



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2011

Marking Scheme

MATHEMATICS

Foundation Level

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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

Each Part	10 marks	Att 4
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Part (i)	10 marks	Att 4
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Find $\sqrt{132.9}$, correct to two decimal places.

(i)	10 marks	Att 4
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$$\sqrt{132.9} = 11.528\dots = \mathbf{11.53}$$

* Accept correct answer with no work

Blunders (-3)

B1 $\sqrt{1329} = [36.45545\dots] = 36.46$

B2 $\sqrt{13.29} = [3.645545\dots] = 3.65$

B3 $\sqrt{1.329} = [1.152822\dots] = 1.15$

B4 $\sqrt{0.1329} = [0.3645545\dots] = 0.36$

B5 Root other than square root indicated and correctly worked $\sqrt[3]{132.9} = 5.10$

Slips (-1)

S1 Incorrect or omitted rounding off

Misreadings (-1)

M1 $\sqrt{123.9} = [11.131037\dots] = 11.13$

M2 $\sqrt{139.2} = [11.79830\dots] = 11.80$

Attempts (4 marks)

A1 $(132.9)^2 = 17662.41$

A2 $\frac{132.9}{2} = 66.45$

A3 $(132.9) \times 2 = 265.8$

A4 Work at estimating answer: $\sqrt{132.9} = 11$ or 12

A5 Any work at finding or estimating another root with work shown

A6 An incorrect figure correctly rounded off to two decimal places

A7 Any other answers as B1, B2, B3 and B4 but with misplaced point and no work shown

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (ii)

10 marks

Att 4

Find the exact value of $14.32 - 2.6 \div 0.4$.

(ii)

10 marks

Att 4

$$14.32 - 2.6 \div 0.4 = 14.32 - 6.5 = \mathbf{7.82}$$

- * Accept correct answer with no work
- * Accept $39\frac{1}{50}$ or $7\frac{41}{50}$ for full marks

Blunders (-3)

- B1 Errors in precedence: $14.32 - 2.6 = 11.72 \div 0.4 = 29.3$
- B2 A step omitted [may also occur in B1]
- B3 The use of the wrong operator or operators is indicated (once only)
- B4 A different order of the numbers indicated and worked out correctly

Slips (-1)

- S1 Numerical slips to a maximum of 3

Misreadings (-1)

- M1 A clear and obvious numerical misreading not involving the decimal point

Attempts (4 marks)

- A1 Work at estimating the answer e.g. $14 - 3 \div 1$
- A2 Work towards some correct step e.g. long division begun
- A3 29 only

Worthless (0 marks)

- W1 Incorrect answer with no work other than those in scheme

Part (iii)

10 marks

Att 4

Find $(4.2)^3 - (2.8)^2$, correct to one decimal place.

(iii)

10 marks

Att 4

$$(4.2)^3 - (2.8)^2 = 74.088 - 7.84 = 66.248 = \mathbf{66.2}$$

* Accept correct answer with no work

Blunders (-3)

B1 $(4.2)^3 - (2.8)^2 = 74.088... - 784 = -709.912 = -710$

B2 $(4.2)^3 - (2.8)^2 = 74088... - 7.84 = 74080.16 = 74080.2$

B3 $(4.2)^3 - (0.28)^2 = 74.088... - 0.0784 = 74.0096 = 74.0$

B4 Cube not found

B5 Square not found

B6 No subtraction

Slips (-1)

S1 Numerical slips to a maximum of 3

S2 Incorrect or omitted rounding-off

Misreadings (-1)

M1 $(4.2)^3 - (8.2)^2 = 74.088... - 67.24 = 6.848 = 6.8$

M2 $(2.4)^3 - (2.8)^2 = 13.824... - 7.84 = 5.984 = 6.0$

Attempts (4 marks)

A1 Work at estimating the answer

A2 Any other answers as B1, B2 and B3 but with misplaced decimal point and no work shown

A3 No cube or square evaluated e.g. $4.2 - 2.8 = 1.4$

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (iv)

10 marks

Att 4

A concert hall has 1200 seats.
For one concert 1050 seats were occupied.
What percentage of the seats were occupied?

(iv)

10 marks

Att 4

$$\frac{1050}{1200} \times 100 = 87.5\%$$

* Accept correct answer with no work

Blunders (-3)

B1 $\frac{1200 \times 100}{1050} = 114.28$

B2 $\frac{1050 \times 100}{1200}$ and stops

B3 Errors in establishing $\frac{1050 \times 100}{1200}$ (all three elements must be present, otherwise attempt marks only)

Misreading (-1)

M1 Finds percentage of seats unoccupied e.g. $\frac{150 \times 100}{1200} = 12.5$

Attempts (4 marks)

A1 Writes down $\frac{1050}{1200}$ and stops

A2 Writes down 1050×100 and stops

A3 $1200 - 1050 = 150$ and stops

Worthless (0 marks)

W1 $1200 + 1050 = 2250$

Part (v)

10 marks

Att 4

Find the value in euro of 600 South African rand given that €1 = 9.674 South African rand.

(v)

10 marks

Att 4

$$\frac{600}{9.674} = €62.0219 = \mathbf{€62.02}$$

- * Accept correct answer with no work
- * Accept candidates degree of rounding
- * 6202 cent – 9 marks

Blunders (-3)

B1 $600 \times 9.674 = 5804.4$

B2 $\frac{9.674}{600} = 0.0161233$

B3 Division not finished or finished incorrectly

Slips (-1)

S1 Answer given in cents

Attempts (4 marks)

A1 Some use of the given data

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

W2 600 ± 9.674 with or without an answer.

Part (vi)

10 marks

Att 4

Find the number of seconds in 24 hours.

(vi)

10 marks

Att 4

$24 \times 60 \times 60 = \mathbf{86\ 400}$

* Accept correct answer with no work

Blunders (-3)

B1 $24 \times 60 \times 60$ and stops

B2 $24 \times 60 = 1440$ and stops

B3 $60 \times 60 = 3600$ and stops

B4 $24 \div 60 \div 60 = 0.0066$

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (4 marks)

A1 24×60 and stops

A2 60×60 and stops

A3 Writes 60 seconds = 1 minute and / or 60 minutes = 1 hour

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (vii)

10 marks

Att 4

$$\text{Find the exact value of } \frac{1}{(0.5)^2} + \frac{1}{(0.25)^2}.$$

(vii)

10 marks

Att 4

$$\frac{1}{(0.5)^2} + \frac{1}{(0.25)^2} = \frac{1}{0.25} + \frac{1}{0.0625} = 4 + 16 = 20$$

* Accept correct answer with no work

Blunders (-3)

B1 $(0.5)^2 + (0.25)^2 = 0.25 + 0.0625 = 0.3125$

B2 $\frac{1}{(0.5)} + \frac{1}{(0.25)} = 2 + 4 = 6$

B3 $\frac{1}{(0.5)} + \frac{1}{(0.25)^2} = 2 + \frac{1}{0.0625} = 2 + 16 = 18$

B4 $\frac{1}{(0.5)^2} + \frac{1}{(0.25)^2} = \frac{1}{0.25} + 4 = 4 + 4 = 8$

B5 Use of wrong operator (–) giving the answer 12 or –12

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (4 marks)

A1 Converts 0.5 to $\frac{1}{2}$ or 0.25 to $\frac{1}{4}$.

A2 $0.5 + 0.25 = 0.75$ or $\frac{3}{4}$

A3 $(0.5)^2 = 0.25$ and / or $(0.25)^2 = 0.0625$

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (viii)

10 marks

Att 4

Write $\frac{8}{11} - \frac{3}{7}$ as a decimal, correct to three decimal places.

(viii)

10 marks

Att 4

$$\frac{8}{11} - \frac{3}{7} = 0.7272 - 0.4285 = 0.2987 = \mathbf{0.299}$$

$$\frac{8}{11} - \frac{3}{7} = \frac{56 - 33}{77} = \frac{23}{77} = 0.299$$

* Accept correct answer with no work

Blunders (-3)

B1 Error(s) in converting fraction to decimal (only once)

B2 No addition

B3 Use of wrong operator indicated ($\times, \div, +$) giving answers 0.3120, 1.697, 1.156

B4 $\frac{8}{11 - \frac{3}{7}} = 0.757$

Slips (-1)

S1 Numerical slips to a maximum of 3

S2 Incorrect or no rounding-off

Attempts (4 marks)

A1 Effort at converting either of the given fractions to a decimal

A2 Correctly converts a fraction (written) to a decimal and stops

A3 A correct calculation

A4 $0 < \text{answer} < 1$ (in decimal form)

A5 An incorrect number correctly rounded off

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (ix)

10 marks

Att 4

Find $\left(\frac{37.6 + 5.92}{0.85}\right)^2$, correct to the nearest integer.

