Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2015

Marking Scheme

Mathematics

Foundation Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Contents *Page*

Model Solutions 3

Marking Scheme 20

Structure of the marking scheme 20

Summary of mark allocations and scales to be applied 21

Detailed marking notes 22

Bonus marks for answering through Irish 30

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2015

Mathematics

Foundation Level

Model Solutions

Note: The model solutions for each question are not intended to be exhaustive – there may be other correct solutions. Any Examiner unsure of the validity of the approach adopted by a particular candidate to a particular question should contact his / her Advising Examiner.

Instructions

There are 14 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. There is space for extra work at the back of the booklet. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

You will lose marks if all necessary work is not clearly shown.

You may lose marks if the appropriate units of measurement are not included, where relevant.

You may lose marks if your answers are not given in simplest form, where relevant.

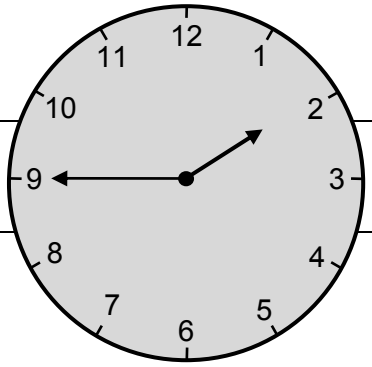
Write the make and model of your calculator(s) here:

Question 1 **30 Marks**

Find the value of each of the following.

(a)	$542 + 419 =$	**961**
(b)	$3125 \div 5 =$	**625**
(c)	$2^3 =$	**8**
(d)	$2 \times (8 + 3) =$	**22**

(e) The clock shows the time Peadar's Maths class begins.



(i) At what time does Peadar's Maths class begin?

1:45 **or** 13:45 **or** quarter to 2.

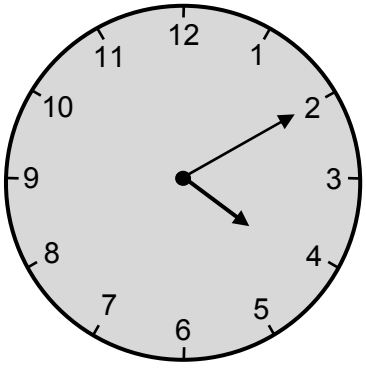
The class finishes 40 minutes later.

(ii) At what time does the class finish?

2:25 **or** 14:25 **or** 25 past 2.

School finishes at 16:10.

(iii) Show this time on the clock.



Question 2 **10 Marks**

A bus fare is €1·85 per student.

(a) Find the fare for four students.

$4 \times 1{\cdot}85$	$= €\ 7{\cdot}40.$

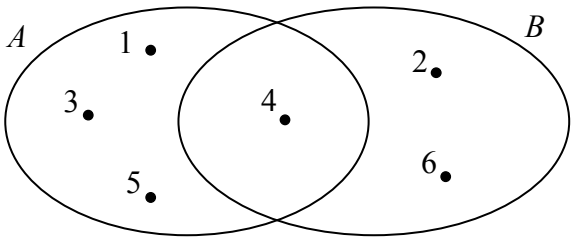
Aisling pays the fare for the four students with a €10 note.

(b) How much change should she get?

$10 - 7{\cdot}40$	$= €2{\cdot}60.$

Question 3 **15 Marks**

(a) The sets A and B are shown in the diagram below.



Fill in the elements of the following two sets.

(i) $A = \{ 1, 3, 4, 5 \}$.

(ii) $A \cap B = \{ 4 \}$.

(b) Find the **mean** of these numbers:

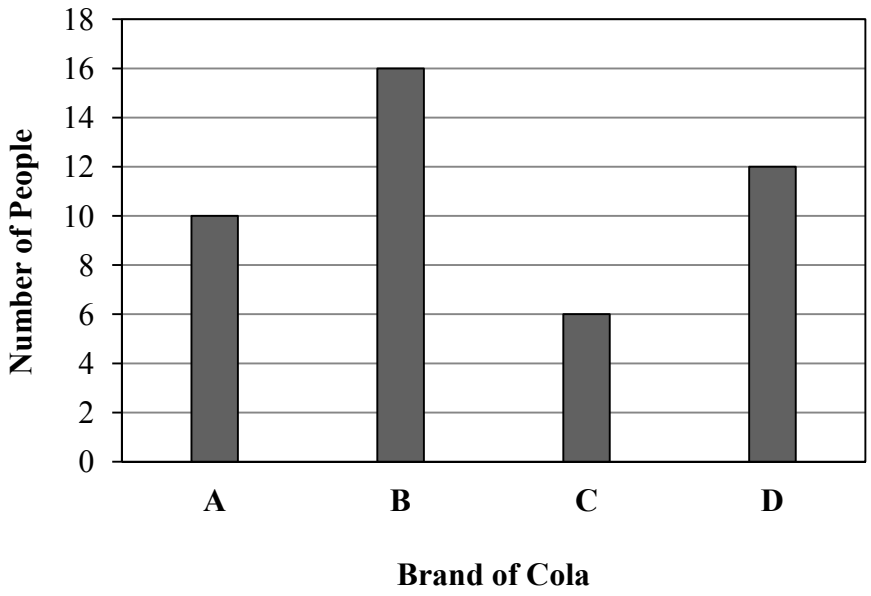
18, 15, 11, 13, 13.

$$\frac{18+15+11+13+13}{5} = \frac{70}{5}$$

$$= 14.$$

Question 4 **10 Marks**

A group of people was asked which of four brands of cola (**A**, **B**, **C**, or **D**) each liked best.
The results are shown in the bar chart below.



