Coimisiún na Scrúduithe Stáit
State Examinations Commission

MARKING SCHEME

JUNIOR CERTIFICATE EXAMINATION 2003
MATHEMATICS
FOUNDATION LEVEL

GENERAL GUIDELINES FOR EXAMINERS

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

   Frequently occurring errors to which these penalties must be applied are listed in the scheme. They are labelled as B1, B2, B3,....., S1, S2, S3,...., M1, M2, etc. Note that these lists are not exhaustive.

2. When awarding attempt marks, e.g. Att(3), it is essential to 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 *same* error in the *same* section of a question is penalised *once* only.

5. 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.

6. Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks only.

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

QUESTION 1

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 6**
Part (c)	**20 marks**	**Att 7**

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

(a)
(i) $34 + 26 =$
(ii) $34 \times 26 =$

(a)	**5marks**	**Att 2**
(i)	60	

Blunders (-3)
B1 Uses incorrect operator
Slips (-1)
S1 Error in calculation (once only)
S2 Decimal error
Misreadings (-1)
M1 Error in copying down a digit
Attempts (2 marks)
A1 Any attempt at addition
A2 8 or 1.307…. or 884 with no work shown
Worthless (0)
W1 Incorrect irrelevant answer with no work

(a) (ii)	**5marks**	**Att 2**
(a) (ii)	884	

* If answers to (i) and (ii) interchanged , blunder *once only.*
Blunders (-3)
B1 Uses incorrect operator (subject to *)
Slips (-1)
S1 Error in calculation (once only)
S2 Decimal error
Misreadings (-1)
M1 Error in copying down a digit
Attempts (2 marks)
A1 Any attempt at multiplication
A2 8, or 1.307…. or 60 with no work shown.
Worthless (0)
W1 Incorrect irrelevant answer with no work

Part (b)	**20(10,10) marks**	**Att (3,3)**
(i) Which of the numbers 4286 or 4826 is greater?		
(ii) Write down the greatest four-digit number that can be made using all the digits 4, 2, 8, 6.		

b(i)	**10marks**	**Att 3**
(b) (i)	4826	

Blunders (-3)

B1 Selects 4286

B2 Writes a 4-digit number greater than 4286, using correct digits.

Attempts (3 marks)

A1 Writes any other combination of given digits (not necessarily 4-digit)

A2 Writes any other 4 digit number greater than 4286

(b)(ii)	**10 marks**	**Att3**
(b)(ii)	8642	

Slips (-1)

S1 Each correct digit incorrectly placed, to max(-3)

Misreadings (-1)

M1 Writes smallest number (2468)

Attempts (3 marks)

A1 Any non 4-digit number using these numbers.

Part(c) **20(15,5)marks** **Att (5,2)**

(c) (i) Find the total cost of

One bus ticket @ €8·00
One C.D. @ €13·50
Two concert tickets @ €15·60 each
Two tee shirts @ €8·50 each

(ii) I pay with four €20 notes. How much change do I get?

(c)(i) **15marks** **Att 5**

Bus ticket:	€8·00 × 1	=	€8.00
C.D.:	€13·50 × 1	=	€13.50
Tickets :	€15·60 × 2	=	€31.20
Tee shirts:	€8·50 × 2	=	€17.00
Total		=	€ 69.70

Blunders (-3)
B1 Does not multiply by 2 (once only)
B2 Each item omitted from total
B3 No addition
B4 Correct answer (69.70 or 6970) with no work.
Slips (-1)
S1 Error in multiplication (once only).
S2 Error in addition (once only)
S3 Misplaced decimal
Misreadings (-1)
M1 Error in copying down an entry from first 2 lines(once only).
Attempts (5 marks)
A1 Answer with correct digits but incorrect decimal location, with no work.
Worthless (0)
W1 Incorrect answer with no work, subject to A1

