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State Examinations Commission

Scéim Mharcála

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Matamaitic

Bonnleibhéal

Marking Scheme

Leaving Certificate Examination, 2003

Mathematics

Foundation Level

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GENERAL INSTRUCTIONS TO EXAMINERS – PAPER 1:

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
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Part (i)	10 marks	Att 4
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(i) Find $\sqrt{73}$, to two decimal places.

$$\sqrt{73} = 8.544 = \mathbf{8.54}$$

Blunders (-3)

B1: Square root mistaken for square (Ans. 5329)

B2: Square root mistaken for half (Ans. 36.5)

Slips (-1)

S1: If $73\sqrt{73} = 623.712$

S2: Incorrect or omitted round-off

S3: Misplacing decimal point e.g. 85.4 or 0.854

Misreadings (-1)

M1: $\sqrt{7.3} = 2.701$

M2: $\sqrt{0.73} = 0.854$

Attempts

Att: Writes 73^2 and stops

Att: Writes $73/2$ and stops

Att: Writes 73×2 and stops

Att: Work at estimating answer e.g. $\sqrt{64} = 8$ or $\sqrt{81} = 9$

(ii) Find $(4.83)^3$.

$$(4.83)^3 = 112.678587$$

Blunders (-3)

B1: Calculates $(4.83)3$; (Ans. 14.49)

B2: Calculates $(4.83)/3$; (Ans. 1.61)

B3: Third root calculated instead of power of 3; (Ans. 1.690)

B4: Interprets $(4.83)^3$ as 4.83×10^3 ; (Ans. 4830)

B5: Calculates $(4.83)^2$; (Ans. 23.3289)

Slips (-1)

S1: Incorrect level of accuracy e.g. 112.68

S2: Misplacing decimal point

Misreadings (-1)

M1: Power other than 3 or 2 worked

Attempts

Att: Writes $(4.83)3$ and stops

Att: Writes $4.83/3$ and stops

Att: Writes 4.83×10^3 and stops

(iii) Find $2.07 + (3.45)^2$.

$$2.07 + (3.45)^2 = 2.07 + 11.9025 = \mathbf{13.9725}.$$

Blunders (-3)

B1: Square mistaken for square root (Ans. 3.9274)

B2: Square mistaken for twice (Ans. 8.97)

B3: Blunder in precedence

B4: Square not found (Ans. 5.52)

B5: $2.07 + 3.45 \times 10^2$ (Ans. 347.07)

Slips (-1)

S1: Incorrect level of accuracy

S2: Misplacing the decimal point, each time

S3: Addition omitted

Misreadings (-1)

M1: Misplaced digits or misread numbers, each time

Attempts

Att: Work at estimating answer e.g. $2 + 9 = 11$

Note:

$$(2.07 + 3.45)^2 = 5.52^2 = 30.4704$$
$$2.07^2 + 3.45^2 = 4.2849 + 11.9025 = 16.1874$$
$$2.07 + (3.5)^2 = 2.07 + 12.25 = 14.32$$
$$2.07 + (3.4)^2 = 2.07 + 11.56 = 13.63$$

(iv) Find the value of $\frac{3}{0.2} - \sqrt{24.01}$.

$$\frac{3}{0.2} - \sqrt{24.01} = 15 - 4.9 = \mathbf{10.1}.$$

Blunders (-3)

- B1: Omits root – calculates $15 - 24.01 = -9.01$
- B2: Blunder in calculating fraction e.g. $3/0.2 = 1.5$
- B3: Each omitted or incorrect step of 2
- B4: Calculates $3 \times 0.2 = 0.6$

Slips (-1)

- S1: Misplacing decimal point, e.g. 1.01, each time
- S2: Slip in subtraction or subtraction omitted

Misreadings (-1)

- M1: Calculates cube root
- M2: Reads + for – (Ans. 19.9)
- M3: Reads \div for – (Ans. 3.06)

Attempts

- Att: Work towards a correct step

(v) A house bought for €95 000 is sold at a profit of 250%. What is the selling price of the house?

$$\text{Profit} = €95\,000 \times 2.5 = 237\,500$$

$$\text{Selling price} = €95\,000 + 237\,500 = €332\,500$$

or

$$\text{Selling price} = €95\,000 \times 3.50 = \mathbf{€332\,500}$$

Blunders (-3)

B1: Calculates profit only (Ans. €237 500)

B2: Blunder in percentages e.g $(95000/250)100 = 38000$

$$\text{or } (95000/350)100 = 27142.85$$

B3: Calculates 1% of €95000 and stops (in addition to above penalties)

Slips (-1)

S1: Numerical slips in calculation

Misreadings (-1)

M1: Incorrect number of zeros taken

Attempts

Att: Writes 250/100 without working

Att: 95000 ± 250 worked

(vi) Find, to the nearest dollar (\$), the value of €500, given that \$1 = €1.12.

$$\frac{500}{1.12} = 446.428 = \mathbf{\$446.}$$

Blunders (-3)

B1: Calculates 500×1.12 (Ans. 560)

B2: Calculates $1.12/500$ (Ans. 0.00224)

Slips (-1)

S1: Incorrect or omitted round-off

S2: Misplacing decimal point

Misreadings (-1)

M1: Uses exchange rate of 1.1 or 1.2

Attempts

Att: Calculates $1/1.12 = 0.8928$

Att: Calculates $1/500 = 0.002$

(vii) Find $\frac{5}{11} + \frac{2}{7}$, correct to one decimal place .

$$\frac{5}{11} + \frac{2}{7} = 0.45 + 0.28 = 0.73 = \mathbf{0.7}$$

or

$$\frac{5}{11} + \frac{2}{7} = \frac{5 \times 7 + 2 \times 11}{11 \times 7} = \frac{35 + 22}{77} = \frac{57}{77} = 0.74 = \mathbf{0.7}$$

Blunders (-3)

B1: Calculates $7/18$ (Ans. 0.388)

B2: Calculates $35/22$ or $22/35$ (Ans. 1.590 or Ans. 0.628)

B3: Calculates $5/18$ or $2/18$ (Ans. 0.2777 or 0.1111)

B4: Inverting fraction e.g. $77/57 = 1.3508$

B5: Each step of three omitted

Slips (-1)

S1: Incorrect or omitted round-off

Misreadings (-1)

M1: Reads \times for $+$ (Ans. $10/77 = 0.1298$)

Attempts

Att: Writes $7/18$ without further work

Att: Effort at "cross-multiplication"

Att: $5/11 + 2/7 \Rightarrow 5/11 = 2/7 \Rightarrow 35 = 22 \Rightarrow 35 + 22$

(viii) Find the total cost of

12 apples at 45 cent each
2 bottles of water at €1.20 each
6 bars of chocolate at 64 cent each.

12 apples at 45 cent each	€5.40
2 bottles of water at €1.20 each	€2.40
6 bars of chocolate at 64 cent each	€3.84
Total cost	€11.64

Blunders (-3)

- B1: Multiplication replaced by addition
- B2: Each omission of any calculation of 4
- B3: Mixing euro and cent

Slips (-1)

- S1: Slips in multiplication or addition
- S2: Misplacing decimal point, each time

Misreadings (-1)

- M1: Misreading any number
- M2: Using a correct price for an incorrect item

Attempts

- Att: Effort at calculating any step.