(ix)

10 marks

Att 4

$$\left(\frac{37.6 + 5.92}{0.85}\right)^2 = \left(\frac{43.52}{0.85}\right)^2 = 51.2^2 = 2621.44 = \mathbf{2621}$$

- * Accept correct answer with no work
- * Award attempt mark for some relevant work

Award marks as follows:

10 marks: Fully correct answer

4 marks: Answer of some merit

0 marks: Otherwise

Part (x)

10 marks

Att 4

Find $\frac{(3.68 \times 10^5) - (2.1 \times 10^4)}{3.8 \times 10^3}$, correct to three significant figures.

(x)

10 marks

Att 4

$$\frac{(3.68 \times 10^5) - (2.1 \times 10^4)}{3.8 \times 10^3} = \frac{368000 - 21000}{3800} = \frac{347000}{3800} = 91.315 = \mathbf{91.3}$$

- * Accept correct answer with no work
- * Award attempt mark for some relevant work

Award marks as follows:

10 marks: Fully correct answer

4 marks: Answer of some merit

0 marks: Otherwise

QUESTION 2

Part (a)	10 (5, 5) marks	Att (2, 2)
Part (b)	20 (10, 5, 5) marks	Att (4, 2, 2)
Part (c)	20 (5, 5, 10) marks	Att (2, 2, -)

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

- | | |
|------------|---|
| (a) | (i) Change 6.3 kilometres to metres. |
| | (ii) Change 8245 grams to kilograms. |

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

- | | |
|-------------|--|
| (i) | $6.3 \times 1000 = \mathbf{6300 \text{ metres}}$ |
| (ii) | $\frac{8245}{1000} = \mathbf{8.245 \text{ kilograms}}$ |

- * Accept correct answer with no work
- * Accept answers given without units

Blunders (-3)

- B1 Incorrect conversion factor
- B2 Misuse of conversion factor e.g. $6.3 \div 1000 = 0.0063$
- B3 Misuse of conversion factor e.g. $8245 \times 1000 = 8\,245\,000$

Slips (-1)

- S1 Numerical slips to a maximum of 3
- S2 Answer given as 8 kg 245 g

Attempts (2 marks)

- A1 Any use of given data (covers both parts)
- A2 6030 or 6003 without work

Worthless (0 marks)

- W1 Incorrect answer with no work other than those in scheme

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

- (b)** The following information was used to calculate the cost of electricity used by Emma.
- | | |
|-------------------------|----------|
| Previous meter reading: | 72 010 |
| Present meter reading: | 73 485 |
| Cost per unit: | 15 cent. |
- (i)** Calculate the number of units of electricity used between these two readings.
(ii) Calculate the cost of the units used.
(iii) A standing charge of €24.75 and VAT of €33.21 are added to the cost of the units.
Find the total cost of Emma's electricity bill.

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

Units used $73\,485 - 72\,010 = 1475$ units

* Accept correct answer with no work

Blunders (-3)

B1 Adds the two readings e.g. 145 495

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (4 marks)

A1 Gives 72 010 or 73 485 as answer

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

(b) (ii)

5 marks

Att 2

$\text{Cost} = 1475 \times 0.15 = \mathbf{\text{€}221.25}.$

- * Accept correct answer with no work
- * Accept candidates answer from part (i)
- * Accept answer in € or cents

Blunders (-3)

B1 $1475 \div 15 = 98.333$

Slips (-1)

S1 Decimal error

S2 Numerical slips to a maximum of 3

Attempts (2 marks)

A1 Multiplies some random number by 15

A2 Some correct step

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

(b) (iii)

5 marks

Att 2

$\text{Total cost} = \text{€}221.25 + \text{€}24.75 + \text{€}33.21 = \mathbf{\text{€}279.21}.$

- * Accept correct answer with no work
- * Accept candidates answer from part (ii)

Blunders (-3)

B1 Subtracts instead of adds

B2 Omits one of the three charges e.g. $24.75 + 33.21 = 57.96$

Slips (-1)

S1 Numerical slips to a maximum of 3

S2 Decimal error

Attempts (2 marks)

A1 Writes down $24.7 + 33.21$ and stops or similar

A2 Some correct step

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

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

- (c) Sam earns €550 a week. His rate of tax is 20% and he has tax credits of €75 a week.
- (i) How much tax does Sam pay each week?
- (ii) Sam also pays other deductions of €91.50 each week.
Find his weekly take-home pay
- (iii) What percentage of his total pay does Sam take home each week?

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

$$€550 \times 0.2 = €110$$

$$€110 - €75 = \mathbf{€35}$$

* Accept correct answer with no work

Blunders (-3)

B1 Error in calculating percentage e.g. $€550 \times 1.2$

B2 Mishandles tax credit

B3 Subtraction not completed

B4 Errors in establishing $\frac{550 \times 20}{100}$ (all three elements must be present, otherwise attempt marks only)

Slips (-1)

S1 Numerical slips to a maximum of 3

S2 Decimal error

Attempts (2 marks)

A1 Some effort at getting a percentage

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

(c) (ii)

5 marks

Att 2

$€550 - (€35 + €91.50) = €550 - €126.50 = €423.50$
--

- * Accept correct answer with no work
- * Accept candidates answer from part (i)
- * €35 will recoup marks if necessary for part (i)
- * €423.50 will recoup marks if necessary for part (i)

Blunders (-3)

- B1 Uses a tax other than that calculated in (c) (i) above
- B2 Fails to subtract (once only)
- B3 Subtraction not completed

Slips (-1)

- S1 Numerical slips to a maximum of 3
- S2 Decimal error

Attempts (2 marks)

- A1 Some spurious number subtracted from gross wage

Worthless (0 marks)

- W1 Incorrect answer with no work other than those in scheme

(c) (iii)

10 marks

Hit or Miss

$\frac{423.50}{550} \times 100 = 77\%$
--

- * Accept correct answer with no work
- * Accept candidates answer from part (ii)

QUESTION 3

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

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

- (a)** Seán estimates that he will get €200 by selling his DVDs.
He actually gets €184.
- (i)** Find the error in the estimate.
(ii) Calculate the percentage error, correct to one decimal place.

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

(i) Error = $200 - 184 = \mathbf{€16}$

* Accept correct answer with no work

Blunders (-3)

B1 $200 - 184$ and stops

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (2 marks)

A1 Some use of given data

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

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

(ii) Percentage error = $\frac{16}{184} \times 100 = 8.69\% = \mathbf{8.7\%}$

* Accept correct answer with no work

Blunders (-3)

B1 Errors in establishing $\frac{16}{184} \times 100$ [all three elements must be present, otherwise attempt mark only]

B2 Incorrect or incomplete answer or no answer [use candidates answer from (a)(i)]

Slips (-1)

S1 Numerical slips to a maximum of 3

S2 Incorrect or no rounding-off

Attempts (2 marks)

A1 Some use of given data

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (b)

15 (10, 5) marks

Att (4, 2)

(b) A raffle ticket costs €1. Caoimhe pays 40 cent and Aoife pays 60 cent of the cost. They share a prize in the ratio of how much each paid. Caoimhe gets €160.

(i) How much does Aoife get?

(ii) How much is the total prize they share?

(b) (i)

10 marks

Att 4

$$(i) \quad \frac{40}{100} = 160 \Rightarrow \frac{1}{100} = 4 \therefore \frac{60}{100} = 4 \times 60 = 240$$

* Accept correct answer without work

Blunders (-3)

B1 Error in establishing ratios (each time)

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (4 marks)

A1 $\frac{40}{100}$ and / or $\frac{60}{100}$ and / or 4

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

(b) (ii)

5 marks

Att 2

$$(ii) \quad \text{€}160 + \text{€}240 = \text{€}400$$

* Accept correct answer without work

* Accept answer from (b)(i)

Blunders (-3)

B1 Subtracts instead of adds

B2 Fails to add

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (2 marks)

A1 Some correct work

A2 Adds some random number to 160

Worthless (0 marks)

W1 Incorrect answer with no work other than those in scheme

Part (c)**25 (10, 15) marks****Att (-, 6)**

(c) Tom bought a television set for €1100.
At the end of the first year the television set is worth €935.



- (i) Find the annual rate of depreciation
(ii) At this rate of depreciation, how much will the television set be worth at the end of 3 years?
Give your answer correct to the nearest euro.

