Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2013

Marking Scheme

Mathematics
(Project Maths Phase 3)

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.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2013

Mathematics
(Project Maths – Phase3)

Foundation Level

300 marks

SOLUTIONS and MARKING SCHEME

Contents *Page*

Introduction

The Foundation Level Mathematics examination for candidates in the 24 initial schools shared common material with all other candidates. The marking scheme used for the common material was identical for the two groups.

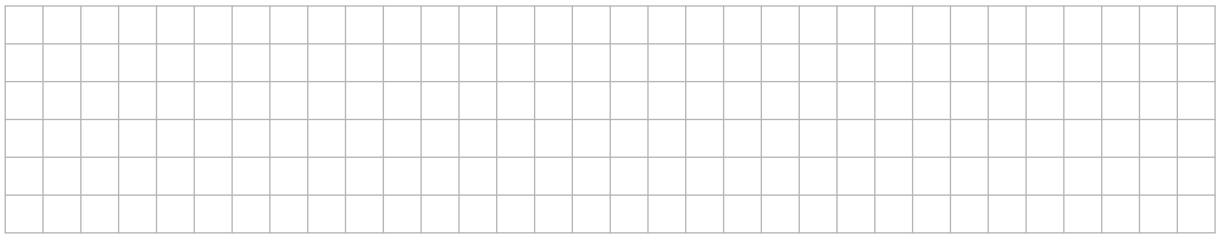
Question 1 **(20 marks)**

(a) $4 + 9 =$ 13

(b) $25 \times 11 =$ 275

(c) $107{\cdot}8 - 63{\cdot}5 =$ 44·3

(d) $4{\cdot}9 \div 0{\cdot}7 =$ 7



Question 2 **(10 marks)**

Shade the boxes which contain prime numbers.

1	**2**	**3**	**4**	**5**
6	**7**	**8**	**9**	**10**
11	**12**	**13**	**14**	**15**
16	**17**	**18**	**19**	**20**
21	**22**	**23**	**24**	**25**

Question 3 **(20 marks)**

Continue the number patterns below. Fill in the missing numbers in the empty spaces.

(a)

1	4	7	10	**13**	16	**19**

(b)

2	4	8	**16**	**32**	64	**128**

(c)

25	20	15	**10**	5	**0**	**-5**

Question 4 **(5 marks)**

The five coins below add to €3·72. What is the value of each of the missing coins?

Answer: **€1** and **50 cent**

Question 5 **(10 marks)**

A lawnmower costs €200 excluding VAT.
If the VAT rate is 23%, find the total cost of the lawnmower.

Cost of Lawnmower =	€200
VAT @ 23% =	€46
Total Cost =	€246

Question 6 **(30 marks)**

Mark bought two pairs of jeans and three tee shirts.
The jeans cost €35 per pair and the tee shirts cost €12 each.

(a) Find the total cost of Mark's purchases.

2 pairs of jeans @ €35 per pair	=	€70
3 tee shirts @ €12 each	=	€36
Total Cost	=	€106

(b) Mark paid with three €50 notes. How much change did he receive?

$3 \times €50 = €150$

$€150 - €106 = €44$

One pair of jeans was blue and the other pair was black. One tee shirt was green in colour, the second was red and the third was yellow.

(c) If Mark selected one tee shirt at random from the three that he bought, what is the probability that he would select a red tee shirt?

$\frac{1}{3}$

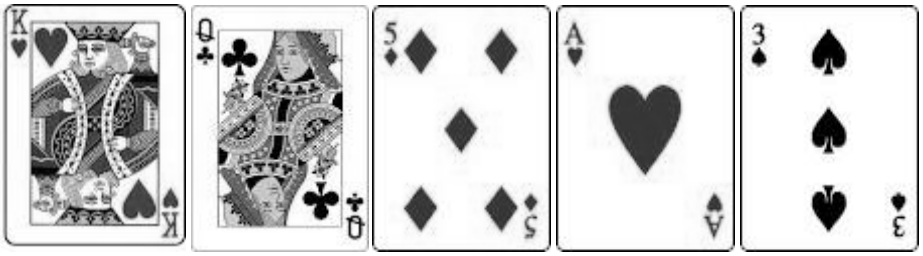
(d) List all the different outfits consisting of jeans and a tee shirt that Mark could wear.

