

**Pre-Leaving Certificate**  
**Mathematics – P2**  
**Ordinary Level**  
**Marking Scheme**

## Marking Scheme – Paper 2, Section A and Section B

### Structure of the marking scheme

Candidate responses are marked according to different scales, depending on the types of response anticipated. Scales labelled A divide candidate responses into two categories (correct and incorrect). Scales labelled B divide responses into three categories (correct, partially correct, and incorrect), and so on. The scales and the marks that they generate are summarised in this table:

Scale Label	A	B	C	D	E
No of categories	2	3	4	5	6
5 mark scales	0, 5	0, 3, 5	0, 3, 4, 5	0, 2, 3, 4, 5	
10 mark scales	0, 10	0, 5, 10	0, 5, 7, 10	0, 3, 7, 8, 10	
15 mark scales	0, 15	0, 7, 15	0, 7, 10, 15	0, 5, 9, 12, 15	

A general descriptor of each point on each scale is given below. More specific directions in relation to interpreting the scales in the context of each question are given in the scheme, where necessary.

### Marking scales – level descriptors

#### A-scales (two categories)

- incorrect response
- correct response

#### B-scales (three categories)

- response of no substantial merit
- partially correct response
- correct response

#### C-scales (four categories)

- response of no substantial merit
- response with some merit
- almost correct response
- correct response

#### D-scales (five categories)

- response of no substantial merit
- response with some merit
- response about half-right
- almost correct response
- correct response

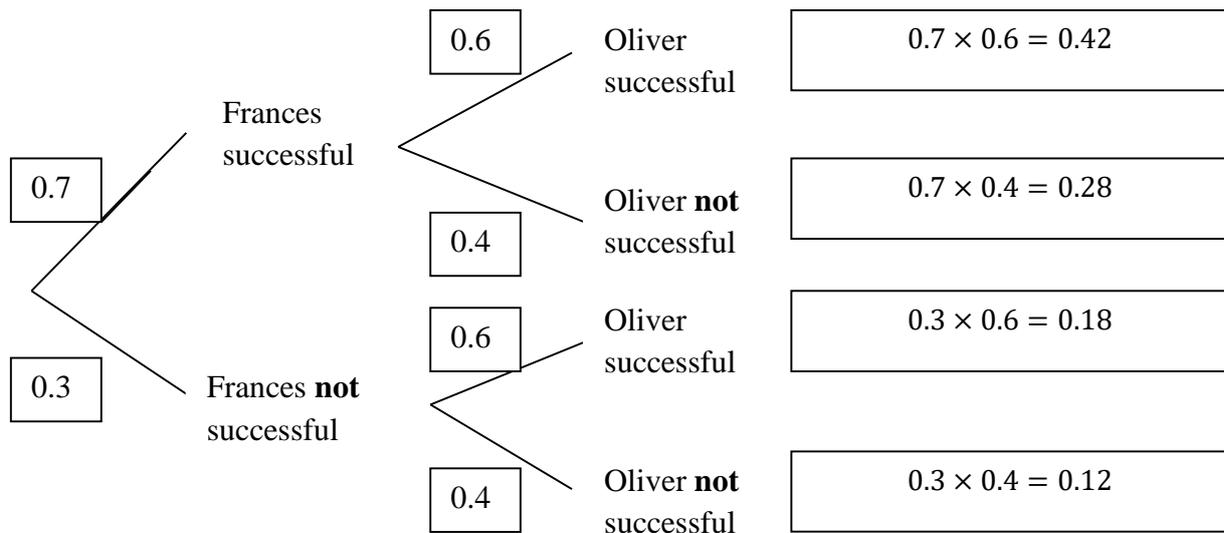
In certain cases, typically involving incorrect rounding, omission of units, a misreading that does not oversimplify the work or an arithmetical error that does not oversimplify the work, a mark that is one mark below the full-credit mark may also be awarded. Thus, for example, in scale 10C, 9 marks may be awarded.

Answer **all six** questions from this section

**Question 1****(25 marks)**

(a) Frances and Oliver are on a fitness program for one month. The probability that Frances will finish the program successfully is 0.7 while the probability that Oliver will finish successfully is 0.6

(i) Complete the tree diagram shown using the above information.