(a) Which brand was **most** popular?

B

(b) Which brand was **least** popular?

C

(c) Fill in the missing letter in this sentence.

"Brand **D** was **twice** as popular as brand **C**."

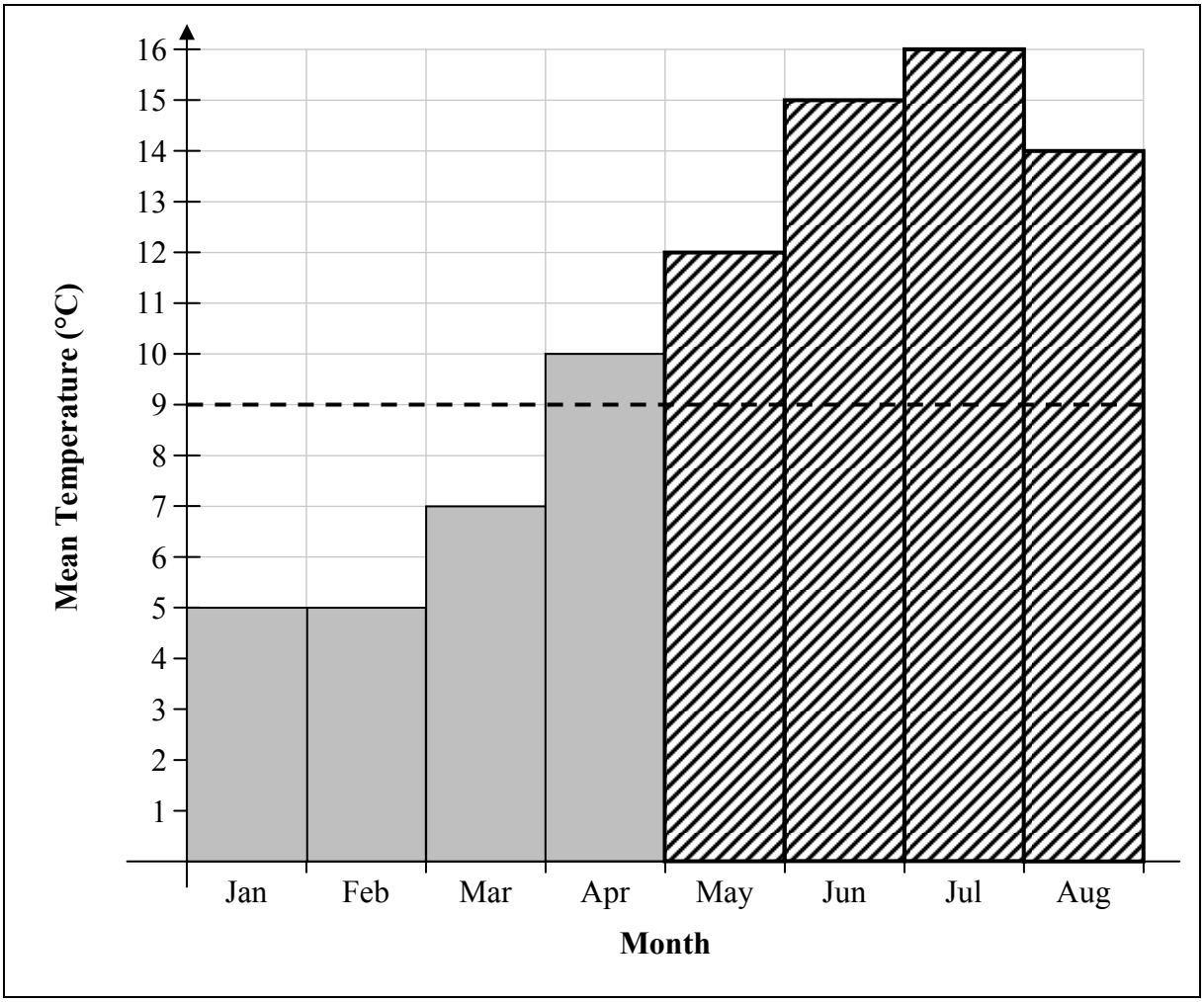
Question 5 **20 Marks**

The table below shows the mean temperature in Moorepark for the first 8 months of 2014.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Mean Temperature (°C)	5	5	7	10	12	15	16	14

The bar chart below shows this information for the first 4 months in the table.