Outfit	Jeans	Tee Shirt
1	Blue	Green
2	**Blue**	**Red**
3	**Blue**	**Yellow**
4	**Black**	**Green**
5	**Black**	**Red**
6	**Black**	**Yellow**

(e) What is the probability of Mark selecting blue jeans and a yellow tee shirt?

$\frac{1}{6}$

Question 7 **(10 marks)**



(a) A card is picked at random from the five cards above.

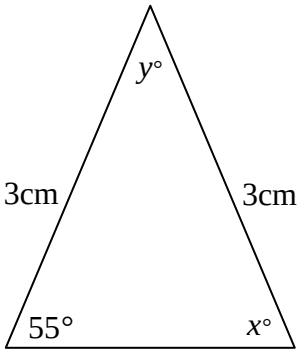
What is the probability of picking:

(i) a King? $\frac{1}{5}$

(ii) a King or a Queen? $\frac{2}{5}$

(b) What fraction of the five cards above are hearts? $\frac{2}{5}$

Question 8 **(10 marks)**



(i) Write down the value of x. $x =$ 55°

(ii) Find the value of y. $y =$ 70°

$55^\circ + 55^\circ = 110^\circ$

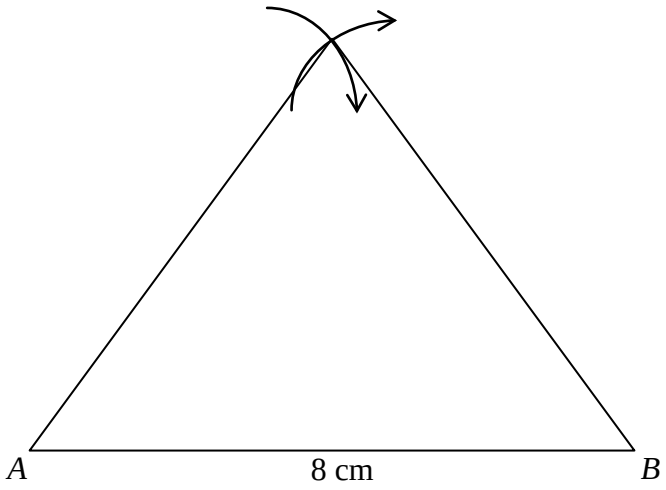
$180^\circ - 110^\circ = 70^\circ$

Question 9 **(15 marks)**

(a) Explain what it means to say that a triangle is *equilateral*.

A triangle is equilateral if all 3 sides are the same length. Or A triangle is equilateral if all 3 angles have the same measure.

(b) Construct a triangle ABC with $|AB| = 8$ cm, $|BC| = 8$ cm and $|AC| = 8$ cm.
Show all your construction lines.



Question 10 **(15 marks)**

(a) $\sqrt{121}$ = 11

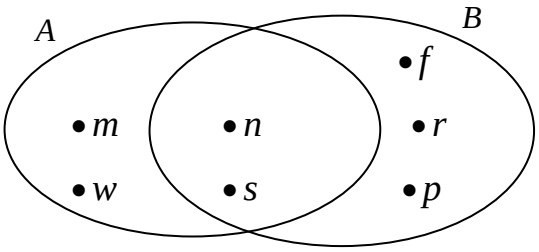
(b) $5 + 6 \times 9$ = 59

(c) 4^3 = 64

Question 11 **(15 marks)**

$A = \{m, n, s, w\}$ and $B = \{f, n, r, p, s\}$.

(a) Fill in the Venn diagram below.



(b) List the elements of $A \cup B$ $A \cup B = \{m, w, n, s, f, r, p\}$

(c) List the elements of $A \cap B$ $A \cap B = \{n, s\}$

Question 12 **(40 marks)**

A local shopkeeper records the number of ice creams of different flavours sold on the of May. The results are:

Ice Cream Flavour	Strawberry	Chocolate	Vanilla	Mint
Number sold	9	16	11	4

(a) How many ice creams were sold that day? 40

$9 + 16 + 11 + 4 = 40$

(b) Which flavour of ice cream was the mode? Give a reason for your choice.

Mode = Chocolate
Reason: Most number sold

(c) What was the mean number of ice cream flavours sold per flavour?

