.
A3   Effort at writing *x* in terms of *y* (or vice-versa)

A4   Effort at substituting first variable
A5   Effort at cancelling second variable or second effort at combining variables.

*Attempts (**8** marks)*
A6   Attempt at finding a solution by T + E
A7   Correct answers with no work shown.
A8   Any correct work, even in the context of an approach of no merit (Att6 *or* Att6 + Att2)

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

Part (c)   **20(5, 10, 5) marks**   **Att 8 (2, 4, 2)**

(c)   **(i)**   Solve $2x + 1 \geq 9$.
       (ii)   Solve $3 - 4x \geq -17$.
       (iii)   Write down the whole numbers which satisfy both $2x + 1 \geq 9$ and $3 - 4x \geq -17$.

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

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

     (ii) $3 - 4x \geq -17 \Rightarrow -4x \geq -20 \Rightarrow 4x \leq 20 \Rightarrow \mathbf{x \leq 5}$
         or $3 - 4x \geq -17 \Rightarrow 20 \geq 4x \Rightarrow \mathbf{5 \geq x}$

     (iii)   **4, 5**

*   If equality dropped : ignore (>for ≥)
*   Using equality instead of inequality in (i)   ignore
*   Using equality instead of inequality in (ii)   B(-3)
*   Accept correct answer (4 , 5), *or* correct answer from candidate's work in (iii)

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

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

QUESTION 5

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

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

> **(a)** **(i)** List all the even numbers between 9 and 21.
> **(ii)** List all the prime numbers between 9 and 21.

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

(i)	10, 12, 14, 16, 18, 20	
(ii)	11, 13, 17, 19	

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

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

Part (b)	20(5, 15) marks	Att 8 (2, 6)

> **(b)** **(i)** Solve the quadratic equation $x^2 + 3x + 2 = 0$.
>
> **(ii)** Solve the quadratic equation $5x^2 - 11x - 3 = 0$, correct to one decimal place.

(b) (i)	5 marks	Att 2

(i)	$x^2 + 3x + 2 = 0 \implies (x + 2)(x + 1) = 0 \implies$ **x = − 2** **x = −1**

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

> *** without work**
>   2 correct answers, both verified: full marks
>   2 correct answer and one verified,   1xB(-3)
>   2 correct answers, neither verified: Att 2
>   marks
>   1correct answer, and verified: Att 2marks

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

(b) (ii)	15 marks	Att 6

(ii)	$5x^2 - 11x - 3 = 0 \implies x = \dfrac{-(-11) \pm \sqrt{(-11)^2 - 4(5)(-3)}}{2(5)} \implies \dfrac{11 \pm \sqrt{121 + 60}}{10} \implies \dfrac{11 \pm \sqrt{181}}{10}$ *
	$\implies x = \dfrac{11 \pm 13.45..}{10} = 2.44...or\ -0.24... \implies$ **x = 2.4 or x = −0.2**

*Maximum deductions beyond this point is 4 marks

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

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

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

Part (c)	**20(5,5,5,5) marks**	**Att8(2,2.2.2)**

(c)   Laura, Barry and David use their mobile phones to send text messages. In one week they sent a total of 74 messages.

Laura sent *x* messages.
Barry sent twice as many as Laura.
David sent 8 messages.

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

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

    (iii)   How many messages did Barry send?

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

(c)(i)	**5 marks**	**Att 2**
(i)	$x + 2x + 8 = 74$	

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

Attempts(2 marks)
A1 $2x$ identified
A2   Two or more correct elements linked, but an equation not formed.

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

(ii)	$x + 2x + 8 = 74 \Rightarrow 3x = 74 - 8 = 66 \Rightarrow x = \mathbf{22}$

*Use candidate's equation from (i)

*Accept correct worked solution, even if the variable x is not used .

Blunders (-3)

B1   Errors in grouping terms

B2   Transposition errors

Attempts (2marks)

A1   Effort at solving equation by T + E

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

(iii)	$2(22) = \mathbf{44}$

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

Blunders(-3)

B1   ½(answer from (ii))

Attempts(2 marks)

A1   2(8) =16 with/without work

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

(iv)	$\dfrac{22 \times 100}{74} = 29.7... = \mathbf{30\%}$

*Use candidate's answer from (ii)

Blunders (-3)

B1   Error in finding % e.g. 22 ×0.74

Misreading (-1)

M1   Uses 44 or 8 in numerator (59.4..=59% or 10.8..=11%)

Slips (-1)

S1   Incorrect or no rounding off.