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

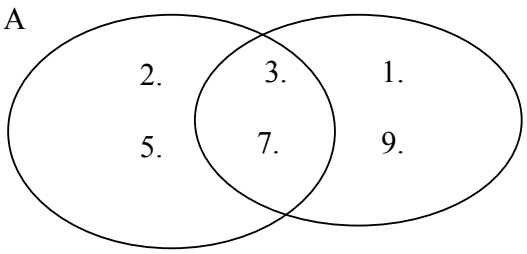
(c)(ii) 4×20 = 80 80 – 69.70 = 10.30

*Accept candidate's answer from (i)
Blunders (-3)
B1 4 not used or used incorrectly
B2 Adds totals
B3 4×20 = 80 and stops.
Slips (-1)
S1 Error in multiplication.
S2 Error in addition
S3 Misplaced decimal.
S4 Correct answer with no work shown
Attempts (2 marks)
A1 80 with no work. A2 Transfers (i) and stops

QUESTION 2

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 6**
Part (c)	**20 marks**	**Att 6**

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



(i) A = { , , , }

(ii) A∩B = { , }

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

(i) A = {2, 5, 3, 7}

(ii) B = {3, 7 }

*Accept appropriate shading

Slips (-1)

S1 Each incorrect or blank entry (to max –3 for each part)

Part(b) **20(10,10)** **Att (3,3)**

(b) (i) Without using a calculator, write $\frac{1}{4} + \frac{2}{5}$ as a single fraction.

(ii) Write $\frac{4}{7}$ as a decimal, correct to two decimal places.

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

b(i) $\frac{5}{20} + \frac{8}{20} = \frac{13}{20}$ or $\frac{5+8}{20} = \frac{13}{20}$

*Accept any equivalent fraction

Blunders (-3)

B1 Incorrect denominator

B2 Incorrect numerator

B3 Multiplication instead of addition

B4 Answer as decimal with work.

B5 Correct answer with no work shown.

Slips (-1)

S1 Arithmetic error

S2 $^5/_{20} + ^8/_{20}$ and stops

Attempts (3 marks)

A1 Correct answer as decimal (0.65) with no work.

A2 $¼ + ^2/_5$ and stops.

Worthless (0)

W1 Incorrect answer with no work

b(ii)	**10 marks**	**Att 3**
b(ii)	0.57	

Blunders (-3)
B1 Fraction inverted (=1.75)
Slips (-1)
S1 Misplaced decimal
S2 Error in rounding off, or no rounding off
Attempts (3 marks)
A1 Any effort at division and stops
A2 1.75 without work shown.
Worthless (0)
W1 Incorrect answer without work

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

(c) I bought an old bicycle for €40. I spent €10 fixing it. I sold the bicycle for €70.

✍ **(i)** Calculate the total amount of money I spent.

✍ **(ii)** Calculate the profit I made when I sold the bicycle.

✍ **(iii)** Express the profit I made as a percentage of the total amount I spent.

(c)(i)	**10 marks**	**Att 3**
✍ (c) (i)	40+10 = 50	

Blunders (-3)
B1 No addition (40 or 10 given) + S1
B2 Includes 70
Slips (-1)
S1 Error in addition
S2 Subtracts instead of adds.
S3 Correct answer with no work shown.
Attempts (3 marks)
A1 Any of 120, 110, 80 , 60, 30, 20 *without work*
Worthless (0)
W1 Any other incorrect answer without work.

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

✍	(c) (ii)	70-50 = 20

* Accept candidate's answer from (i)

Slips (-1)

S1 70 + ans(i) and continues
S2 Error in calculations
S3 70 – number other than ans(i) and continues.
S4 Correct answer with no work shown

Attempts (2marks)

A1 70 or ans(i) written and stops.

Worthless (0)

W1 Incorrect answer with no work.

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

✍	(c) (iii)	$(^{20}/_{50})\times 100 = 40\%$

*Accept candidate's answers from previous parts
* % symbol not required

Blunders (-3)

B1 No relevant fraction formed
B2 Error in numerator.
B3 Error in denominator.

Slips (-1)

S1 Uses selling price
S2 Error in calculations
S3 No multiplication by 100
S4 Misplaced decimal
S5 Correct answer with no work shown
S6 Divides by 100

Attempts (2 marks)

A1 Some effort at %.

QUESTION 3

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 7**
Part (c)	**20 marks**	**Att 6**

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

(a) A prize of €72 is shared equally between 6 people. How much does each person get?

