



AN ROINN OIDEACHAIS  
AGUS EOLAÍOCHTA | DEPARTMENT OF  
EDUCATION  
AND SCIENCE

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*Scrúduithe Ardteistiméireachta, 2001*

*Matamaitic*

*Bonnleibhéal*

*Marking Scheme*

*Leaving Certificate Examination, .2001*

*Mathematics*

*Foundation Level*

# An Roinn Oideachais Agus Eolaíochta

## MARKING SCHEME

### LEAVING CERTIFICATE EXAMINATION 2001

#### *MATHEMATICS - FOUNDATION LEVEL*

#### PAPER 1

#### **General Instructions:**

##### *1. Penalties:*

- (a) Numerical slips, e.g.  $4 \times 8 = 36$ : (-1)
- (b) Misreadings (if not serious): (-1)
- (c) Mathematical blunders, omissions: (-3)
- (d) Serious blunders or omissions may result in the loss of all marks for a particular section or may result in the attempt mark being awarded.
- (e) Do not penalise for the same error twice in the same section of a question.

##### *2. Marking Scripts:*

- (a) Mark scripts in red or a colour not used by the candidate.
- (b) Mark deductions as (-1) or (-3) on the script where they occur.
- (c) Show section marks in the right hand margin.
- (d) Indicate attempt marks on the right hand margin as Att 4, for example.
- (e) Show total marks awarded for each question on the left hand margin near the start of the question and ring the mark.
- (f) Worthless or irrelevant work must be marked 0.
- (g) Scrutinise all pages and indicate by marking pages.
- (h) Mark all questions, including cancelled questions.
- (i) Where a candidate offers two or more attempts for a section of a question award the marks for the best attempt.

##### *3. Attempt Mark:*

- (a) If deductions result in a mark which is lower than the attempt mark, award the attempt mark.
- (b) The attempt mark for a section is the final mark for that section and so a mark between 0 and the attempt mark may not be awarded.
- (c) Attempt marks must be awarded for any relevant work.
- (d) Particular cases or verifications qualify for an attempt mark in general.

## QUESTION 1

**Each part**

**10 marks**

**Att 4**

**Part (i)**

**10 marks**

**Att 4**

(i) Find  $\sqrt{42}$ , correct to one decimal place.

$$\sqrt{42} = 6.48 = \mathbf{6.5}$$

*Blunders (-3)*

B1: Square root mistaken for square (Ans. 1764)

B2: Square root mistaken for half (Ans. 21)

*Slips (-1)*

S1: If  $42\sqrt{42} = 272.19$

S2: Incorrect or omitted round-off

S3: Misplacing decimal point

*Misreadings (-1)*

M1:  $\sqrt{4.2} = 2.04$

M2:  $\sqrt{0.42} = 0.64$

M3:  $\sqrt{420} = 20.49$

M4: Misreading line in Tables e.g.  $\sqrt{41} = 6.403$  or  $\sqrt{43} = 6.557$

*Attempts*

Att: Writes  $42^2$  and stops

Att: Writes  $42/2$  and stops

Att: Writes  $42 \times 2$  and stops

Att: Work at estimating answer

(ii) Find  $(2.05)^4$ , correct to three significant figures.

$$(2.05)^4 = 17.66 = 17.7$$

*Blunders (-3)*

B1: Calculates  $(2.05)4$ ; (Ans. 8.2)

B2: Calculates  $(2.05)/4$ ; (Ans. 0.5125)

B3: Fourth root calculated instead of power of 4; (Ans. 1.196)

B4: Interprets  $(2.05)^4$  as  $2.05 \times 10^4$ ; (Ans. 20500)

B5: Calculates  $(2.05)^2$ ; (Ans. 4.2025)

*Slips (-1)*

S1: Incorrect or omitted round-off

S2: Misplacing decimal point

*Misreadings (-1)*

M1: Power other than 4 or 2 worked

*Attempts*

Att: Writes  $(2.05)4$  and stops

Att: Writes  $2.05/4$  and stops

Att: Writes  $2.05 \times 10^4$  and stops

**Part (iii)**

**10 marks**

**Att 4**

**(iii)** Find  $2.36 + 3.24 \times 5.82$ , correct to the nearest whole number.

$$2.36 + 3.24 \times 5.82 = 2.36 + 18.8568 = 21.2168 = \mathbf{21}$$

*Blunders (-3)*

B1: Blunders in precedence e.g.  $5.6 \times 5.82 = 32.592$  or  $2.36 \times 5.82 + 3.24 = 16.9752$

B2: Any step omitted

*Slips (-1)*

S1: Misplacing the decimal point, each time

S2: Incorrect or omitted round-off

*Misreadings (-1)*

M1: Misplaced digits or misread numbers, each time

M2: Misreads + for  $\times$  or  $\times$  for +, each time

*Attempts*

Att: Work towards some correct step e.g. long multiplication begun.

Att: Work at estimating answer e.g.  $2 + 3 \times 6 = 20$

Note:  $2.36 + 3.24 + 5.82 = 11.42$

$2.36 \times 3.24 \times 5.82 = 44.502048$

$2.36 \times 3.24 + 5.82 = 13.4664$

(iv) Find the value of  $\frac{1}{(0.1)^2} - \frac{1}{0.25}$ .

$$\frac{1}{(0.1)^2} - \frac{1}{0.25} = \frac{1}{0.01} - 4 = 100 - 4 = \mathbf{96}$$

or

$$\frac{1}{(0.1)^2} - \frac{1}{0.25} = \frac{1}{0.01} - \frac{1}{0.25} = \frac{0.25 - 0.01}{0.01 \times 0.25} = \frac{0.24}{0.0025} = \mathbf{96}$$

*Blunders (-3)*

B1: Omits square – calculates  $10 - 4 = 6$

B2: Blunder in calculating fraction

B3: Each omitted or incorrect step

*Slips (-1)*

S1: Misplacing decimal point, e.g.  $1/.25 = 40$ , each time

S2: Answer given is  $-96$

S3: Slips in subtraction

*Misreadings (-1)*

M1: If  $1/0.025 = 40$

*Attempts*

Att: Writes  $(1/0.25) \times 100$  and stops

Att: Writes  $1 - 0.1 = 0.9$

- (v) A person earns IR£254 a week.  
PRSI is paid at the rate of 2% on the first IR£100 and at 6% on the remaining IR£154.  
How much PRSI does the person pay in a week?

$$\begin{aligned} \text{IR£}100 \times 0.02 &= \text{IR£}2.00 \\ \text{IR£}154 \times 0.06 &= \text{IR£}9.24 \\ \text{Total PRSI is IR£}2.00 + \text{IR£}9.24 &= \text{IR£}11.24 \end{aligned}$$

*Blunders (-3)*

- B1: Blunder in converting percentage to decimal;  $2\% \neq 0.02$   
B2: Calculates 2% of IR£254 or IR£154 (Ans. IR£5.08, IR£3.08)  
B3: Calculates 6% of IR£254 or IR£100 (Ans. IR£15.24 or IR£6)  
B4: Calculates 8% of IR£254 (Ans. IR£20.32)  
B5: One percentage not calculated

*Slips (-1)*

- S1: Misplaced decimal point in calculating  
S2: Does not add two amounts  
S3: Numerical slips in calculation

*Misreadings (-1)*

- M1: Misreading of digits, each time

*Attempts*

- Att: Answer given is  $100/2$  or  $154/6$  and stops (Ans. 50 or 25.66)  
Att: Calculates 1% or writes  $2/100$  without working  
Att: Effort at calculating a percentage of IR£354 or IR£408 or IR£508

(vi) Find  $\frac{5}{8} + \frac{3}{7}$ , correct to two decimal places.

$$\frac{5}{8} + \frac{3}{7} = 0.625 + 0.428 = 1.053 = \mathbf{1.05}$$

or

$$\frac{5}{8} + \frac{3}{7} = \frac{35 + 24}{8 \times 7} = \frac{59}{56} = 1.053 = \mathbf{1.05}$$

*Blunders (-3)*

B1: Calculates  $8/15$  (Ans. 0.53333)

B2: Calculates  $12/24$  or  $24/12$  (Ans. 0.5 or Ans. 2)

B3: Calculates  $5/15$  or  $3/15$  (Ans. 0.333 or 0.2)

B4: Calculates  $8/8$  or  $8/7$  (Ans. 1 or 1.1428)

B5: Each step of three omitted

B6: Inverting fraction e.g.  $56/59 = 0.949$

*Slips (-1)*

S1: Incorrect or omitted round-off e.g.  $0.63 + 0.43 = 1.06$

*Misreadings (-1)*

M1: Reads  $\times$  for  $+$  (Ans.  $15/56 = 0.2678$ )

*Attempts*

Att: Writes  $8/15$  or  $53/87$  without further work

Att: Answer  $35/24$  or  $35/8$  or  $24/7$  or inverted

Att: Effort at "cross-multiplication"

Att:  $5/8 + 3/7 \Rightarrow 5/8 = 3/7 \Rightarrow 35 = 24 \Rightarrow 35 + 24$

Att: Answer of 0.56 without work shown (other combinations worthless)



(vii) The price of a video is IR£12.85. The price is reduced by 15%.  
Find, correct to the nearest penny, the new price.

$$\text{IR£}12.85 \times 0.85 = \text{IR£}10.9225 = \mathbf{\text{IR£}10.92.}$$

or

$$\text{IR£}12.85 \times 0.15 = \text{IR£}1.9275 = \text{IR£}1.93$$

$$\text{IR£}12.85 - \text{IR£}1.93 = \mathbf{\text{IR£}10.92.}$$

*Blunders (-3)*

B1: Blunder in converting percentage to decimal e.g. 15%  $\neq$  0.15

B2: 12.85  $\times$  0.15 not worked

B3: 12.85  $\times$  0.85 not worked

B4: Sets 12.85 = 115% and calculates 15% (Ans. 1.676)

B5: Sets 12.85 = 85% and calculates 100% (Ans. 15.117)

B6: Writes (12.85/15)100 (Ans. 85.66)

*Slips (-1)*

S1: Omitted or incorrect round-off

S2: Misplacing decimal point in calculating

S3: Does not subtract the 15%

*Misreadings (-1)*

M1: Misreading of digits in number

M2: Correct calculation of incorrect percentage

M3: Calculates 115% (Ans. 14.7775)

*Attempts*

Att: Answer given is 12.85/15 and stops

Att: 12.85  $\pm$  15 = 27.85 or -2.15 or 12.85  $\pm$  0.15 = 13 or 12.7

Att: Calculates 1% or writes 15/100 without working

(viii) Find, correct to the nearest euro, the value of £300 sterling given that IR£1 = £0.72 sterling and 1 euro = IR£0.787564.

$$\text{£300 sterling} = \frac{300}{0.72} = \text{IR£416.666}$$

$$\text{IR£416.666} = \frac{416.666}{0.787564} = 529.057 = \mathbf{529 \text{ euro}}$$

*Blunders (-3)*

B1: Calculates  $300 \times 0.72$  (Ans. 216)

B2: Calculates  $416.66$  (or equivalent)  $\times 0.787564$  (Ans. 328.15)

B3: One conversion omitted e.g.  $300/0.787564$  (Ans. 380.92)

B4: Calculates sterling euro exchange ( $0.72 \times 0.787564 = 0.56704608$ ) but does not apply to £300

*Slips (-1)*

S1: Omitted or incorrect round-off

S2: Misplacing decimal point, each time

*Attempts*

Att: Effort at getting equivalence between sterling and euro.