S2   Incomplete calculations i.e. $\dfrac{22 \times 100}{74}$ and stops   3 marks (S1 + S2)

Attempts (2 marks)

A1   Any attempt at %

QUESTION 6

Part (i)	15 marks	Att 6
Part (ii)	15 marks	Att 6
Part (iii)	10 marks	Att 4
Part (iv)	5 marks	Att 2
Part (v)	5marks	Att 2

6. A shop rents out videos and DVDs. The graph below shows the breakdown of rentals over a week. For example, on Tuesday there were 5 video and 8 DVD rentals.
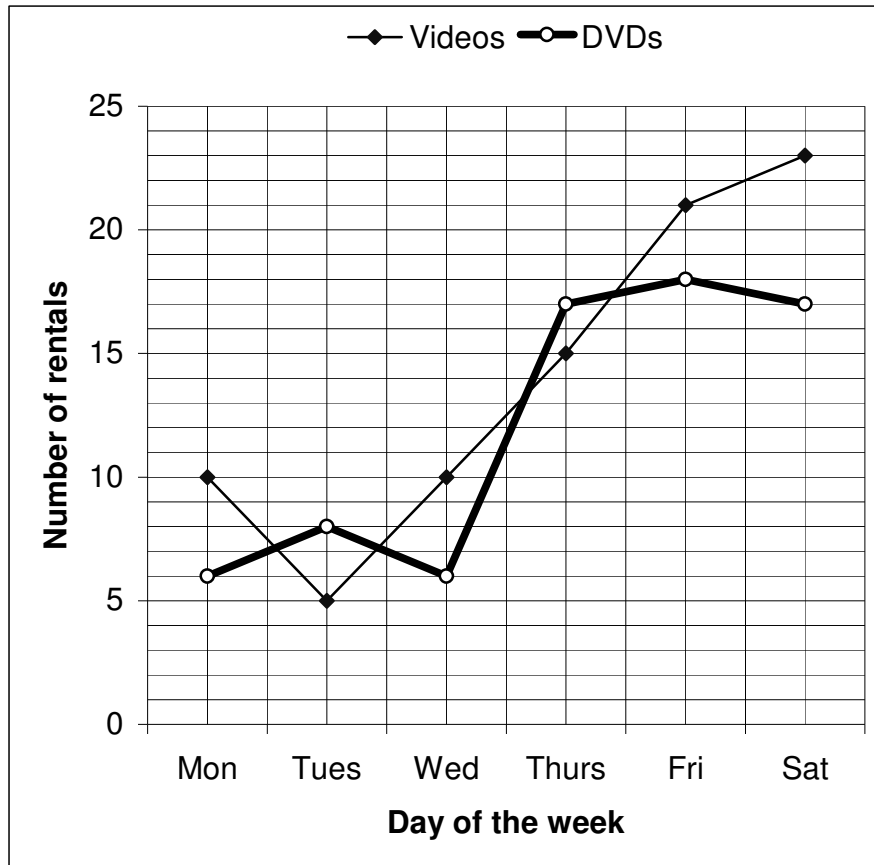
Part (i)	15 marks	Att 6

(i) How many videos were rented on Friday?

(i)	15 marks	Att 6

(i)	**21**

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

Slips (-1)
S1   Gives 20 or 22

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

Part (ii)   **15 marks**   **Att 6**

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

(ii)   10 - 6 = **4**

*Accept correct answer without work

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

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

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

Part (iii)   **10 marks**   **Att 4**

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

(iii)   Mon,   Weds,   Fri,   Sat

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

Attempts (4marks)
A1   At least one correct day listed

Part (iv)	5 marks	Att 2
(iv) Find the average number of videos rented per day.		

(iv)	5 marks	Att 2

(iv)	$\dfrac{10+5+10+15+21+23}{6} = \dfrac{84}{6} = \mathbf{14}$

Blunders (-3)

B1   Uses DVD total: $\dfrac{72}{6} = 12$

B2   Uses incorrect numerator
B3   Uses incorrect denominator
B4   Fraction inverted (0.071…)
B5   Blunder in precedence
B6   Calculation not complete
B7   Correct answer and no work.

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

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

Part (v)	5 marks	Att 2
(v) Over the six days, what percentage of rentals were DVDs? Give your answer correct to the nearest whole number.		

(v)	5 marks	Att 2

(v)	$6 + 8 + 6 + 17 + 18 + 17 = 72 \implies 72 + 84 = 156$ $\dfrac{72 \times 100}{156} = 46.15 = \mathbf{46\%}$

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

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

Slips (-1)
S1   Incorrect or no rounding off

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

QUESTION 7

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

Draw the graph of the function
$$f : x \rightarrow 2x^2 + 3x - 4 \text{ for } -3 \leq x \leq 2, \ x \in \mathbf{R}.$$

Table			**20 marks**			**Att8**

x	**-3**	**-2**	**-1**	**0**	**1**	**2**
$2x^2$	18	8	2	0	2	8
$+3x$	-9	-6	-3	0	3	6
-4	-4	-4	-4	-4	-4	-4
f(x)	**5**	**-2**	**-5**	**-4**	**1**	**10**