(c) (i)**10 marks****Hit or Miss**

(i) $\frac{935}{1100} \times 100 = 85\%$
Depreciation $100 - 85 = 15\%$

* Accept correct answer without work

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

(ii) $F = P(1 - i)^t = 1100(1 - 0.15)^3 = 1100(0.85)^3 = €675.54 = \mathbf{€676}$

or

Second year: $935(0.85) = €794.75$
Third year: $794.75(0.85) = €675.54 = \mathbf{€676}$

* Accept correct answer without work

* Accept answer from (c)(i)

Blunders (-3)

- B1 Error in substitution into formula (each time)
B2 Error in manipulation of formula
B3 $935 \div 0.85 = 1100$ (each time)
B4 Incorrect number of years

Slips (-1)

- S1 Numerical slips to a maximum of 3
S2 Decimal error
S3 Answer not correct to nearest euro

Attempts (6 marks)

- A1 Some correct substitution into formula
A2 Fails to multiply out in formula method

Worthless (0 marks)

- W1 Incorrect answer with no work other than those in scheme

QUESTION 4

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

Part (a)	10 marks	Att 4
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Solve for x

$$3x - 7 = 6x + 8$$

(a)	10 marks	Att 4
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$$3x - 7 = 6x + 8 \Rightarrow -6x + 3x = 7 + 8 \Rightarrow -3x = 15 \Rightarrow x = -5$$

* Award full marks for correct answer by trial and error with verification

Blunders (-3)

- B1 Blunders in grouping terms e.g. $3x - 7 = -4x$ [each time]
- B2 Transposition errors [once only]
- B3 $-3x = 15 \Rightarrow x \neq -5$ OR $3x = -15 \Rightarrow x \neq -5$
- B4 Each step omitted e.g. $-3x = 15$ and stops
- B5 $x = -5$ without work

Slips (-1)

- S1 Numerical slips to a maximum of 3

Attempts (4 marks)

- A1 Some correct work
- A2 Effort at trial and error by substitution

Worthless (0 marks)

- W1 Incorrect answer without work

Part (c)

20 (10, 5, 5) marks

Att (4, 2, 2)

(c) The cost of a blue mobile phone is €12 less than the cost of a pink mobile phone.
Let x be the cost of a pink mobile phone.

- (i) Write an expression in x for the cost of a blue mobile phone.
The total cost of 2 pink and 4 blue mobile phones is €840.
- (ii) Write this information as an equation in x .
- (iii) Solve this equation to find the cost of a pink mobile phone.



(c) (i)

10 marks

Att 4

Cost of blue mobile phone: $x - 12$

Blunders (-3)

B1 $x + 12$ or $12 - x$

B2 $12x$

Attempts (4 marks)

A1 Some use of the data given e.g. $\frac{x}{12}$, $\frac{12}{x}$

Worthless (0 marks)

W1 No use of x or 12

W2 $x = 12$ and stops

(c) (ii)

5 marks

Att 2

$$2x + 4(x - 12) = 840$$

* Accept candidates answer from part (i)

Blunders (-3)

B1 Each price omitted

B2 $6x - 48$ only

Attempts (2 marks)

A1 A spurious equation in x involving 840

A2 $2x$ or $4(x - 12)$ or $4x$

Worthless (0 marks)

W1 No use of x

(c) (iii)

5 marks

Att 2

$2x + 4(x - 12) = 840 \Rightarrow 2x + 4x - 48 = 840 \Rightarrow 6x = 840 + 48 = 888 \Rightarrow x = \text{€}148$

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

* $2x + 4x - 48$ or $2x + 4x - 48 = 840$ as starting work can earn marks for parts (i) and (ii)

Blunders (-3)

B1 Incorrectly formed equation

B2 Blunders in grouping terms e.g. $6x - 48 = -42x$ (each time)

B3 Transposition error(s) (once only)

B4 $6x = 888 \Rightarrow x \neq 148$

B5 Each step omitted

B6 Correct answer without work

B7 Distribution error

Slips (-1)

S1 Numerical slips to a maximum of 3

Attempts (2 marks)

A1 Some correct work

A2 Effort at trial and error by substitution

Worthless (0 marks)

W1 Incorrect answer without work

QUESTION 5

Part (a)	10 (5, 5) marks	Att (2, 2)
Part (b)	20 (10, 10) marks	Att (4, 4)
Part (c)	20 (5, 10, 5) marks	Att (2, -, 2)

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

- | |
|---|
| (a) (i) Write down all the whole number factors of 24. |
| (a) (ii) List which of these numbers are multiples of 3. |

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

- | |
|-------------------------------------|
| (i) 1, 2, 3, 4, 6, 8, 12, 24 |
| (ii) 3, 6, 12, 24 |

Slips (-1)

S1 Each omitted or incorrect entry provided at least one is correct [to a maximum of 3]

Attempts (2 marks)

A1 At least one correct entry, each part

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

- | |
|---|
| (b) (i) Solve the quadratic equation $x^2 + 4x - 12 = 0$. |
| (b) (ii) Solve the quadratic equation $3x^2 - 6x + 2 = 0$, correct to two decimal places. |

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

$x^2 + 4x - 12 = 0 \Rightarrow (x + 6)(x - 2) = 0 \Rightarrow x = -6 \text{ or } x = 2$

Blunders (-3)

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

Attempts (4 marks)

- A1 Effort at finding factors
- A2 Attempt at trial and error

Worthless (0 marks)

- W1 Quadratic reduced to linear

(b) (ii)

10 marks

Att 4

$$\begin{aligned}3x^2 - 6x + 2 &= 0 \\ \Rightarrow x &= \frac{6 \pm \sqrt{(-6)^2 - 4(3)(2)}}{2 \times 3} \\ &= \frac{6 \pm \sqrt{12}}{6} * \\ &= \frac{6 \pm 3.464}{6} \\ \Rightarrow x &= \frac{9.464}{6} \text{ or } x = \frac{2.536}{6} \\ \Rightarrow x &= 1.577 \text{ or } x = 0.422 \\ \Rightarrow x &= \mathbf{1.58} \text{ or } x = \mathbf{0.42}\end{aligned}$$

* Maximum deductions beyond point * is 3 marks

* $\frac{6 \pm \sqrt{\text{negative number}}}{2 \times 3}$ cannot earn final 3 marks

Blunders (-3)

B1 Blunders in application of formula

Slips (-1)

S1 Slip in substitution into formula to a maximum of 3

S2 Incorrect or omitted rounding off, each time

Attempts (4 marks)

A1 Effort at substitution into formula

A2 Incorrect formula with substitution

A3 Attempt at finding factors e.g. $(x \quad)(x \quad)$

A4 Appearance of the variable in the answer

A5 Identifies a or b or c

Worthless (0 marks)

W1 Quadratic reduced to linear

Part (c)

20 (5, 10, 5) marks

Att (2, -, 2)

- | |
|--|
| <p>(c) (i) Solve $3x + 6 < 24$, $x \in \mathbb{Z}$.
(ii) Solve $6 - 4x \leq 10$, $x \in \mathbb{Z}$.
(iii) Write down all the values of x which satisfy both of the above inequalities.</p> |
|--|

(c) (i)

5 marks

Att 2

$3x + 6 < 24 \Rightarrow 3x < 18 \Rightarrow x < 6$

Blunders (-3)

- B1 Blunders in grouping terms e.g. $3x + 6 = 9x$ [each time]
- B2 Transposition errors [once only]
- B3 Each step omitted e.g. $3x < 18$ and stops
- B4 $x < 6$ without work
- B5 Replaces inequality with equality sign

Slips (-1)

- S1 Numerical slips to a maximum of 3

Misreadings (-1)

- M1 Uses \leq instead of $<$

Attempts (4 marks)

- A1 Some correct work
- A2 Effort at trial and error by substitution

Worthless (0 marks)

- W1 Incorrect answer without work

(c) (ii)

10 marks

Hit or Miss

$6 - 4x \leq 10 \Rightarrow -4x \leq 4 \Rightarrow x \geq -1$

(c) (iii)

5 marks

Att 2

$\{-1, 0, 1, 2, 3, 4, 5\}$

- * Accept candidates answers from (i) and (ii)
- * If equality used in (i) or (ii) then attempt mark at most here

Slips (-1)

- S1 Each entry omitted or incorrect provided at least one is correct [to a maximum of 3]