(a) **Finish** the graph to show all the information in the table.



(b) In which month was the mean temperature 12°C?

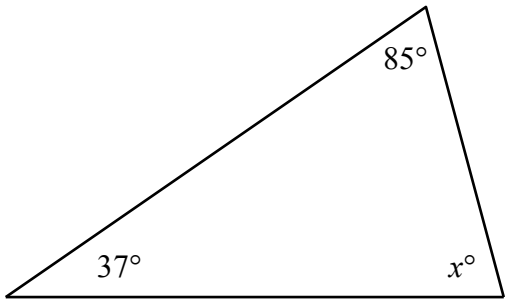
May

(c) For how many of these months was the mean temperature **above** 9°C?

5

Question 6 **40 Marks**

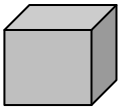
(a) **Calculate** the value of x in this triangle.

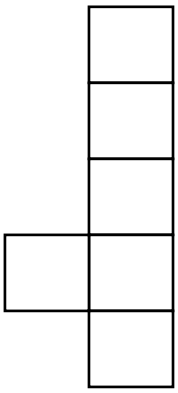


$180 - (85 + 37) = 180 - 122$

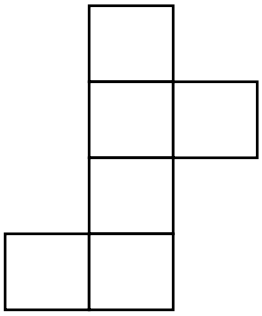
$= 58°.$

(b) Which of the shapes **A**, **B**, or **C** is a correct **net** of a **cube**?