(ix) Find the value of

$$\frac{(6.2 \times 10^4) - (7.4 \times 10^3)}{(1.05 \times 10^2)}$$

$$\frac{(6.2 \times 10^4) - (7.4 \times 10^3)}{(1.05 \times 10^2)} = \frac{62000 - 7400}{105} = \frac{54600}{105} = \mathbf{520}$$

or

$$\frac{(6.2 \times 10^4) - (7.4 \times 10^3)}{(1.05 \times 10^2)} = \frac{620 \times 10^3 - 7.4 \times 10^3}{1.05 \times 10^2} = \frac{54.6 \times 10^3}{1.05 \times 10^2} = 52 \times 10 = \mathbf{5.2 \times 10^2}$$

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 6.2×40 , once only

Slips (-1)

- S1: Any number incorrect by factor of 10 when written in decimal form
- S2: Omitted or incorrect round-off

Attempts

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

Att: $\frac{6.2 - 7.4}{1.05} = -1.1428$

(x) Find, correct to the nearest whole number, the value of

$$\frac{32.3 + 1.27}{18.3 \times 0.04}$$

$$\frac{32.3 + 1.27}{18.3 \times 0.04} = \frac{33.57}{0.732} = 45.86 = \mathbf{46}$$

Blunders (-3)

- B1: Blunders in order of precedence, applied once
 B2: Each omitted or incorrect step if slips not clear
 B3: Fraction inverted (Ans. 0.0218)

Slips (-1)

- S1: Omitted or incorrect roundoff
 S2: Numerical slips, including misplacing decimal point – max. of 3

Misreading (-1)

- M1: Uses + instead of \times or vice versa

Attempt

- Att: Some correct step
 Att: Work at estimating answer

Note:

$$\begin{aligned} ((32.3 + 1.27) \div 18.3) \times 0.04 &= (33.57 \div 18.3) \times 0.04 = 1.834 \times 0.04 = 0.07336 \\ 32.3 + ((1.27 \div 18.3) \times 0.04) &= 32.3 + (0.069 \times 0.04) = 32.3 + .00276 = 32.3027 \\ (32.3 + (1.27 \div 18.3)) \times 0.04 &= (32.3 + 0.069) \times 0.04 = 1.29476 \\ (32.3 \div 18.3) + (1.27 \div 0.04) &= 1.765 + 31.75 = 33.515 \\ (32.3 \div 18.3) \times (1.27 \div 0.04) &= 1.765 \times 31.75 = 56.03875 \end{aligned}$$

QUESTION 2

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

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

- (a) Change to metres
(i) 0.15 km
(ii) 350 cm.

(i) $0.15 \text{ km} = 0.15 \times 1000 = \mathbf{150 \text{ m}}$

(ii) $350 \text{ cm} = \frac{350}{100} = \mathbf{3.5 \text{ m}}$.

Blunders (-3)

B1: Incorrect conversion factor

B2: Writes $1000 \div 0.15$ (Ans. 6666.666)

B3: Writes $100 \div 350$ (Ans. 0.2857)

Slips (-1)

S1: Misplacing decimal point, where work is shown.

Misreading (-1)

M1: Misreads digits

Attempt

Att: 350×0.15 or similar effort

- (b) Michael earns €450 a week and has tax credits of €105 a week. Find
- (i) the amount of tax he pays per week if the tax rate is 42%
 - (ii) his weekly take-home pay.

- (i) Gross tax = $€450 \times 0.42 = €189$
Tax paid = $€189 - €105 = €84$.
- (ii) Take home pay = $€450 - €84 = €366$

* Apply maximum of three slips if long multiplication used.

Section (i):

Blunders (-3)

B1: Blunder in calculating percentage e.g. $(450/42)100 = 1071.43$

B2: Incorrect treatment of tax credit e.g. doesn't subtract credit and stops at €189

B3: Calculates percentage of incorrect amount e.g. on €105 (Ans. 44.1)

Slips (-1)

S1: Mislacing decimal point

Attempts

Att: 450 ± 105 , worked

Section (ii): Work from candidates answer to part (i)

Blunders (-3)

B1: Subtraction of incorrect amount, if not penalised above

B2: Tax credit added to gross

Note: $(450 + 105)0.42 = 233.1$
 $(450 - 105)0.42 = 144.90$

Joanne is 12 years old and Ronan is 8 years old. €140 is divided between them in the ratio of their ages. How much money does each receive?

In four years time, another €140 will be divided between them in the ratio of their ages at that time. How much of that money will they each then receive?

$$\text{Joanne gets } \frac{12}{20}(140) = \mathbf{€84}.$$

$$\text{Ronan gets } \frac{8}{20}(140) = \mathbf{€56} \quad \text{or} \quad \text{Ronan gets } €140 - €84 = \mathbf{€56}$$

In four years time, Joanne is 16 and Ronan is 12.

$$\text{Joanne gets } \frac{16}{28}(140) = \mathbf{€80}.$$

$$\text{Ronan gets } \frac{12}{28}(140) = \mathbf{€60} \quad \text{or} \quad \text{Ronan gets } €140 - €80 = \mathbf{€60}$$

Blunders (-3)

B1: Blunder in ratio e.g. 12/8 or 8/12

B2: Only one ratio calculated

B3: Blunder in ratio in four year time e.g. 16/20, if different blunder

B4: €280 divided in ratio 16 : 12

Slips (-1)

S1: Slips in calculation

Misreadings (-1)

M1: Misreading ages or amount

Attempts

Att: Effort at establishing a ratio

Att: Writes 20 and no other work

QUESTION 3

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

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

- (a) The price quoted for painting a house was €400. The actual cost was €384.
Find
(i) the error in the price quoted
(ii) the percentage error, correct to one decimal place, in the price quoted.

(i) Error = $400 - 384 = \text{€}16$

(ii) Percentage error = $\frac{16}{384} \times 100 = 4.16\% = \text{4.2\%}$

Blunders (-3)

- B1: Takes $400 + 384$ (Ans. 784)
B2: Blunders in percentages e.g. $384/16$ (Ans. 24)
B3: Divides by 400

Slips (-1)

- S1: Writes $(400/384) \times 100 = 104.16\%$
S2: Incorrect or omitted round-off

Attempts

- Att: Writes $400/384$ and stops
Att: Writes $384/400$ and stops
Att: Writes 400×384 and stops
Att: Writes $100/384$
Att: Writes 384×100 or $384/100$
Att: Mean of 400 and 384 found

- (b) €4000 is invested at a rate of 4.5% per annum compound interest .
Find, to the nearest cent, its value at the end of 4 years.

$$A = €4000(1 + 0.045)^4 = €4000(1.045)^4 = €4000(1.192518) \\ = €4770.072 = \mathbf{€4770.07}$$

or

Year 1:	Principal	€4000,	Interest	€180
Year 2:	Principal	€4180,	Interest	€188.1
Year 3:	Principal	€4368.1,	Interest	€196.5645
Year 4:	Principal	€4564.6645,	Interest	€205.4099
Amount after 4 years			€4770.074	= €4770.07

Blunders (-3)

- B1: Blunder in calculating percentage e.g. $4.5\% \neq 0.045$ or $4.5\% \neq 4.5/100$
 B2: Blunder in formula as written by student or incorrect formula e.g. depreciation
 B3: Blunder in substituting into formula, once
 B4: Takes $(1.045)^4 = (1.045)4 = 4.18$
 B5: Takes $(1.045)^4 = 1.045/4 = 0.26125$
 B6: Writes $4000/(1.045)^4$ (Ans. 3354.24)
 B7: Writes $4000/(0.955)^4$ (Ans. 4808.908)
 B8: Writes $4000 \times (0.955)^4$ (Ans. 3327.15)

Slips (-1)

- S1: Incorrect or omitted roundoff
 S2: Numerical slips in calculation
 S3: Incorrect principal used to calculate an annual interest, each time
 S4: Final amount incorrect or not calculated, if calculation done year by year

Misreadings (-1)

- M1: $(1.045)^n$, $n = 2$ or 3 or $n \geq 5$ used in formula

Attempts

- Att: $4000 \div 4.50 = 888.888$
 Att: $4000 \times 4.50 = 18000$
 Att: $4000 \div 0.045 = 88888.88$
 Att: Interest not compounded i.e. simple interest (Ans. 4720)

- (c) A shopkeeper buys
 10 kg of hazel nuts at €9 per kg
 8 kg of pecan nuts at €15.25 per kg and
 7 kg of Brazil nuts at €10.50 per kg.