Att: Effort at a currency conversion involving  $\times$  or  $\div$

(ix) Find the value of

$$\frac{(5.14 \times 10^3) + (3.1 \times 10^4)}{(2.6 \times 10^{-2})}$$

$$\frac{(5.14 \times 10^3) + (3.1 \times 10^4)}{(2.6 \times 10^{-2})} = \frac{(0.514 \times 10^4) + (3.1 \times 10^4)}{(2.6 \times 10^{-2})} = \frac{(3.614 \times 10^4)}{(2.6 \times 10^{-2})}$$

$$= 1.39 \times 10^6$$

or

$$\frac{5140 + 31000}{0.026} = \frac{36140}{0.026} = 1\,390\,000$$

#### Blunders (-3)

- B1: Blunders in dealing with scientific notation
- B2: Blunders in order of precedence
- B3: Each omitted or incorrect step, if slips not clear
- B4: Blunder  $5.14 \times 30$ , once only
- B5: Fraction inverted (Ans.  $7.19 \times 10^{-7}$ )

#### Slips (-1)

- S1: Any number incorrect by factor of 10 when written in decimal form.
- S2: Treats  $2.6 \times 10^{-2} = 260$  (Ans. 139)
- S3: Slip in order of magnitude of final answer from correct fraction

#### Attempts

Att: Some correct step, e.g. approximation with correct order of magnitude

Att:  $\frac{(5.14 \times 10^3)}{(2.6 \times 10^{-2})}$ , worked

Att:  $\frac{5.14 + 3.1}{2.6} = 3.1692$

(x) Find, correct to three significant figures, the value of

$$\frac{(27.9 - 5.67)}{(0.48 \times 10.8)}$$

$$\frac{(27.9 - 5.67)}{(0.48 \times 10.8)} = \frac{22.23}{5.184} = 4.288 = \mathbf{4.29}$$

*Blunders (-3)*

B1: Blunders in order of precedence

B2: Each omitted or incorrect step if slips not clear

B3: Fraction inverted (Ans. 0.23319838)

*Slips (-1)*

S1: Omitted or incorrect roundoff

S2: Numerical slips, including misplacing decimal point

*Misreading (-1)*

M1: Uses + instead of  $\times$ .

*Attempt*

Att: Some correct step

Att: Work at estimating answer

*Note:*  $((27.9 - 5.67) \div 0.48) \times 10.8 = 500.175$   
 $(27.9 - (5.67 \div 0.48)) \times 10.8 = 173.745$   
 $(27.9 \div 0.48) - (5.67 \div 10.8) = 57.6$   
 $(27.9 \div 0.48) \times (5.67 \div 10.8) = 30.515625$   
 $(27.9 - (5.67 \div 10.8)) \div 0.48 = 57.03125$



**Part (b)**

**25 (15 + 10) marks**

**Att 10 (6 + 4)**

(b) John normally works a 38 hour week. He is paid IR£6.40 for each hour worked.

(i) Calculate John's gross income for a 38 hour week.

(ii) The overtime rate is 2 times IR£6.40. This is paid for each hour worked over the 38 hours.

Calculate John's gross income for a 46 hour week.

(i)  $\text{IR}\pounds 6.40 \times 38 = \text{IR}\pounds 243.20$

(ii) Overtime worked is  $46 - 38 = 8$  hours

Overtime pay is  $\text{IR}\pounds 6.40 \times 2 \times 8 = \text{IR}\pounds 102.40$

Gross income is  $\text{IR}\pounds 243.20 + \text{IR}\pounds 102.40 = \text{IR}\pounds 345.60$

Apply maximum of three slips if long multiplication used.

*Section (i):*

*Blunders (-3)*

B1: Writes  $6.40 \times 38$  and stops

B2: Works  $6 \times 38$  or  $7 \times 38$  (Ans. 228 or 266)

*Slips (-1)*

S1: Misplacing decimal point

*Attempts*

Att:  $38 \pm 6.40$ , worked

*Section (ii):*

*Blunders (-3)*

B1: Incorrect calculation of number of hours of overtime

B2: Calculates  $46 \times 6.40$  (Ans. 294.40)

B3: Calculates  $46 \times 6.40 \times 2$  (Ans. 588.8)

B4: Each omitted or incorrect step

*Slips (-1)*

S1: Omits addition of  $\text{IR}\pounds 243.20 + \text{IR}\pounds 102.40$

*Attempts*

Att: Multiply  $6.40 \times 2$

**Part (c)****15 (5 + 5 + 5) marks****Att 6(2 + 2 + 2)**

- (c) Síle and Seán share a prize fund of IR£770.  
 For each IR£2 Seán gets, Síle gets IR£5.  
 How much money does Seán get?

If, instead, the prize fund of IR£770 is shared in the following way:  
 for each IR£4 Seán gets, Síle gets IR£7,  
 how much extra does Seán then get?  
 Express the extra amount Seán gets as a percentage of IR£770.  
 Give your answer correct to one decimal place.

$$\text{Ratio } 2 : 5 \qquad \text{Seán gets } \frac{2}{7}(770) = \mathbf{IR£220}$$

$$\text{New ratio } 4 : 7 \qquad \text{Seán gets } \frac{4}{11}(770) = \mathbf{IR£280}$$

$$\text{Extra amount is } \mathbf{IR£280 - IR£220 = IR£60}$$

$$\text{Percentage is } \frac{60}{770} \times 100 = 7.79 = \mathbf{7.8\%}$$

*Blunders (-3)*

B1: Uses incorrect ratio e.g.  $2/5(770)$  or  $5/2(770)$  (Ans. 308 or 1925)

B2: Calculates  $1/7$  as Seán's amount

B3: Gives Seán's amount as  $220 \times 2$  for second ratio

B4: Blunder in setting up percentage e.g.  $(770 \times 60)/100$

B5: Calculates percentage of wrong amount

*Slips (-1)*

S1: Calculates how much Síle gets

S2: Numerical slips in calculation

S3: Calculates IR£280 as percentage of IR£770

S4: Slip in or omission of subtraction to get IR£60

S5: Incorrect or omitted round-off

*Attempts*

Att: Effort at establishing ratio

Att: Writes 7 and no other work

Att: Calculates  $770/2$

Att: Effort at setting up percentage

### QUESTION 3

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

**Part (a)** **10 (5 + 5) marks** **Att 4 (2 + 2)**

- (a) The depth of a swimming pool was estimated to be 1.65 m.  
The true depth was 1.5 m.  
Find (i) the error  
(ii) the percentage error.

(i) Error =  $1.65 - 1.5 = 0.15$

(ii) Percentage error =  $(0.15/1.5) \times 100 = 10\%$

#### *Blunders (-3)*

B1: Blunders in percentages e.g.  $1.5/0.15$  (Ans. 10)

B2: Divides by 1.65 (Ans. 9.090)

B3: Takes  $1.65 + 1.5$  (Ans. 3.15)

#### *Slips (-1)*

S1: Writes  $(1.65/1.5) \times 100 = 110\%$

#### *Attempts*

Att: Writes  $1.65/1.5$  and stops (Ans. 1.1)

Att: Writes  $1.5/1.65$  and stops (Ans. 0.9090)

Att: Writes  $1.5 \times 1.65$  and stops (Ans. 2.475)

Att: Writes  $100/1.65$  (Ans. 60.606)

Att: Writes  $1.5 \times 100$  or  $1.5/100$  or  $100/1.5$  (Ans. 66.66)

Att: Mean of 1.5 and 1.65 found (Ans. 1.575)

Att: 0.15% of 1.5 (Ans. 0.00225)

Att: 0.15% of 1.65 (Ans. 0.002475)



- (b) IR£1500 was invested for 3 years at the rate of 4% per annum compound interest.  
Calculate the amount at the end of the 3 years.  
Give your answer correct to the nearest IR£.

$$A = \text{IR£}1500(1 + 0.04)^3 = \text{IR£}1500(1.04)^3 = \text{IR£}1500(1.124864) \\ = \text{IR£}1687.296 = \text{IR£}1687$$

or

Year 1: Principal	IR£1500,	Interest	IR£60
Year 2: Principal	IR£1560,	Interest	IR£62.40
Year 3: Principal	IR£1622.40,	Interest	IR£64.896
Amount after 3 years			IR£1687.296 = <b>IR£1687</b>

#### *Blunders (-3)*

- B1: 4% incorrectly converted to decimal  
 B2: Blunder in formula as written by student or incorrect formula  
 B3: Blunder in substituting into formula  
 B4: Takes  $(1.04)^3 = (1.04)3 = 3.12$   
 B5: Takes  $(1.04)^3 = 1.04/3 = 0.346$   
 B6: Writes  $1500/(1.04)^3$  (Ans. 1333.49)  
 B7: Writes  $1500/(0.96)^3$  (Ans. 1695.42)  
 B8: Writes  $1500 \times (0.96)^3$  (Ans. 1327.10)  
 B9: Each step omitted or incorrect

#### *Slips (-1)*

- S1: Incorrect or omitted roundoff  
 S2: Numerical slips in calculation

#### *Misreadings (-1)*

- M1:  $(1.04)^n$ ,  $n = 2$  or  $n \geq 4$  used in formula

#### *Attempts*

- Att:  $1500 \div 4 = 375$   
 Att:  $1500 \times 4 = 6000$   
 Att:  $1500 \div 0.04 = 37500$   
 Att: Interest not compounded (Ans. 1680)

**Part (c)**

**20 (10 + 10) marks**

**Att 8 (4 + 4)**

- (c) Mary started a journey of 90 km by car at 10:40.  
She arrived at her destination at 12:10.
- (i) Calculate the average speed for the journey, in km/hr.
- (ii) If the average speed for the first 35 km of the journey was 84 km/hr, how long, in hours and minutes, did it take to complete the remainder of the journey?

- (i) Time is  $12:10 - 10:40 = 1:30$   
Average speed =  $90/1.5 = \mathbf{60 \text{ km/hr}}$
- (ii) Time is  $\frac{35}{84} \times 60 = 25$  minutes  
Time for remainder is 1 hour 30 minutes – 25 minutes = **1 hour 5 minutes**

*Blunders (-3)*

B1: Blunder in calculating time

B2: Incorrect conversion of hours and minutes e.g.  $90/1.3$  (Ans. 69.23)

B3: Blunder in formula for speed

B4: Blunder in formula for time

B5: Calculates time for first part of journey but does not subtract.

B6: Answer given as 1.0833 hours

*Slips (-1)*

S1: Early round-off of decimal

S2: Answer given in minutes only

*Attempts*

Att: Effort at calculating time of journey

Att: Effort at calculating a speed or time

## QUESTION 4

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

<b>Part (a)</b>	<b>10 marks</b>	<b>Att 4</b>
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(a) Solve for  $x$

$$5x + 3 = 17 - 2x.$$

$$5x + 3 = 17 - 2x \Rightarrow 5x + 2x = 17 - 3 \Rightarrow 7x = 14 \Rightarrow x = 2$$

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

*Blunders (-3)*

B1: Blunders in grouping terms e.g.  $5x + 3 = 8x$

B2: Each step omitted.