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

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

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

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

Graph	**10 marks**	**Att 4**
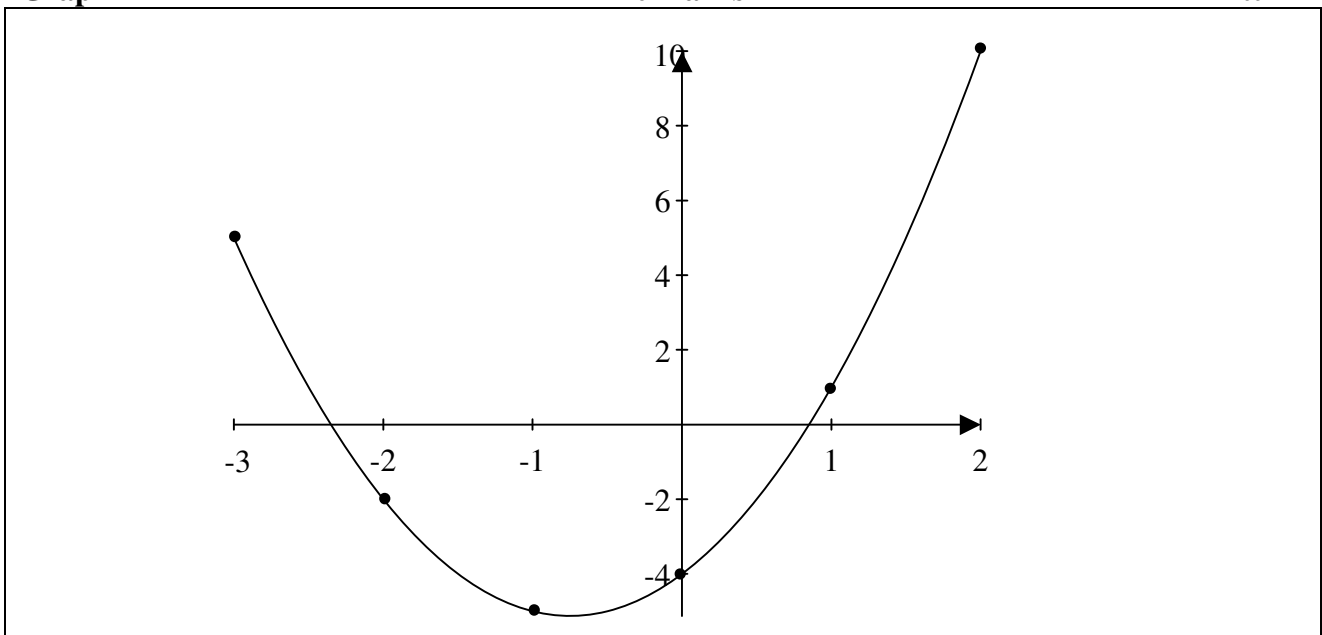
*Accept candidate's values from table
*<u>Fully</u> correct graph drawn with no work shown: award 30 marks

Values	**(5, 5, 5, 5)**	**Att 8(2, 2, 2, 2)**

Use your graph to estimate
(i)   the roots of $f(x) = 0$
(ii)   the minimum value of $f(x)$
(iii) the value of $f(1.5)$
(iv)   The values of x for which $f(x) = 1$.

(i)	**5 marks**	**Att 2**
(ii)	**5 marks**	**Att 2**
(iii)	**5 marks**	**Att 2**
(iv)	**5 marks**	**Att 2**

(i)	**0.8** and **–2.4**	
(ii)	**-5.1**	
(iii)	**5**	
(iv)	**-2.5** and **1**	

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

MARKING SCHEME

LEAVING CERTIFICATE EXAMINATION 2005

MATHEMATICS – FOUNDATION LEVEL – PAPER 2

GENERAL GUIDELINES FOR EXAMINERS – PAPER 2

1. Penalties of three types are applied to candidates' work as follows:
   - Blunders   - mathematical errors/omissions   (-3)
   - Slips   - numerical errors   (-1)
   - Misreadings   (provided task is not oversimplified)   (-1).

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

2. When awarding attempt marks, e.g. Att(3), note that
   - any *correct, relevant* step in a part of a question merits at least the attempt mark for that part
   - if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
   - a mark between zero and the attempt mark is never awarded.

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

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

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

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

7. The sample solutions for each question are not intended to be exhaustive lists – there may be other correct solutions. Any examiner unsure of the validity of the approach adopted by a particular candidate to a particular question should contact his/her advising examiner.

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

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

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

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

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

QUESTION 1

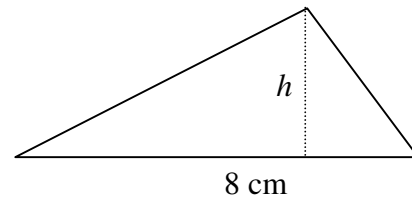| Part (a)	10 marks	Att 4
Part (b)	40 marks	Att 16

Part (a)	20 marks	Att 8

. **(a)** The area of the triangle shown is 10 cm^2.
The length of the base is 8 cm.

Find *h* the perpendicular height of the triangle.

(a)	20 marks	Att 8

$$\frac{1}{2}(8)h = 10$$
$$\Rightarrow h = 2.5cm$$

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

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

Attempts (8 marks)
A1   Copies diagram
A2   Defines area
A3   Adds or subtracts or multiplies 10 and 8.