Find the total cost.

The shopkeeper mixes all the nuts together. Find the cost per kg of the mixed nuts

The shopkeeper sells the mixed nuts at a profit of 50%. What is the selling price per kg of the mixed nuts?

10 kg of hazel nuts at €9 per kg	€90.00
8 kg of pecan nuts at €15.25 per kg	€122.00
7 kg of Brazil nuts at €10.50 per kg	€73.50
Total cost	€285.50

$$\text{Cost per kilogram} = \frac{285.50}{25} = \mathbf{€11.42}$$

$$\text{Selling price } 11.42 \times 1.50 = \mathbf{€17.13}$$

Blunders (-3)

- B1: Multiplication replaced by addition
- B2: Each omission of any calculation of 4
- B3: Mixing euro and cent
- B4: Blunder in cost per kilogram e.g. average cost per kg (€11.58)
- B5: Blunder in calculating percentage
- B6: Blunder in calculating profit
- B7: Calculates profit only (Answer €5.71)

Slips (-1)

- S1: Numerical slips

Misreadings (-1)

- M1: Misreading any number
- M2: Using a correct price for an incorrect item

QUESTION 4

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

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

(a) Solve for x
$$6x + 7 = 34 - 3x.$$

$$6x + 7 = 34 - 3x \Rightarrow 6x + 3x = 34 - 7 \Rightarrow 9x = 27 \Rightarrow x = 3$$

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

Blunders (-3)

B1: Blunders in grouping terms e.g. $6x + 7 = 13x$

B2: Each step omitted

B3: $9x = 27 \Rightarrow x = 18$ or $x = 36$ or $x = 243$

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

(b) Solve the simultaneous equations

$$2x - y = 3$$

$$x + 4y = 24.$$

$$\begin{array}{l} 2x - y = 3 \Rightarrow 8x - 4y = 12 \\ x + 4y = 24 \Rightarrow \underline{x + 4y = 24} \\ \hline 9x = 36 \Rightarrow x = 4 \end{array}$$

$$2x - y = 3 \Rightarrow 8 - y = 3 \Rightarrow -y = 3 - 8 = -5 \Rightarrow y = 5$$

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

Blunders (-3)

B1: Blunder in multiplying equation by 4, or failing to multiply equation, once only

B2: Blunder in cancelling, once

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

B4: $9x = 36 \Rightarrow x = 27$ or $x = 45$ or $x = 324$

Slips (-1)

S1: Slips in signs

Random x picked, y calculated and stops - award 5 marks

Random x picked, y calculated and then y used to calculate an x value - award A6 + 5

Substitution of correct values in both equations – award A8

Substitution of correct values in both equations and verification shown – award 20

Attempts - First variable - Att 6

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

Att: Effort at cancelling one variable

Attempts - Second variable - Att 2

Att: Effort at substituting first variable

Att: Effort at cancelling second variable

Attempts - Att 8

Att: Attempt at finding a solution by trial and error

Worthless (0)

W1: Incorrect answers, no work shown

- (c) A music store sells special-offer CDs at €5 less than full-price CDs.
The total cost of two special-offer CDs and one full-price CD is €41.

Let x be the price of a special-offer CD and write this information as an equation in x .

Solve this equation for x to find the cost of a special-offer CD.

$$2x + (x + 5) = 41$$

$$2x + (x + 5) = 41 \Rightarrow 3x + 5 = 41 \Rightarrow 3x = 36 \Rightarrow x = 12$$

- * There must be an effort to set up equation in x , including 2 or 5, for the award of any of the first 10 marks.

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

Blunders (-3)

B1: Blunder in setting up equation e.g. $2 + x$ for $2x$

B2: Each omitted step of three steps, $2x$, $x + 5$, 41

Slips (-1)

S1: Slips in signs

Attempts

Att: Set-up: Writes $2x$ or $x + 5$ and stops

Att: Effort at trial and error

QUESTION 5

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

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

- (a) (i) Write down all of the prime numbers between 1 and 20.
(ii) How many of these prime numbers are even ?

(i) 2, 3, 5, 7, 11, 13, 17, 19
(ii) 1

Section (i):

Slips (-1)

S1: Each omitted or incorrect prime number

Attempts

Att: Any one correct value

Section (ii):

Slips (-1)

S1: Answer is digit “2” (as being the prime number) but word “two” is worthless.

Attempts

Att: Attempt at factors of 20

Att: Answer is 7 or lists the odd numbers

Att: List from (i) is repeated in (ii).

- (b) Solve the quadratic equation $3x^2 - 7x + 3 = 0$.
Give your answer correct to two decimal places.

$$3x^2 - 7x + 3 = 0 \Rightarrow x = \frac{7 \pm \sqrt{49 - 4(3)(3)}}{2(3)} = \frac{7 \pm \sqrt{49 - 36}}{6} = \frac{7 \pm \sqrt{13}}{6} *$$

$$\Rightarrow x = \frac{7 \pm 3.605}{6} = \frac{10.605}{6} \text{ or } \frac{3.395}{6} \Rightarrow x = 1.7675 \text{ or } 0.565$$

$$\Rightarrow x = \mathbf{1.77} \quad \text{or} \quad \mathbf{0.57}$$

* 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 – refer S2 below
 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, each time
 S2: Incorrect sign on coefficient, applied each time
 S3: $49 - 36 = 85$
 S4: Incorrect or omitted roundoff, each time

Attempts

- Att: Effort at substitution into formula
 Att: Incorrect formula with substitution
 Att: Attempt at finding factors $(3x \quad)(x \quad)$
 Att: If quadratic element eliminated (e.g. $6x - 7x + 2 = 0$) and attempts to solve

- (c) (i) Solve $5x - 1 \geq 14$.
 (ii) Solve $3 - 2x \geq -7$.
 (iii) Write down all the whole numbers which satisfy both $5x - 1 \geq 14$ and $3 - 2x \geq -7$.

(i) $5x - 1 \geq 14 \Rightarrow 5x \geq 15 \Rightarrow x \geq 3$

(ii) $3 - 2x \geq -7 \Rightarrow -2x \geq -10 \Rightarrow x \leq 5$

(iii) $\{3, 4, 5\}$

- * 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. $5x - 1 = 4x$
 B2: Blunder in direction of inequality when multiplying by “minus” in (ii)
 B3: Blunder in transposing e.g. $3 - 2x \geq -7 \Rightarrow -2x \geq -7/3$
 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 \geq

Attempts

- Att4: Some effort at rearranging terms
 Att4: Substitutes in a value - trial and error
 Att2: Any correct value listed in (iii)

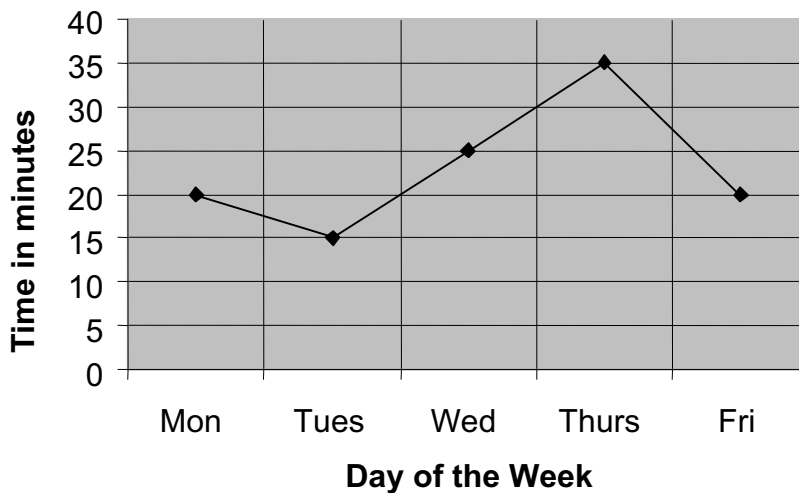
Worthless (0)

- W1: Incorrect answers, no work shown

QUESTION 6

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 sixth year student lives 10 km from school. Each day she travels to school by scooter. The graph below shows the time taken in minutes to travel to school on each day of a particular week. For example on Wednesday it took 25 minutes.