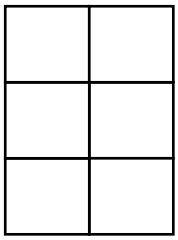




A



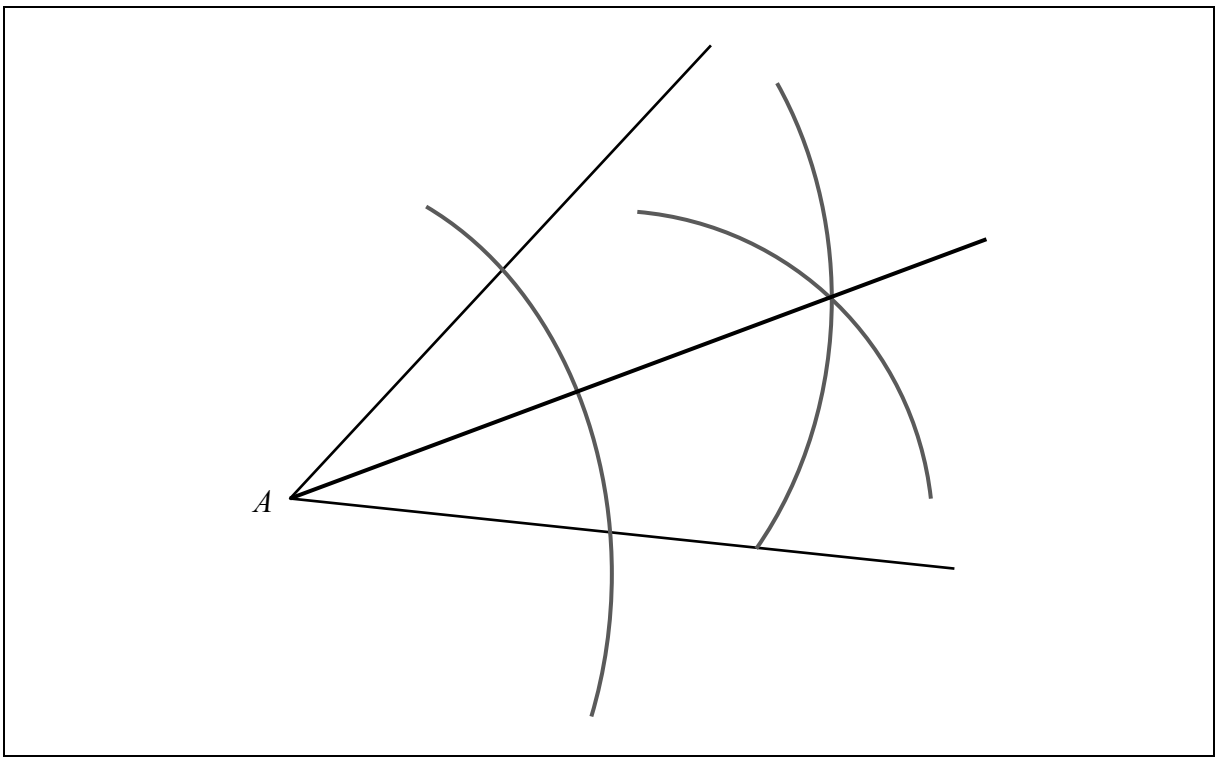
B



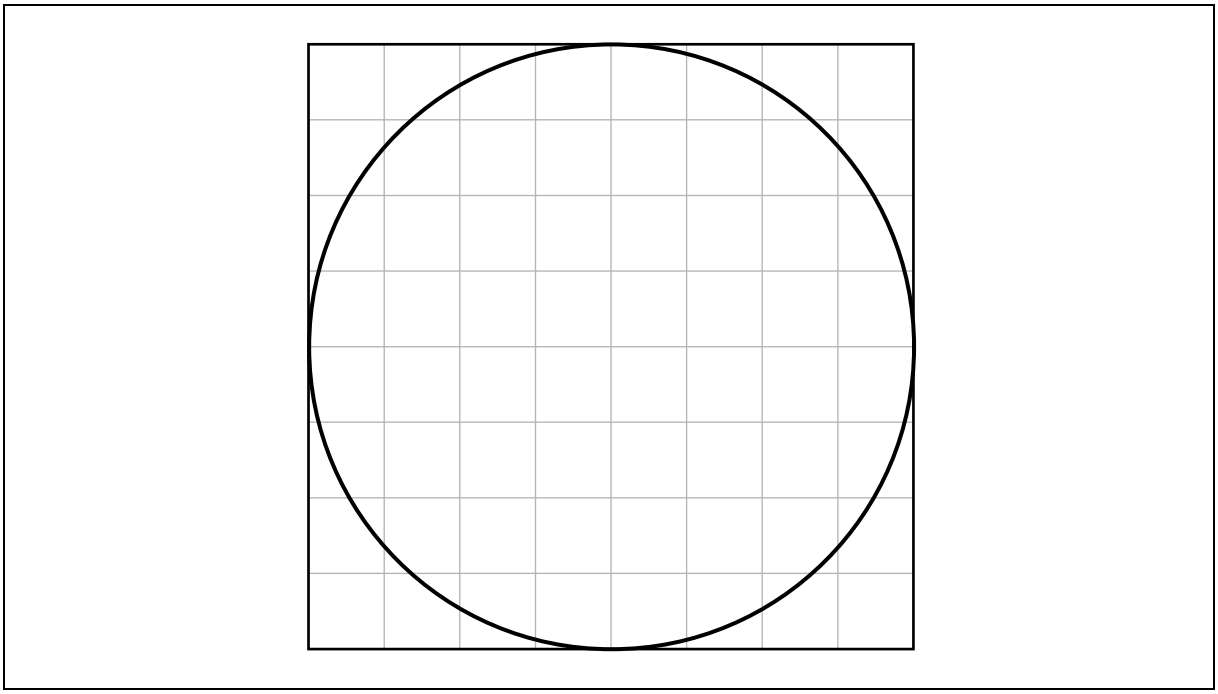
C

B

(c) **Construct** the **bisector** of the angle at A, using only a compass and ruler.
Show your construction lines clearly.



(d) **(i)** Using a compass, draw the **biggest circle** that will fit into the big square below.



(ii) Find the **radius** of your circle, in centimetres.

4 cm.

Question 7 **20 Marks**

Wayne wants to buy a motorbike. He has two options to pay for it.

Option 1: Wayne can pay a deposit of €800, and then pay €120 a month for 24 months.

(a) Find the total cost of the motorbike, using **Option 1**.

Deposit =	€	**800**
24 months @ €120 per month =	€	**2,880**
Total Cost =	€	**3,680**

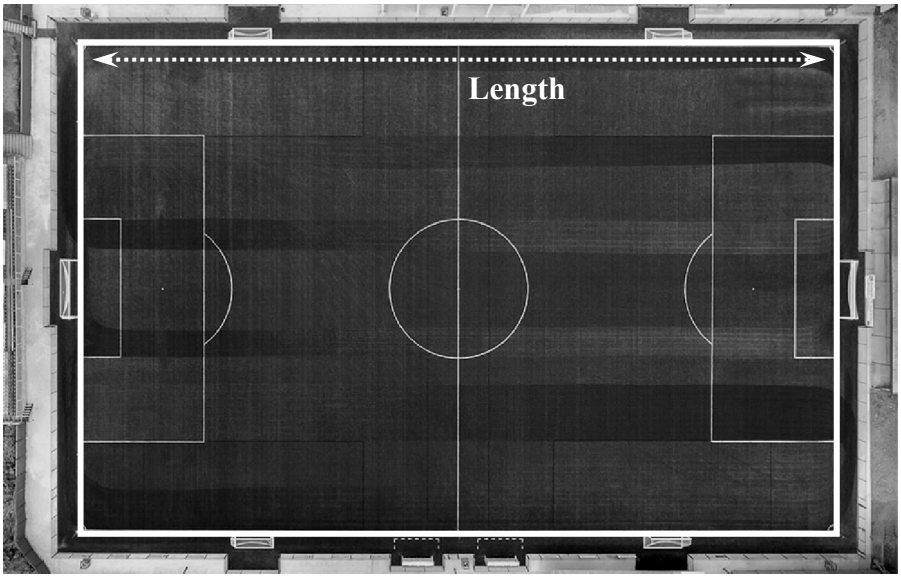
Option 2: Wayne can make one payment of €3200 for the motorbike.