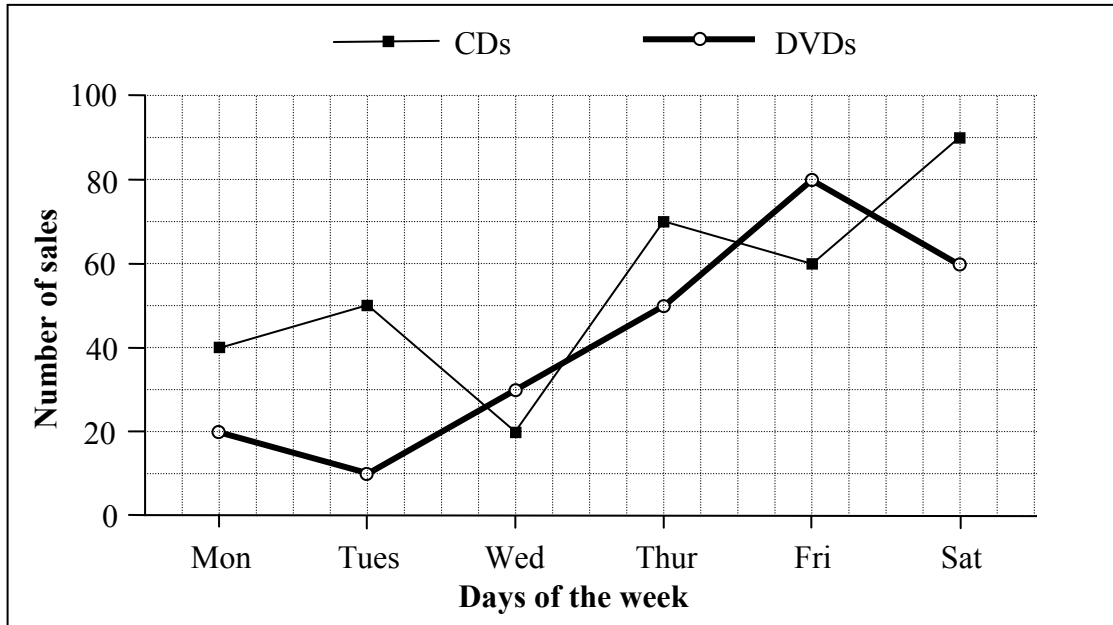
Attempts (2 marks)

- A1 Partial listing of answers to (i) or (ii) or both

QUESTION 6

Part (i)	10 marks	Att 4
Part (ii)	10 marks	Att 4
Part (iii)	10 marks	Att 4
Part (iv)	10 marks	Att 4
Part (v)	10 marks	Att 4

A music shop sells CDs and DVDs. The graph shows the number of each sold over six days. For example, on Tuesday, 50 CDs and 10 DVDs were sold



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

How many CDs were sold on Friday?

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

60

Blunders (-3)

B1 Gives 80 as answer

B2 $60 + 80 = 140$

Worthless (0 marks)

W1 Incorrect answer without work other than those in the scheme

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

How many **more** CDs than DVDs were sold on Saturday?

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

$90 - 60 = 30$

* Accept correct answer without work

Blunders (-3)

B1 $90 + 60 = 150$

Worthless (0 marks)

W1 Incorrect answer without work other than those in scheme

(iii)

10 marks

Att 4

On which days of the week was the number of DVDs sold greater than the number of CDs sold?

(iii)

10 marks

Att 4

Wednesday, Friday

* Accept correct answer without work

Blunders (-3)

B1 Only one of the correct days given

B2 Monday, Tuesday, Thursday & Saturday

Attempts (4 marks)

A1 Monday, Tuesday & Thursday

Worthless (0 marks)

W1 Incorrect answer without work other than those in scheme

(iv)

10 marks

Att 4

Find the average number of CDs sold per day?

(iv)

10 marks

Att 4

$$\frac{40 + 50 + 20 + 70 + 60 + 90}{6} = \frac{330}{6} = 55$$

* Accept correct answer without work

Blunders (-3)

B1 Stops at $\frac{330}{6}$

B2 90 the mode given as the average

Slips (-1)

S1 Each omitted amount, or incorrect amount, provided at least one is correct

S2 Uses a divisor other than 6

S3 Numerical slips to a maximum of 3

Attempts (4 marks)

A1 Stops at 330 or candidates answer

Worthless (0 marks)

W1 Incorrect answer without work other than those in scheme

(v)

10 marks

Att 4

The shop sells each CD for €8 and each DVD for €12.
Find in euro the total amount of sales over the six days.

(v)

10 marks

Att 4

$$\begin{aligned} & 330 \times 8 + (20 + 10 + 30 + 50 + 80 + 60) \times 12 \\ & = 2640 + 250 \times 12 \\ & = 2640 + 3000 \\ & = \text{€}5640 \end{aligned}$$

- * Accept correct answer without work
- * Accept candidates work from part (iv)

Blunders (-3)

- B1 Divides instead of multiplies $330/8 = 41.25$
- B2 Writes $2640 + 3000$ and stops
- B3 Writes $2640 - 3000 = -360$

Misreadings (-1)

- M1 Takes €12 for price of CD and €8 for price of DVD

Slips (-1)

- S1 Numerical slips to a maximum of 3

Attempts (4 marks)

- A1 Some correct work
- A2 Some use of 250
- A3 330×8 or 2640 and stops
- A4 $330 + 250$ and / or 580

Worthless (0 marks)

- W1 Incorrect answer without work other than those in scheme

QUESTION 7

Graph	30 (20, 10) marks	Att (8, 4)
Values	20 (5, 5, 5, 5) marks	Att (2, 2, 2, 2)

Evaluation	20 marks	Att 8
Graph	10 marks	Att 4

Draw the graph of the function
 $f : x \rightarrow 2x^2 - x - 5$, for $-3 \leq x \leq 3$, $x \in \mathbb{R}$.

Table method **20 marks** **Att 8**

x	-3	-2	-1	0	1	2	3
$2x^2$	18	8	2	0	2	8	18
$-x$	3	2	1	0	-1	-2	-3
-5	-5	-5	-5	-5	-5	-5	-5
$f(x)$	16	5	-2	-5	-4	1	10

* Accept correct $f(x)$ values without work

Blunders (-3)

- B1 x values added on when calculating $f(x)$ values
- B2 Consistent errors across full line otherwise slips apply
- B3 $f(x)$ not evaluated for an x value in domain or some x value omitted

Slips (-1)

- S1 Each incorrect or omitted value in the body of the table
- S2 Each incorrect or omitted $y / f(x)$ value from candidates work

Misreadings (-1)

- M1 -5 treated as 5 across the line

Attempts (8 marks)

- A1 Any four values in the table
- A2 Function treated as linear e.g. $x^2 = 2x$, or x , or $2x^2 = 4x$ or x

$$f(x) = 2x^2 - x - 5$$

$$f(-3) = 2(-3)^2 - (-3) - 5 = 16$$

$$f(-2) = 2(-2)^2 - (-2) - 5 = 5$$

$$f(-1) = 2(-1)^2 - (-1) - 5 = -2$$

$$f(0) = 2(0)^2 - (0) - 5 = -5$$

$$f(1) = 2(1)^2 - (1) - 5 = -4$$

$$f(2) = 2(2)^2 - (2) - 5 = 1$$

$$f(3) = 2(3)^2 - (3) - 5 = 10$$

Blunders (-3)

B1 Consistent errors in the evaluation of $2x^2$

B2 -5 omitted from the evaluation

B3 Each incorrect $f(x)$ value when no work is shown to a maximum of 3 provided that at least one $f(x)$ value is correct

All $f(x)$ values incorrect without work \rightarrow 0 marks. Otherwise slips applied when work is shown

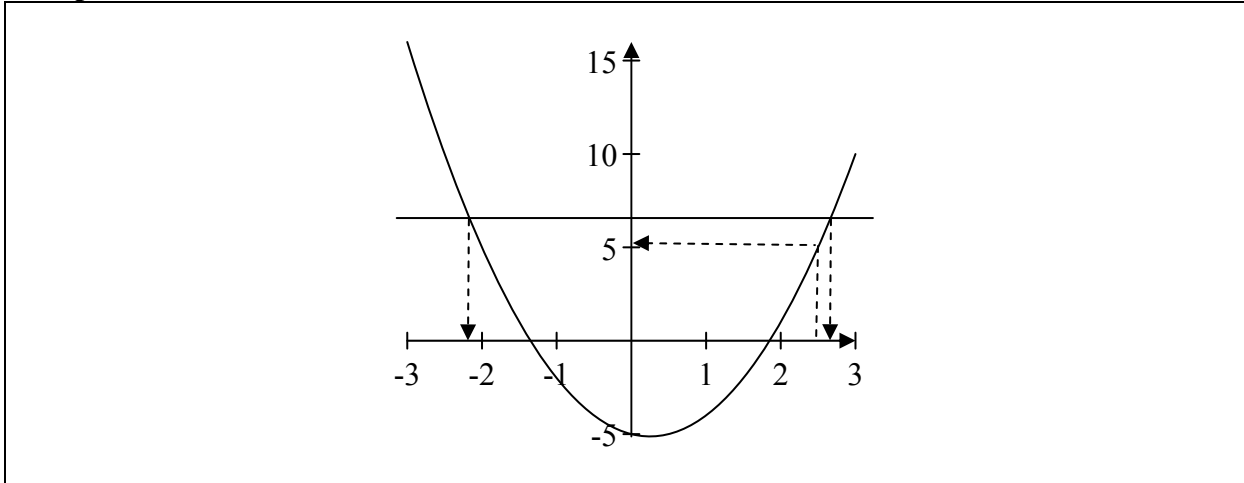
Slips (-1)

S1 Each incorrect or omitted value from the evaluation after substitution

S2 Each incorrect or omitted $f(x)$ value, calculated from candidates work

Misreadings (-1)

M1 -5 consistently treated as 5 in the evaluation

Graph**10 marks****Att 4**

- * Accept values from candidates work
- * Fully correct graph drawn with no work shown: award 30 marks

Blunders (-3)

B1 Blunders in scales on axis or axes (once only)

Slips (-1)

- S1 Each point from table plotted incorrectly
- S2 Each pair of successive points not joined to a maximum of 3
- S3 Not a smooth curve
- S4 The graph of the function is not in the conventional position or orientation

Attempts (4 marks)

- A1 At least two of the candidates points plotted
- A2 Any U-shaped graph
- A3 Axes drawn

Use your graph to estimate

- (i) the value of $f(2.5)$
- (ii) the minimum value of $f(x)$
- (iii) the values of x for which $f(x) = 7$
- (iv) the range of values of x for which $f(x)$ is increasing.