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

(a) $72 \div 6 = 12$

Blunders (-3)
B1 Incorrect operator
Slips (-1)
S1 Inverted fraction, but ignore if answer correct.
S2 Misplaced decimal
S3 Error in calculations
S4 Correct answer with no work shown.
Attempts (3 marks)
A1 Any attempt at division.
Worthless (0)
W1 Incorrect answer with no work.

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

The number of goals scored by each of 20 teams is shown below:

2	4	1	0	3
3	2	0	3	3
3	2	2	1	2
1	3	2	0	3

(i) Complete the table below:

Goals scored	0	1	2	3	4
Number of teams		3			

(ii) Find the mean score per team.
(iii) What fraction of the teams scored exactly two goals?

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

Goals scored	0	1	2	3	4
Number of teams	3	[3]	6	7	1

Slips (-1)

S1 Each incorrect or omitted entry

Attempts (3 marks)

A1 Any effort at counting from array.

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

✍ $\frac{3(0)+3(1)+6(2)+7(3)+1(4)}{3+3+6+7+1}=\frac{40}{20}=2$ *or* uses original array $\frac{40}{20}=2$

* Accept figures from candidates table

*Accept $^{40}/_{20}$ (with / without other work)

Blunders (-3)

B1 Incorrect numerator

B2 Incorrect denominator

B3 No denominator

B4 Correct answer (**2**) with no work shown

Slips (-1)

S1 Arithmetic error

Attempts (2 marks)

A1 Finds mode (3 or 7)

A2 40 with or without work and stops

A3 20 with or without work and stops.

b(iii) **5 marks** **Att2**

✍ (b)(iii) $\frac{6}{20}$

*Accept figures from candidate's table.

Blunders (-3)

B1 No fraction

B2 Incorrect numerator

B3 Incorrect denominator

Slips (-1)

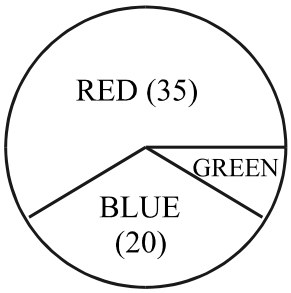
S1 Correct equivalent fraction, without work

Part (c) **20 marks** **Att 6**

(c) 60 people were asked what colour of car they had. 35 said red, 20 said blue and the rest said green.
Draw a pie chart to show this information.

(c) **20 marks** **Att 6**

(c) $\frac{35}{60}\times 360 = 210^0$ $\frac{20}{60}\times 360 = 120^0$ $\frac{5}{60}\times 360 = 30^0$ ***any two***



* Tolerance $\pm 5^0$.
* It is only necessary to calculate any two angles.
*Accept candidate's calculated angles in pie chart.

Blunders (-3)

B1 Mathematical error in calculating angle each time, unless consistent error.
B2 Each segment not drawn or incorrectly drawn (once or twice)
B3 No circle

Slips (-1)

S1 Arithmetic error in calculations

Attempts (6 marks)

A1 Circle drawn
A2 Draws bar chart, pictogram etc.
A3 Gets 5
A4 Mention of 360^0.

***Case*:** If no calculations/values for angles shown and Pie chart with **3** segments drawn

- 3 correct and correctly- labelled segments 2 ×B= 14m
- 1 or more of segments incorrect but appropriately labelled 3×B = 11m
- 3 correct segments but unlabelled or mislabelled 3×B = 11m
- 1 or more segments incorrect and unlabelled 4×B = 8m

QUESTION 4

Part(a)	**10 marks**	**Att 3**
Part(b)	**20 marks**	**Att 6**
Part(c)	**20 marks**	**Att 6**

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

(a) I set off for school at 07:54. It took me 45 minutes to get there. At what time did I arrive at school?

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

(a) 08:39

Blunders (-3)
B1 1hr = 100mins
Slips (-1)
S1 Subtracts (07:09)
S2 Numerical error

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

(b) A car travels 150km in 2.5 hours
(i) Find the average speed of the car in km/hr.
(ii) How far does the car travel in 5 hours at that speed?