10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – at least one correct entry into table

Mid Partial Credit: (7 marks) – two rows OR columns correct

High Partial Credit: (8 marks) – minor error

(ii) What is the probability that they will both be successful?

$$0.7 \times 0.6 = 0.42 \text{ or } 42\%$$

5B [0, 3, 5]

Low Partial Credit: (3 marks) – indication of multiplication or at least one correct probability (consistent with their table) used

(iii) What is the probability that only one of them will both be successful?

$(0.7 \times 0.4) + (0.3 \times 0.6) = 0.28 + 0.18 = 0.46 \text{ or } 46\%$
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10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – indication of multiplication or addition or at least one correct probability (consistent with their table) used
---

Mid Partial Credit: (7 marks) – either bracket (consistent with their table) correctly stated with errors in 2 <sup>nd</sup> bracket or no second bracket
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High Partial Credit: (8 marks) – both brackets correct (consistent with their table) but answers not added or incorrectly added
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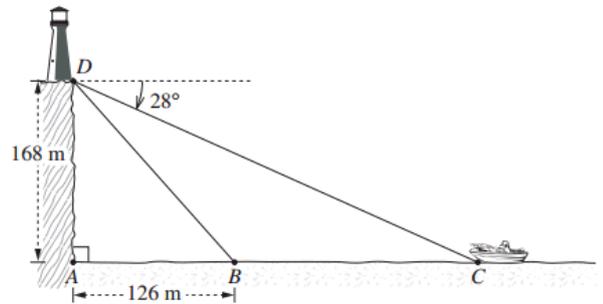
**Question 2**

**(25 marks)**

(a) (i) A square has an area of  $100 \text{ cm}^2$ . Calculate the length of one side of the square.

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

5A [0, 5]
Hit or miss



(ii) Find the length of the diagonal of the square. Write your answer in the form  $a\sqrt{2}$ ,  $a \in N$ .

$$10^2 + 10^2 = d^2$$

$$d^2 = 200$$

$$d = \sqrt{200}$$

$$d = 10\sqrt{2}$$

5B [0, 3, 5]

Low Partial Credit: (3 marks) – Pythagoras identified with at least 1 substitution (doesn't need to be correct) – can use their answer from (i) for partial or full marks
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(b) The base of a lighthouse, D, is at the top of a cliff 168 metres above sea level. The angle of depression from D to a boat at C is  $28^\circ$ . The boat heads towards the base of the cliff, A, and stops at B. The distance AB is 126 metres.

(i) What is the angle of depression from D to B, correct to the nearest minute?

$$\tan \theta = \frac{126}{168}$$
$$\theta = \tan^{-1} \frac{126}{168}$$
$$\theta = 36^{\circ}52'11''$$
$$\theta = 36^{\circ}52'$$

Angle of depression from D to B is  $90^{\circ} - 36^{\circ}52' = 53^{\circ}08'$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – tan ratio identified with at least one value correctly subbed in

Mid Partial Credit: (4 marks) – angle not subtracted from  $90^{\circ}$

(ii) How far did the boat travel from C to B, correct to the nearest metre?

$$\tan 62 = \frac{x}{168}$$
$$x = 168(\tan 62)$$
$$x = 315.962 - 126$$
$$|CB| = 189.962$$
$$|CB| = 190m$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – any correct relevant statement

Mid Partial Credit: (7 marks) – errors in solution (2 max; not including rounding)

High Partial Credit: (8 marks) – 1 minor error in solution – or 126 not subtracted from length

**Question 3****(25 marks)**

(a) Greg needs to conduct a statistical inquiry into how much time people aged 18–25 years have spent accessing social media websites in the last two weeks. He has decided to survey a sample of students from his university. The process of statistical inquiry includes the following steps, which are NOT in order.

<b>A</b>	Writing a report
<b>B</b>	Posing questions
<b>C</b>	Organising data
<b>D</b>	Analysing data and drawing conclusions
<b>E</b>	Collecting data
<b>F</b>	Summarising and displaying data

(i) Using the letters A, B, C, D, E and F, list the steps in the most appropriate order for Greg to conduct his statistical inquiry.

<b>1<sup>st</sup> Step</b>	<b>B</b>
<b>2<sup>nd</sup> Step</b>	<b>E</b>
<b>3<sup>rd</sup> Step</b>	<b>C</b>
<b>4<sup>th</sup> Step</b>	<b>F</b>
<b>5<sup>th</sup> Step</b>	<b>D</b>
<b>6<sup>th</sup> Step</b>	<b>A</b>

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – at least two correctly matched up
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Mid Partial Credit: (4 marks) – 4 correctly matched
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(ii) Greg conducts his statistical inquiry. At which step in the process would he have drawn a graph of his findings?