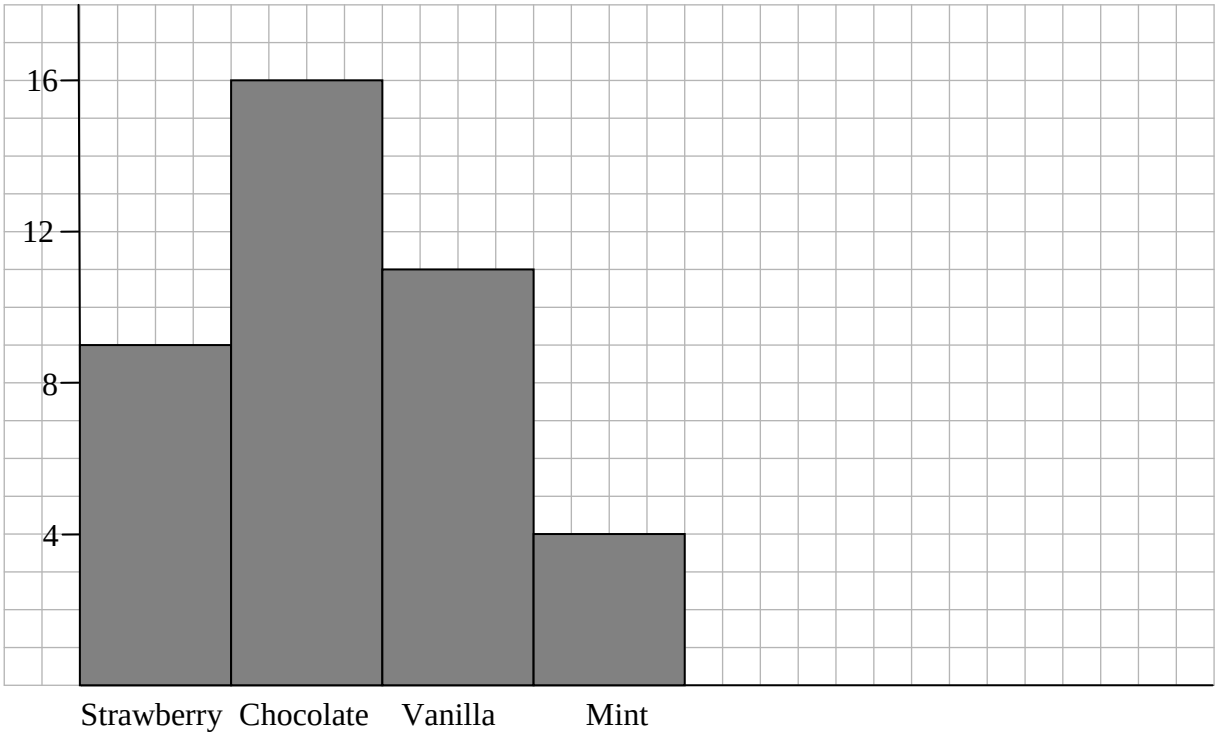
$$\text{Mean} = \frac{9+16+11+4}{4} = \frac{40}{4} = 10$$

Mean number of ice cream flavours sold = 10

(d) Express the number of mint ice creams sold as a percentage of the total.

$$\frac{4}{40} \times 100 = 10\%$$

(e) Draw a bar chart to show the different flavours of ice cream sold on the 15th of May.



(f) If the shopkeeper recorded ice cream sales on the 15th of November, how would you expect the data to differ? Give a reason for your answer.

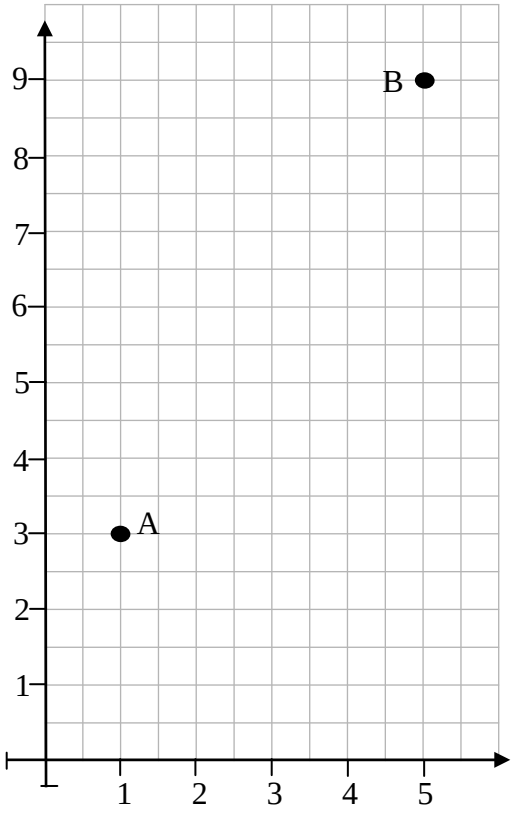
I would expect fewer ice creams to be sold.