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

(b) (i) $150 \div 2{\cdot}5 = 60$

Blunders (-3)
B1 Inverts fraction: (0.0166)
B2 Multiplies 150 by 2.5: (375)
Slips (-1)
S1 Error in calculations
S2 Misplaced decimal
S3 Correct answer with no work shown.
Misreadings (-1)
M1 2.5 hrs = 2hr 05min or 2hr 50min
Attempts (3 marks)
A1 Any mention of dist/time e.g. Triangle with D,T,S.
A2 0.0166 or 375 with no work
Worthless (0)
W1 150±2.5
W2 Incorrect answer with no work (other than A2)

(b)(ii) **10marks** **att 3**

(b) (ii) $60\times5 = 300$ *or* $^{5}/_{2.5} = 2$, $150 \times 2 = 300$

*Accept candidates answer from(i)
Blunders (-3)
B1 150 × 5 and continues.
B2 150÷2.5 = 60 and stops.
B3 60 ÷ 5 and continues
B4 5 ÷60 and continues.

Slips (-1)
S1 Incomplete calculations
S2 Numerical slip
S3 Decimal error
S3 Correct answer with no work shown
Attempts (3 marks)
A1 Any use of 5, 60, 150, 2
A2 Dist = speed × time and stops.
A3 Triangle with D,T,S correct in (i) would merit an attempt in(ii) and vice-versa.

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

(c) The radius of a circle is 3 cm.
(i) Write down the length of the diameter.
(ii) Find the length of the perimeter of the circle, taking $\pi = 3{\cdot}142$.

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

(c) (i) 6 cm

Blunders (-3)
B1 d = 9
Slips (-1)
S1 d = 1.5
S2 Numerical slip
S3 Misplaced decimal
Attempts (3 marks)
A1 d = 3

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

(c)(ii) L = πd =>3.142×6 = 18.852 *or* L = 2πr = 2 ×3.142× 3 = 18.852

*Accept candidate's "d" from (i)
* No penalty for using π button on calculator.(18.8495….)
* If other variations of π used then (S (-1)) i.e.
18·something (other than correct answer) *with work* 9 marks
18·something (other than correct answer) *without work* 6 marks
Blunders (-3)
B1 Incorrect relevant formula
B2 Correct answer with no work shown
B3 Incorrect substitution (once only)
Slips (-1)
S1 Numerical errors (once only)
S2 Misplaced decimal
Attempts (3 marks)
A1 π not used
A2 Indicates perimeter on diagram

QUESTION 5

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 6**
Part(c)	**20 marks**	**Att 6**

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

(a) Find the value of $3x + 2$ when $x = 4$

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

(a) $3(4) + 2 = 12 + 2 = 14$

Blunders (-3)
B1 Wrong operator used (once only)
B2 Association error e.g. 3(4+2) = 18
Slips (-1)
S1 Numerical error
S2 Correct answer with no work shown
Misreadings (-1)
M1 Error in copying down a component
Attempts (3 marks)
A1 $3x + 2 = 4$ and continues
Worthless (0)
W1 Incorrect answer with no work

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

(b) (i) Solve for x: $x + 5 = 12$

(ii) Solve for x: $3(x - 1) = 9$

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

(b) (i) $x = 12 - 5 = 7$

*Accept 7 + 5 = 12 (written) as correct work (full marks)
Blunders (-3)
B1 Transposition error (once only)
B2 $5x$
Slips (-1)
S1 Calculation error
S2 Correct answer with no work shown
Attempts (3 marks)
A1 Unsuccessful T + E
Worthless (0)
W1 Incorrect answer with no work shown.

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

(b) (ii) $3x - 3 = 9 \Rightarrow 3x = 9 + 3 = 12 \Rightarrow x = {}^{12}/_{3} = 4$
or $x - 1 = {}^{9}/_{3} = 3 \Rightarrow x = 3 + 1 = 4$

Blunders (-3)
B1 Distribution error
B2 Transposition error
B3 Ignores "3" and continues
Slips (-1)
S1 Errors in calculations
S2 Calculations not complete
S3 Correct answer with no work shown
Misreadings (-1)
M1 $3(x + 1)$ used
Attempts (3 marks)
A1 Any correct step e.g. $3x$
A2 Unsuccessful T+E
Worthless (0)
W1 Incorrect answer with no work shown.