<b>F</b>	Summarising and displaying data
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5A [0, 5]

Hit or miss

(iii) Suggest a way that Greg could choose his sample of University students for his survey to ensure it is not biased in any way.

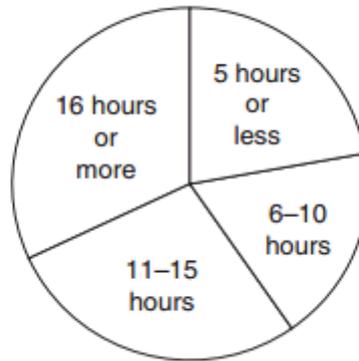
He could select a sample of students at random from the university cafeteria at lunch time on a 'regular' day – i.e. not directly after a holiday time or a typical university night out. He could also send an online version of his survey to a randomly generated selection of students from a variety of different courses and years within the university.

5C [0, 3, 5]

Partial Credit: (3 marks) – any understanding of bias shown but answer not sufficiently correct for full credit

(b) Greg produces the following graph to present his findings.

**Time spent accessing social media websites (in hours)**



(i) Measure the size of the angle in each segment of his pie-chart.

*Solution*

$$5 \text{ hours or less} = 80^{\circ}$$

$$6-10 \text{ hours} = 65^{\circ}$$

$$11-15 \text{ hours} = 100^{\circ}$$

$$16 \text{ hours or more} = 115^{\circ}$$

\*allow tolerance of  $\pm 2^{\circ}$  but all angles must add to  $360^{\circ}$  for full marks

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – at least one correct angle measured or reference to  $360^{\circ}$

Mid Partial Credit: (4 marks) – 1 minor error/inaccuracy but angles add to  $360^{\circ}$

(ii) If approximately 18 people claim to have spent between 11-15 hours on social media sites, calculate the number of people who Greg surveyed.

$$100^0 = 18$$

$$1^0 = \frac{18}{100}$$

$$360^0 = 360 \left( \frac{18}{100} \right)$$

$$360^0 = 64.8$$

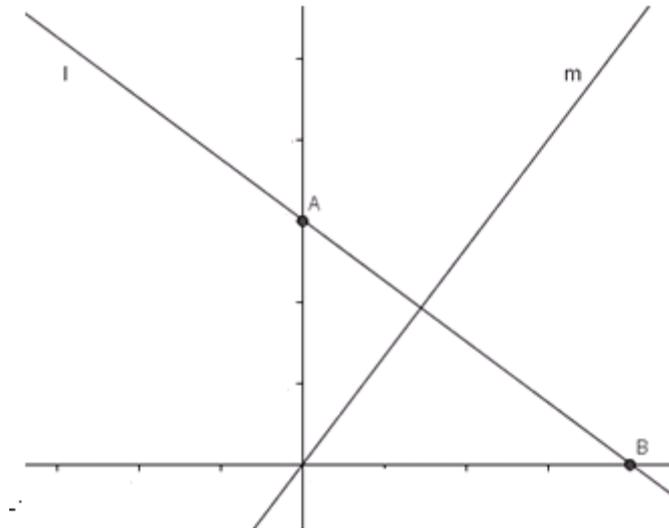
So, final answer will be either 64 or 65. 64.8 is not acceptable for full credit.

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – any correct relevant step
Mid Partial Credit: (4 marks) – arrives at 64.8 but not contextualised properly

**Question 4****(25 marks)**

The diagram shows a line  $l$ , with equation  $3x + 4y - 12 = 0$ , which intersects the  $y$ -axis at A. A second line  $m$ , with equation  $4x - 3y = 0$ , passes through the origin O and intersects  $l$  at E.



(i) Show that the coordinates of A are (0, 3).