B3:  $7x = 14 \Rightarrow x = 7$  or  $x = 21$  or  $x = 98$

*Slips (-1)*

S1: Slips in signs on crossing "=", each time

*Attempts*

Att: Some correct step towards solution

Att: Stops after one transposition

Att: Effort at trial and error, by substitution

**Part (b)****20 (15 + 5) marks****Att 8 (6 + 2)****(b)** Solve the simultaneous equations

$$\begin{aligned} 2x - y &= 8 \\ x + 3y &= 11. \end{aligned}$$

$$\begin{aligned} 2x - y &= 8 & \Rightarrow & 6x - 3y = 24 \\ x + 3y &= 11 & \Rightarrow & \frac{x + 3y = 11}{7x} = 35 & \Rightarrow & x = 5 \\ x + 3y &= 11 & \Rightarrow & 5 + 3y = 11 & \Rightarrow & 3y = 6 & \Rightarrow & y = 2 \end{aligned}$$

*First variable found: 15 marks, att 6; Second variable found: 5 marks, att 2*

*Blunders (-3)*

B1: Blunder in multiplying equation by 3, once only

B2: Blunder in cancelling, once

B3: Blunder in substituting e.g. y value for x.

B4:  $7x = 35 \Rightarrow x = 28$  or  $x = 42$  or  $x = 245$ *Slips (-1)*

S1: Slips in signs

*Attempts - Att 8*

Attempt at finding a solution by trial and error

*Attempts - First variable - Att 6*

Att: Effort at equalising coefficients of x's or y's

Att: Effort at cancelling one variable.

Att: Picks a random x value and substitutes to find y (Note: also earns marks for y)

*Attempts - Second variable - Att 2*

Att: Effort at substituting first variable

Att: Effort at cancelling second variable

*Worthless (0)*

W1: Incorrect answers, no work shown

**Part (c)**

**20 (10 + 10) marks**

**Att 8 (4 + 4)**

- (c) Anne is  $x$  years of age. Paul is 6 years older than Anne.  
The sum of their ages is 16 years.

Write this information as an equation in  $x$ .  
Hence, solve for  $x$ .

Anne's age  $x$   
Paul's age  $x + 6$   
 **$x + x + 6 = 16$**

$$x + x + 6 = 16 \Rightarrow 2x = 16 - 6 \Rightarrow 2x = 10 \Rightarrow x = 5$$

There must be an effort to set up equation in  $x$ , including 6 or 16, for the award of any of the first 10 marks.

For award of marks for solving – use student's equation.

*Blunders (-3)*

B1: Blunder in setting up equation e.g.  $6x$  for  $x + 6$

B2: Each omitted step of three steps,  $x$ ,  $x + 6$ ,  $x + x + 6 = 16$

*Slips (-1)*

S1: Slips in signs

*Attempts*

Att: Set-up: Writes  $x + 6$  or  $6x$  and stops

Att: Effort at trial and error

## QUESTION 5

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

**Part (a)** **10 (5 + 5) marks** **Att 4(2 + 2)**

- (a) List all the prime numbers which are less than 10.  
Write 10 as the sum of two prime numbers.

2, 3, 5, 7  
 $3 + 7 = 10$  or  $5 + 5 = 10$

Allow pupil's numbers for sum to 10

*Slips (-1)*

S1: Each omitted or incorrect prime number

*Attempts*

Att: Any one correct value

Att: Gives attempt at definition of prime number without examples

Att: Gives sum of prime numbers

Att: Gives any two numbers which sum to 10

(b) Solve the quadratic equation

$$5x^2 + 8x - 6 = 0.$$

Give your answers correct to two places of decimals.

$$5x^2 + 8x - 6 = 0 \Rightarrow x = \frac{-8 \pm \sqrt{64 - 4(5)(-6)}}{2(5)} = \frac{-8 \pm \sqrt{64 + 120}}{10} = \frac{-8 \pm \sqrt{184}}{10}$$

\*

$$\Rightarrow x = \frac{-8 \pm 13.564}{10} = \frac{5.564}{10} \text{ or } \frac{-21.564}{10} \Rightarrow x = 0.5564 \text{ or } -2.1564$$

$$\Rightarrow x = \mathbf{0.56 \text{ or } -2.16}$$

\* The maximum deductions for errors or omissions beyond this point is 7 marks.

#### *Blunders (-3)*

B1: Incorrect choice of variables  $a$ ,  $b$ ,  $c$  applied once

B2: Incorrect substitution into formula

B3: Blunder in application of formula

B4: Omits  $\pm$  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

#### *Attempts*

Att: Effort at substitution into formula

Att: Incorrect formula with substitution

Att: Attempt at finding factors  $(5x \quad)(x \quad)$

Att: If quadratic element eliminated (e.g.  $10x + 8x - 6 = 0$ ) and attempts to solve.

**Part (c)**

**20 (10 + 5 + 5)marks**

**Att 8 (4 + 2 + 2)**

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

- (i)  $4x + 1 \leq 17 \Rightarrow 4x \leq 16 \Rightarrow x \leq 4$   
(ii)  $1 - 3x \leq -2 \Rightarrow -3x \leq -3 \Rightarrow x \geq 1$   
(iii) **{1, 2, 3, 4}**

If equality used in parts (i) and (ii), no marks can be awarded for part (iii).  
If equality used in parts (i) or (ii), award attempt mark at most for part (iii).

*Blunders (-3)*

B1: Blunder in grouping terms e.g.  $4x + 1 = 5x$

B2: Blunder in direction of inequality when multiplying by “minus” in (ii)

B3: Blunder in transposing e.g.  $4x + 1 \leq 17 \Rightarrow 4x \leq 17/1$

B4: Replaces inequality sign with equality sign, applied once

*Slips (-1)*

S1: Slips in signs on crossing inequality, each time

S2: Each value omitted in (iii)

S3: Each value outside range

*Misreading (-1)*

M1: Misreading direction of inequality

M2: Uses  $<$  for  $\leq$

*Attempts*

Att4: Some effort at rearranging terms

Att4: Substitutes in a value - trial and error

Att2: Any correct value listed in (iii)

*Worthless (0)*

W1: Incorrect answers, no work shown



## QUESTION 6

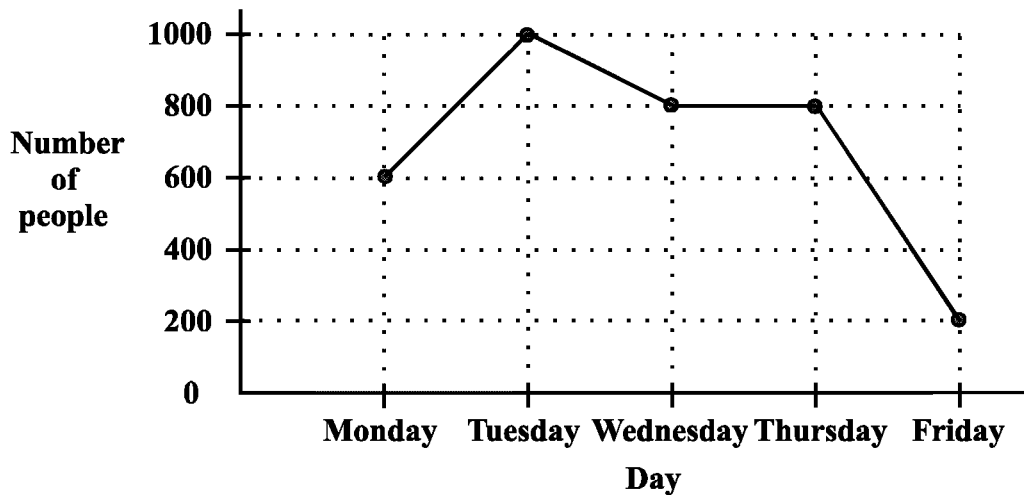
<b>Part (i)</b>	<b>10 marks</b>	<b>Att 4</b>
<b>Part (ii)</b>	<b>10 marks</b>	<b>Att 4</b>
<b>Part (iii)</b>	<b>10 marks</b>	<b>Att 4</b>
<b>Part (iv)</b>	<b>10 marks</b>	<b>Att 4</b>
<b>Part (v)</b>	<b>10 marks</b>	<b>Att 4</b>

The graph below shows the number of people who visited an art museum on each of the days Monday to Friday inclusive.

The number of people is shown on the vertical axis.

The day is shown on the horizontal axis.

For example, on Monday, the number of people who visited the museum was 600.



<b>Part (i)</b>	<b>10 marks</b>	<b>Att 4</b>
-----------------	-----------------	--------------

(i) On which day did the largest number of people visit the museum?

**Tuesday**

*Blunders(-3)*

B1: Answer is Friday

*Worthless (0)*

W1: Answer given is Monday, Wednesday or Thursday

**Part (ii)**

**10 marks**

**Att 4**

**(ii)** What was the increase in the number of people who visited the museum between Monday and Tuesday?

$$1000 - 600 = 400$$

*Blunders(-3)*

B1: Answer is 1000 or 600

B2: Answer is 2 (intervals on graph)

*Slips (-1)*

S1: Answer is 1600

S2: Values not subtracted

*Attempts*

Att: Effort at reading some increase

**Part (iii)**

**10 marks**

**Att 4**

**(iii)** On which days was the number of people who visited the museum the same?

**Wednesday and Thursday**

*Blunders (-3)*

B1: Only one correct day given

B2: Each incorrect day given

*Attempts*

Att: Lists all days

*Worthless (0)*

W1: Any answer not including Wednesday or Thursday

**Part (iv)**

**10 marks**

**Att 4**

(iv) Find the decrease in the number of people who visited the museum between Thursday and Friday.

$$800 - 200 = \mathbf{600}$$

*Blunders (-3)*

B1: Answer given is 400

B2: One correct value given

B3: Answer is 3 (intervals on graph)

*Slips (-1)*

S1: Does not subtract but gives the two values

*Attempts*

Att: Effort at reading some decrease

**Part (v)**

**10 marks**

**Att 4**

(v) Calculate the average number of people who visited the museum per day over the five days.

$$\frac{600 + 1000 + 800 + 800 + 200}{5} = \frac{3400}{5} = \mathbf{680}$$

*Blunders (-3)*

B1: Division by incorrect number using student's values

B2: Incorrect formula for average

B3: Each value omitted

*Slips (-1)*

S1: Numerical slips

S2: Incorrect reading from graph each time

*Attempts*

Att: Indication that student knows how to find average

## QUESTION 7

<b>Graph</b>	<b>30 marks</b>	<b>Att 12</b>
<b>Values</b>	<b>20 marks</b>	<b>Att 8</b>

<b>Table</b>	<b>20 marks</b>	<b>Att 8</b>
<b>Graph</b>	<b>10 marks</b>	<b>Att 4</b>

Draw the graph of the function

$$f: x \rightarrow 2x^2 + 3x - 1 \quad \text{for } -3 \leq x \leq 2, x \in \mathbf{R}$$

*Blunders (-3)*

B1: Additional line in table

B2: Blunder such as  $2x^2 = (2x)^2$  or  $4x$  or  $-1 = x - 1$  or  $1 = x$  consistently across full line  
Otherwise (-1) applied to each incorrect value in the line

*Slips (-1):*

S1: Each incorrect or omitted value in body of table.