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

(c) (i) Given that $y = 2x - 1$, complete the table below:

x	1	2	3	4
y			5	

(ii) Draw the graph of $y = 2x - 1$ from $x = 1$ to $x = 4$

(c) (i) **10 marks** **Att3**

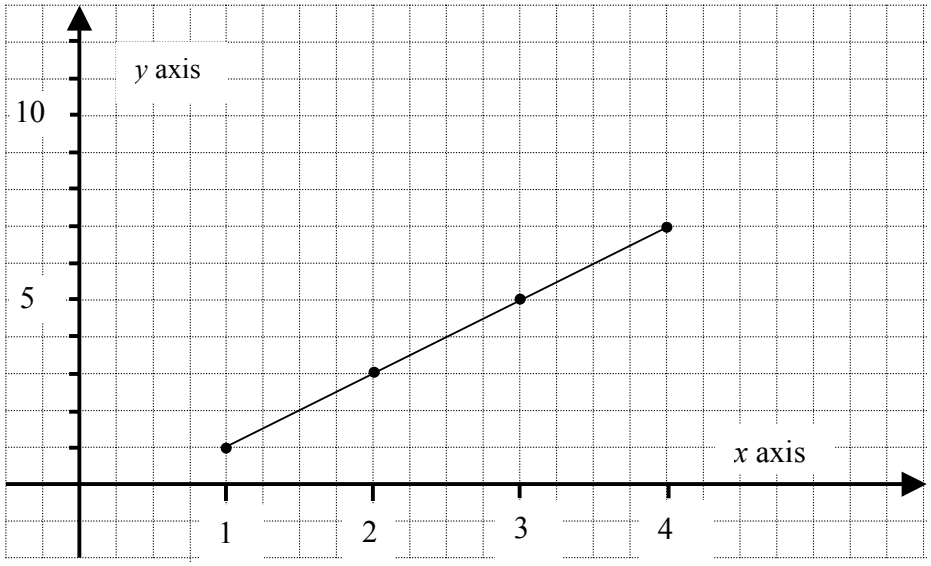
(c) (i) $2(1)-1 = 1$, $2(2)-1 = 3$, $2(4) - 1 = 7$

x	1	2	3	4
y	1	3	(5)	7

Blunders (-3)
B1 Does not multiply by 2 (once only)
B2 Each entry omitted.
B3 Each incorrect entry, if no work shown.
Slips (-1)
S1 Error in calculations (once only, if consistent error)
S2 Correct answers with no work shown.
S3 Adds in top line.
Misreadings (-1)
M1 Error in taking down question e.g. $2x + 1$
Attempts (3 marks)
A1 Any correct step A2 Table completed with spurious numbers

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

(c) (ii)



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* Accept candidate's figures from (i)
* Tolerance ±0.5cm (± a box on grid)
* If 4 correct points are correctly plotted and no marks were awarded for (i) , award att 3 marks retrospectively for (i)

Blunders (-3)

B1 Scale error if different graph/ squared paper used(once)

Slips (-1)

S1 Each incorrectly plotted point, subject to S2, or each omitted point.

S2 (*y,x*) consistently drawn, penalise once only.

S3 All points not joined.

Attempts (3 marks)

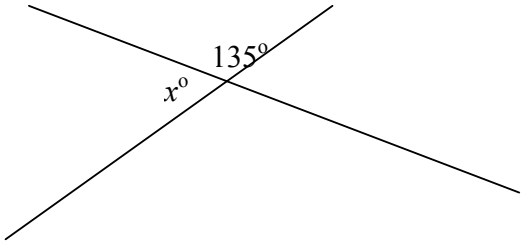
A1 Random (straight) line drawn.

QUESTION 6

Part (a)	**10 marks**	**Att 3**
Part (b)	**20 marks**	**Att 6**
Part (c)	**20 marks**	**Att 7**

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

(a)



$x =$

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

(a) $180^o - 135^o = 45^o$

Blunders (-3)

B1 360 – 135 *or* 135 – 90 and continues.

Slips (-1)

S1 Correct answer with no work shown.