A is where the line  $l$  intersects the  $y$ -axis  $\therefore x = 0$

$$3(0) + 4y - 12 = 0$$

$$4y = 12$$

$$y = 3$$

A(0,3) QED

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – subs (0,3) into equation (this doesn't prove that A is the point required – just that A is on the line!) or any correct relevant step i.e. cuts  $y$ -axis or  $x = 0$  etc

Mid Partial Credit: (4 marks) – finds  $y = 3$  but doesn't contextualise (i.e. doesn't put point together)

(ii) Show that  $l$  is perpendicular to  $m$ .

$$l: 3x + 4y - 12 = 0$$

$$m = \frac{-3}{4}$$

$$m: 4x - 3y = 0$$

$$m_m = \frac{-4}{-3} = \frac{4}{3}$$

$$-\frac{3}{4} \times \frac{4}{3} = -1$$

So, lines are perpendicular

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – any reference to slope or attempt to find slope of one line

Mid Partial Credit: (4 marks) – correctly finds both slopes but fails to finish or finishes incorrectly

(b) (i) Find the coordinates of the point E, the point of intersection of line  $l$  and line  $m$ .

Express your answer in the form  $\left(\frac{p}{25}, \frac{q}{25}\right)$ ,  $p, q \in \mathbb{N}$

$$3x + 4y - 12 = 0$$

$$\underline{4x - 3y = 0}$$

$$12x + 16y = 48$$

$$\underline{-12x + 9y = 0}$$

$$25y = 48$$

$$y = \frac{48}{25}$$

$$4x - 3\left(\frac{48}{25}\right) = 0$$

$$4x = \frac{144}{25}$$

$$x = \frac{144}{100} = \frac{36}{25}$$

$$E\left(\frac{36}{25}, \frac{48}{25}\right)$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – recognises simultaneous equations or isolates  $x$  or  $y$  from either equation or attempts to line up both equations for simultaneous eqs.

Mid Partial Credit: (7 marks) – either  $x$  or  $y$  correctly found or both found with, at most, minor errors or 1 major error

High Partial Credit: (8 marks) – 1 minor error in work (e.g. sign error – not consistent)

(ii) Hence or otherwise, find the area of  $\triangle AEO$ , where  $O$  is the origin.

$$A(0,3) \quad E\left(\frac{36}{25}, \frac{48}{25}\right)$$

$$A = \frac{1}{2} |X_2Y_1 - X_1Y_2|$$

$$A = \frac{1}{2} \left| \left(\frac{36}{25}\right)(3) + \left(\frac{48}{25}\right)(0) \right|$$

$$A = \frac{54}{25} \text{ sq units OR } 2.16 \text{ sq units}$$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – correct formula with one correct substitution

Mid Partial Credit: (4 marks) – uses distances to use  $\frac{1}{2}(b)(Lh)$  but with a minor error or minor error in solution provided

**Question 5****(25 marks)**

The circle  $C$  has equation  $(x - 10)^2 + (y - 12)^2 = 49$ .

The centre of  $C$  is at the point  $M$ .

(a) (i) Find the coordinates of the point  $M$

$$M(10,12)$$

5C [0, 3, 5]

Partial Credit: (3 marks) – incorrect sign/signs

(ii) Find the length of the radius of the circle  $C$

$$r = \sqrt{49}$$

$$r = 7$$

5C [0, 3, 5]

Partial Credit: (3 marks) – any correct statement or leaves answer as  $\sqrt{49}$

(b)  $N$  is the point with coordinates  $(25,32)$ . Find the length of the line  $MN$

$$|MN| = \sqrt{(25 - 10)^2 + (32 - 12)^2}$$

$$|MN| = \sqrt{225 + 400}$$

$$|MN| = \sqrt{625}$$

$$|MN| = 25$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – distance formula identified (no substitution required)

Mid Partial Credit: (7 marks) – as above but 1 error in substitution

High Partial Credit: (8 marks) –  $\sqrt{625}$  correctly calculated but not simplified or 1 minor error in work

(c) The tangent to  $C$  at a point  $P$  on the circle passes through point  $N$ . Find the length of the line  $NP$ .

$$25^2 = 7^2 + x^2$$

$$625 - 49 = x^2$$

$$576 = x^2$$

$$x = 24$$

5C [0, 3, 5]