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

*Misreadings (-1):*

M1: Uses +1 instead of -1 consistently, otherwise penalise each incorrect value

*Attempts:*

Att: Any four correct calculated values in the table

### **Plotting Graph:**

Use pupils values in table for plotting points

*Blunders (-3)*

B1: Not all points joined

B2: Points joined in incorrect order

B3: Blunders in scales

B4: Points joined by line segments

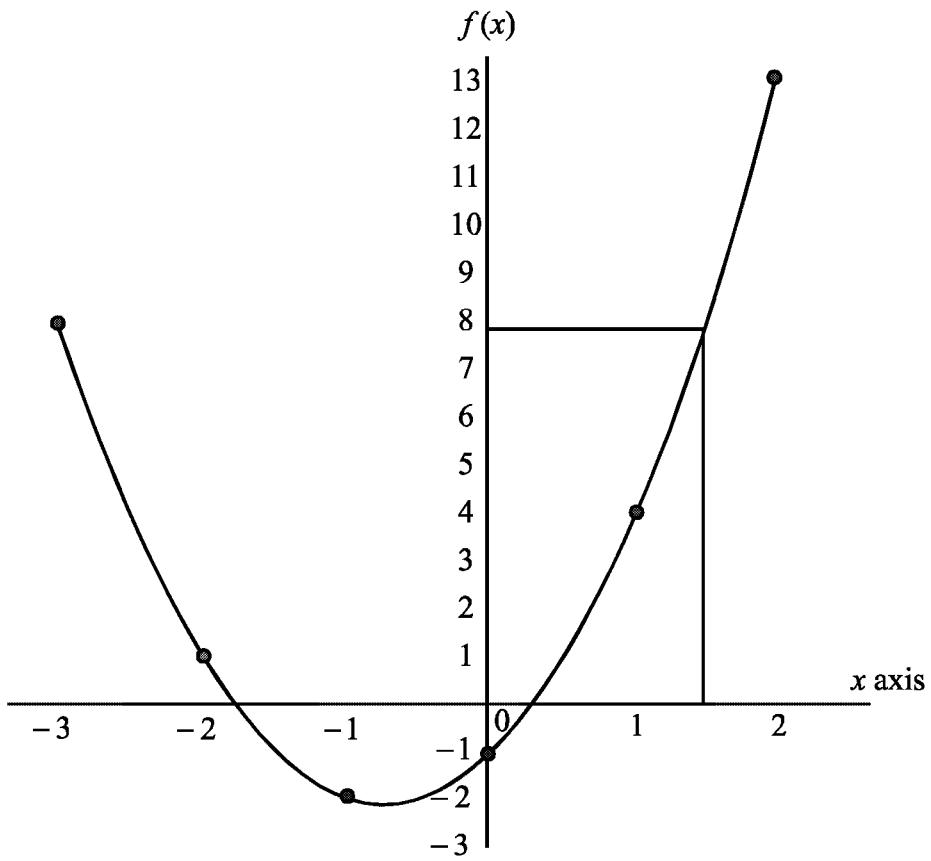
*Slips (-1):*

S1: Each point plotted incorrectly, using students values.

*Attempts:*

Att: Any two of students points plotted

$x$	-3	-2	-1	0	1	2
$2x^2$	18	8	2	0	2	8
$+3x$	-9	-6	-3	0	3	6
$-1$	-1	-1	-1	-1	-1	-1
$f(x)$	8	1	-2	-1	4	13



Values

20 (5 + 5 + 5 + 5) marks

Att 8 (2 + 2 + 2 + 2)

Use your graph to find as accurately as possible

- (i) the value of  $f(1.5)$
- (ii) the values of  $x$  for which  $f(x) = 0$
- (iii) the minimum (least) value of  $f(x)$
- (iv) the range of values of  $x$  for which  $f(x)$  is decreasing.

(i)  $f(1.5) = 8$

(ii)  $f(x) = 0$  for  $x = 0.3$  or  $x = -1.8$

(iii) Minimum value of  $f(x) = -2.1$

(iv)  $f(x)$  decreasing for  $-3 \leq x < -0.75$

Accept pupils value from graph for award of marks  
Allow tolerance in reading values of  $\pm 0.2$

*Blunders (-3)*

B1: Each value outside the tolerance

B2: Only one value given in part (ii)

*Misreading (-1)*

M1: Misreads the value of  $x$  corresponding to the minimum of  $f(x)$

M2: Misreads decreasing for increasing

*Attempts:*

Att: Effort at reading values from graph

Att: For solving equation algebraically, correctly

# An Roinn Oideachais agus Eolaíochta

## MARKING SCHEME

LEAVING CERTIFICATE EXAMINATION 2001

*MATHEMATICS - FOUNDATION LEVEL*

PAPER II

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### General Instructions

#### 1. *Penalties :*

- (a) Numerical slips e.g.  $4 \times 8 = 36$  (-1)
- (b) Misreading, if not serious (-1)
- (c) Mathematical blunders, omissions (-3)
- (d) Serious blunders or omissions may result in the loss of all marks for a particular section or may result in the attempt mark being awarded.
- (e) Do not penalise twice for the same error in the same section of a question.

#### 2. *Marking scripts :*

- (a) Mark scripts in red or a colour not used by the candidate.
- (b) Mark deductions as (-1) or (-3) on the script where they occur.
- (c) Show section marks in the right hand margin.
- (d) Indicate attempt marks on the right margin as Att 3, for example.
- (e) Show total marks awarded for each question on the left hand margin near the start of the question and ring the mark.
- (f) Worthless or irrelevant work should be marked 0.
- (g) Scrutinise all pages and indicate by marking pages.
- (h) Mark all questions, including cancelled non-repeated questions.
- (i) Where a candidate offers two or more attempts for a section of a question, award the marks for the best attempt.

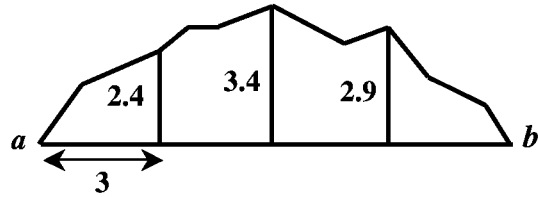
#### 3. *Attempt Marks.*

- (a) If deductions result in a mark which is lower than the attempt mark, award the attempt mark.
- (b) The attempt mark for a section is the final mark for that section and so a mark between 0 and the mark may not be awarded.
- (c) Attempt mark must be awarded for any relevant work.
- (d) Particular cases or verifications qualify for the attempt mark in general.





- (b) The diagram shows a garden which is planted with tulip bulbs. The offsets of lengths 2.4, 3.4 and 2.9 metres are measured at intervals of 3 metres along  $[ab]$ .



Using Simpson's Rule, calculate the area of the garden.

One tulip bulb is planted every  $0.04 \text{ m}^2$  of garden area. How many tulip bulbs are planted ?

### Solution

$$\begin{aligned} \text{Area} &= \frac{h}{3} [F + L + \text{TOFE}] \\ &= \frac{3}{3} [0 + 0 + 2(3.4) + 4(2.4 + 2.9)] = 1 [6.8 + 4(5.3)] \\ &= [6.8 + 21.2] = 28 \text{ m}^2 \end{aligned}$$

$$\text{Number of tulip bulbs} = \frac{28}{0.04} = 700$$

\* Always deduct from total.

### Blunders (-3)

- B1 Incorrect relevant formula e.g. 'four odd + twice even'  $\Rightarrow 24.2 \text{ m}^2$   
 B2 Omits 2 or 4 in formula.  
 B3 Uses forwards or backwards rectangulation i.e.  $3[2.4 + 3.4 + 2.9] = 26.1 \text{ m}^2$ .  
 B4 Uses trapezoidal method  
 e.g.  $3[\frac{1}{2}(0 + 2.4) + \frac{1}{2}(2.4 + 3.4) + \frac{1}{2}(3.4 + 2.9) + \frac{1}{2}(2.9 + 0)] = 26.1 \text{ m}^2$   
 B5 Incorrect  $h$ , or omits  $h$ .  
 B6  $\frac{h}{3} = 28 \Rightarrow h = 84$  apply  $2 \times (-3)$  i.e. B1 + B5  
 B7  $\frac{3}{3}(28)$  and stops, i.e. has failed to finish.

### Slips (-1)

- S1 Each incorrect ordinate.  
 S2 Uses second ordinate i.e. 2.4 as first ordinate, similarly with 2.9 as last, apply  $2 \times (-1)$   
 S3 Interchanges odd and even i.e. 2.4 is first odd ordinate.  
 S4 Misplaced decimal, numerical errors.

### Misreadings (-1)

- M1 First or last  $\neq 0$ , apply each time.

### Attempts (10,2)

- A1 Simpson's Rule: formula only or worked diagram.  
 A2 Number of tulip bulbs =  $\frac{0.04}{\text{area}}$  or  $0.04 \pm \text{area}$  or  $0.04 \times \text{area}$ .

## QUESTION 2

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
<b>Part (b)</b>	<b>20 Marks</b>	<b>Att. 8</b>
<b>Part (c)</b>	<b>20 Marks</b>	<b>Att. 8</b>

**Part (a)** **10(5,5) Marks** **Att. 4(2,2)**

- (a) The area of a square is  $36 \text{ cm}^2$ .
- (i) Find the length of a side of the square.
- (ii) Find the perimeter of the square.

**Solution**

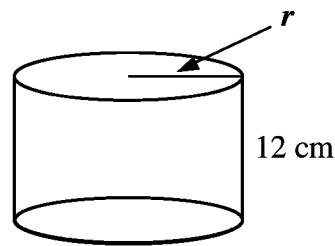
6 cm



(b)

The volume of a cylinder is  $3768 \text{ cm}^3$ .  
The height of the cylinder is 12 cm.

Calculate the radius,  $r$ , of the cylinder,  
taking  $\pi = 3.14$ .

**Solution**

$$\pi r^2 h = 3768 \Rightarrow 3.14 r^2 h = 3768$$

$$37.68 r^2 = 3768 \Rightarrow r^2 = \frac{3768}{37.68}$$

$$r^2 = 100 \quad r = 10 \text{ cm}$$

$$r = \sqrt{\frac{\text{Volume}}{\pi h}} = \sqrt{\frac{3768}{3.14 \times 12}}$$

$$r = \sqrt{\frac{3768}{3.14 \times 12}} = \sqrt{\frac{3768}{37.68}}$$

$$r = \sqrt{100} = 10 \text{ cm}$$

*Blunders (-3)*

B1 Ignores  $\pi$  in calculations.

B2  $r^2 = 2r$

B3 Incorrect volume formula, must contain  $\pi$ , e.g.  $\frac{1}{3} \pi r^2 h$ .

B4 Substitutes correctly but fails to finish.

B5 Square root not found.

B5 Incorrect transposition when using volume =  $\pi r^2 h$

B6 Uses formula for surface area of cylinder e.g. Area =  $2 \pi r h$  or  $r = \frac{\text{Area}}{2 \pi h}$

*Slips (-1)*

S1 Numerical, misplaced decimal, one position only.

S2 Calculates diameter  $\sqrt{\frac{4 \times \text{Volume}}{\pi h}}$  and stops.

S3 Uses 'x' key for '÷' giving  $\sqrt{14400}$

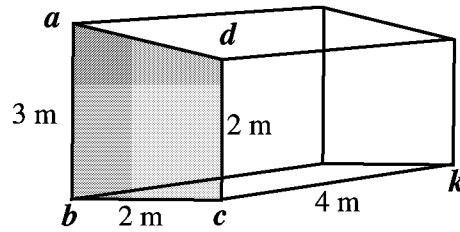
*Misreadings (-1)*

M1 Misreads  $r = 12 \text{ cm}$  and calculates  $h \Rightarrow \frac{\text{Volume}}{\pi r^2} = \frac{3768}{144\pi} = 8.33$

*Attempts (8)*

A1 Any formula including  $\pi$  with some substitution.