The temperature is colder in November and fewer people buy ice cream.

Question 13 **(15 marks)**

$A(1, 3)$ and $B(5, 9)$ are two points.

(a) Plot the points A and B on the co-ordinate plane below.



(b) Find the co-ordinates of C, the midpoint of $[AB]$.

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{1+5}{2}, \frac{3+9}{2}\right)$$
$$= \left(\frac{6}{2}, \frac{12}{2}\right) = (3,6)$$

(c) Find the slope of AB.

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9-3}{5-1} = \frac{6}{4} = \frac{3}{2}$$

OR

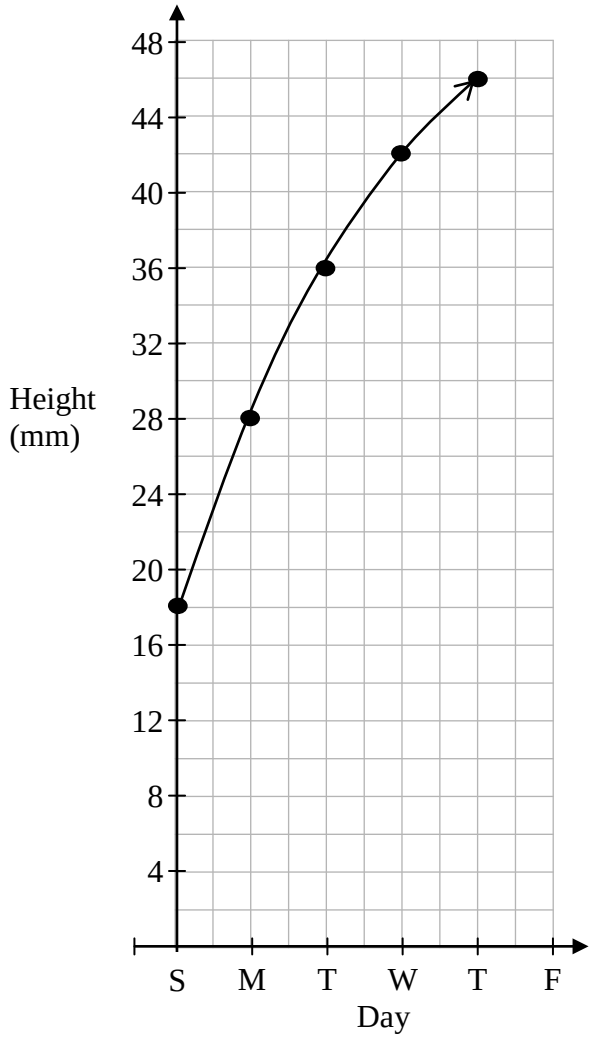
$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{6}{4} = \frac{3}{2}$$

Question 14 **(20 marks)**

The table below shows the height of a plant over five days.

Day	Height
Sunday	18 mm
Monday	28 mm
Tuesday	36 mm
Wednesday	42 mm
Thursday	46 mm

(a) Draw a graph to show the information given in the table above.



(b) What height would you expect the plant to be on Friday? Give a reason for your answer.