S2 Calculation error

Case: Straight angle = 180^o written or identified on diagram: Award 6m

Attempts (3 marks)

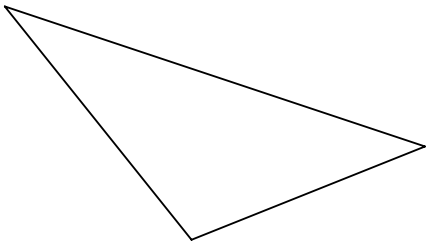
A1 Measures angle ($56^o \pm 5$ or $124^o \pm 5$)

A2 States vertically opposite angles are equal (or marks equal angles on diagram)

A3 180 or 360 written, with no work.

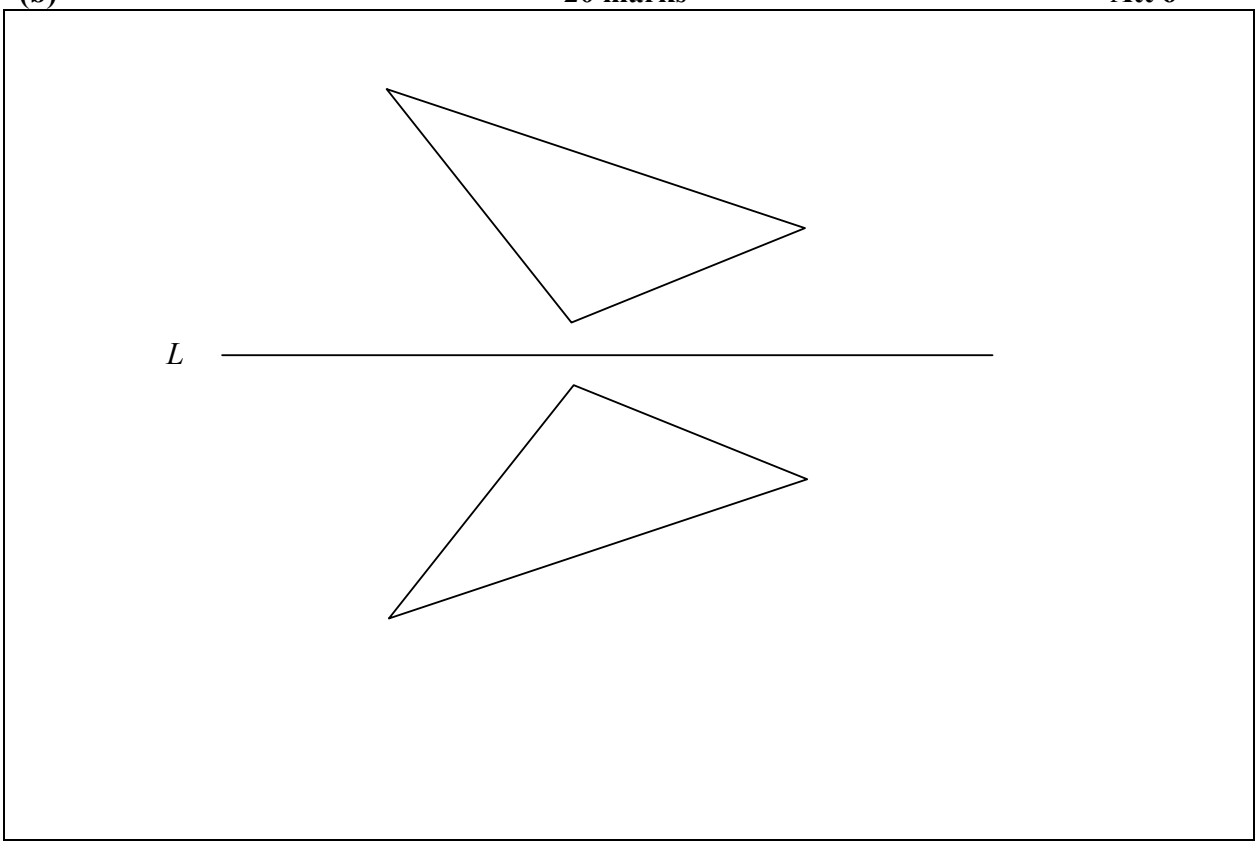
(b) **20 marks** **Att 6**

(b) Construct the image of the triangle under the axial symmetry in the line *L*.