(b) How much money would Wayne save if he chose **Option 2** instead of **Option 1**?

3,680 – 3,200 = € 480.

Question 8 **25 Marks**

Below is a photograph of a soccer pitch.
The pitch is a rectangle. It is outlined in white in the photograph.
The length of the pitch is marked.



Source: www.horizonimaging.co.uk. Altered.

(a) Using your ruler, find the **length** and the **width** of the pitch in the photograph.
Give each answer in centimetres, correct to one decimal place.

Length = 10 cm. Width = 6·5 cm.

(b) Find the **perimeter** of the pitch in the photograph, in centimetres.

$10 + 6{\cdot}5 + 10 + 6{\cdot}5 = 33$ cm.

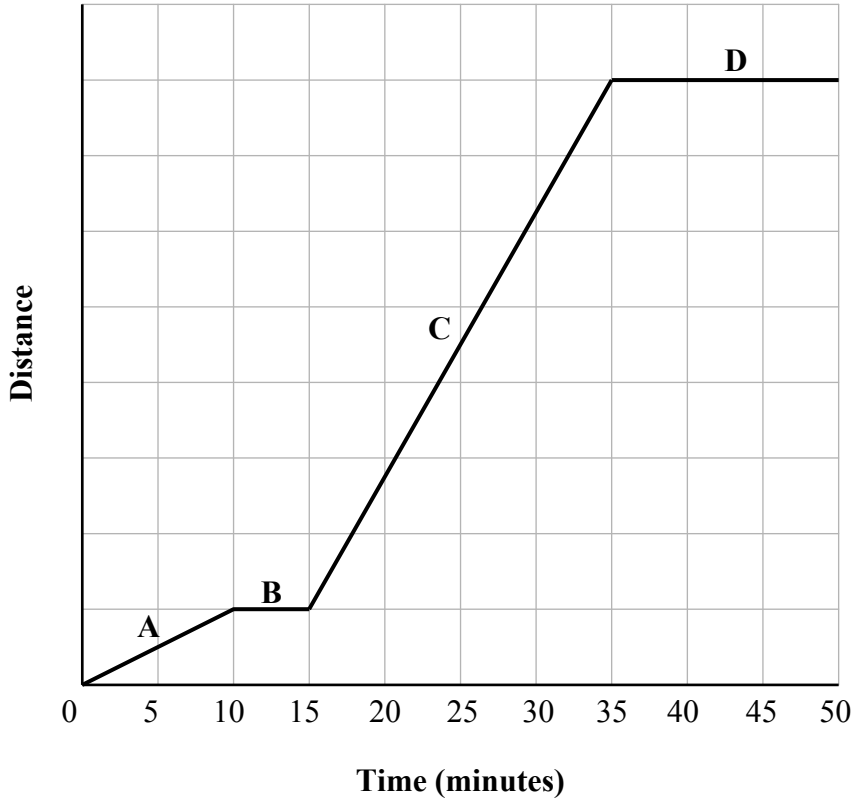
The photograph is to a scale of 1 cm = 10 m.

(c) Find the **actual perimeter** of the pitch, in metres.

$33 \times 10 = 330$ m.

Question 9 **15 Marks**

Gráinne is taking part in a training session.
The graph shows the distance she travelled during the session.
The four parts of the graph are labelled **A**, **B**, **C**, and **D**.



Write the letters **A**, **B**, **C**, and **D** into the table to match each description with the correct part of the graph.

Description	Part of the Graph
Gráinne runs for 20 minutes	**C**
Gráinne stops for 15 minutes	**D**
Gráinne walks for 10 minutes	**A**
Gráinne stops for 5 minutes	**B**

Question 10 **35 Marks**

(a) Find the value of $3x + 2$ when $x = 5$.

$3(5) + 2 = 17.$

(b) Simplify $7x + 2y + x + 3y$.

$8x + 5y.$

(c) Solve the equation $3x - 1 = 11$.