(b)   A plot of land has a straight edge $[ab]$.
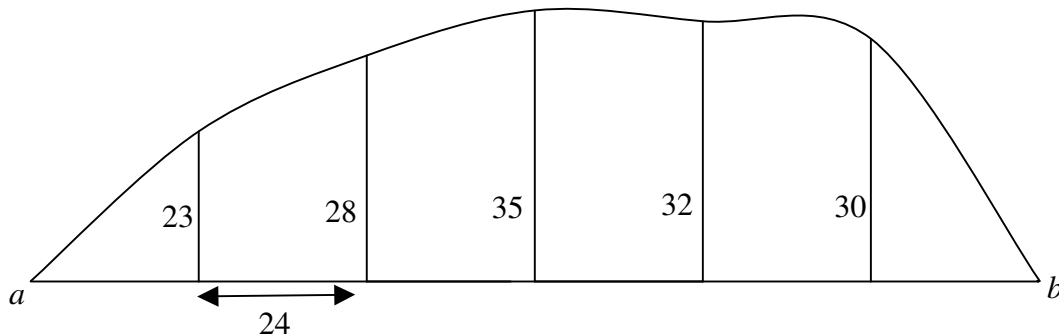
Offsets of lengths 23, 28, 35, 32, and 30 metres are measured at intervals of 24 metres along $[ab]$ as shown. Calculate the area of the plot using Simpson's Rule.

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

$$Area = \frac{24}{3}\left[0 + 0 + 2(28 + 32) + 4(23 + 35 + 30)\right]$$

$$Area = 3776m^2$$

Blunders (-3)
B1   Uses four odd and twice even
B2   Omits 2 or 4 in the formula or both
B3   Omits *h* or uses an incorrect *h* or does not divide *h* by 3.

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

Attempts (12)
A1   Gives Simpson's Formula only
A2   Copies diagram

QUESTION 2

Part (a)	20(10,5,5) marks	Att 8 (4,2,2)
Part (b)	30(10,10,10) marks	Att 12

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

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

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

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

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

Take $\pi = 3.14$.
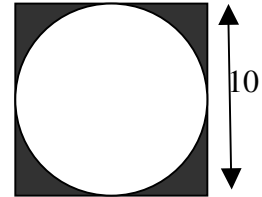
(i)   **10 marks**   **-**

$$Area = 10 \times 10 = 100 m^2$$

10 marks :Correct area
7 marks :for 10 by 10 not multiplied
4 marks : correct statement of area
0 marks : no meaningful work

(ii)   **5 marks**   **-**

$$Area = 3.14 \times 5^2 \, or$$
$$Area = \frac{3.14(10)^2}{4}$$
$$Area = 78.5 cm^2$$

5 marks: Correct area
3 marks: Writes down correct formula
0 marks: No meaningful work
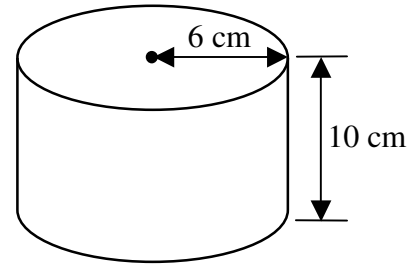
(iii)   **5 marks**   **-**

$$Shaded = 100 - 78.5$$
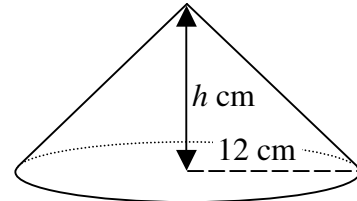$$Ans = 22 m^2$$

5 marks : Correct area
3 marks: Areas written down, no subtraction
0 marks : No meaningful work

Part (b)   **30(10,10,10) marks**   **Att 12**

(i) The radius of a cylinder is 6 cm and its height
is 10 cm.
Calculate the volume of the cylinder
in terms of π.

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

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

(i)   **10 marks**   **-**

$$Volume = \pi(6)^2 \times 10$$
$$Volume = 360\pi cm^3$$

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

(ii)   **10 marks**   **-**

$$Volume = \frac{\pi r^2 h}{3}$$
$$Volume = 48\pi h \ cm^3$$

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

(iii)   **10 marks**   **-**

$$48\pi h = 360\pi$$
$$\Rightarrow h = \frac{360\pi}{48\pi}$$
$$\Rightarrow h = 7.5 \ cm$$

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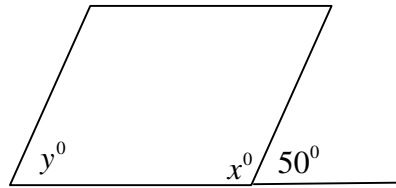7 marks: Equation correctly set up ,h not evaluated
4marks: Some incorrect equation written down
0 marks: no meaningful work