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

(i) On which day did the student take the shortest time to travel to school ?

Tuesday

Blunders(-3)

B1: Answer is Thursday

Attempts

Att: More than one day listed, including Tuesday

Worthless (0)

W1: Any other day given

Part (ii)

10 marks

Att 4

(ii) On which two days did she take the same time to travel to school ?

Monday and Friday

Blunders (-3)

B1: A correct day omitted

Slips (-1)

S1: Each incorrect day included

Worthless (0)

W1: No correct days listed

Part (iii)

10 marks

Att 4

(iii) What was the average time per day spent travelling to school over the week?

$$\frac{20 + 15 + 25 + 35 + 20}{5} = \frac{115}{5} = \mathbf{23 \text{ minutes}}$$

Blunders (-3)

B1: Blunder in average e.g. division by 7

B2: Blunder in precedence

Slips (-1)

S1: Each omitted or incorrect value in calculating numerator

Attempts

Att: Some effort at finding average

Att: One correct value read

Part (iv)

10 marks

Att 4

(iv) What was her average speed for the journey to school on Monday ?

$$\text{Speed} = \frac{10}{20} = \mathbf{0.5 \text{ km per minute}}$$

Blunders (-3)

B1: Blunder in speed formula

B2: Incorrect time read from graph

B3: Answer left as 10/20.

Slips (-1)

S1: Misplacing decimal point

Attempts

Att: No effort at calculating average, but gives time or distance

Part (v)

10 (5 + 5) marks

Att 4(2 + 2)

(v) On which day did the student travel at the slowest average speed ? Write this speed in km/hour, giving your answer correct to the nearest whole number .

Thursday,

$$\text{Speed} = \frac{10}{35} \times 60 = 17.14 = \mathbf{17 \text{ km per hour}}$$

Blunders (-3)

B1: Answer given is Tuesday

B2: Blunder in speed formula, if not penalised above

B3: Incorrect conversion to km per hour

Slips (-1)

S1: Numerical slips

S2: Incorrect or omitted round-off

Attempts

Att: Indication that student knows how to find speed.

QUESTION 7

Graph
Values

30 marks
20 marks

Att 12
Att 8

Table
Graph

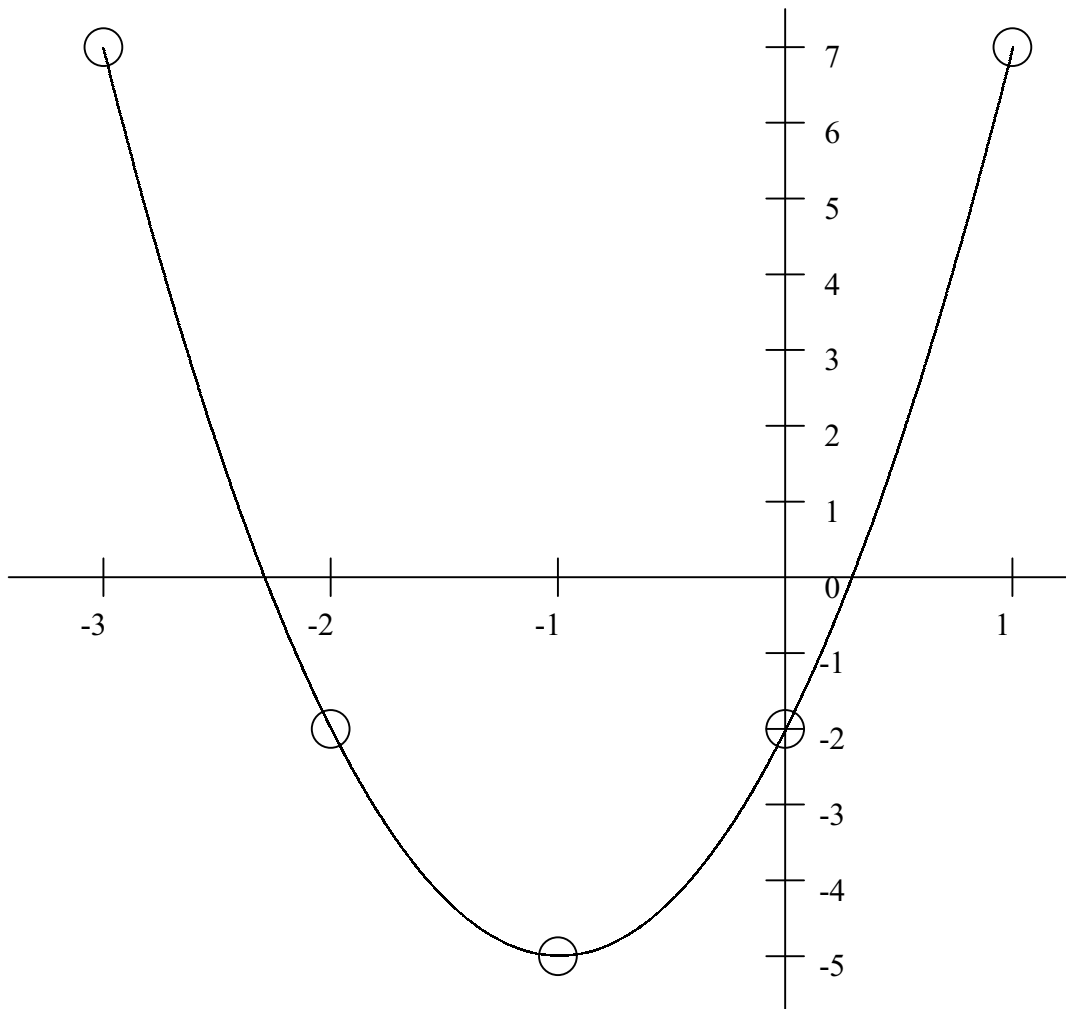
20 marks
10 marks

Att 8
Att 4

Draw the graph of the function

$$f : x \rightarrow 3x^2 + 6x - 2 \quad \text{for } -3 \leq x \leq 1, \quad x \in \mathbf{R}.$$

x	-3	-2	-1	0	1
$3x^2$	27	12	3	0	3
$+6x$	-18	-12	-6	0	6
-2	-2	-2	-2	-2	-2
$f(x)$	7	-2	-5	-2	7



Blunders (-3)

B1: Additional line in table

B2: Blunder such as $3x^2 = (3x)^2$ or $6x$ or $-2 = x - 2$ or $-2 = x$ 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 candidate's work

S3: Error in sign applied consistently across a line

Attempts:

Att: Any four correct calculated values in the table or function form

Plotting Graph:

Accept candidate's values in table for plotting points

Blunders (-3)

B1: Points joined in incorrect order

B2: Blunders in scales on axes, including reversing + for -.

Slips (-1):

S1: Each point plotted incorrectly, using students values

S2: Each pair of successive points not joined, maximum of 3

S3: Points joined by line segments in the correct order

S4: Axes reversed

Attempts:

Att: Any two of candidate's points plotted

Use your graph to find as accurately as possible

- (i) the minimum (least) value of $f(x)$
- (ii) $f(-1.5)$
- (iii) the values of x for which $f(x) = 4$
- (iv) the range of values of x for which $f(x)$ is decreasing.