- (c) The diagram shows a prism-shaped building on a farm.  
 One of the end walls is  $abcd$ .  
 $ab$  and  $dc$  are perpendicular to  $bc$ .  
 The internal length is  $lckl$ .  
 $ck$  is perpendicular to  $bc$ .  
 The internal measurements of the building are  $labl = 3$  m,  $lbcl = ldc = 2$  m and  $lckl = 4$  m.



- (i) Find the area of the end wall  $abcd$ .  
 (ii) Find the internal volume of the building.

**Solution**

$$(i) \text{ Area} = (2 \times 2) + \frac{1}{2}(2 \times 1) = 4 + 1 = 5 \text{ m}^2$$

or

$$\text{Area} = \frac{h(a+b)}{2} = \frac{2(3+2)}{2} = 5 \text{ m}^2.$$

$$(ii) \text{ Volume} = 5 \times 4 = 20 \text{ m}^3.$$

**Blunders (-3)**

- B1 Omits triangle of trapezium i.e. area =  $2 \times 2$  or  $2 \times 3$  apply  $2 \times (-3)$   
 or area =  $2 \times 4$  or  $3 \times 4$  apply  $2 \times (-3) + M(-1)$   
 B2 Error in triangle formula.  
 B3 Area =  $2 \times 3 \times 2 = 12$  apply  $2 \times (-3)$   
 B4 Calculates area of 'back' wall, apply  $2 \times (-3) + (-1)$ .  
 B5 Incorrect substitution into Area =  $\frac{h(a+b)}{2}$   
 B6 Volume = area  $\times \pi$ .

**Slips (-1)**

- S1 Numerical errors

**Misreadings (-1)**

- M1  $h = 3$

**Attempts (6,2)**

- A1 Area =  $3 \times 2 \times 2 \times 4 = 48$   
 A2 Any relevant work.  
 A3 Area =  $3 + 2 + 2 = 7$   
 A4 Area =  $3 + 2 + 2 + 4 = 11$   
 A5 Correct formula for area of trapezium/ rectangle/triangle only.  
 A6 Correct formula for volume of rectangular block or prism only.  
 A7 Worked diagram.  
 A8 Average height = 2.5 m only

## QUESTION 3

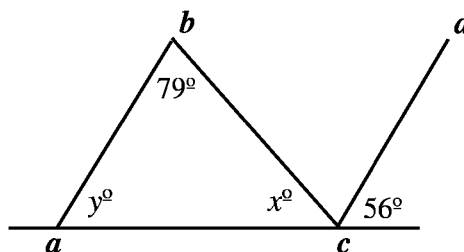
<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
<b>Part (b)</b>	<b>20 Marks</b>	<b>Att. 8</b>
<b>Part (c)</b>	<b>20 Marks</b>	<b>Att. 8</b>

**Part (a)** **10(5,5)Marks** **Att. 4(2,2)**

(a)

In the diagram  $ab$  is parallel to  $cd$ .

Find the value of  $x$  and the value of  $y$ .



**Solution**

$$x = 45^\circ \quad \text{and} \quad y = 56^\circ$$

\* Accept answers on diagram.

*Blunders (-3)*

- B1 Considers  $\triangle abc$  as isosceles i.e.  $x = y = [\frac{1}{2}(180^\circ - 79^\circ)] = 50.5^\circ$   
 or  $y = 56^\circ \Rightarrow x = 56^\circ$   
 or  $x = 45^\circ \Rightarrow y = 45^\circ$   
 or  $x = 79^\circ \Rightarrow y = 22^\circ$   
 or  $y = 79^\circ \Rightarrow x = 22^\circ$
- B2 Sum of internal angles =  $90^\circ$  or  $100^\circ$  or  $200^\circ$  or  $360^\circ$
- B3 Alternate or corresponding angles sum to  $180^\circ$   
 e.g.  $y = 180^\circ - 56^\circ = 124^\circ$   
 or  $|\angle bcd| = 180^\circ - 79^\circ = 101^\circ$
- B4 Straight angle =  $90^\circ$  or  $100^\circ$  or  $200^\circ$  or  $400^\circ$
- B5  $56^\circ = y + 79$ , but allow  $y = 23^\circ$
- B6 In parallelogram  $abcd$ , diagonal  $[bc]$  bisects obtuse angle  $\Rightarrow x = 62^\circ$

*Slips (-1)*

- S1 Numerical errors

*Misreadings (-1)*

- M1  $97^\circ$  for  $79^\circ$  or equivalent

*Attempts (2,2)*

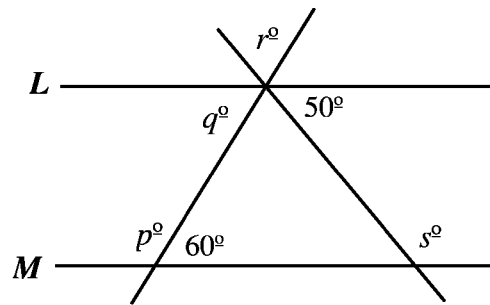
- A1 Visual inspection e.g.  $x = 50^\circ$ ,  $y = 50^\circ$   
 A2 Graphical approach  $\pm 5^\circ$   
 A3 Worked diagram e.g. alternate angles indicated.

(b)

The lines  $L$  and  $M$  are parallel.

Find the value of

- (i)  $p$   
(ii)  $q$   
(iii)  $r$   
(iv)  $s$

**Solution**

- (i)  $p = 120^\circ$       (ii)  $q = 60^\circ$       (iii)  $r = 70^\circ$       (iv)  $s = 130^\circ$

- \* Accept answers on diagram.  
\* No penalty for  $60^\circ - 180^\circ = 120^\circ$

*Blunders* (-3)

- B1 Internal angles sum to  $90^\circ / 100^\circ / 200^\circ / 360^\circ$  apply once only.  
B2 Assumes triangle to be equilateral ( $60^\circ, 60^\circ, 60^\circ$ )  
B3 Opposite angles sum to  $180^\circ$  or  $90^\circ$ .  
B4 Alternate or corresponding angles sum to  $180^\circ$   
B5 Interior angles sum to  $90^\circ$  or  $360^\circ$  e.g.  $s = 40^\circ$  or  $s = 310^\circ$   
B6  $q = 50^\circ$   
B7  $p = s$

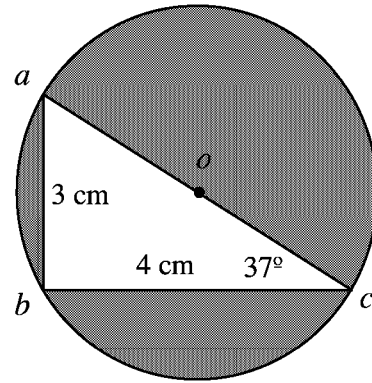
*Slips* (-1)

- S1 Numerical

*Misreadings* (-1)*Attempts* (2,2,2,2)

- A1 Worked diagram only, att.8 overall.  
A2 Graphical.

(c)

 $a, b$  and  $c$  are points on a circle with centre  $o$ . $[ac]$  is a diameter of the circle. $|ab| = 3\text{cm}$ ,  $|bc| = 4\text{cm}$  and  $|\angle acb| = 37^\circ$ (i) Give a reason why  $\angle abc$  is a right angle(ii) Find the measure of the  $\angle bac$ (iii) Calculate the length of the diameter  $[ac]$ (iv) Calculate the area of the shaded region, that is, area enclosed by the circle – area of triangle  $abc$ , taking  $\pi = 3.14$ .**Solution**

(i) Angle in semi-circle or equivalent

(ii)  $|\angle bac| = 90^\circ - 37^\circ = 53^\circ$ (iii)  $|ac|^2 = 3^2 + 4^2 = 9 + 16 = 25 \Rightarrow |ac| = \text{diameter} = 5$ 

(iv) Shaded area =  $\pi r^2 - \frac{1}{2}(\text{base})(\text{perp. height}) = 3.14(2.5)^2 - \frac{1}{2}(4)(3)$   
 $= 3.14(6.25) - 6$   
 $= 19.625 - 6 = 13.625 \text{ cm}^2$

\* Accept  $|\angle bac| = \tan^{-1}\left(\frac{4}{3}\right) = 53.13^\circ$ , similarly for  $\sin^{-1}\left(\frac{4}{5}\right)$  and  $\cos^{-1}\left(\frac{3}{5}\right)$ .

**Blunders (-3)**B1  $|\angle bac| = 37^\circ$  i.e. isoscelesB2  $|\angle bac| = 180^\circ - 2(37^\circ) = 106^\circ$ B3  $|\angle bac| = 180^\circ - 37^\circ = 143^\circ$  or  $360^\circ - 37^\circ = 323^\circ$ B4  $|\angle bac| = 180^\circ$  i.e. sum of interior anglesB5 In (ii) measures length of  $\Delta bac$ **Slips (-1)**

S1 In (iii) no square root sign, diameter = 25

S2 In (iii)  $\sqrt{4^2 - 3^2}$ , i.e. error in PythagorasS3 In (iii)  $|ac|^2 = 25$  and stops.

S4 Incorrect perpendicular height in (iv)

i.e.  $h = 5 \Rightarrow \text{Area } \Delta = \frac{1}{2}(4)(5) = 10$  or  $\frac{1}{2}(3)(5) = 7.5$ **Attempts (2,2,2,2)**

A1 Clear use of protractor or ruler in (ii) or (iii)

A2 In (iii)  $4 \leq |ac| \leq 7$ A3 In (iii)  $|ac| = 180^\circ$  or similarA4 In (iv)  $r = 2.5$  only.A5 In (i) " $\Delta abc$  is  $90^\circ$ ", only.

## QUESTION 4

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
<b>Part (b)</b>	<b>25 Marks</b>	<b>Att. 10</b>
<b>Part (c)</b>	<b>15 Marks</b>	<b>Att. 6</b>

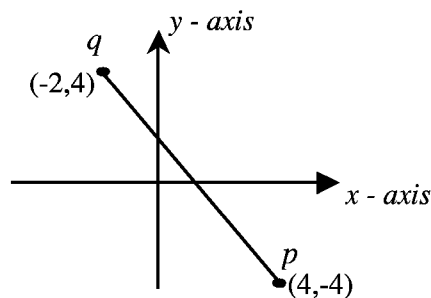
**Part (a)** **10 Marks** **Att. 4**

**(a)**

$p(4, -4)$  and  $q(-2, 4)$  are two points.  
Find the length of  $|pq|$ .

**Solution**

$$\begin{aligned}
 |pq| &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 &= \sqrt{(-2 - 4)^2 + (4 + 4)^2} \\
 &= \sqrt{(-6)^2 + (8)^2} \\
 &= \sqrt{36 + 64} = \sqrt{100} = 10
 \end{aligned}$$



- \* Candidate writes  $(x_2 - x_1)^2$  as  $(x^2 - x^1)^2$ , similarly for y .... no penalty applies.
- \* Accept answer in surd form.
- \* Accept correct answer from graph.

**Blunders (-3)**

- B1 Omits square root i.e.  $|pq| = 100$
- B2 Incorrect distance formula, correct slope or midpoint formula.
- B3 Slope or midpoint formula incorrect, apply  $2 \times (-3)$
- B4 Vector or translation presented and stops,  $\vec{pq} = (-6, 8)$  or  $-6\vec{i} + 8\vec{j}$
- B5 Error in Pythagoras, apply once only.