QUESTION 3

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

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

y^0 x^0 50^0

(a)	10(5,5) m	Att (2,2) 4

$$Ans: x = 130^o, y = 50^0$$

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

Slips (-1)
S1 Numerical errors

Attempts (2,2)
A1 Copies diagram

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

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

C
B $40°$ →K
A $55°$ D →L
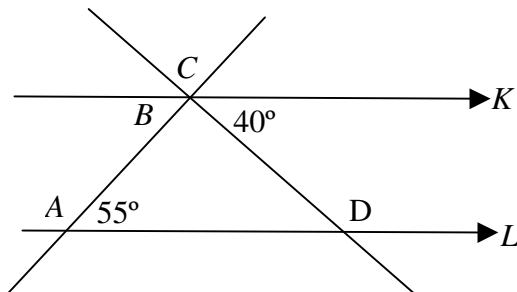
Each part	5 marks	Att 2

$$Ans: (i)A = 125^0, (ii)B = 55^0, (iii)C = 85^0, (iv)D = 140^0.$$

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

Slips(-1)
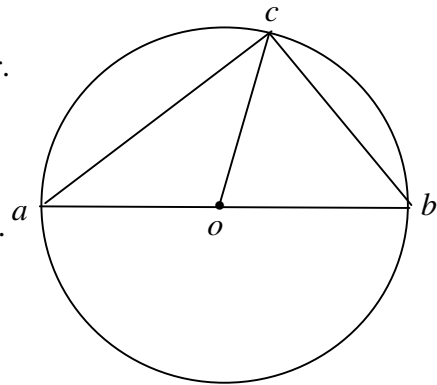S1 Numerical errors

Attempts 8
A1 Copies diagram

(c)   The diagram shows a circle with centre *o*.
a, *b* and *c* are points on the circle and $[ab]$ is a diameter.

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

   Calculate $|cb|$.

(i)	**5 marks**	**Att 2**
(ii)	**5+5 marks**	**Att 2, 2**
(iii)	**5 marks**	**Att 2**

$Ans:(i)90^0,(ii)oc,ob,(iii)2.5cm.$

Blunders (-3)

B1 $|\angle acb| \neq 90^o$

B2   Gives *ab*

B3   Any error in Pythagoras

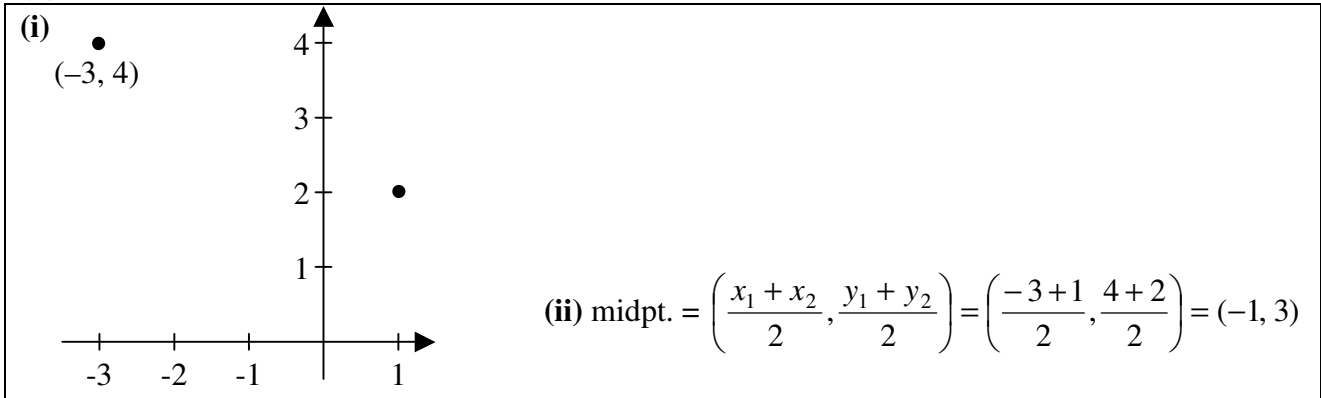*Slips (-1)*
S1   Numerical errors

Attempts (2,2,2,2)
A1   Copies diagram

QUESTION 4

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

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

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

    (ii)   Find the co-ordinates of the midpoint of $[pq]$.

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

(i)

$(-3, 4)$

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

* Accept co-ordinates of midpoint without work.

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

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

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

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

    (i)   Find the length of $[ab]$.

    (ii)   Find the slope of the line ab.

    (iii) Find the equation of the line ab.

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

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

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

Slips (-1)
S1   Numerical errors

Attempts
A1   Draws axes

(c) The line K has equation $y = 3x - 5$.

The point c has co-ordinates $(1, -2)$.

(i) Show that the point c lies on the line K.

(ii) Write down the slope of K.

(iii) Find the equation of the line M, which passes through the point (4, -3) and is parallel to K.

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

$(i)\, y = 3x - 5$

$\Rightarrow -2 = 3(1) - 5$

$\Rightarrow -2 = -2$

$(ii)\, 3$

$(iii)\, y - (-3) = 3(x - 4)$

$\Rightarrow y + 3 \quad = 3x - 12$

$\Rightarrow 3x - y - 15 = 0$

Blunders (-3)

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

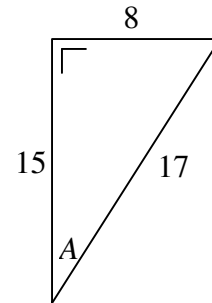B2   Mathematical error

Slips (-1)

S1   Numerical errors

Attempts

A1   Draws a diagram

QUESTION 5

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

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

    (i)   Write down cos*A* as a fraction.

    (ii)   Write down sin*A* as a fraction.