- (i) Minimum value of $f(x) = -5$
- (ii) $f(-1.5) = -4.25$
- (iii) $f(x) = 4$ for $x = -2.7$ or $x = 0.7$
- (iv) $f(x)$ is decreasing for $-3 \leq x < -1$

- * Accept candidate's value from graph for award of marks
- * Allow tolerance in reading values of ± 0.2

Blunders (-3)

- B1: Each value outside the tolerance
- B2: Only one value given in part (iii)

Misreading (-1)

- M1: Misreads the value of x corresponding to the minimum of $f(x)$
- M2: Misreads increasing for decreasing

Attempts:

- Att: Effort at reading values from graph
- Att: For solving equation algebraically, correctly

**STATE EXAMINATIONS COMMISSION
MARKING SCHEME**

LEAVING CERTIFICATE EXAMINATION 2003

MATHEMATICS

FOUNDATION LEVEL

PAPER 2

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.

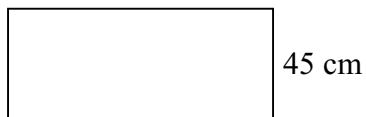
2. When awarding attempt marks, e.g. Att(3), it is essential to note that
- any correct relevant step in a part of a question merits *at least* the attempt mark for that part
 - if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
 - a mark between 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 at most.
7. The phrase “and stops” means that no more work is shown by the candidate.

QUESTION 1

Part (a)	20(15,5) marks	Att 8(6,2)
Part (b)	30 marks	Att 12

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

A wire of length 3 metres is bent to form a rectangle, one side of which is 45 cm.



Calculate the length of the longer side and hence calculate the area enclosed by the rectangle.

(a)	20(15,5) marks	Att 8(6,2)
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$$\begin{aligned}\text{Length of longer side} &= \frac{300 - 90}{2} = 105 \text{ cm} \\ \text{Area of rectangle} &= 105 \times 45 = 4725 \text{ cm}^2\end{aligned}$$

Blunders (-3)

- B1 Fails to multiply 45 by 2
- B2 Incorrect conversion to cms
- B3 Fails to divide by 2
- B4 Does not subtract
- B5 Error in area formula
- B6 Incorrect substitution in area formula

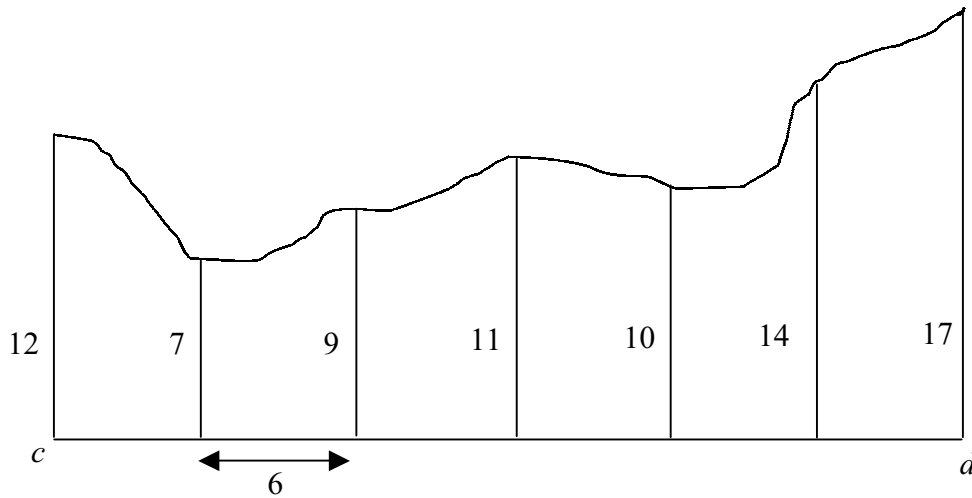
Slips (-1)

- S1 Numerical errors

Attempts (6,2 marks)

- A1 Copies diagram
- A2 Defines length or area.

- (b) A road has a straight edge cd .
The diagram below shows a section of the road that is covered by a flood.



Offsets of lengths 12, 7, 9, 11, 10, 14 and 17 metres are measured at intervals of 6 metres along $[cd]$. Calculate the area of the flooded section using Simpson's Rule.

$$Area = \frac{1}{3} height [1^{st} + Last + 2(odd) + 4(even)]$$

$$Area = \frac{1}{3}(6)[12+17+2(9+10)+4(7+11+14)]$$

$$Area = 2[29+2(19)+4(32)]$$

$$Area = 2[29+38+128]$$

$$Area = 2[195]$$

$$Area = 390 \text{ m}^2$$

Blunders (-3)

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

Slips (-1)

- S1 Each incorrect or omitted altitude
- S2 Numerical errors

Attempts (12)

- A1 Gives Simpson's formula only
- A2 Copies diagram

QUESTION 2

Part (a)

20(15,5) marks

Att(6,2) 8

Part (b)

30 marks

Att 12

(a) A sphere and a cylinder have the same volume.

The sphere has radius 6 cm.

(i) Calculate the volume of the sphere.

The radius of the cylinder is 4 cm.

(ii) Calculate the height of the cylinder.

Take $\pi = 3.14$.

(i)

15 marks

Att 6

(i)
$$\text{Volume of sphere} = \frac{4}{3}(3.14)(6)^3$$

$$\text{Volume of sphere} = 904.32\text{cm}^3$$

Blunders (-3)

B1 Uses incorrect relevant volume formula containing π .

Slips (-1)

S1 Uses 4cm as radius

S2 Numerical errors

S3 Error in evaluating 6^3

Attempts (4)

A1 Draws diagram

A2 Correct or relevant formula without substitution

(ii)

5 marks

Att 2m

(ii)
$$\text{Volume of cylinder} = \text{Volume of sphere}$$

$$\pi r^2 h = \frac{4}{3}\pi r^3$$

$$(4)^2 h = \frac{4}{3}(6)^3$$

$$4h = \frac{1}{3}(6)^3$$

$$4h = (6)^2(2)$$

$$4h = 72 \Rightarrow h = 18\text{cm.}$$

Blunders (-3)

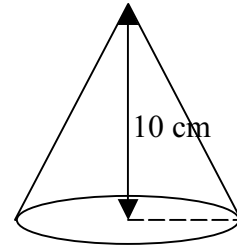
B1 Uses incorrect relevant formula, containing π , for volume of cylinder.

B2 Transposition error

Slips (-1)

S1 Numerical errors

- (b) The volume of a right circular cone is 3246 cm^3 .
 The height of the cone is 10 cm .
 Calculate the radius of the base, correct to one decimal place.
 Take $\pi = 3.14$.