**Slips (-1)**

- S1 Incorrect addition subtraction or squaring e.g.  $(-6)^2 = -36$ .
- S2 Each incorrect substitution, maximum  $3 \times (-1)$
- S3 Squaring = multiplication by 2
- S4 Ordered pairs reversed in diagram, then uses incorrect version  $\Rightarrow |pq| = 6$ .

**Misreadings (-1)**

- M1  $q(-2, 4) = q(-2, -4)$  or similar  $\Rightarrow |pq| = 6$  and  $|pq| = \sqrt{68}$

**Attempts (4)**

- A1 Points plotted correctly or incorrectly
- A2 Copies correct formula from formula sheet only
- A3  $-2 + 4 + 4 - 4$  only.
- A4 Graphical



(b)  $r(3, 6)$  and  $s(-1, 4)$  are points.

(i) Find the co-ordinates of the midpoint of  $[rs]$ .

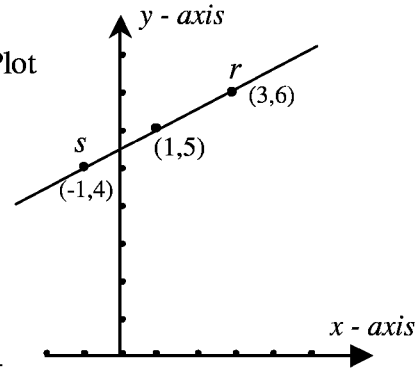
(ii) Plot the points  $r$  and  $s$  and the midpoint of  $[rs]$  on graph paper.

(iii) Find the slope of  $rs$ .

### Solution

$$\begin{aligned} \text{(i) Midpoint} &= \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &= \left( \frac{-1 + 3}{2}, \frac{4 + 6}{2} \right) \\ &= \left( \frac{2}{2}, \frac{10}{2} \right) = (1, 5) \end{aligned}$$

(ii) Plot



$$\text{(iii) Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 4}{3 - (-1)} = \frac{2}{4} = \frac{1}{2}$$

- \* Accept correct mid-point from graph
- \* Accept correct slope from graph.
- \* Accept use of mid-point when calculating slope.

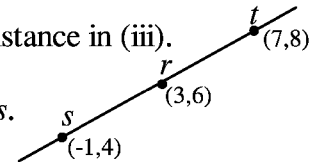
### Blunders (-3)

B1 Error in formula e.g.  $\left( \frac{x_1 + y_1}{2}, \frac{x_2 + y_2}{2} \right) \Rightarrow \left( \frac{3}{2}, \frac{9}{2} \right)$  or  $\left( \frac{9}{2}, \frac{3}{2} \right)$ ,  
slope formula inverted or equivalent.

B2 Uses incorrect formula i.e. slope or distance in (i), midpoint or distance in (iii).

B3 Error in axes, poor calibration.

B4 In (i) calculates  $t(7,8)$  where  $r$  is the midpoint of  $[st]$ , similar for  $s$ .



### Slips (-1)

- S1 Uses  $p$  and  $q$  from (i).
- S2 Each incorrect addition, subtraction, division.
- S3  $\left( \frac{2}{2}, \frac{10}{2} \right)$  and stops.
- S4 Each incorrect substitution, maximum  $3 \times (-1)$ .
- S5 Fails to plot midpoint

### Attempts (4,4,2)

- A1 Correct formula copied from formula sheet only.
- A2 Axes only in (ii)
- A3 Incorrect formula with any substitution.

- (c) The line  $L$  has equation  $5y = 3x + 18$ .  
The point  $k$  has co-ordinates  $(-1, 3)$ .
- (i) Show that the point  $k$  lies on the line  $L$ .
- (ii) Find the slope of  $L$ .
- (iii) Find the equation of the line  $M$  which passes through the point  $k$  and is perpendicular to  $L$ .

**Solution**

$$(i) \quad k(-1,3) \quad L: 5y = 3x + 18$$

$$5(3) = 3(-1) + 18$$

$$15 = -3 + 18 \Rightarrow k \in L$$

$$(ii) \quad 5y = 3x + 18$$

$$y = \frac{3}{5}x + \frac{18}{5} \Rightarrow m_L = \frac{3}{5}$$

$$(iii) \quad \text{Slope of } M: m_M = -\frac{5}{3}$$

$$y - y_1 = m(x - x_1)$$

$$y - 3 = -\frac{5}{3}(x + 1) \Rightarrow M: 5x + 3y = 4$$

\* Accept  $y - 3 = -\frac{5}{3}(x + 1)$  in (iii), for full marks.

**Blunders (-3)**

B1 In (ii) slope =  $\pm 5, \pm 3, \pm 18, \pm \frac{5}{18}, \pm \frac{3}{18}, \pm \frac{18}{5}, \pm \frac{18}{3}$

B2 Incorrect slope in (iii), see S3 and S4

B3 Error in equation of line formula .

B4  $-3 = -\frac{5}{3}(+1)$ , any incorrect number/letter for .

B5  $y = \frac{3}{5}x + c$  and stops.

**Slips (-1)**

S1 In (i), substitutes  $x = 3$  and  $y = -1$  i.e. reverses the  $x$  and  $y$  coordinates.

S2 In (ii), slope =  $\frac{5}{3}$  or  $\pm \frac{3}{5}$  .

S3 In (iii) slope is reciprocal of  $m_L$ .

S4 Change of sign but no inversion.

S5 Each incorrect substitution.

**Attempts (2,2,2)**

A1 In (i) any correct transposition.

A2 Attempt to plot  $k$  .

A3 In (ii), any attempt to find a second point on  $L$ .

A4 Copies correct slope formula from formula sheet only.

A5 In (iii), copies correct line equation formula from formula sheet only.

A6 Copies incorrect line equation formula with / without some substitution.

A7 Draws perpendicular lines only.

A8 Displays knowledge of  $m_L m_M = -1$

A9 Some substitution in slope formula.

## QUESTION 5

<b>Part (a)</b>	<b>15 Marks</b>	<b>Att. 6</b>
<b>Part (b)</b>	<b>20 Marks</b>	<b>Att. 8</b>
<b>Part (c)</b>	<b>15 Marks</b>	<b>Att. 6</b>

**Part (a)** **15(5,5,5) Marks** **Att. 6(2,2,2)**

(a) Given that  $\cos A = \frac{5}{13}$  write down, in each case as a fraction, the value of

(i)  $\sin A$

(ii)  $\tan A$

(iii)  $\cos B$ .

**Solution**

(i)  $\sin A = \frac{12}{13}$       (ii)  $\tan A = \frac{12}{5}$       (iii)  $\cos B = \frac{12}{13}$

\* Accept fractions or decimals ( $\sin A = 0.9231$ ,  $\tan A = 2.4$ ,  $\cos B = 0.9231$ ) to 2 dec.places.

\* Accept  $\sin(\frac{12}{13})$ ,  $\tan(\frac{12}{5})$ ,  $\cos(\frac{12}{13})$  for  $\sin A = \frac{12}{13}$  etc.

### Blunders (-3)

B1 Incorrect trigonometric ratio. Where  $\sin = \frac{adj}{hyp}$  has been penalised, apply no penalty for  $\cos = \frac{opp}{hyp}$ . If  $\sin A = \frac{5}{13}$  then apply (-1) for  $\tan A = \frac{5}{12}$ , then no penalty for  $\cos B = \frac{5}{13}$  and accept also  $\cos B = \frac{12}{13}$  or  $\frac{5}{13}$

B2 In (i) substitutes into Sine Rule and stops

### Slips (-1)

S1 Inverted ratio i.e.  $\sin A = \frac{13}{12}$ ,  $\tan A = \frac{5}{12}$ ,  $\cos B = \frac{13}{12}$

S2 Where  $\sin = \frac{adj}{hyp}$  has been penalised, apply no penalty for  $\cos = \frac{opp}{hyp}$

S3 Truncation  $67.38^\circ = 67^\circ$  or  $68^\circ$  and calculates  
 $\sin 67^\circ = 0.9205$ ,  $\sin 68^\circ = 0.9272$ ,  $\tan 67^\circ = 2.3559$ ,  $\tan 68^\circ = 2.4751$   
 $\cos 23^\circ = 0.9205$ ,  $\cos 22^\circ = 0.9272$

### Misreadings (-1)

M1  $\sin = \sin^{-1}$  and similarly for  $\cos$  and  $\tan$ .  
i.e.  $\sin A = 67.38^\circ$ ,  $\tan A = 67.38^\circ$ ,  $\cos B = 22.62^\circ$

### Attempts (2,2,2)

A1  $\sin = \frac{opp}{hyp}$  only, same for  $\tan$  and  $\cos$ .

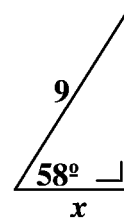
A2 Mnemonic (SOHCAHTOA) or equivalent in (i), (ii), (iii).

- A3 Writes Sine Rule or Cosine Rule (*iii*).  
 A4 Statement of Cosine Rule (*iii*).  
 A5 Correct sin/cos/tan for some stated angle.  
 A6 sin 12° but do not then penalise for cos 5° or tan 12°.  
 A7 Using rad or grad modes on calculator.

	<b>Degrees</b>	<b>Radians</b>	<b>Grads</b>
sin 5	0.0872	- 0.9589	0.0785
sin 12	0.2079	-0.5366	0.1874
sin 13	0.2250	0.4201	0.2028
cos 5	0.9962	0.2837	0.9969
cos 12	0.9781	0.8439	0.9823
cos 13	0.9744	0.9074	0.9792
tan 5	0.0875	-3.3805	0.0787
tan 12	0.2126	-0.6359	0.1908
tan 13	0.2309	0.4630	0.2071

(b)

Calculate the value of  $x$ , correct to one place of decimals.

**Solution**

$$\cos 58^\circ = \frac{x}{9} \Rightarrow x = 9 \cos 58^\circ = 9 (0.5299) = 4.769 = 4.8$$

*Blunders (-3)*

B1 Incorrect trigonometric ratio e.g.  $\cos 58^\circ = \frac{9}{x}$  (if candidate stops apply att.8)

B2 Incorrect trigonometric function e.g.  $\sin 58^\circ$  or  $\tan 58^\circ = \frac{x}{9}$ .

B3 Uses  $\cos 32^\circ = \frac{x}{9}$

B4 Incorrect transposition.

B5  $x = 9 \times 58 = 522$  and continues, apply 2(-3), without  $x$  apply 3(-3)

B6  $\frac{x}{9} = \cos 58^\circ$  and stops, apply 3(-3) + (-1)

i.e. no transposition, no evaluation of cosine, no multiplication, no round-off

*Slips(-1)*

S1 No rounding off.

S2 RAD or GRAD mode on calculator.

$$\text{RAD: } 5 \times 0.9929 = 8.9361 = 8.9 \quad \text{GRAD: } 9 \times 0.7901 = 7.1109 = 7.1$$

S3 Incorrect reading from tables

*Attempt(8)*

A1 Graphical e.g.  $x = 1.6$  cm

A3 Definition of cosine only or mnemonic.

A4 Pythagoras

A5 Some attempt to get area.

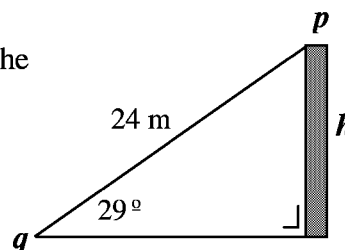
A6  $32^\circ$  and stops

A7  $58 \div 9$  and stops or  $58 \times 9$  and stops, also  $9 \div 58$ .