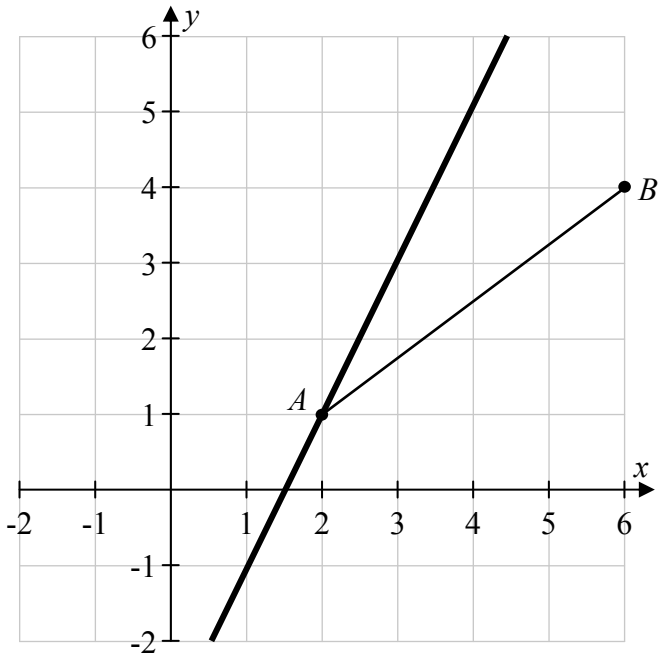
$3x = 11 + 1$

$3x = 12$

$x = 4.$

Question 11 **30 Marks**

The line segment $[AB]$ is shown on the co-ordinate diagram below.



(a) Write down the **co-ordinates** of A and B.

$A = (2, 1)$	$B = (6, 4)$

(b) Find the **slope** of the line AB.

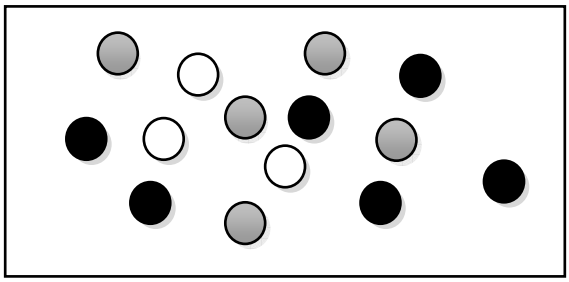
$$\frac{\text{rise}}{\text{run}} = \frac{3}{4}.$$

(c) Using your ruler, **draw** a line on the diagram through A that has a slope **greater** than the slope of AB.

See diagram above.

Question 12 **15 Marks**

Shauna has a bag of marbles. The picture shows the number of marbles of each colour in the bag.



(a) Fill in the table to show the number of marbles of each colour in Shauna's bag.

Colour	Black	White	Grey
Number of marbles	**6**	3	**5**

(b) Find the **total** number of marbles in the bag.

14

One marble is picked at random from the bag.

(c) Find the **probability** that a **white** marble is picked.

$\frac{3}{14}$

(d) Find the **probability** that a **black or grey** marble is picked.

$\frac{11}{14}$

Question 13 **15 Marks**

x is a number. Here are five terms containing x.

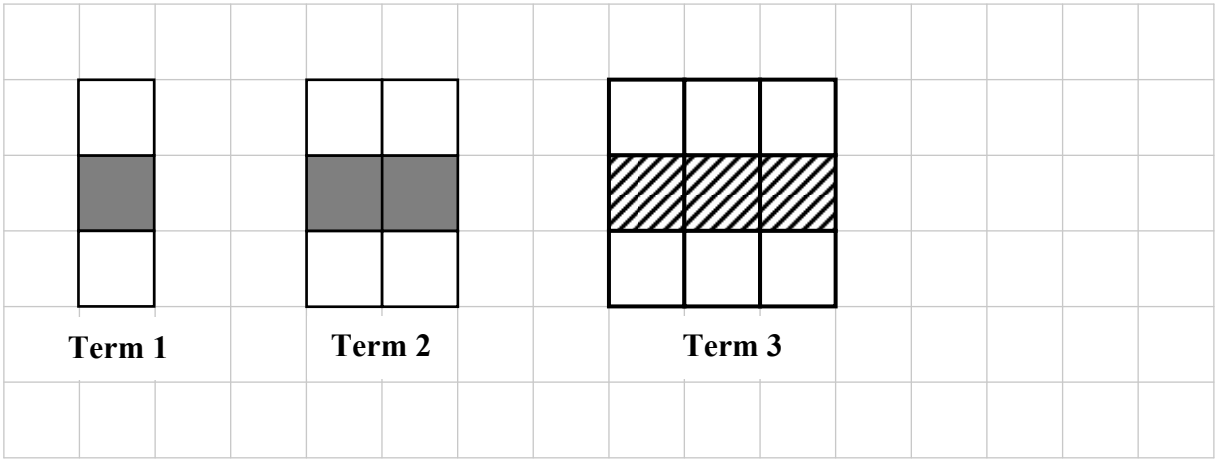
$$2x \qquad \frac{x}{2} \qquad x^2 \qquad 2+x \qquad \sqrt{x}$$

Write each term into the table below to match it with the correct description.

Description	Term
The **square root** of the number.	$\sqrt{x}$
The number is **divided** by 2.	$\frac{x}{2}$
The number is **multiplied** by 2.	$\boldsymbol{2x}$
The number is **added** to 2.	$\boldsymbol{2+x}$
The number is **squared**.	$\boldsymbol{x^2}$

Question 14 **20 Marks**

A pattern is made using white tiles and shaded tiles.
Here are the first two terms in the pattern.