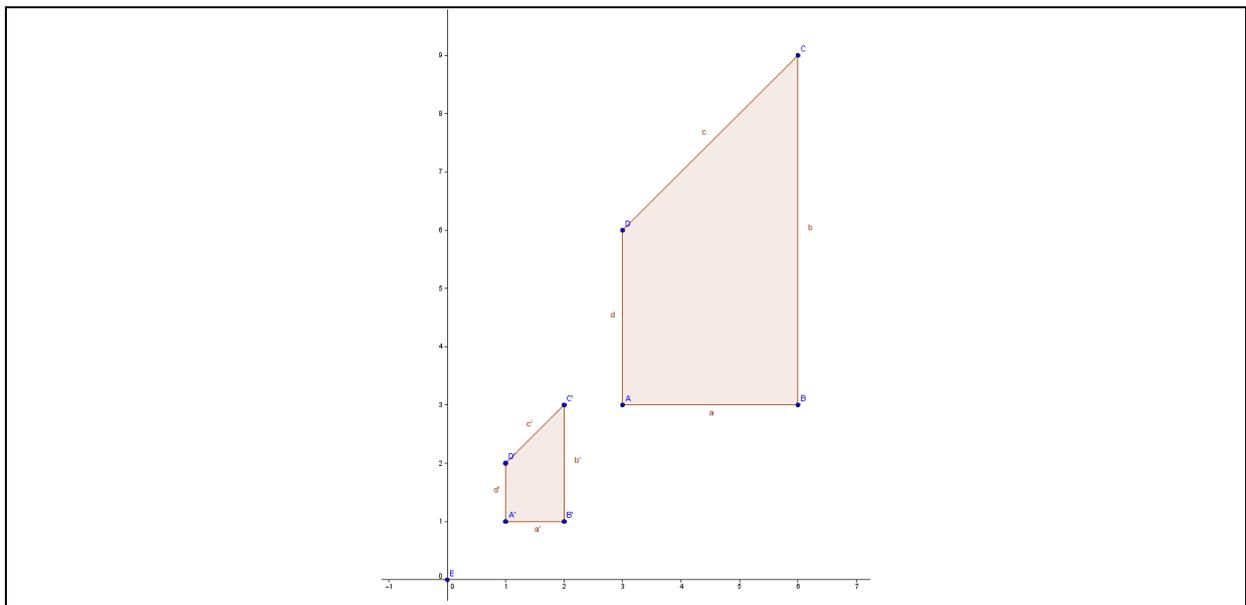
Partial Credit: (3 marks) – any correct statement or knowledge of what a tangent is or any use of Pythagoras

### Question 6

(25 marks)

(a) A shape ABCD has coordinates  $A(3,3)$ ,  $B(6,3)$ ,  $C(6,9)$  and  $D(3,6)$ .

(i) Draw the shape in the grid below.



5C [0, 3, 5]

Partial Credit: (3 marks) – any 2 points correctly plotted or all 4 points correct but joined incorrectly

(ii) What name is given to such a shape?

Trapezium
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5B [0, 3, 5]

Low Partial Credit: (3 marks) – shape identified as a parallelogram (rectangle or square or diamond or rhombus etc. are worthless)
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(b) (i) Draw the enlargement of shape A with scale factor  $\frac{1}{3}$  and centre of enlargement (0, 0) on the grid above.

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – 2 points correctly plotted
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Mid Partial Credit: (4 marks) – 1 minor error in enlargement or treats scale factor as 3 and arrives at correct answer (will have to be done on extra paper as it won't in space provided on paper?)
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(ii) Calculate the area of the original shape,  $ABCD$ .

$$\text{Area of square} + \text{Area of Triangle} = (3)(3) + \frac{1}{2}(3)(3) = 13.5\text{cm}^2$$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – area of either section correctly found
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Mid Partial Credit: (4 marks) – 1 minor error in calculations but continues to get a final answer
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(iii) By using the **scale factor only**, calculate the area of the image?