*Worthless*

W1  $58 \pm 9$

- (c) The distance of the point  $p$ , the top of a house, from the point  $q$  on the level ground, is 24 m.  
The angle of elevation of the point  $p$  from the point  $q$  is  $29^\circ$ .  
Calculate the height  $h$  of the house, correct to two places of decimals.

**Solution**

$$\sin 29^\circ = \frac{h}{24} \Rightarrow h = 24 \sin 29^\circ = 24 (0.4848) = 11.64 \text{ m}$$

- \*  $\sin 29^\circ = \frac{h}{24}$  apply 8 marks.       $h = 24 \sin 29^\circ$  apply 11marks.  
       $h = 11.635$  apply 14 marks.       $h = 11.64 \text{ m}$  apply 15 marks.  
 \*  $24 \tan 29^\circ = 13.30$  apply 12 marks.

*Blunders (-3)*

- B1 Incorrect trigonometric ratio e.g.  $\sin 29^\circ = \frac{24}{h}$   
 B2 Incorrect trigonometric function e.g.  $\cos 29^\circ = \frac{h}{24}$   
 B3 Uses  $\sin 61^\circ = \frac{h}{24}$   
 B4 Incorrect transposition  
 B5 Correct substitution into Sine Rule and stops, apply  $2 \times (-3)$   
 B6 Incorrect substitution into Sine Rule and stops, apply  $3 \times (-3)$

*Slips (-1)*

- S1 No rounding off  
 S2 Rad or Grad mode on calculator.  
     Rad:  $24 \times (-0.6636) = -15.93$ , no penalty if (-) omitted.  
     Grad:  $24 \times 0.4399 = 10.56$   
 S3 Incorrect reading from tables.

*Attempts (6)*

- A1 Graphical  
 A2 Measurement from diagram,  $h = 3.4 \text{ cm}$ .  
 A3 Definition of sine or mnemonic.  
 A4 Pythagoras.  
 A5 Some attempt to calculate area.  
 A6  $61^\circ$  and stops.  
 A7  $29 \times 24$  or  $\frac{29}{24}$  or  $\frac{24}{29}$  only.

*Worthless*

- W1  $29 \pm 24$ .

## QUESTION 6

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
<b>Part (b)</b>	<b>25 Marks</b>	<b>Att. 10</b>
<b>Part (c)</b>	<b>15 Marks</b>	<b>Att. 6</b>

**Part (a)** **10 Marks** **Att. 4**

**(a)** A factory produces different types of cars as follows:

the colour can be black or silver or blue  
the model can be Saloon or Estate or Hatchback  
the style can be Standard or Deluxe.

How many different types of cars does the factory produce?

**Solution**

$$3 \times 3 \times 2 = 18 \text{ different types of car.}$$

\* Accept correct answer for full marks.

*Blunders*(-3)

B1  $3 + 3 + 2 = 8$  but  $\frac{3}{8} + \frac{3}{8} + \frac{2}{8}$  merits 6 marks.

B2  $3! = 6$

B3  $3! \times 3! \times 2! = 72$

B4  $3! + 3! + 2! = 14$  apply  $2 \times (-3)$

B5  $18 \times 3! = 108$  but apply full marks for 18 only.

B6  $2 \times 2 \times 2 \times 3 = 24$  apply  $(-3) + \text{mr}(-1)$

*Misreadings*(-1)

M1  $3 \times 3 \times 3$ .

*Slips* (-1)

S1 Probability of a certain type =  $\frac{1}{18}$ .

S2  $3 \times 3 \times 2$  and stops.

S3 Each three types omitted from listing ( NB. listing not required)

No. of types	Marks
15 – 17	9
12 – 14	8
9 – 11	7
6 – 8	6
3 – 5	5

*Attempts* (4)

A1 Any answer, apart from above.

- (b) A fair coin is tossed once and a fair die is thrown once.  
List the twelve possible outcomes. For example, two of the possible outcomes are:  
head, one;  
head, two.
- What is the probability of
- a head and a four
  - a head and an even number
  - a tail and a number greater than two?

**Solution**

Possible outcomes (H,1), (H,2), (H,3), (H,4), (H,5), (H,6)  
(T,1), (T,2), (T,3), (T,4), (T,5), (T,6)

$$(i) \quad P(\text{head and a four}) = \frac{1}{12}$$

$$(ii) \quad P(\text{head and an even number}) = \frac{3}{12} = \frac{1}{4}$$

$$(iii) \quad P(\text{tail and a number greater than two}) = \frac{4}{12} = \frac{1}{3}$$

\* Accept fraction, ratio, decimal or percentage format.

fraction	1/12	3/12	4/12
decimal	0.08	0.25	0.33
ratio	1 : 12	3 : 12	4 : 12
percentage	8%	25%	33%

\* Simplification of fractions not required

\* Accept candidates  $n(S)$  and  $n(E)$  from listing

**Blunders (-3)**

B1 Incorrect  $n(S)$ , apply once only.

B2 Incorrect  $n(E)$ .

B3 Fails to divide by  $n(S)$ , apply once only i.e.  $P(\text{head and an even number}) = 3$

B4 Inverted fraction, apply once only.

**Slips (-1)**

S1 Each outcome omitted in listing

$$S2 \quad \frac{1}{12} = \frac{1}{11} (= 0.09), \quad \frac{3}{12} = \frac{3}{9} (= 0.33), \quad \frac{4}{12} = \frac{4}{8} (= 0.5)$$

S3 Interprets 'and' as 'or', apply once only

$$\text{e.g. } P(H,4) = P(H) + P(4) = \frac{6}{12} + \frac{2}{12} = \frac{8}{12} \quad \text{or} \quad \frac{6}{12} + \frac{2}{12} - \frac{1}{12} = \frac{7}{12}$$

**Misreadings(-1)**

M1 'and' for 'or'.

**Attempts (4,2,2,2)**

A1 Any other outcome apart from the two given

A2 Approximate results e.g.  $P(H,4) = 10\%$



- (c) The following table shows the number of boys and girls from a group of 50 pupils who wear glasses or who do not wear glasses.

Pupils	Wear glasses	Do not wear glasses
Boys	5	20
Girls	4	21

A pupil is selected at random from the group.

What is the probability that this pupil is

- (i) a girl  
(ii) a boy who wears glasses  
(iii) a boy who wears glasses or a girl who does not wear glasses?

### Solution

$$(i) P(\text{girl}) = \frac{25}{50} = \frac{1}{2} \quad (ii) P(\text{boy who wears glasses}) = \frac{5}{50} = \frac{1}{10}$$

$$(iii) P(\text{boy with glasses or a girl without glasses}) = \frac{26}{50} = \frac{13}{25}$$

\* Accept fraction, ratio, decimal or percentage format. Apply 4 marks for 'fifty fifty' in (i).

fraction	25/50	5/50	26/50
decimal	0.5	0.1	0.52
ratio	25 : 50	5 : 50	26 : 50
percentage	50%	10%	52%

\* Mark sections in a manner to optimise candidate's grade.

### Blunders (-3)

- B1 Incorrect  $n(S)$ , once only.  
B2 Incorrect  $n(E)$   
B3 Fails to divide by  $n(S)$ , once only. e.g.  $P(\text{girl}) = 25$   
B4 Inverted fraction, once only.

### Slips (-1)

S1  $\frac{25}{50} = \frac{25}{25} (= 1)$ ,  $\frac{5}{50} = \frac{5}{45} (= 0.11)$ ,  $\frac{26}{50} = \frac{26}{24} (= 1.08)$

S2  $n(S) = 49$  in part (i),  $n(S) = 48$  in part (ii).

S3 Interprets 'and' as 'or', apply once only e.g.  $P(\text{boy, glasses}) = P(\text{boy}) + P(\text{glasses})$   
 $= \frac{25}{50} + \frac{9}{50} = \frac{34}{50}$  or  $\frac{25}{50} + \frac{9}{50} - \frac{5}{50} = \frac{29}{50}$

S4 Fails to add  $\frac{5}{50}, \frac{21}{50}$ .

### Misreading(-1)

M1 'boy' for 'girl' i.e. (iii)  $\frac{5}{50} + \frac{20}{50} = \frac{25}{50}$

### Attempts (2,2,2)

- A1 Approximate results, e.g. 75% chance.

## QUESTION 7

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
<b>Part (b)</b>	<b>25 Marks</b>	<b>Att. 10</b>
<b>Part (c)</b>	<b>15 Marks</b>	<b>Att. 6</b>

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
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- (a) The mean of five numbers  
3, 4, 9,  $x$ , 14  
is 8.  
Find the value of  $x$ .

### Solution

$$\frac{3 + 4 + 9 + x + 14}{5} = 8 \quad \Rightarrow \quad 30 + x = 40$$
$$x = 10$$

- \* Allow trial and error approach.
- \* Accept  $x = 10$  without work shown.
- \*  $x = 0$ , giving mean = 6, award 6 marks.

### Blunders (-3)

- B1 Determines mean of 3, 4, 9, 14 =  $\frac{30}{4} = 7.5$
- B2 Determines mean of 3, 4, 9, 14, 8 =  $\frac{38}{5} = 7.6$
- B3 Multiplies by 4 instead of by 5 i.e.  $8 \times 4 = 32 \Rightarrow x = 2$
- B4  $3 + 4 + 9 + 14 = 30$  and stops, apply  $2 \times (-3)$ .
- B5  $(3 + 4 + 9 + 14) \div 8 = \frac{30}{8} = 3.75$  apply  $2 \times (-3)$ .
- B6  $\frac{3 + 4 + 9 + x + 14}{2} = 8 \Rightarrow x = -14$ .
- B7 Division by number other than 5.

### Slips (-1)

- S1 Numerical, in addition / subtraction / multiplication / division.
- S2

### Attempts (4)

- A1 By inspection  $3 \leq x \leq 14$ , exclude 9 and 11, treat these as S1.
- A2 Any addition of 2 or more numbers.
- A3 Multiplies any number by 8 or 5.

- (b) 50 students put money into a school savings scheme for a school trip  
The results are as follows.

Amount saved in IR£	0 –10	10 –20	20 –30	30 –40	40 –50	50 –60
Number of students	5	12	18	8	4	3

Note: 10–20 means IR£10 or more but less than IR£20, etc.

Copy and complete the cumulative frequency table below:

Amount saved in IR£	<10	<20	<30	<40	<50	<60
Number of students	5					50

Draw the cumulative frequency curve.

Put the number of students on the vertical axis.

Use your curve to estimate

- (i) the median amount of money saved  
(ii) the number of students who saved IR£27 or more

### Solution

Amount saved in IR£	<10	<20	<30	<40	<50	<60
Number of students	5	17	35	43	47	50

\* Join to origin not required.

### Blunders (-3)

- B1 Numbers subtracted instead of added or added pairwise 5, 17, 30, 26, 12, 50(7)  
 B2 Plots on mid-points i.e. 5, 15, 25, etc.  
 B3 Error in scales, clearly non-uniform.  
 B4 Uses incorrect table for curve + (-1) if axes reversed..  
 B5 Points not joined  
 B6 Uses incorrect axes for (i),(ii), apply once only, two or one incorrect.