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

- (i) $f(2.5) = 5$
- (ii) -5.1
- (iii) $x = -2.2, x = 2.7$
- (iv) $0.2 < x \leq 3$

- * Accept candidates values from graph
- * Allow tolerance of ± 0.3 units on x -axis, ± 0.5 on y -axis

Blunders (-3)

- B1 Extra value, applies in parts (i) and (ii)
- B2 $f(x) = 7$ treated as $f(7)$
- B3 Value omitted, applies in part (iii).

Slips (-1)

- S1 Answers indicated correctly on axis but not specified
- S2 Increasing part of graph indicated but no x value written down

Misreadings (-1)

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

Attempts (2 marks)

- A1 Effort at reading value(s) from graph
- A2 Correctly solving equation algebraically, part (iii)



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2011

Marking Scheme

MATHEMATICS – Paper 2

Foundation Level

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 (35, 5) marks

Att (14, 2)

Part (a)

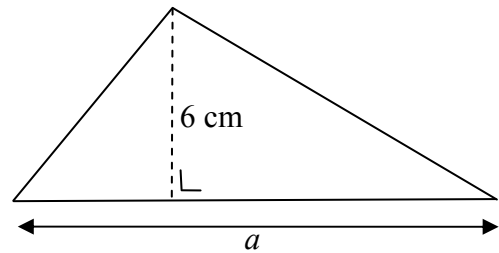
10 marks

Att 4

(a)

The area of the triangle shown is 39 cm^2 .
The perpendicular height of the triangle is 6 cm.

Find a , the length of the base of the triangle.



(a) (i)

10 marks

Att 4

$$\text{Area} = \frac{1}{2}ah \Rightarrow 39 = \frac{1}{2}(a)(6) \Rightarrow 3a = 39 \Rightarrow a = 13 \text{ cm}$$

Slips (-1)

S1 Error in substitution

Attempts (4 marks)

A1 Correct formula without substitution

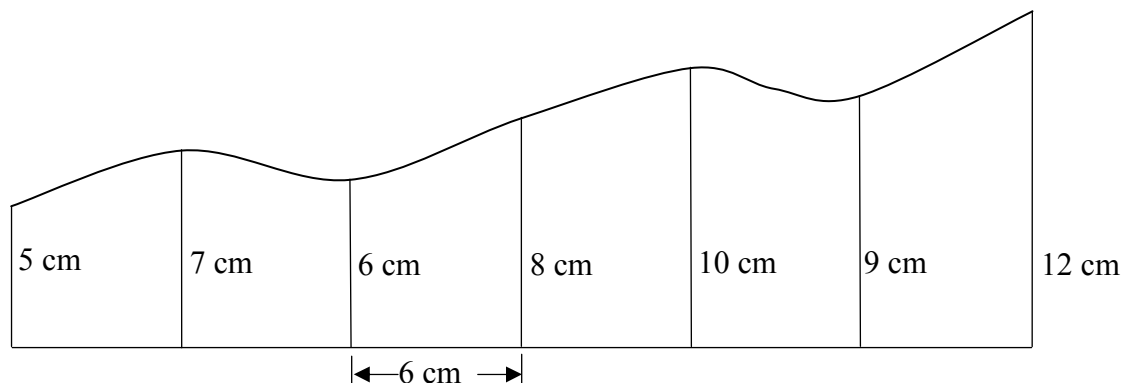
A2 Incorrect answer of some merit

Part (b)(i)
(ii)

35 marks
5 marks

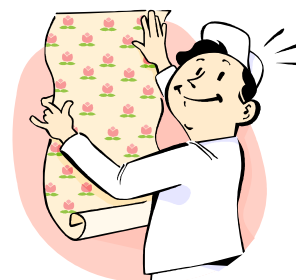
Att 14
Att 2

(b) A damaged section of wallpaper is shown in the diagram.



Offsets of lengths 5, 7, 6, 8, 10, 9 and 12 cm are measured at intervals of 6 cm along the horizontal line as shown.

- (i) Use Simpson's rule to estimate the area of the damaged section of wallpaper.
- (ii) What is the area of the smallest rectangle of wallpaper that can be used to cover the damaged section?



(b) (i)
(ii)

35 marks
5 marks

Att 14
Att 2

- (i) $\text{Area} = \frac{1}{3}(\text{First} + \text{Last} + \text{T.O.F.E})$
 $= \frac{6}{3}(5 + 12 + 2(6 + 10) + 4(7 + 8 + 9)) = 2(17 + 32 + 96) = 290 \text{ cm}^2$.
- (ii) $(6 \times 6) \times 12 = 432 \text{ cm}^2$

Blunders (-3)

- B1 Uses four odd and twice even, $4(6 + 10) + 2(7 + 8 + 9)$
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
B4 Incorrect substitution

Slips (-1)

- S1 Numerical errors to a maximum of 3
S2 Each incorrect or omitted altitude

Attempts (14, 2 marks)

- A1 Gives Simpson's Formula only
A2 Copies diagram

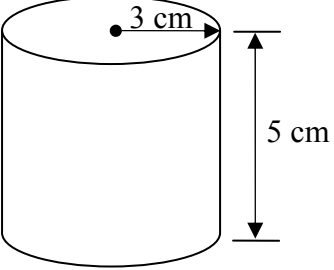
QUESTION 2

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

Part (a) **20 marks** **Att 8**

(a) A cylinder has a radius of 3 cm and a height of 5 cm.

Calculate the volume of the cylinder, correct to the nearest cm^3 .



(a) **20 marks** **Att 8**

$$\text{Volume} = \pi r^2 h = \pi \times 3^2 \times 5 = 45\pi = 141.3 = 141 \text{ cm}^3$$

Blunders (-3)

B1 Incorrect substitution

Slips (-1)

S1 Numerical errors to a maximum of 3

S2 Error in rounding or gives answer in terms of π

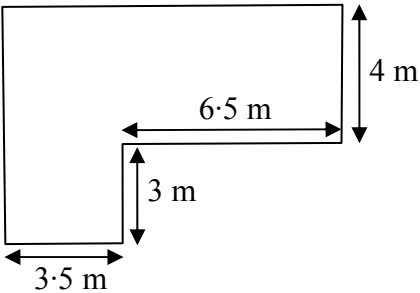
Attempts (8 marks)

A1 Correct formula without substitution

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

(b) The diagram shows a formal pond in a garden.

Calculate the area of the pond



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

$$\text{Area} = 4 \times (6.5 + 3.5) + 3 \times 3.5 = 40 + 10.5 = 50.5 \text{ m}^2$$

or
$$\text{Area} = 7 \times 10 - 3 \times 6.5 = 70 - 19.5 = 50.5 \text{ m}^2$$

Blunders (-3)

B1 Incorrect substitution

Slips (-1)

S1 Numerical errors to a maximum of 3

Attempts (4 marks)

A1 Defines area

Part (c)

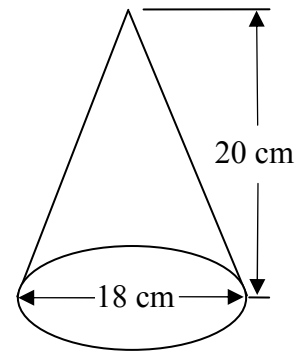
20 (15, 5) marks

Att (6, 2)

(c)

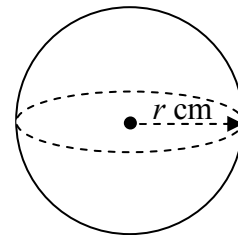
- (i) The diameter of a solid cone is 18 cm and the height is 20 cm.

Find the volume of the cone, in terms of π .