$$A = \left(\frac{1}{3}\right)^2 (13.5) = \frac{13.5}{9} = 1.5 \text{ cm}^2$$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – fails to square scale factor (should be 1/3 of their answer to (ii))
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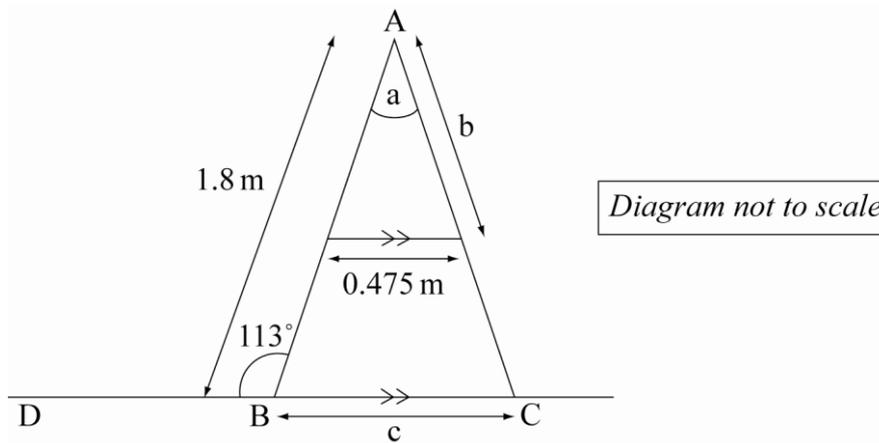
Mid Partial Credit: (4 marks) – 1 minor error but scale factor <b>must</b> be squared
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Answer **all three** questions from this section

**Question 7**

**(60 marks)**

- (a) Carmel is doing some work in her garden shed. She is using a ladder which has two legs AB and AC. Each leg is 1.8m long. Angle ABD =  $113^\circ$



- (i) Calculate the size of angle BAC, explaining the reason for each step of your answer.

$$|\angle ABC| = 180 - 113 = 67^\circ \text{ Straight line has } 180^\circ$$

$$|\angle ACB| = 67^\circ \text{ Isosceles triangle}$$

$$|\angle BAC| = 180 - (67 + 67) = 46^\circ \text{ Remaining angle in a triangle}$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – any correct angle found or any correct geometric statement

Mid Partial Credit: (7 marks) – fully correct but no reasons given or 1 minor error in calculations

High Partial Credit: (8 marks) – fully correct but at most 1 reason given throughout

\*2 reasons required for full marks

(ii) Express  $b$  in terms of  $c$ .

$$\frac{0.475}{c} = \frac{b}{1.8}$$
$$b = \frac{(1.8)(0.475)}{c}$$
$$b = \frac{0.855}{c}$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – any correct statement about similar/equiangular triangles or diagram which is an attempt to show this or any correct fraction established

Mid Partial Credit: (7 marks) – correct statement or arrives at line 1 of solution or 1 major error throughout

High Partial Credit: (8 marks) – line 2 of solution established but fails to expand top or expands incorrectly or 1 minor error throughout

(iii) Calculate the length of  $c$ , correct to two decimal places.

$$\frac{c}{\sin 46} = \frac{1.8}{\sin 67}$$
$$c = \frac{(1.8)(\sin 46)}{\sin 64}$$
$$c = 1.440609944$$
$$c = 1.44$$

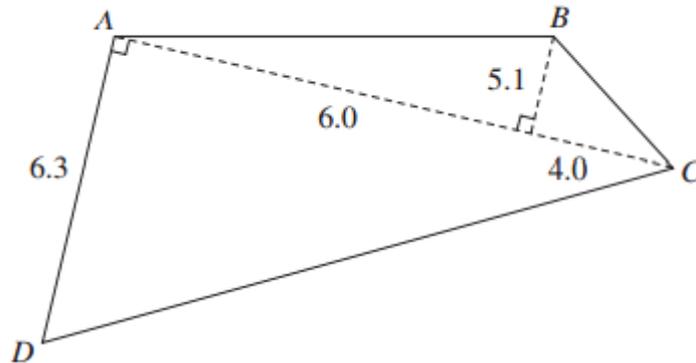
10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – sine rule implied or stated with no substitution required

Mid Partial Credit: (7 marks) – 2<sup>nd</sup> line of solution established

High Partial Credit: (8 marks) – minor error in solution

(b) The diagram shows the shape of Carmel's garden bed. All measurements are in metres.