(a) **Draw Term 3** of the pattern in the grid above.

See diagram above.

(b) Fill in the fraction boxes below to show what fraction of each term is shaded.

Term 1	Term 2	Term 3
$\frac{1}{3}$	$\frac{2}{6}$	$\frac{3}{9}$

Ciarán draws another term of the pattern. It has 14 white tiles.

(c) How many shaded tiles should it have?

$14 \div 2 = 7.$

Marking Scheme

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
No of categories	2	3	4	5
5-mark scale	0, 5	0, 2, 5	0, 2, 3, 5	
10-mark scale		0, 4, 10	0, 4, 7, 10	0, 2, 4, 7, 10
15-mark scale			0, 5, 10, 15	0, 3, 6, 10, 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 (no credit)
- correct response (full credit)

B-scales (three categories)

- response of no substantial merit (no credit)
- partially correct response (partial credit)
- correct response (full credit)

C-scales (four categories)

- response of no substantial merit (no credit)
- response with some merit (low partial credit)
- almost correct response (high partial credit)
- correct response (full credit)

D-scales (five categories)

- response of no substantial merit (no credit)
- response with some merit (low partial credit)
- response about half-right (middle partial credit)
- almost correct response (high partial credit)
- correct response (full credit)

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 be awarded. Thus, for example, in Scale 10C, 9 marks may be awarded.

No marks may be awarded other than those on the appropriate scale, and *Full Credit –1*.

In general, accept a candidate's work in one part of a question for use in subsequent parts of the question, unless this oversimplifies the work involved.

Summary of mark allocations and scales to be applied

Question 1 (30)

(a) – (d)	15D
(e)(i)&(ii)	10C
(e)(iii)	5B

Question 2 (10)

(a)	5B
(b)	5B

Question 3 (15)

(a)(i)&(ii)	5C
(b)	10C

Question 4 (10)

(a)&(b)	5C
(c)	5B

Question 5 (20)

(a)	10C
(b)	5B
(c)	5B

Question 6 (40)

(a)	10B
(b)	5B
(c)	10C
(d)(i)	10C
(d)(ii)	5B

Question 7 (20)

(a)	10C
(b)	10B

Question 8 (25)

(a)	5C
(b)	10B
(c)	10B

Question 9 (15)

15D

Question 10 (35)

(a)	10C
(b)	10C
(c)	15C

Question 11 (30)

(a)	10C
(b)	10C
(c)	10B

Question 12 (15)

(a)&(b)	5C
(c)&(d)	10C

Question 13 (15)

15D

Question 14 (20)

(a)	5C
(b)	10D
(c)	5C

Detailed Marking Notes

Question 1 (30 Marks)

(a)–(d) Scale 15D (0, 3, 6, 10, 15)

Low Partial Credit
- Some work of merit

Mid Partial Credit
- 2 correct parts

High Partial Credit
- 3 correct parts

Full Credit –1
- Work with only one arithmetical error in parts (a) to (d)

(e)(i)&(ii) Scale 10C (0, 4, 7, 10)

Low Partial Credit
- Some work of merit

High Partial Credit
- (i) or (ii) correct
- 9:10 for (i) and 9:50 for (ii), or similar

(e)(iii) Scale 5B (0, 2, 5)

Partial Credit
- Incorrect time shown on the clock
- Shows an understanding of the 24-hour clock

Full Credit
- Accept 2:20 shown on the clock if 9:10 has been penalised in part (e)(i)

Question 2 (10 Marks)

(a) Scale 5B (0, 2, 5)

No Credit
- $4 + €1{\cdot}85 = €5{\cdot}85$

Partial Credit
- Divides €1·85 by 4

(b) **Scale 5B (0, 2, 5)**

Partial Credit
- €10 – 1·85, or €8·15, or €17·40

Question 3 (15 Marks)

(a)(i)&(ii) **Scale 5C (0, 2, 3, 5)**

Low Partial Credit
- One correct entry

High Partial Credit
- (i) or (ii) correct

(b) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Some work of merit
- Finds the mode or median (i.e. answer = 13)
- Total = 70, and stops

High Partial Credit
- Multiplies by 5 (i.e. answer = 350)
- 59·6

Full Credit –1
- Answer left as $\frac{70}{5}$

Question 4 (10 Marks)

(a)&(b) **Scale 5C (0, 2, 3, 5)**

Low Partial Credit
- Some work of merit

High Partial Credit
- (a) or (b) correct
- (a) answered as 16, **and** (b) answered as 6
- (a) answered as C, **and** (b) answered as B

(c) **Scale 5B (0, 2, 5)**

Partial Credit
- Some work of merit

Question 5 (20 marks)

(a) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Some work of merit

High Partial Credit
- 3 bars drawn within tolerance

Full Credit
- Tolerance of ± 0·5 cm

(b) **Scale 5B (0, 2, 5)**

Partial Credit
- 12 indicated on the graph

Full Credit
- Accept answer consistent with the table or the candidate's graph

(c) **Scale 5B (0, 2, 5)**

Partial Credit
- 9 indicated on the graph

Full Credit
- Accept answer consistent with the table or the candidate's graph

Question 6 (40 Marks)