### Slips (-1)

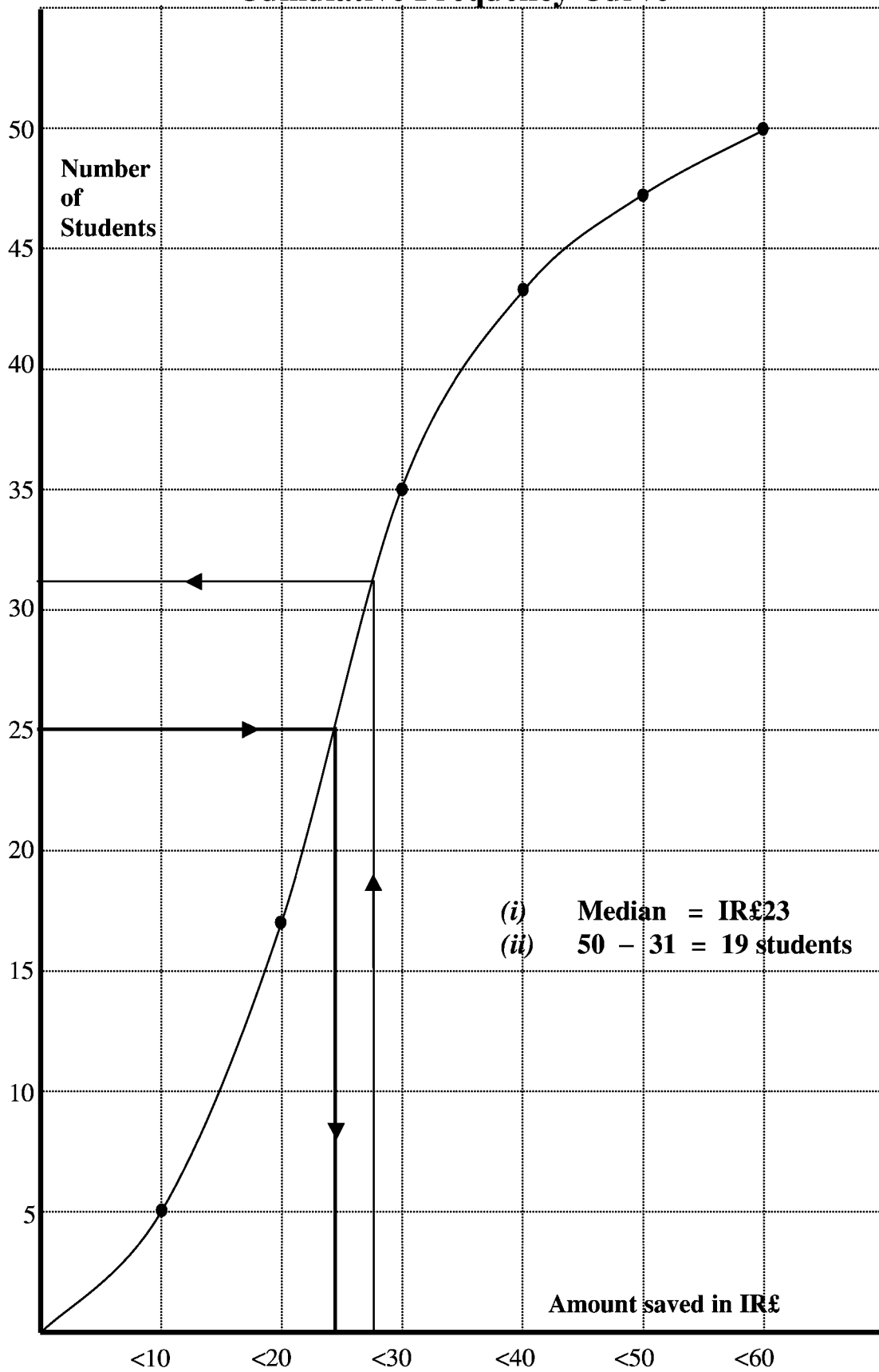
- S1 Fails to subtract in (ii).  
 S2 Answer not specified in (i),(ii), but one line in each required.  
 S3 Each point not plotted.  
 S4 Each point plotted incorrectly.  
 S5 Reverses axes.  
 S6 Joins points with straight lines.  
 S7 No origin on graph.

### Attempts (2,4,2,2)

- A1 Attempt to draw bar chart, pie chart, histogram. Trend graph (B2,S6)  
 A2 In (i) 25 identified on vertical axis.

- A3 In (ii) 27 identified on horizontal axis.
- A4 Axes only for curve, att 4.
- A5 Mid-interval values only : 5, 15, 25, 35, 45, 50 (55).

### Cumulative Frequency Curve



- (a) Find the mean and standard deviation of the numbers  
5, 15, 25, 35  
correct to two places of decimals.

**Solution**

$$\bar{x} = \frac{5 + 15 + 25 + 35}{4} = \frac{80}{4} = 20$$

$$SD = \sqrt{\frac{(5 - 20)^2 + (15 - 20)^2 + (25 - 20)^2 + (35 - 20)^2}{4}}$$

$$= \sqrt{\frac{(-15)^2 + (-5)^2 + (5)^2 + (15)^2}{4}} = \sqrt{\frac{500}{4}} = \sqrt{125} = 11.18$$

- \* Allow full marks for correct answer without work shown.
- \* Correct mean merits 10 marks, correct standard deviation merits 5 marks

*Blunders (-3)*

B1 5 + 15 + 25 + 35 = 80 only

B2 Divides by 2 i.e.  $\frac{80}{2} = 40$

*Slips (-1)*

S1 Numerical errors.

S2 Each step omitted when finding SD,  
i.e. deviation, square, addition, mean, square root.

S3 Errors in signs  $(-5)^2 = -25$

*Attempts (4,2)*

A1 Any addition

A2 Any work on table for standard deviation.

A3 Formula for SD and steps.

## QUESTION 8

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
<b>Part (b)</b>	<b>25 Marks</b>	<b>Att.</b>
<b>Part (c)</b>	<b>15 Marks</b>	<b>Att.</b>

<b>Part (a)</b>	<b>10 Marks</b>	<b>Att. 4</b>
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- (a) Draw a line segment  $[pq]$  of length 8 cm.  
Construct a perpendicular to  $[pq]$  at the point  $p$ .

**Solution**



*Blunders (-3)*

- B1 Construction arcs not shown.
- B2  $[pq]$  outside tolerance of  $\pm 0.5$  cm.
- B3 Unsatisfactory right angle, outside  $\pm 5^\circ$ .
- B4 Units other than cm.
- B5 Parallel lines drawn.

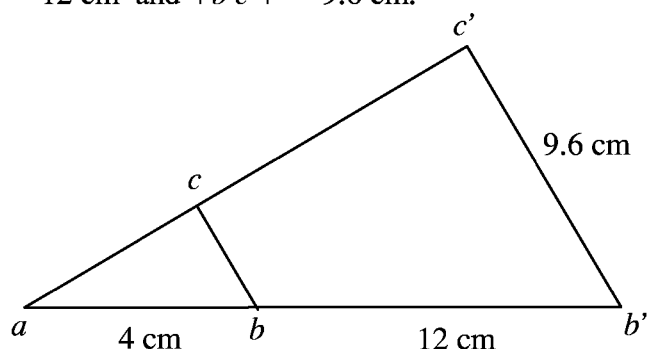
*Slips (-1)*

- S1 Perpendicular drawn through  $q$ .
- S2  $p, q$  not identified (however if  $p$  is identified other is implicit).

*Attempts (-1)*

- A1 Any line drawn.
- A2 Sketches  $\perp$ , apply  $(-3) + (-1) = 6$  marks i.e. B2 + S2
- A3 Sketches  $\angle$ , apply  $2 \times (-3) + (-1) = 4$  marks.

- (b) The triangle  $ab'c'$  is an enlargement of the triangle  $abc$ .  
The centre of enlargement is  $a$ .  
 $|ab| = 4 \text{ cm}$ ,  $|bb'| = 12 \text{ cm}$  and  $|b'c'| = 9.6 \text{ cm}$ .



- (i) Calculate the scale factor of the enlargement.  
(ii) Find the length of  $[bc]$   
(iii) The area of the triangle  $abc$  is  $3.84 \text{ cm}^2$ .  
Find the area of the triangle  $ab'c'$ .

### Solution

- (i) Scale factor  $= \frac{16}{4} = 4$   
(ii) Length of  $[bc] = \frac{9.6}{4} = 2.4$   
(iii) Area of the triangle  $ab'c' = 3.84 \times 4^2 = 3.84 \times 16 = 61.44 \text{ cm}^2$

### Blunders (-3)

B1 Incorrect proportionality when evaluating scale factor

$$\text{i.e. scale factor } k = \frac{12}{4} = 3 \text{ or } k = \frac{16}{12} = \frac{4}{3}$$

B2 In (ii)  $|bc| = 4 \times 9.6 = 38.4$        $|bc| = 9.6 \div 12 = 0.8$   
 $= 9.6 \times 12 = 115.2$        $|bc| = 9.6 \div 16 = 0.6$   
 $= 9.6 \times 16 = 153.6$

B3 Area  $\Delta ab'c' = 3.84 \times 4 = 15.36$  or  $3.84 \div 4 = 0.96$  or  $3.84 \div 4^2 = 0.24$   
 $= 3.84 \div 4^2 = 0.24$

B4 Area  $\Delta ab'c'$  multiplied or divided by any incorrect number

### Slips (-1)

S1  $4^2 = 8$

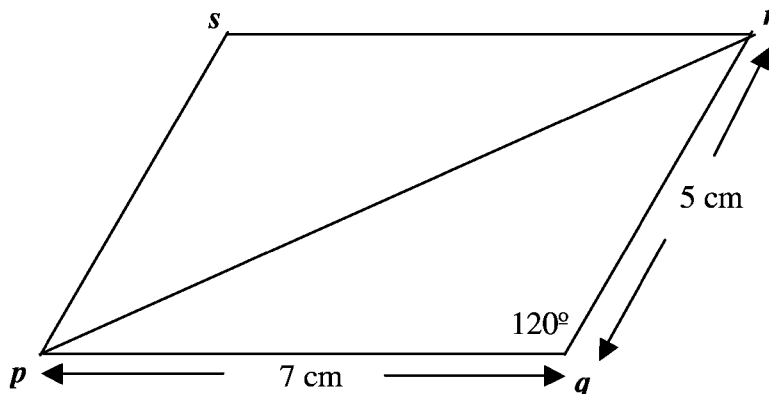
### Attempts (4,4,2)

A1 Worked diagram e.g.  $|ab'| = 16$  marked on diagram.

A2 Copies diagram

A3 Area  $= \frac{1}{2}(16)(9.6) \sin |\angle ab'c'|$  and stops. Measures angle and continues (-1).

- (c) Construct a parallelogram  $pqrs$  so that  $|pq| = 7$  cm,  $|qr| = 5$  cm and  $|\angle pqr| = 120^\circ$ .

**Solution**

- \* Allow use of protractor to produce angle of  $120^\circ$

*Blunders (-3)*

- B1 Triangle  $pqr$  only.  
 B2 Units other than centimetres.  
 B3 Fails to produce an angle of  $120^\circ$ , tolerance  $\pm 5^\circ$ .  
 B4 Draws parallelogram with  $|\angle pqr| = 60^\circ$   
 B5  $7 \times 5$  rectangle  
 B6 Sides outside tolerance of  $\pm 0.5$  cm.

*Slips (-1)*

- S1 Non labelled parallelogram.

*Attempts (6)*

- A1 Unrelated parallelogram or rectangle.  
 A2 Angle of  $60^\circ$  or  $120^\circ$  only