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

$$\cos A = \frac{15}{17}$$

$$\sin A = \frac{8}{17}$$

Blunders (-3)
B1   Uses incorrect numerator or denominator each time, unless error is consistent.
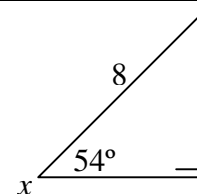
Slips (-1)
S1   Calculates the angle approx 28 degrees

Atts.(2,2)
A1   Defines *cos* or *sin*

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

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

| (b) | 15 marks | Att 6 |

$$\cos 54^o = \frac{x}{8}$$

$$\Rightarrow x = 8\cos 54^o$$

$$\Rightarrow x = 4.7 (to \ 1 \ dec. \ place)$$

Blunders (-3)
B1   Incorrect trig ratio
B2   Transposition error

Attempts (8)
A1 Measures from diagram
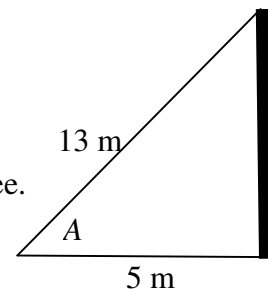A2 Pythagoras

Part (c)   **15(10,5)**   **Att 6(4,2)**

(c) A cable 13 m long joins the top of a pole to
a point on level ground 5m from the foot of the pole as shown.
    (i) Calculate the height of the pole.

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

13 m

A

5 m

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

    (i) $h = \sqrt{13^2 - 5^2}$

               $h = \sqrt{144}$

               $h = 12$

    (ii) $\sin^{-1} A = \dfrac{12}{13}$

               $A = 67^o$

Blunders (-3)
B1 Any error in setting up or applying Pythagoras.
B2 $13^2 = 26$ or similar
B3 Incorrect trig ratio

Slips (-1)
S1 Numerical errors

Attempts
A1 States Pythagoras

QUESTION 6

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

Part (a)	10 marks	Att 4

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

(a)	10 marks	Att 4

Ans : 30

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

Slips (-1)
S1   Numerical errors

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

(b) A box contains 12 tickets. Six of the tickets are white, 4 are red and 2 are yellow. A person takes one ticket at random from the box.
Find the probability that it is
(i) a white ticket
(ii) a red or a yellow ticket
(iii) not a red ticket.

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

$$Ans: (i)\frac{6}{12}(ii)\frac{6}{12}(iii)\frac{8}{12}.$$

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

Slips (-1)
S1   Numerical errors

(c) A school has 60 students sitting the Junior Certificate and Leaving Certificate examinations this year. The table below gives the numbers of boys and girls sitting each level.

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

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

$$Ans: (i)\frac{20}{60}(ii)\frac{27}{60}(iii)\frac{48}{60}.$$

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

Slips (-1)
S1   Numerical errors

QUESTION 7

Part (a)	5 marks	Att 2
Part (b)	25(5,10,5,5) marks	Att10(2,4,2,2)
Part (c)	20(10,10) marks	Att 8(4,4)

Part (a)	10 m	Att 4

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

(a)	10 m	Att 4

Ans:2

Blunders (-3)
B1   Calculates the mean

Attempt
A1   Incorrect answer with no work

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

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

Amount of money €	0 - 40	40 - 80	80 - 120	120 - 160	160 -200
Number of students	8	22	35	29	6

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

Copy and complete the cumulative frequency table below.

Amount of money €	< 40	< 80	< 120	< 160	< 200
Number of students					

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

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

Amount of money €	< 40	< 80	< 120	< 160	< 200
Number of students	**8**	**30**	**65**	**94**	**100**
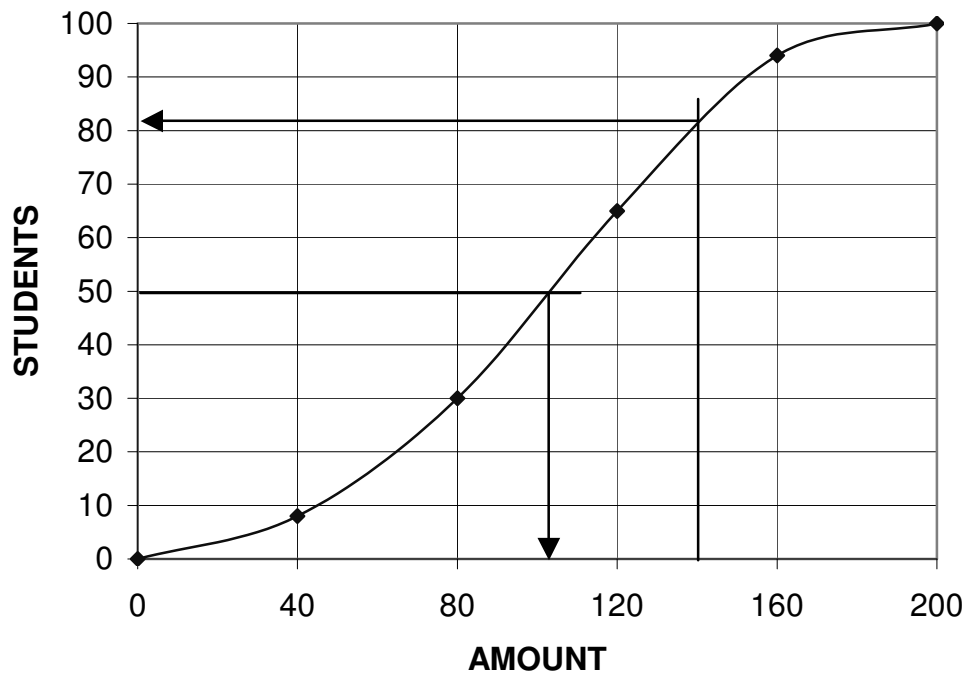
(i) median = 103
(ii) 100 – 82 = 18