Part (b)

30 marks

Att 12

$$\text{Volume of Cone} = \frac{1}{3}\pi r^2 h$$

$$3246 = \frac{1}{3}(3.14)r^2(10)$$

$$\frac{(3)(3246)}{(3.14)(10)} = r^2$$

$$r^2 = 310.1273885$$

$$r = \sqrt{310.1273885} = 17.610434$$

$$r = 17.6 \text{ cm}$$

Blunders (-3)

- B1 Uses incorrect relevant formula, containing π , for volume of cone
- B2 Error in transposition
- B3 Square root not found

Slips (-1)

- S1 Numerical errors
- S2 Error in rounding
- S3 Misplaced decimal

Attempts (12)

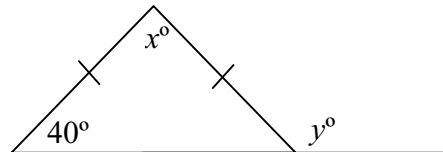
- A1 Any formula containing π
- A2 Copies diagram

QUESTION 3

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

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

- (a) The diagram shows an isosceles triangle.
Find the value of x and the value of y .



$$x = 180^\circ - 2(40) = 100^\circ$$

$$y = 180^\circ - 40^\circ = 140^\circ$$

- * Accept answers on diagram
- * Accept $40^\circ - 180^\circ = 140^\circ$

Blunders (-3)

- B1 Sum of internal angles $\neq 180^\circ$
- B2 Straight angle $\neq 180^\circ$
- B3 $x = 180^\circ - 40^\circ$
- B4 $y = 40^\circ$
- B5 Omits x or y
- B6 Wrong isosceles

Slips(-1)

- S1 Numerical errors

Attempts(4)

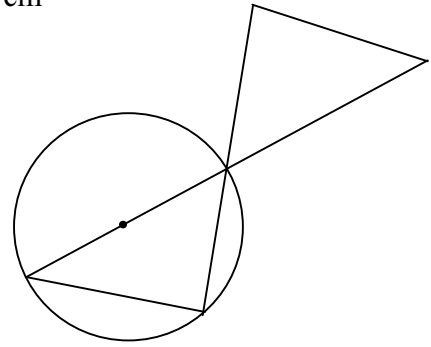
- A1 Marks equal angles on diagram
- A2 Uses protractor ($x = 94^\circ \pm 5^\circ$)
- A3 Copies diagram

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

(b) o is the centre of the circle. The radius of the circle is 5 cm and $|lq| = |qm|$.

Find:

- (i) the measure of the angle P
- (ii) the measure of the angle Q
- (iii) the measure of the angle R
- (iv) the length of $[qm]$.



- (i) $P = 90^{\circ}$
- (ii) $Q = 35^{\circ}$
- (iii) $R = 70^{\circ}$
- (iv) $[qm] = 10 \text{ cm}$.

Blunders(-3)

- B1 $P = 180^{\circ}$ or 360° or 55° or 35° or 70° or 75°
- B2 $Q = 55^{\circ}$ (assumes triangle is isosceles)
- B3 $R = 75^{\circ}$ or 90° or 55° or 35°
- B4 $|qm| = 5$ or any multiple of 5.

Slips (-1)

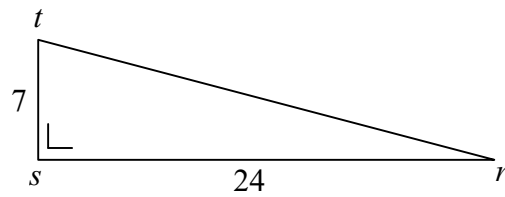
- S1 Numerical errors

Attempts(2)

- A1 Additional material on a diagram
- A2 Copies diagram

(c) The diagram shows a right-angled triangle with $|rs| = 24$ and $|st| = 7$.

Use the theorem of Pythagoras to find $|rt|$.



$$rt^2 = 7^2 + 24^2$$

$$rt^2 = 49 + 576$$

$$rt^2 = 625$$

$$rt = \sqrt{625} = 25$$

Blunders (-3)

B1 No number squared

B2 No square root or $\sqrt{625}$ only or $|tr|^2 = \sqrt{625}$ and stops

Slips (-1)

S1 $\sqrt{24^2 - 7^2} = \sqrt{576 - 49} = \sqrt{527}$

S2 Numerical errors

Attempts(8)

A1 Draws diagram

A2 Any attempt to define Pythagoras

A3 Calculates area

A4 Uses trigonometric ratio

QUESTION 4

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

(a) $p(1, 8)$ and $q(3, -8)$ are two points.
Find the slope of pq

$$\text{Slope} = \frac{-8-8}{3-1}$$

$$\text{Slope} = -8$$

Blunders (-3)

- B1 Incorrect slope formula
- B2 Correct distance or mid-point formula
- B3 Incorrect distance or mid-point formula, apply 2(-3)

Slips (-1)

- S1 Numerical errors

Attempts(8)

- A1 Plots points only

Part (b)	15(5,5,5)	Att(2,2,2)
-----------------	------------------	-------------------

a is the point $(2, 5)$ and b is the point $(-3, 6)$.
(i) Find the length of $[ab]$.
(ii) Find the co-ordinates of the midpoint of $[ab]$.
(iii) Plot the points a and b and the midpoint of $[ab]$ on graph paper

(i) $\text{Length} = \sqrt{(-3-2)^2 + (6-5)^2}$
 $\text{Length} = \sqrt{26}$

(ii) $\text{Midpoint} = \left(\frac{2-3}{2}, \frac{5+6}{2} \right)$
 $\text{Midpoint} = \left(\frac{-1}{2}, \frac{11}{2} \right)$

(iii) Plot points

Blunders (-3)

- B1 Incorrect distance formula
- B2 Incorrect mid-point formula

Slips(-1)

- S1 Numerical errors
- S2 Each incorrectly plotted point

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

The line L has equation $4y = 3x + 20$.

The point c has co-ordinates (0, 5).

- (i) Show that the point c lies on the line L.
- (ii) Write down the slope of L.
- (iii) Find the equation of the line M, which passes through the point (-2, 3) and is parallel to L.

$$4y = 3x + 20$$

$$4(5) = 3(0) + 20$$

$$20 = 20$$

(ii)
$$\text{Slope} = \frac{3}{4}$$

(iii)
$$\text{Equation Formula: } y - 3 = \frac{3}{4}(x + 2)$$

$$4(y - 3) = 3(x + 2)$$

$$4y - 12 = 3x + 6$$

$$3x - 4y + 18 = 0$$

Blunders(-3)

B1 Incorrect substitution

B2 In (ii) slope = $\pm 4, \pm 3, \pm 20, \pm \frac{4}{20}, \pm \frac{3}{20}, \pm \frac{20}{4}, \pm \frac{20}{3}$

B3 Error in equation of line formula

B4 Incorrect substitution in line formula

Slips(-1)

S1 Numerical errors

S2 Slope = $\frac{4}{3}$ or $-\frac{3}{4}$

Attempts(6)

A1 Draws a sketch

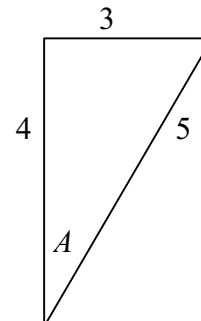
A2 Writes down correct relevant formula

QUESTION 5

Part (a)	20(10,5,5) marks	Att8(4,2,2)
Part (b)	15 marks	Att 6
Part (c)	15 marks	Att 6

Part (a) **20 marks** **Att 8(4,2,2)**

The diagram shows a right-angled triangle with sides of length 3, 4 and 5 cm and angles named A and B .



Write down the value of:

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

(i) $\cos A = \frac{4}{5}$	(ii) $\sin A = \frac{3}{5}$	(iii) $\tan B = \frac{4}{3}$
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* Accept fractions or decimals
 $\cos A = 0.8, \sin A = 0.6, \tan A = 0.75$

* Accept $\cos\left(\frac{4}{5}\right), \sin\left(\frac{3}{5}\right), \tan\left(\frac{4}{3}\right)$

Blunders(-3)

- B1 Incorrect trigonometric ratio
- B2 Substitutes in Sine or Cosine rule where appropriate.

Slips(-1)

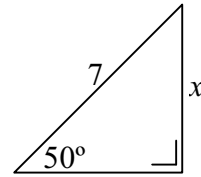
- S1 Inverted ratio
- S2 Uses $\cos = \cos^{-1}$ to give $\cos A = 36.87^\circ$ etc.