- (ii) The cone is melted down and recast as 15 identical spheres of radius r .

Find the value of r .



(c) (i)
(ii)

15 marks
5 marks

Att 6
Att 2

(i) $\text{Volume} = \frac{1}{3} \pi r^2 h = \frac{1}{3} \times \pi \times 9^2 \times 20 = 540\pi \text{ cm}^3$

(ii) $\text{Volume} = 15 \times \frac{4}{3} \pi r^3 = 540\pi$

$$\Rightarrow r^3 = \frac{540 \times 3}{15 \times 4} = 27 \Rightarrow r = 3 \text{ cm}$$

Blunders (-3)

B1 Incorrect substitution

B2 Error in balancing equation

Slips (-1)

S1 Numerical errors to a maximum of 3

S2 Omits π or gives answer as 1696.46 or 1695.6 or similar

Attempts (6, 2 marks)

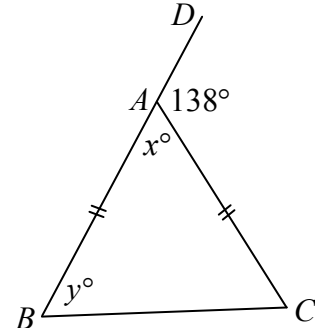
A1 Correct formula without substitution

QUESTION 3

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

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

- (a) In the triangle ABC
 $|AB| = |AC|$ and $|\angle DAC| = 138^\circ$
- Find the value of x and the value of y .



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

$$x + 138 = 180 \Rightarrow x = 42$$
$$2y = 138 \Rightarrow y = 69$$

or

$$2y + x = 180 \Rightarrow 2y + 42 = 180 \Rightarrow 2y = 138 \Rightarrow y = 69$$

Blunders (-3)

- B1 Geometrical error
- B2 Error in balancing equation

Slips (-1)

- S1 Numerical errors to a maximum of 3

Attempts (2, 2 marks)

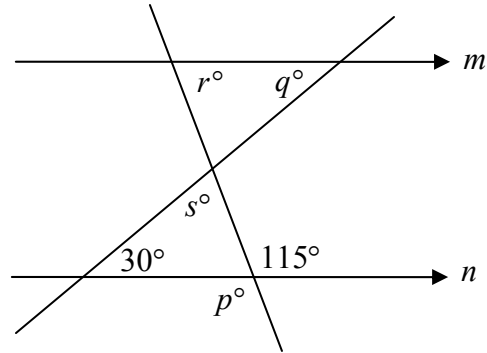
- A1 Incorrect answer of some merit

Part (b)

20 (5, 5, 5, 5) marks

Att (2, 2, 2, 2)

- (b) The lines m and n are parallel.
- (i) Find the value of p .
 - (ii) Find the value of q .
 - (iii) Find the value of r .
 - (iv) Find the value of s .



(b)

20 (5, 5, 5, 5) marks

Att (2, 2, 2, 2)

- (i) $p = 115$
- (ii) $q = 30$
- (iii) $r + 115 = 180 \Rightarrow r = 65$
- (iv) $r + q + s = 180 \Rightarrow 65 + 30 + s = 180 \Rightarrow s = 85$

Blunders (-3)

B1 Geometrical error

Slips (-1)

S1 Numerical errors to a maximum of 3

Attempts (2, 2, 2, 2 marks)

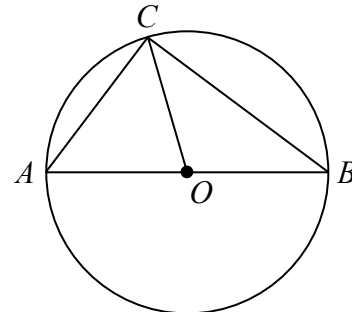
A1 Incorrect answer of some merit

Part (c)

20 (10, 5, 5) marks

Att (4, 2, 2)

- (c) The diagram shows a circle with centre at O .
[AB] is a diameter of the circle.
 $|AB| = 15$ cm and $|BC| = 12$ cm.
- (i) Find $|\angle BCA|$.
 - (ii) Find $|CO|$.
 - (iii) Find $|AC|$.



(c)

20 (10, 5, 5) marks

Att (4, 2, 2)

- (i) $|\angle BCA| = 90^\circ$
- (ii) $|CO| = 7.5$ cm
- (iii) $|AC|^2 + |CB|^2 = |AB|^2$
 $\Rightarrow |AC|^2 = 15^2 - 12^2 = 225 - 144 = 81 \Rightarrow |AC| = 9$ cm.

Blunders (-3)

B1 Geometrical error

Slips (-1)

S1 Numerical errors to a maximum of 3

Attempts (4, 2, 2 marks)

A1 Incorrect answer of some merit

QUESTION 4

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

Part (a)	15 marks	Att 6
-----------------	-----------------	--------------

- (a)** $P(1, 3)$ and $Q(6, -2)$ are two points.
Find the length of $[PQ]$.

(a)	15 marks	Att 6
------------	-----------------	--------------

$$|PQ| = \sqrt{(6-1)^2 + (-2-3)^2} = \sqrt{(5)^2 + (-5)^2} = \sqrt{25+25} = \sqrt{50} \text{ or } 5\sqrt{2}$$

Blunders (-3)

- B1 No square root
- B2 Incorrect substitution once only
- B3 Mathematical error

Slips (-1)

- S1 Numerical errors to a maximum of 3

Attempts (6 marks)

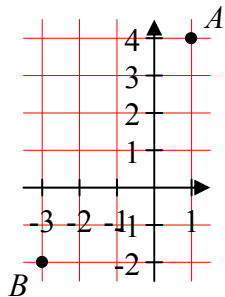
- A1 Draws axes

Part (b)	20 (10, 5, 5) marks	Att (4, 2, 2)
-----------------	----------------------------	----------------------

- (b)** A is the point $(1, 4)$ and B is the point $(-3, -2)$.
- (i)** Plot the points A and B on graph paper.
 - (ii)** Find the slope of AB .
 - (iii)** Find the equation of the line AB .

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

(i)



(ii) Slope = $\frac{-2-4}{-3-1} = \frac{-6}{-4}$ or $\frac{3}{2}$

(iii) Equation: $y - 4 = \frac{3}{2}(x - 1)$ or $3x - 2y + 5 = 0$

Blunders (-3)

- B1 Each point omitted
- B2 Incorrect substitution once only
- B3 Mathematical error

Slips (-1)

- S1 Error in scales
- S2 Each incorrectly plotted point

Attempts (4, 2, 2 marks)

- A1 Draws axes

Part (c)**15 (5, 5, 5) marks****Att (2, 2, 2)**

- (c) The line l has equation $5y = 2x + 4$.
 The point R has co-ordinates $(3, 2)$.
- (i) Show that the point R lies on the line l .
 (ii) Find the slope of the line l .
 (iii) Find the equation of the line k that is perpendicular to l and passes through the point R .

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

- (i) $5y = 2x + 4 \Rightarrow 5(2) = 2(3) + 4 \Rightarrow 10 = 10$.
- (ii) $5y = 2x + 4 \Rightarrow y = \frac{2}{5}x + \frac{4}{5} \Rightarrow \text{slope} = \frac{2}{5}$
- (iii) Slope $l = \frac{2}{5}$ Slope $k = -\frac{5}{2}$ $y - 2 = -\frac{5}{2}(x - 3)$ or $5x + 2y - 19 = 0$

Blunders (-3)

- B1 Incorrect substitution once only
- B2 Incorrect slope of l
- B3 Incorrect slope of k
- B4 Error in balancing equation

Slips (-1)

- S1 Numerical errors to a maximum of 3

Attempts (2, 2, 2 marks)

- A1 Draws axes

QUESTION 5

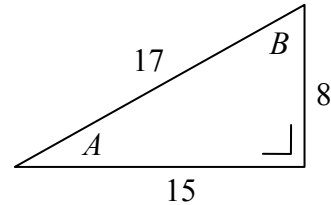
Part (a)	20 (10, 10) marks	Att (4, 4)
Part (b)	10 marks	Att 4
Part (c)	20 (10, 10) marks	Att (4, 4)

Part (a) **20 (10, 10) marks** **Att (4, 4)**

- (a) The diagram shows a right angled triangle with sides of length 8, 15 and 17 cm and angles named A and B .

Write as a fraction

- (i) $\tan A$
(ii) $\cos B$.