Blunders(-3)
B1 Plots on the midpoints
B2 Error in scales, one blunder
B3 Points not joined
B4 Uses wrong axis for median

Slips (-1)
S1 Each incorrect or omitted value in the table
S2 Median not specified
S3 Each incorrectly plotted point
S4 Reverses axes
S5 Joins points with straight lines

Attempts (2,4,2)
A1 Draws axes only
A2 Copies table

(i)   Find the mean of the numbers 8, 9, 12, 15.

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

Mean	**5 marks**		**Att 2**
Standard deviation	**10 marks**		**Att 4**

x	Mean	d	d^2
8	11	3	9
9	11	2	4
12	11	1	1
15	11	4	16
$\Sigma x = 44$			$\Sigma d^2 = 30$

$$\text{Mean} = \frac{\sum x}{n} = \frac{44}{4} = 11$$

$$\text{Standard deviation} = \sqrt{\frac{\sum d^2}{n}} = \sqrt{\frac{30}{4}} = 2.74$$

* Accept correct answer with or without work.

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

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

Attempts
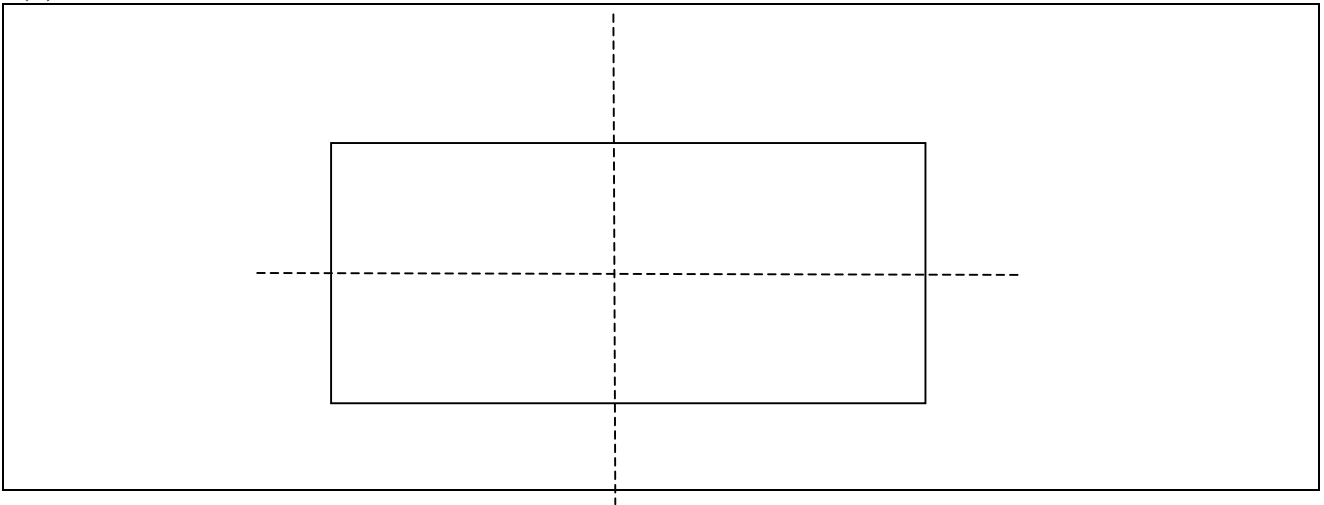A1   Any addition
A2   Work on SD table or defines SD.

QUESTION 8

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

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

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

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

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

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

(ii)
Slips (-1)
S1   Each incorrect axis.

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

(b)
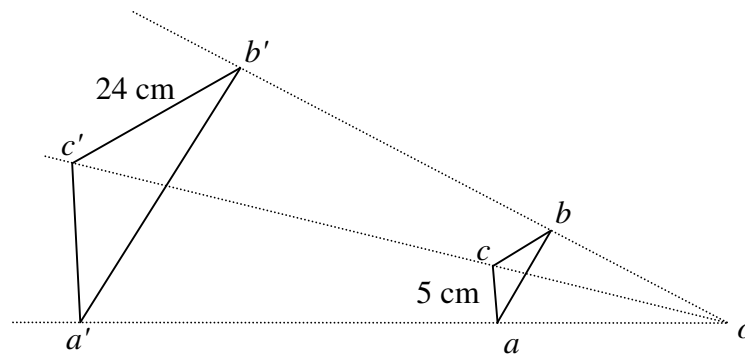
The triangle *a'b'c'* is the image of the triangle *abc* under an enlargement with centre *o*. The scale factor is 3.