Attempts(8)

- A1 $\cos = \frac{adj}{hyp}$ only, same for Sin and Tan.
- A2 SOHCAHTOA or equivalent in (i),(ii) and (iii)
- A3 Draws diagram

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

Calculate the value of x , to one decimal place.



$$\sin 50^\circ = \frac{x}{7} \Rightarrow x = 7 \sin 50^\circ \Rightarrow x = 5.4 \text{ (to 1 dec. place)}$$

Blunders(-3)

B1 Incorrect trigonometric ratio

Slips(-1)

S1 Fails to round off

S2 Numerical errors

Attempts(6)

A1 Measures from diagram

A2 Some attempt at Pythagoras

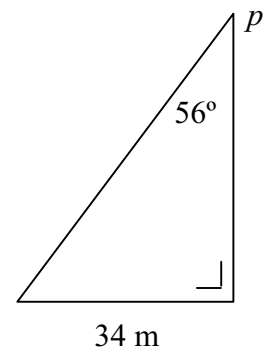
A3 7×50

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

A car is on level ground 34 m from the foot of a hotel.
The point p is at the top of the hotel.

To see the car from p , a person must look down 56°
from the horizontal.

Calculate the height of p above ground level,
correct to the nearest metre.



$$\tan 56^\circ = \frac{p}{34} \Rightarrow p = 34 \tan 56^\circ \Rightarrow p = 50 \text{ m (to nearest metre)}$$

Blunders(-3)

B1 Incorrect trig ratio

B2 Incorrect transposition

Slips(-1)

S1 No rounding

S2 Rad or grad mode

Attempts(-1)

A1 Measures from diagram

A2 Defines Tan

A3 Pythagoras

QUESTION 6

Part (a)	20 marks	Att 8
Part (b)	15 marks	Att 6
Part (c)	15 marks	Att 6

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

Of the people working in a factory 20 walk to work, 10 go by car and the remaining 25 go by bus.
One of the people working in the factory is chosen at random.
What is the probability that this person goes to work by bus

$$P(\text{Bus}) = \frac{25}{55} = \frac{5}{11}$$

Blunders(-3)

- B1 Incorrect n(S)
- B2 Incorrect n(E)
- B3 Fails to divide by n(S) or equivalent (ratio,percentage,decimal)
- B4 Inverts Fraction

Slips(-1)

- S1 Numerical

Attempts(6)

- A1 Any fraction apart from those above

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

A young person starting a new job needs an outfit, consisting of a jacket, trousers and shirt. A local shop stocks the following:
three different types of jacket,
two different types of trousers,
five different types of shirt.
How many different selections of outfit are possible?

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

Blunders(-3)

- B1 $3 + 2 + 5 = 12$
- B2 $3! \times 2! \times 5! = 1440$
- B3 $3! + 2! + 5! = 128$ apply 2(-3)
- B4 $3 \times 3 \times 3 = 27$ or equivalent

Slips(-1)

- S1 Gets probability of a certain type $= \frac{1}{30}$

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

150 students sitting an examination were grouped according to age (16, 17 or 18), and gender (female or male). The results are given in the following table:

	Age 16	Age 17	Age 18
Female	23	30	21
Male	10	50	16

One student is chosen at random.

What is the probability that the student is

- (i) male
- (ii) a 16 year old female
- (iii) younger than 18?

$$(i) \quad P(\text{male}) = \frac{76}{150} = \frac{38}{75}$$

$$(ii) \quad P(\text{16 year old female}) = \frac{23}{150}$$

$$(iii) \quad P(\text{younger than 18}) = \frac{113}{150}$$

Blunders(-3)

- B1 Incorrect number of possible outcomes; apply once only
- B2 Incorrect number of favourable outcomes
- B3 Fails to divide by number of possible outcomes; apply once only
- B4 Inverted fraction; apply once only

Slips(-1)

- S1 Numerical errors eg fails to add in (i) or (iii)

QUESTION 7

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

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

The mean of the five numbers 4, 8, y , 12, 15 is 9.
Find the value of y .

$$\text{Mean} = \frac{4+8+y+12+15}{5} = 9$$

$$39 + y = 45$$

$$y = 6$$

Blunders(-3)

- B1 Ignores y when finding mean
- B2 Error in forming the equation
- B3 Error in solving the equation

Slips(-1)

- S1 Numerical errors

Attempts(6)

- A1 Multiplies any number by 9
- A2 Picks a number between 4 and 15

The following table is a record of the time taken by employees to travel to work.

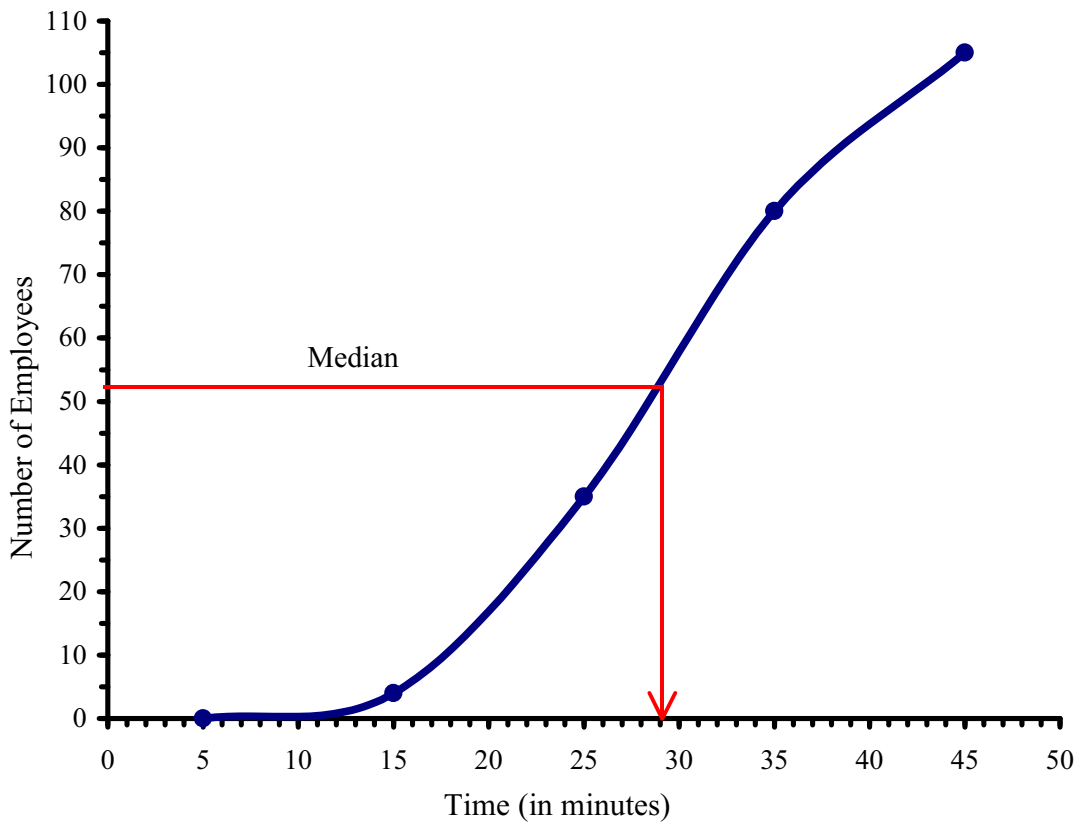
Time Taken (in Minutes)	5 - 15	15 - 25	25 - 35	35 - 45
Number of Employees	4	31	45	25

Copy and complete the cumulative table below

Time Taken (in Minutes)	<5	<15	<25	<35	<45
Number of Employees	0				

Draw the cumulative frequency curve. Put the number of employees on the vertical axis. Use your curve to estimate the median amount of time taken.

Time Taken (in Minutes)	<5	<15	<25	<35	<45
Number of Employees	0	4	35	80	105



Median = 29 mins.