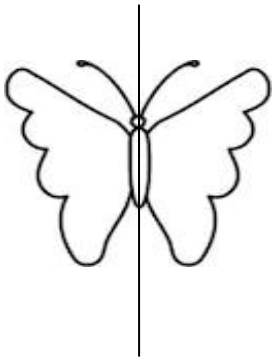
Height on Friday = 48 mm

Reason: There is a pattern to the differences in height: 10, 8, 6, 4

The next increase should be 2 mm: 46 mm +2 mm = 48 mm

Question 15 **(5 marks)**

Draw the axis of symmetry of the following shape:



Question 16 **(5 marks)**

f is the function $f : x \rightarrow 6x - 2$. Find $f(4)$

$$\begin{aligned} f(4) &= 6(4) - 2 \\ &= 24 - 2 \\ &= 22 \end{aligned}$$

Question 17 **(15 marks)**

(a) Find the value of $4a - 2b$, where $a = 3$ and $b = 1$.

$$\begin{aligned} 4a - 2b &= 4(3) - 2(1) \\ &= 12 - 2 \\ &= 10 \end{aligned}$$

(b) Simplify $x + 7y + 10x - 15y$

$$\begin{aligned} &x + 7y + 10x - 15y \\ &= 11x - 8y \end{aligned}$$

(c) Factorise $12x + 15$

$$12x + 15 = 3(4x + 5)$$

Question 18 **(15 marks)**

Teresa is three times older than her son Eric.

(a) If Eric's age is x, select a suitable expression for Teresa's age from the following list:

(i) $x+3$ (ii) $3x$ (iii) $3x+3$

Teresa's age = $3x$

(b) Teresa's age added to Eric's age is 44 years. Write an equation in x to show this information.

$3x + x = 44$

(c) Solve your equation from part (b) to find Eric's age.

$3x + x = 44$

$4x = 44$

$x = 11$

$\therefore$ Eric's age $= 11$ years

Question 19 **(25 marks)**

Jessica went to Bulgaria on her summer holidays.

(a) The plane left Ireland at 8.15 am and landed in Bulgaria 3hours 20 minutes later.
At what time did the plane land in Bulgaria?

8.15 + 3.20 = 11.35a.m.

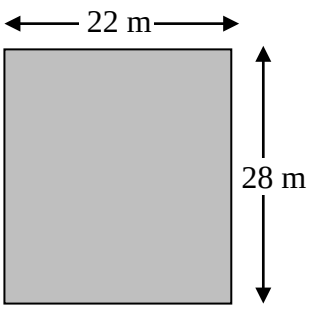
(b) Jessica needed to purchase some local currency. She changed €600 into Bulgarian Leva.
The exchange rate was €1 = 1· 96 Bulgarian Leva.
How many Bulgarian Leva did Jessica receive?

€1 = 1· 96 Bulgarian Leva.

€600 = (600×1.96)
= 1176 Bulgarian Leva

Part (c) on next page

(c) The floor of the lobby of the hotel she stayed in was rectangular in shape. It measured 22 metres by 28 metres.



Calculate the area of the floor.

$$\text{Area} = 22 \times 28$$

$$= 616 \text{ m}^2$$

(d) There was a circular rug on the floor of the hotel lobby. It had a radius of 7 metres.

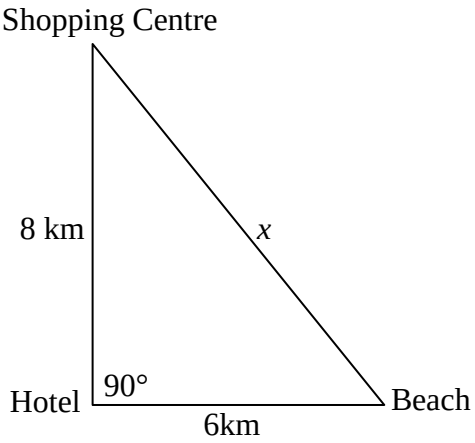
Calculate the area of the rug. Use $\pi = \frac{22}{7}$

$$\text{Area} = \pi r^2$$

$$\text{Area} = \frac{22}{7} \times (7)^2 = \frac{22}{7} \times 49 = 154 \text{ m}^2$$

(e) When Jessica arrived at the hotel, she was told that the beach was 6 kilometres directly East and that the nearest shopping centre was 8 kilometres directly North.

The hotel receptionist drew the following map for her:



Using Pythagoras' Theorem, find the shortest distance (marked x in the diagram) from the shopping centre to the beach.

$$8^2 + 6^2 = x^2$$

$$64 + 36 = x^2$$

$$100 = x^2$$

$$10 = x$$

The shortest distance is 10 km

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
No of categories	2	3	4
2 mark scale	0, 2	0, 1, 2	
5 mark scale	0, 5	0, 3, 5	0, 3, 4, 5
10 mark scale	0, 10	0, 5, 10	0, 5, 8, 10
15 mark scale	0, 15	0, 10, 15	0, 10, 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 (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)

In certain cases, typically involving incorrect rounding or omission of units, a mark that is one mark below the full-credit mark may also be awarded. Such cases are flagged with an asterisk.
Thus, for example, *scale 10C** indicates that 9 marks may be awarded.