L

(b) **20 marks** **Att 6**



***** Tolerance ±1.0cm

Blunders (-3)

B1 Incorrect transformation (correctly drawn)

B2 Vertices located but not joined.

Attempts (6 marks)

A1 Any triangle drawn

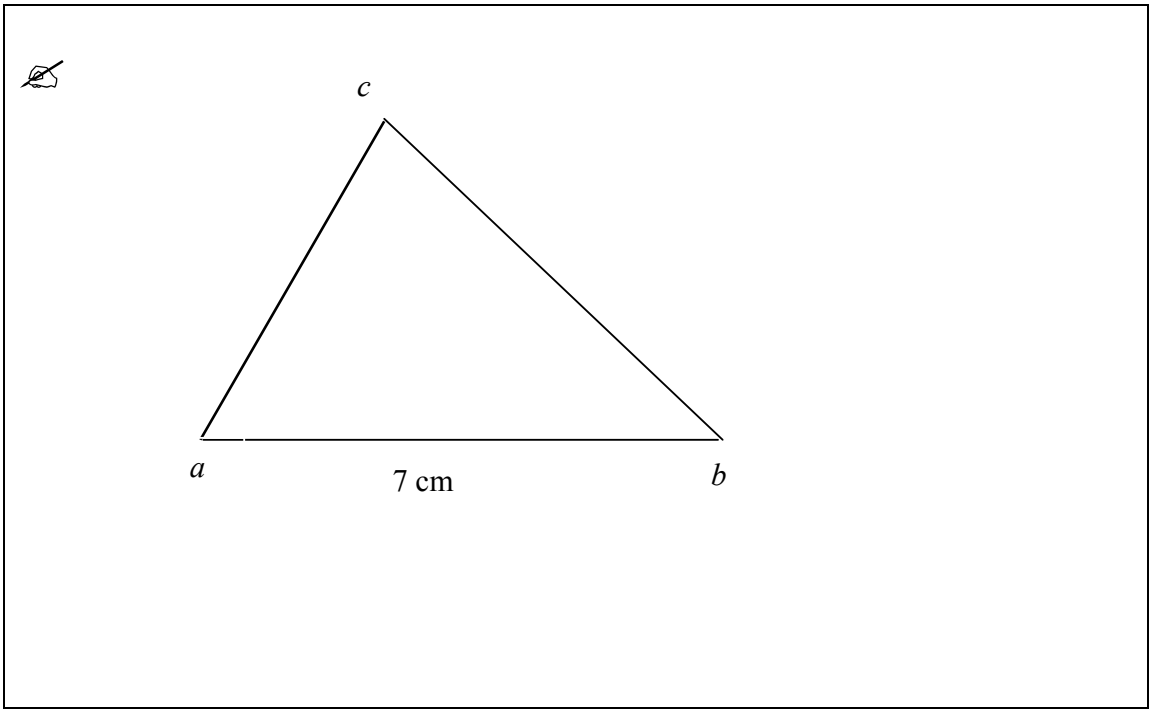
A2 Any effort at locating an image

Part (c) **20(15,5)** **Att (5,2)**

(c) **(i)** Construct the triangle *abc* with $|ab| = 7$ cm, $|ac| = 5$ cm and $|\angle bac| = 60^o$.

(ii) Measure the length of the side $[bc]$.

(c)(i) **15marks** **Att 5**



*Tolerance ± 0.5 cm, ±5º

Blunders (-3)

B1 Third line not drawn

Slips (-1)

S1 Measurements outside tolerance (angle *and/or* side)

S2 Uses inches (once only)

Misreadings (-1)

M1 60º at *b*

Attempts (5 marks)

A1 Any triangle, not on base [ab], drawn.

A2 Any reasonable addition to given line.

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

(c) (ii)	6.3cm

* Use candidate's diagram

*Tolerance ± 0.5cm

*Accept answer in mm.

Slips (-1)

S1 Incorrect side measured

S2 Measures an angle other than their < bac

Attempts (2 marks)

A1 Any relevant work.