(a) (i) **10 marks** **Att 4**
(a) (ii) **10 marks** **Att 4**

- (i) $\tan A = \frac{8}{15}$
(ii) $\cos B = \frac{8}{17}$

Blunders (-3)

- B1 Uses incorrect numerator or denominator each time
B2 Inversion of fraction

Slips (-1)

- S1 Calculates the angle approximately, $A = 28^\circ$ or $B = 61^\circ$
S2 Answer not in fraction form

Attempts (4, 4 marks)

- A1 Defines *tan* or *cos* and stops

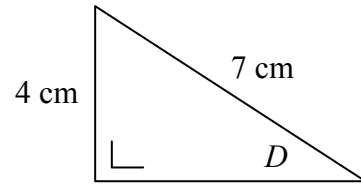
Part (b)

10 marks

Att 4

(b)

Find the measure of the angle D in the diagram, correct to the nearest degree.



Part (b)

10 marks

Att 4

$$\sin D = \frac{4}{7} \Rightarrow D = \sin^{-1}\left(\frac{4}{7}\right) = 34.8^\circ = 35^\circ$$

Blunders (-3)

- B1 Incorrect trigonometric ratio
- B2 Error in balancing equation

Slips (-1)

- S1 Numerical errors to a maximum of 3
- S2 Fails to round-off
- S3 Wrong mode

Attempts (4 marks)

- A1 Measures from diagram

Wrong mode

$$\text{Rad: } D = 0.6082 \approx 1^\circ$$

$$\text{Grad: } D = 38.72 \approx 39^\circ$$

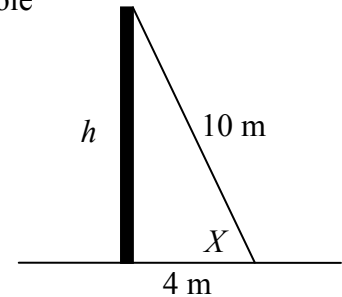
Part (c)

20 (10, 10) marks

Att (4, 4)

(c) A taut cable is 10 m long and joins the top of a vertical flagpole to a point on level ground 4 m from the bottom of the flagpole.

- (i) Calculate h , the height of the flagpole. Give your answer correct to two decimal places.
- (ii) Find the measure of the angle X . Give your answer to the nearest degree.



(c) (i)

10 marks

Att 4

(c) (ii)

10 marks

Att 4

$$(i) \quad h^2 + 4^2 = 10^2 \Rightarrow h^2 + 16 = 100 \Rightarrow h^2 = 84 \Rightarrow h = \sqrt{84} = 9.165 = 9.17$$

$$(ii) \quad \cos X = \frac{4}{10} \Rightarrow X = \cos^{-1}\left(\frac{4}{10}\right) = 66.42^\circ = 66^\circ$$

Blunders (-3)

- B1 Any error in Pythagoras
- B2 Incorrect trigonometric ratio
- B3 Error in balancing equation

Slips (-1)

- S1 Fails to round-off
- S2 Wrong mode

Attempts (4, 4 marks)

- A1 Measures from diagram

Wrong mode

$$\text{Rad: } X = 1.15 \approx 1^\circ$$

$$\text{Grad: } X = 73.8 \approx 74^\circ$$

QUESTION 6

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

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

(a) A certain car is available with a petrol or diesel engine. Each of these is available in five different colours and three different engine sizes.
How many different versions of this car are available?

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

$$2 \times 5 \times 3 = 30$$

Blunders (-3)

B1 $2 + 5 + 3 = 10$ or 10 written down

B2 $2!$ etc

Slips (-1)

S1 Numerical errors to a maximum of 3

Attempts (4 marks)

A1 Incorrect answer of some merit

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

(b) A box contains eight red tickets, four blue tickets and five yellow tickets.
One ticket is drawn at random from the box.
Find the probability that the ticket drawn is

(i) blue
(ii) red
(iii) red or yellow
(iv) not yellow.

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

(i) $\frac{4}{17}$	(ii) $\frac{8}{17}$	(iii) $\frac{8+5}{17} = \frac{13}{17}$	(iv) $\frac{17-5}{17} = \frac{12}{17}$
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Blunders (-3)

B1 Incorrect n(S) apply once only

B2 Incorrect n(E)

B3 Inverted fraction

B4 No division

Ans:(i) 4 (ii) 8 (iii) 13 (iv) 12 merits 17 marks

or

Ans:(i) $\frac{1}{4}$ (ii) $\frac{1}{8}$ (iii) $\frac{1}{13}$ (iv) $\frac{1}{12}$ merits 17 marks

Slips (-1)

S1 Numerical errors to a maximum of 3

Attempts (2, 2, 2, 2 marks)

A1 Incorrect answer of some merit

Part (c)

20 (5, 5, 5, 5) marks

Att (2, 2, 2, 2)

- (c) The age of each student in a group of 60 students was recorded. The information is given in the table below.

	16 years	17 years	18 years
Boys	11	12	4
Girls	15	13	5

A student is chosen at random. Find the probability that the student is

- (i) a girl
- (ii) 16 years of age
- (iii) a boy who is 17 years of age
- (iv) younger than 18 years of age.

(c)

20 (5, 5, 5, 5) marks

Att (2, 2, 2, 2)

- (i) $\frac{15+13+5}{60} = \frac{33}{60}$ or $\frac{11}{20}$
- (ii) $\frac{11+15}{60} = \frac{26}{60}$ or $\frac{13}{30}$
- (iii) $\frac{12}{60}$ or $\frac{1}{5}$
- (iv) $\frac{60-9}{60} = \frac{51}{60}$

Blunders (-3)

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

Ans:(i) 33 (ii) 26 (iii) 12 (iv) 51 merits 17 marks
or

Ans:(i) $\frac{1}{33}$ (ii) $\frac{1}{26}$ (iii) $\frac{1}{12}$ (iv) $\frac{1}{51}$ merits 17 marks

Slips (-1)

- S1 Numerical errors to a maximum of 3

Attempts (2, 2, 2, 2 marks)

- A1 Incorrect answer of some merit

QUESTION 7

Part (a)	5 marks	Att 2
Part (b)	25 (5, 10, 5, 5) marks	Att (2, 4, 2, 2)
Part (c)	20 (15, 5) marks	Att (6, 2)

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

(a) The mode of the numbers
 $5, 6, 4, 5, 6, 3, x$
 is 5. Find the value of x .

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

$x = 5$

Slips (-1)

S1 Misreads mode as mean

Attempts (2 marks)

A1 Incorrect answer of some merit

Part (b) **25 (5, 10, 5, 5) marks** **Att (2, 4, 2, 2)**

(b) The table below shows the number of emails sent by 40 students during one week.



Number of emails	0 – 5	6 – 10	11 – 15	16 – 20	21 – 30
Number of students	2	10	13	12	3

(i) Copy and complete the cumulative frequency table:

Number of emails	≤ 5	≤ 10	≤ 15	≤ 20	≤ 30
Number of students					

(ii) Draw the cumulative frequency curve.

Use your cumulative frequency curve to estimate

(iii) the median number of emails sent

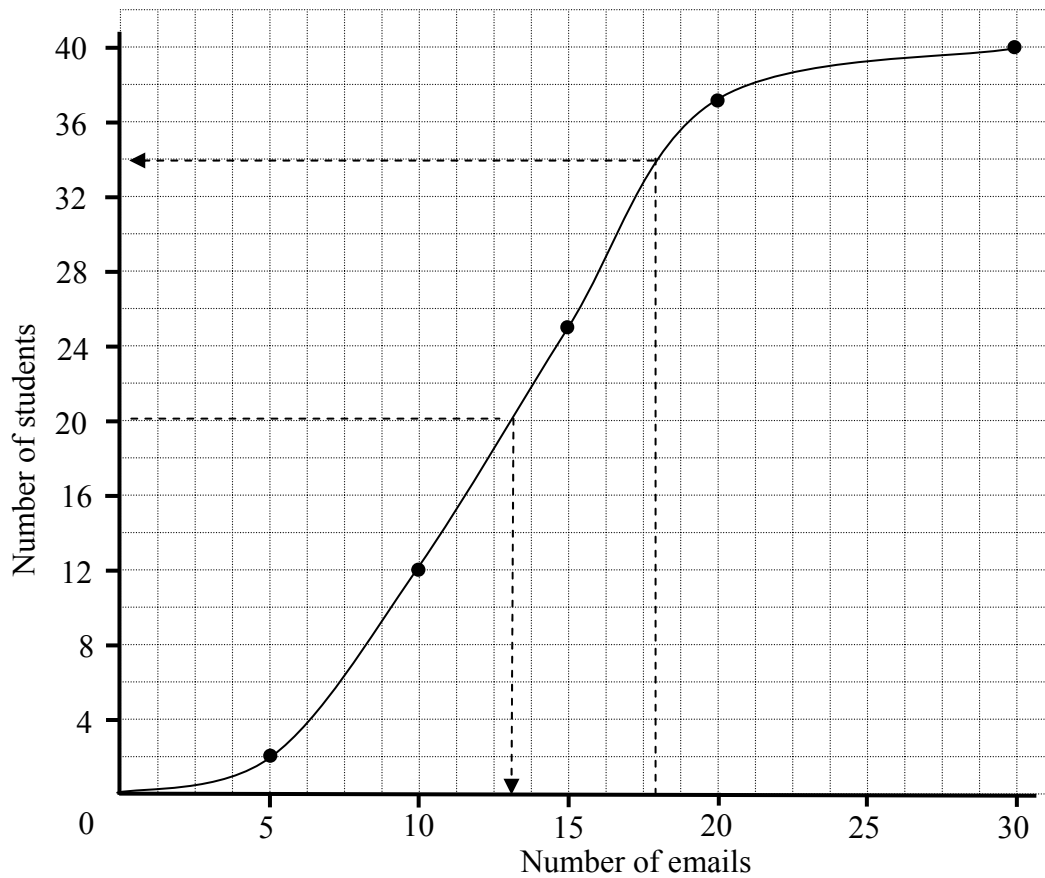
(iv) the number of students who sent more than 18 emails.