(a) **Scale 10B (0, 4, 10)**

Partial Credit
- Carries out one relevant operation (e.g. adds 2 given angles, or takes one from 180)

(b) **Scale 5B (0, 2, 5)**

No Credit
- Incorrect letter with no supporting work

Partial Credit
- Some work of merit

(c) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- A bisector drawn without all necessary construction arcs

High Partial Credit
- Construction arcs correct but no bisector drawn

Full Credit
- Tolerance of ± 0·5 cm

(d)(i) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Some work of merit

High Partial Credit
- Circle drawn using a compass, centre within tolerance and radius outside tolerance

Full Credit
- Tolerance of ± 0·5 cm

(d)(ii) **Scale 5B (0, 2, 5)**

Partial Credit
- Radius outside tolerance

Full Credit
- Tolerance of ± 0·5 cm

Question 7 (20 Marks)

(a) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Some work of merit

High Partial Credit
- €2880 and stops

(b) **Scale 10B (0, 4, 10)**

Partial Credit
- Some work of merit
- €6880

Question 8 (25 Marks)

(a) **Scale 5C (0, 2, 3, 5)**

Low Partial Credit
- Both measurements outside tolerance

High Partial Credit
- One measurement within tolerance

Full Credit –1
- Answers within tolerance, in mm

Full Credit
- Tolerance of ± 0·5 cm

(b) **Scale 10B (0, 4, 10)**

Partial Credit
- Calculates the area
- Finds the semiperimeter

(c) **Scale 10B (0, 4, 10)**

Partial Credit
- Divides answer to (b) by 10

Question 9 (15 Marks)

Scale 15D (0, 3, 6, 10, 15)

Low Partial Credit
- Some work of merit

Mid Partial Credit
- 2 correct entries

High Partial Credit
- 3 correct entries

Question 10 (35 Marks)

(a) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- 37, or 10, or 21
- $3x + 2 = 5$, and continues

High Partial Credit
- $3(5) + 2$, and stops

(b) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- 8 or 5, and stops

High Partial Credit
- $8x$ or $5y$

(c) **Scale 15C (0, 5, 10, 15)**

Low Partial Credit
- Unsuccessful trial and error

High Partial Credit
- $3x = 12$, and stops

Full Credit –1
- Answer left as $\frac{12}{3}$

Full Credit
- $3(4) - 1 = 11$

Question 11 (30 Marks)

(a) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Some work of merit

High Partial Credit
- One correct point
- 2 correct points, reversed

(b) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Rise or run mentioned
- Correct formula

High Partial Credit
- $\frac{4-1}{6-2}$

(c) **Scale 10B (0, 4, 10)**

Partial Credit
- A line through A with a slope of absolute value less than the slope of AB
- A line that does not pass through A

Question 12 (15 Marks)

(a)&(b) **Scale 5C (0, 2, 3, 5)**

Low Partial Credit
- One correct entry in table in (a) **and** incorrect total in (b)
- No correct entry in table in (a) **and** correct total in (b)

High Partial Credit
- 2 correct entries in table in (a) **and** incorrect total in (b)
- One correct entry in table in (a) **and** correct total in (b)

Note
- Total can be taken from the picture or the table

(c)&(d) **Scale 10C (0, 4, 7, 10)**

Low Partial Credit
- Some work of merit

High Partial Credit
- (c) or (d) correct
- 3 correct entries (from the 2 entries in (c), and the 2 entries in (d))

Note
- Answers can be taken from the picture, the table, or the candidate's total in part (b)

Question 13 (15 Marks)

Scale 15D (0, 3, 6, 10, 15)

Low Partial Credit
- Some work of merit

Mid Partial Credit
- 2 correct entries

High Partial Credit
- 3 correct entries

Question 14 (20 Marks)

(a) **Scale 5C (0, 2, 3, 5)**

Low Partial Credit
- Some work of merit

High Partial Credit
- A 3×3 square with incorrect, or no, shading
- A term of incorrect size, with the middle horizontal row shaded

(b) **Scale 10D (0, 2, 4, 7, 10)**

Low Partial Credit
- Some work of merit

Mid Partial Credit
- 2 correct entries

High Partial Credit
- 3 correct entries

(c) **Scale 5C (0, 2, 3, 5)**

Low Partial Credit
- Some work of merit
- $\frac{14}{3}$

High Partial Credit
- $14 \times 2 = 28$
- Indicates that there are 21 tiles in the term

Bonus marks for answering through Irish

Bonus marks are applied as follows:

If the mark achieved is 225 or less, the bonus is 5% of the mark obtained, rounded **down**.
For instance, 198 marks $\times$ 5% = 9·9 $\Rightarrow$ bonus = 9 marks.

If the mark achieved is above 225, the following table applies:

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