(i) Show that the area of the garden bed is 57 square metres.

$$A = \left(\frac{1}{2}\right)(6.3)(10) + \left(\frac{1}{2}\right)(5.1)(10)$$

$$A = 31.5 + 25.5 = 57m^2$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – correct statement e.g. area of 2 triangles needed or formula stated

Mid Partial Credit: (7 marks) – correctly finds either area or minor errors in finding both areas

High Partial Credit: (8 marks) – minor error in work

(ii) Carmel decides to add a 5 cm layer of straw to the garden bed. Calculate the volume of straw required. Give your answer in cubic metres.

$$v = (57)(.05) = 2.85m^3$$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – any correct statement about volume of a cuboid

Mid Partial Credit: (4 marks) – minor error in calculation or answer not in cubic metres

(iii) Each bag of straw holds 0.25 cubic metres of straw. How many bags does she need to buy?

$$\frac{2.85}{0.25} = 11.4$$

So, she needs to buy 12 bags

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – any correct work in right direction

Mid Partial Credit: (4 marks) – answer not contextualised [i.e. not 12]

(iv) A straight fence is to be constructed joining point A to point B. Find the length of this fence to the nearest metre.

$$h^2 = (5.1)^2 + (6)^2$$

$$h = \sqrt{62.01}$$

$$h = 7.8746 \dots$$

$$h = 8m$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – identifies right triangle or Pythagoras stated or implied

Mid Partial Credit: (7 marks) – arrives at 1<sup>st</sup> line of solution

High Partial Credit: (8 marks) – 2<sup>nd</sup> line of solution stated but fails to finish or finishes incorrectly

**Question 8****(55 marks)**

Lie detector tests are not always accurate. A lie detector test was administered to 200 people.

The results were:

- 50 people lied. Of these, the test indicated that 40 had lied;
- 150 people did NOT lie. Of these, the test indicated that 20 had lied.

(i) Complete the table below using the information above.

	<b>Test indicated a lie</b>	<b>Test did not indicate a lie</b>	<b>Total</b>
<b>People who lied</b>	40	10	50
<b>People who did NOT lie</b>	20	130	150
<b>Total</b>	60	140	200

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – 2 correct entries
Mid Partial Credit: (7 marks) – 4 correct entries
High Partial Credit: (8 marks) – 1 minor error throughout (consistent)

\*Answers to be based on their table throughout the rest of question 8

(ii) For how many of the people tested was the lie detector test accurate?

$$40 + 130 = 170$$

5B [0, 3, 5]

Low Partial Credit: (3 marks) – correct figures identified but not added or added incorrectly
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(iii) For what percentage of the people tested was the test accurate?

$$\frac{170}{200} \times 100 = 85\%$$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – correct fraction established
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Mid Partial Credit: (4 marks) – attempt to convert correct fraction to a % but with an error
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(iv) What is the probability that the test indicated a lie for a person who did NOT lie?

$$\frac{20}{200} = 10\%$$

5B [0, 3, 5]

Low Partial Credit: (3 marks) – either numerator or denominator correct
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(b) According to an article in The Irish Times, in the run-up to the Irish presidential election in 2011, a company offered its services to perform a lie-detector test on all of the **seven** candidates in the race.

(i) Using your data from part (a), what is the probability of all 7 candidates telling the truth to a particular question?

$$\text{Probability that a person tells the truth is } \frac{150}{200} \times 100 = 75\%$$

$$(0.75)^7 = 0.133483 = 13.3483\%$$

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – P( tells truth) correct
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Mid Partial Credit: (4 marks) – $(0.75)^7$ correctly found but fails to find correct answer
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(ii) Assuming that the candidates did agree to this, what is the probability that the first person to tell a lie was the third candidate questioned?

Person 1 tells truth AND Person 2 tells truth AND person 3 lies

$$(0.75) \times (0.75) \times (0.25) = 0.140625 = 14.0625\%$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – any correct statement or work in the correct direction
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Mid Partial Credit: (7 marks) – $(0.75) \times (0.75) \times (0.25)$ stated or implied
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High Partial Credit: (8 marks) – correct work but fails to finish or finishes incorrectly
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(iii) The company which offered to perform the test on the election candidates claims that their test is reliable 88% of the time.

Using the 200 people as a representative sample from part (a), use a hypothesis test at the 5% level of significance to decide whether there is sufficient evidence to justify the company's claim. State the null hypothesis and your conclusion clearly.

$H_0$  = The lie detector test is not reliable 88% of the time/the test does not have a success rate of 88%

$$\text{Sample proportion } \hat{p} = \frac{170}{200} = 0.85 = 85\%$$

$$\text{Margin of error} = \frac{1}{\sqrt{n}}$$

$$\text{M of E} = \frac{1}{\sqrt{200}} = 0.0707106 = 7.07\%$$

$$\text{Confidence interval } \hat{p} - \frac{1}{\sqrt{n}} < p < \hat{p} + \frac{1}{\sqrt{n}}$$

$$85\% - 7.07\% < p < 85\% + 7.07\%$$

$$77.93\% < p < 92.07\%$$

We reject the Null Hypothesis

$\therefore$  88% lies within this interval, so the company's claim is valid.