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

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

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

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

$$|a'c'| = 15cm$$

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

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

Slips (-1)
S1 Numerical errors
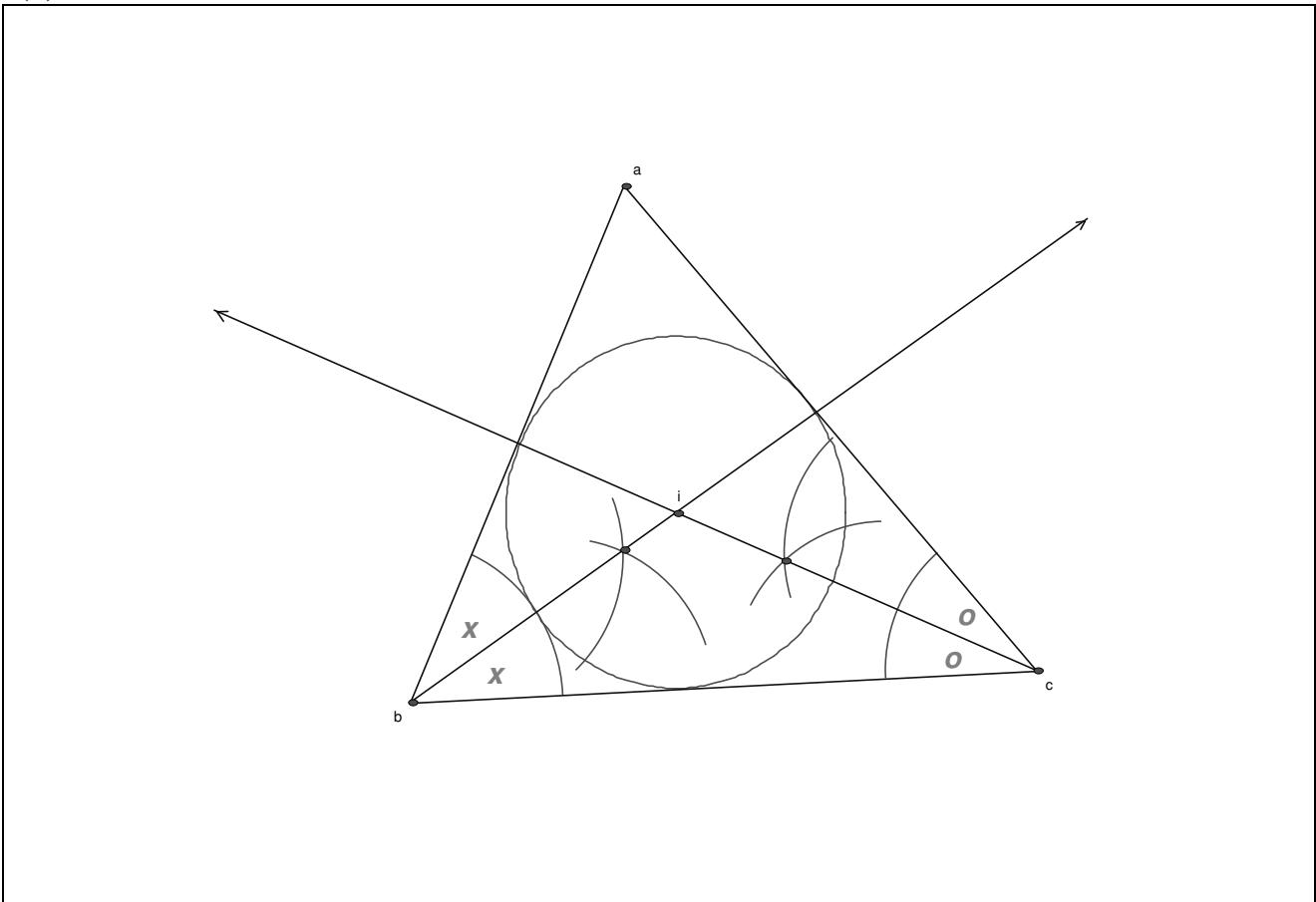S2 Multiplication for division?

(c)	**(i)**	Draw any triangle in your answer book.
	(ii)	Construct the incircle of the triangle. Show all construction lines clearly.

(i)	**5 marks**	**Att 2**
(ii)	**15 marks**	**Att 6**

Blunders(-3)
B1   Omits bisectors, each time
B2   Draws the circumcircle

Slips (-1)
S1   Circle not touching the sides, each time

Draws any triangle is worth 5 marks.
Draws any circle is worth Att 6 marks for (ii).

BONUS MARKS FOR ANSWERING THROUGH IRISH

Bonus marks are applied separately to each paper as follows:

If the mark achieved is less than 226, the bonus is 5% of the mark obtained, rounding *down*.
(e.g. 198 marks $\times$ 5% = 9.9 $\Rightarrow$ bonus = 9 marks.)

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

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