(b)

25 (5, 10, 5, 5) marks

Att (2, 4, 2, 2)

Number of emails	≤ 5	≤ 10	≤ 15	≤ 20	≤ 30
Number of students	2	12	25	37	40



Median = 13 emails

Number of students = $40 - 34 = 6$

Blunders (-3)

- B1 Plots on the midpoints
- B2 Points not joined
- B3 Uses wrong axis for median

Slips (-1)

- S1 Error in scales, one slip
- S2 Each incorrect or omitted value in the table
- S3 Each incorrectly plotted point
- S4 Joins points with straight lines
- S5 Median not specified
- S6 Fails to subtract reading in (iv)

Attempts (2, 4, 2, 2 marks)

- A1 Incorrect answer of some merit

Part (c)

20 (15, 5) marks

Att (6, 2)

(c) (i) Find the mean of the numbers 2, 5, 12, 13.

(ii) Find the standard deviation of the numbers 2, 5, 12, 13, correct to two decimal places.

(c)

20 (15, 5) marks

Att (6, 2)

(i) Mean = $\frac{\sum x}{n} = \frac{2+5+12+13}{4} = \frac{32}{4} = 8$

(ii) Standard Deviation = $\sqrt{\frac{\sum d^2}{n}}$
 $= \sqrt{\frac{(2-8)^2 + (5-8)^2 + (12-8)^2 + (13-8)^2}{4}}$
 $= \sqrt{\frac{36+9+16+25}{4}} = \sqrt{\frac{86}{4}} = 4.636 = 4.64$

Blunders (-3)

B1 Incorrect substitution

Slips (-1)

S1 Numerical errors to a maximum of 3

S2 Error in rounding

Attempts (6, 2 marks)

A1 Any addition

A2 Work on SD or defines SD

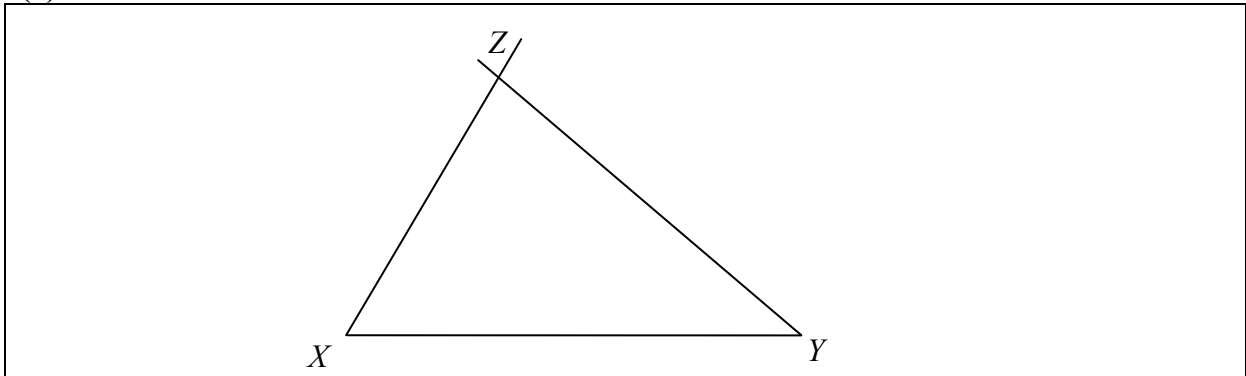
QUESTION 8

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

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

(a) Construct a triangle XYZ where $|XY| = 6$ cm, $|\angle ZXY| = 60^\circ$ and $|\angle ZYX| = 40^\circ$.

(a) **10 marks** **Att 4**



Blunders (-3)

- B1 Each omitted side
- B2 Incorrect angle $\pm 5^\circ$

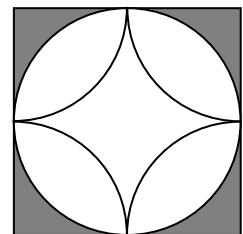
Slips (-1)

- S1 Given side outside tolerance of ± 1 cm

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

(b) The diagram shows a square patterned tile.

- (i)** How many axes of symmetry does the tile have?
- (ii)** What is the smallest angle of rotation about the centre that will map the tile onto itself?



(b) **20 (10, 10) marks** **Att (4, 4)**

- (i)** 4
- (ii)** 90°

Blunders (-3)

- B1 Answer greater than 4
- B2 Incorrect angle

Slips (-1)

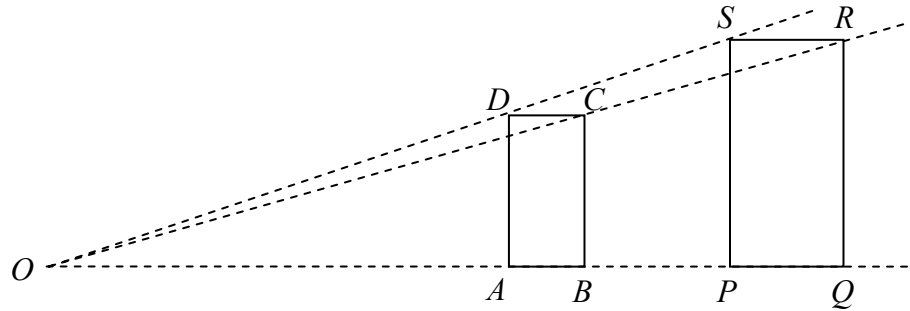
- S1 Each symmetry omitted

Part (c)

20 (10, 5, 5) marks

Att (4, 2, 2)

(c)



The rectangle $PQRS$ is the image of the rectangle $ABCD$ under an enlargement with centre O .

The scale factor is 1.5 .

$|AB| = 3$ cm and $|QR| = 9$ cm.

- (i) Calculate $|PQ|$.
- (ii) Calculate $|BC|$.
- (iii) Find the area of the rectangle $PQRS$.

(c)

20 (10, 5, 5) marks

Att (4, 2, 2)

- (i) $|PQ| = 1.5 |AB| = 1.5 \times 3 = 4.5$ cm
- (ii) $1.5 \times |BC| = |RQ| = 9 \Rightarrow |BC| = \frac{9}{1.5} = 6$ cm
- (iii) Area of rectangle $PQRS = 4.5 \times 9 = 40.5$ cm²

Blunders (-3)

- B1 Incorrect scale factor
- B2 Error in area formula
- B3 Does not square scale factor
- B4 No division

Misreadings(-1)

- M1 Treats $ABCD$ as the image rectangle

Slips (-1)

- S1 Numerical errors to a maximum of 3

Attempts (4, 2, 2 marks)

- A1 Incorrect answer of some merit

MARCANNA BREISE AS UCHT FREAGAIRT TRÍ GHAEILGE

(Bonus marks for answering through Irish)

Ba choir marcanna de réir an ghnáth ráta a bhronnadh ar iarrthóirí nach ghnóthaíonn níos mó ná 75% d'iomlán na marcanna don pháipéar. Ba choir freisinan marc bónais sin a shlánú **síos**.

Déantar an cinneadh agus an ríomhaireacht faoin marc bónais i gcás gach páipéir ar leithligh.

Is é 5% an gnáthráta agus is é 300 iomlán na marcanna don pháipéar. Mar sin, bain úsáid as an gnáthráta 5% i gcás iarrthóirí a ghnóthaíonn 225 marc nó níos lú, e.g. $198 \text{ marc} \times 5\% = 9.9 \Rightarrow \text{bónas} = 9 \text{ marc}$.

Má ghnóthaíonn an t-iarrthóir níos mó ná 225 marc, ríomhtar an bónas de réir na foirmle $[300 - \text{bunmharc}] \times 15\%$, agus an marc bónais sin a shlánú **síos**. In ionad an ríomhaireacht sin a dhéanamh, is féidir úsáid a bhaint as an tábla thíos.

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