15D [0, 5, 9, 12, 15]

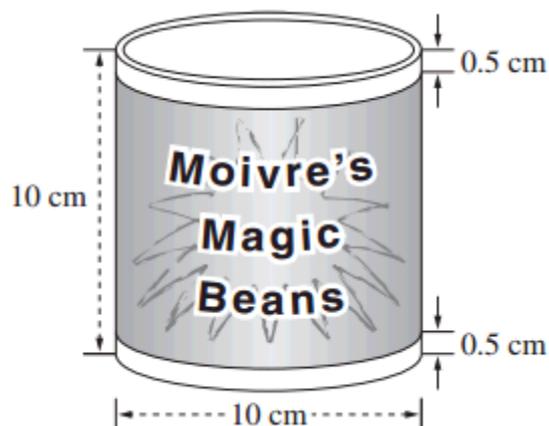
Low Partial Credit: (5 marks) - One relevant step e.g. null hypothesis stated only or some work towards margin of error

Mid Partial Credit: (9 marks) - Margin of error **or** observed proportion only or margin of error **and** observed proportion found but fails to continue

High Partial Credit: (12 marks) - Failure to state null hypothesis correctly or Failure to contextualise answer (e.g. Stops at reject Null Hypothesis)

**Question 9****(35 marks)**

Moivre's manufacturing company produces cans of Magic Beans. The can has a diameter of 10 cm and a height of 10 cm.



(a) Calculate the volume of 1 can of Moivre's Magic Beans, in terms of  $\pi$ .

$$v = \pi r^2 h$$

$$v = (\pi)(5)^2(10)$$

$$V = 250\pi \text{ cm}^3$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – correct formula with at least 1 correct substitution

Mid Partial Credit: (7 marks) – arrives at 2<sup>nd</sup> line of solution but fails to finish

High Partial Credit: (8 marks) – answer not in required form

(b) (i) Moivre's Magic Bean cans are to be packed in rectangular boxes with dimensions 30 cm × 40 cm × 60 cm. What is the **maximum** number of cans that can be packed into one of these boxes?

$$v = (30)(40)(60)$$

$$v = 72,000 \text{ cm}^3$$

$$\frac{72,000}{250\pi} = 91.6732$$

So, 91 cans can be packed into one box

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – finds volume of box correctly but no further work

Mid Partial Credit: (7 marks) – attempts to divide volume of box by volume of 1 can or converts volume of can into decimal form having found volume of box

High Partial Credit: (8 marks) – fails to find max no of cans (leaves answer as 91.6732 or rounds to 92)

(ii) The shaded label on the can shown wraps all the way around the can with no overlap. What area of paper is needed to make the labels for all the cans in this box when the box is full? Write your answer correct to the nearest whole number.

$$A = (9)(2\pi r)$$

$$A = 9(2)(\pi)(5)$$

$$A = 90\pi = 282.7433$$

Total area of paper needed =  $(91)(90\pi) = 8190\pi = 25,729.64383 \text{ cm}^2$

$$A = 25,730 \text{ cm}^2$$

10D [0, 3, 7, 8, 10]

Low Partial Credit: (3 marks) – attempt at finding area of 1 sheet of paper or correctly finds height of wrapper to be 9 cm

Mid Partial Credit: (7 marks) – finds area of 1 wrapper correctly

High Partial Credit: (8 marks) – multiplies by 91 (or their answer) but fails to find correct answer

(iii) The company is considering producing larger cans. Monica says if you double the diameter of the can this will double the volume. Is Monica correct? Justify your answer with suitable calculations.

$$\text{Original Volume of 1 Can} = 250\pi \text{ cm}^3$$

$$\text{New Volume} = \pi r^2 h = \pi(10)^2(10) = 1000\pi \text{ cm}^3$$

Monica is NOT correct – in fact, you quadruple the volume if you double the diameter.

5C [0, 3, 4, 5]

Low Partial Credit: (3 marks) – correct answer with no supporting work (eg. 'No' only)

Mid Partial Credit: (4 marks) – 1 minor error in calculations or correct work but wrong conclusion