Blunders(-3)

- B1 Plot on mid-points
- B2 Error in scales
- B3 Points not joined
- B4 Uses incorrect axis for median

Slips(-1)

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

Attempts(2,4,2)

- A1 Draws axes only

Part(c)

20(15,5) marks

Att 8(6,2)

Find the mean and the standard deviation of the numbers
5, 7, 12, 16,
correct to two places of decimals.

x	Mean	d	d^2
5	10	5	25
7	10	3	9
12	10	2	4
16	10	6	36
$\Sigma x = 40$			$\Sigma d^2 = 74$

$$\text{Mean} = \frac{\sum x}{n} = \frac{40}{4} = 10, \quad \text{Standard Deviation} = \sqrt{\frac{74}{4}} = 4.3011 = 4.30$$

- * Calculates mean merits 15, standard deviation merits 5
- * Accept correct answer without work

Blunders(-3)

- B1 $5 + 7 + 12 + 16 = 40$ only

Slips(-1)

- S1 Numerical errors
- S2 Each step omitted in SD

Attempts(6,2)

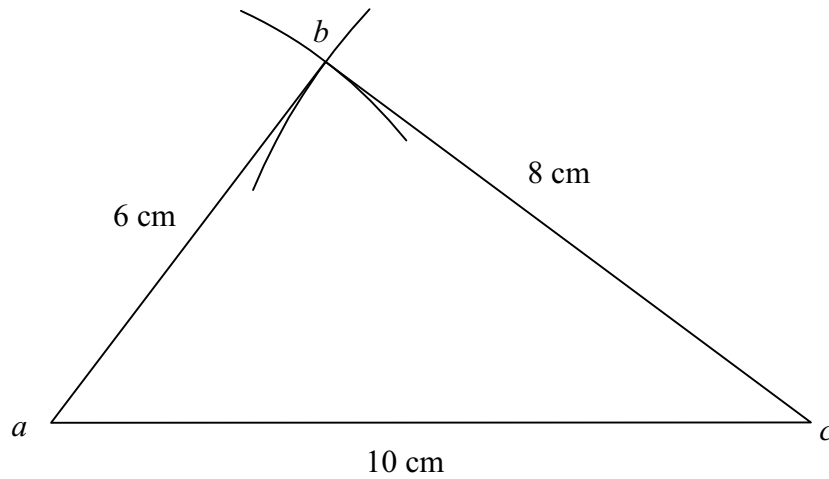
- A1 Any addition
- A2 Any work on SD table or gives formula for SD

QUESTION 8

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

Part (a) 15(10,5) Att 6 (4,2)

Construct a triangle abc with
 $|ac| = 10$ cm, $|bc| = 8$ cm and $|ab| = 6$ cm.
What is the measure of the angle abc ?



The angle $abc = 90^\circ$

Blunders(-3)

B1 Each omitted side

Slips(-1)

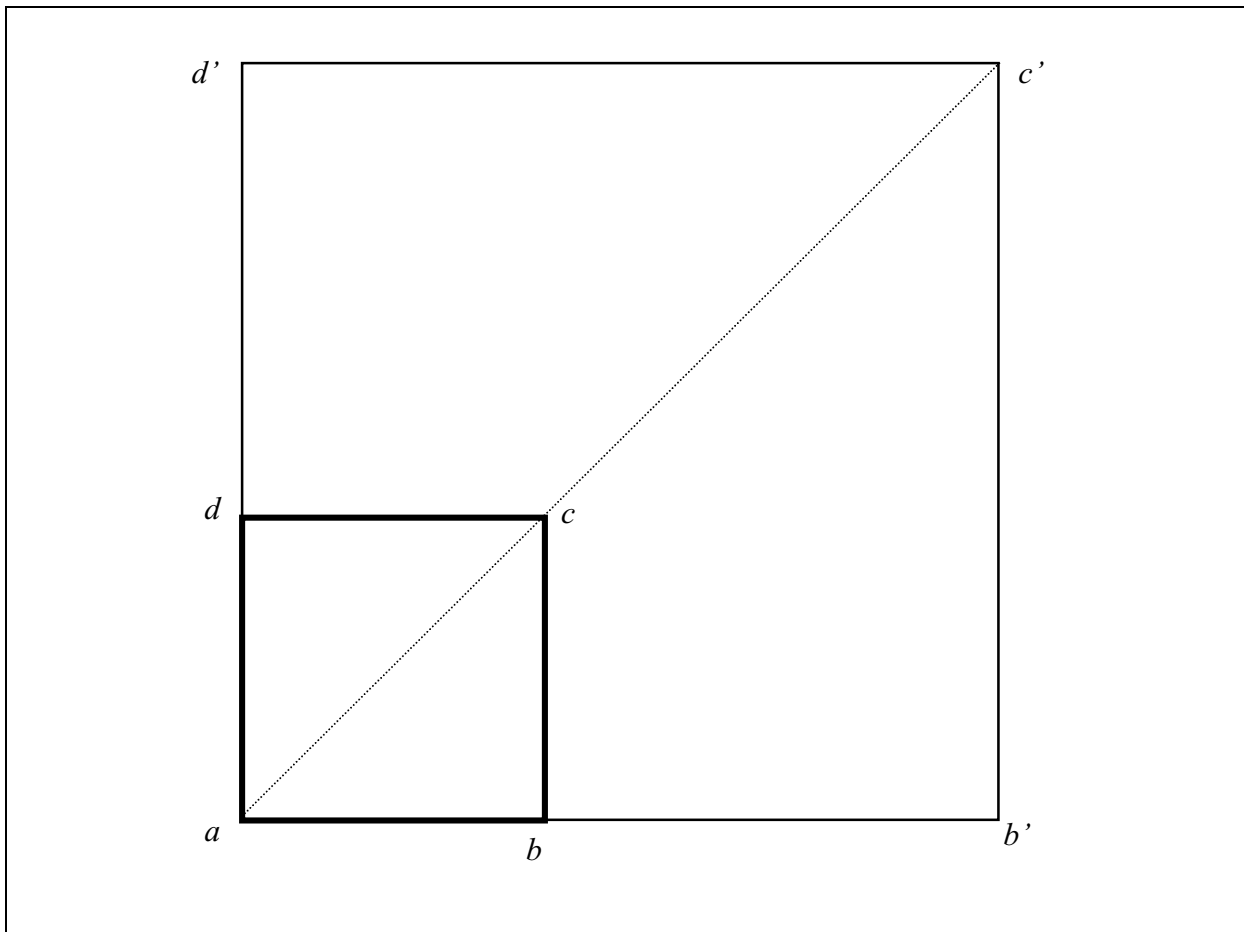
S1 Each side outside tolerance of ± 1 cm

S2 Angle outside tolerance of ± 5 degrees; (measure from candidate's diagram)

Construct a square $abcd$, with $|ab| = 4$ cm.

Draw the image of the square under the enlargement with centre a and scale factor 2.5.

Find the area of the enlarged square



Blunders(-3)

- B1 Uses incorrect scale factor
- B2 Centre other than a
- B3 Non-rectangular enlargement
- B4 Points not joined

Slips(-1)

- S1 Lines outside tolerance
- S2 Numerical errors
- S3 Original area by $2 \cdot 5$
- S4 Each omitted image point

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

A rectangular map is reduced by a scale factor of 0.5.
Two towns were 9 cm apart on the original map.
How far apart are they on the reduced map?

The original map had an area of 350 cm².
Find the area of the reduced map.

Length: $9 = 0.5 \times \text{Length}$
 $\therefore \text{Length} = 4.5 \text{ cm}$

Area: Area of new figure = $k^2 \times$ Area of original figure
Area of new figure = $(0.5)^2(350)$
Area of new figure = 87.5 cm²

Blunders(-3)

B1 Uses incorrect scale factor

Slips

S1 Numerical errors

S2 Multiplies original area by 0.5

Attempts(4,2)

A1 Draws a diagram.