Summary of mark allocations and scales to be applied

Question 1	Question 2	Question 3	Question 4	Question 5
(a) 5B	10C	(a) 10B	5B	10C
(b) 5B		(b) 5B		
(c) 5B		(c) 5B		
(d) 5B				

Question 6	Question 7	Question 8	Question 9	Question 10
(a) 10B	(a) (i) and (ii) 5B	(i) and (ii) 10C	(a) 5A	(a) 5B
(b) 5B	(b) 5A		(b) 10B	(b) 5B
(c) 5B				(c) 5B
(d) 5B				
(e) 5B				

Question 11	Question 12	Question 13	Question 14	Question 15
(a) 5C	(a) 5B	(a) 5B	(a) 15C	5B
(b) 5B	(b) 5B	(b) 5B	(b) 5B	
(c) 5B	(c) 10 C	(c) 5B		
	(d) 5B			
	(e) 10C			
	(f) 5B			

Question 16	Question 17	Question 18	Question 19
5B	(a) 5B	(a) 5A	(a) 5B
	(b) 5B	(b) 5B	(b) 5B
	(c) 5B	(c) 5C	(c) 5B*
			(d) 5B*
			(e) 5B*

Detailed Marking Notes Paper 1

The * for units to be applied only if answered fully right. The * to be applied once only per question.
The * penalty is not applied to currency solutions.

Question 1

(a) Scale 5B (0, 3, 5)
Partial credit: Uses incorrect operator.

(b) Scale 5B (0, 3, 5)
Partial credit: Uses incorrect operator.

(c) Scale 5B (0, 3, 5)
Partial credit: Uses incorrect operator.

(d) Scale 5B (0, 3, 5)
Partial credit: Uses incorrect operator.

Question 2

Scale 10C (0,5,8,10)
High partial credit: 6 correct entries.
Low partial credit: 1 correct entry.

Question 3

(a) Scale 10B (0, 5,10)
Partial credit: One correct entry.

(b) Scale 5B (0, 3, 5)
Partial credit: One correct entry.

(c) Scale 5B (0, 3, 5)
Partial credit: One correct entry.

Question 4

(a) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

Question 5

Scale 10C (0, 5, 8, 10)
High partial credit: Correct VAT.
Low partial credit: Some work of merit.

Question 6

(a)	Scale 10B (0, 5, 10)	Some work of merit.
	Partial credit:	
(b)	Scale 5B (0, 3, 5)	
	Partial credit:	Some work of merit.
(c)	Scale 5B (0, 3, 5)	
	Partial credit:	Numerator or denominator correct.
(d)	Scale 5B (0, 3, 5)	
	Partial credit:	One correct entry.
(e)	Scale 5B (0, 3, 5)	
	Partial credit:	Numerator or denominator correct.

Question 7

(a) (i)	Scale 5B (0, 3, 5)	
and (ii)	*Partial credit:*	One part correct.
(b)	Scale 5A (0, 5)	

Question 8

(i) and	Scale 10C (0, 5, 8,10)	
(ii)	*High partial credit:*	$x = y = 62.5^{o}$
	Low partial credit:	Some work of merit.

Question 9

(a)	Scale 5A (0, 5)	
(b)	Scale 10B (0, 5, 10)	
	Partial credit:	Triangle without construction arcs.

Question 10

(a)	Scale 5B (0, 3, 5)	
	Partial credit:	Some use of ½
(b)	Scale 5B (0, 3, 5)	
	Partial credit:	Incorrect order .Answer given as 99.
(c)	Scale 5B (0, 3, 5)	
	Partial credit:	4+4+4=12

Question 11

(a)	Scale 5C (0, 3, 4, 5)	
	High partial credit:	One incorrect entry or omission.
	Low partial credit:	One correct entry.
(b)	Scale 5B (0, 3, 5)	
	Partial credit:	One correct entry
(c)	Scale 5B (0, 3, 5)	
	Partial credit:	One correct entry

Question 12

(a) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

(b) Scale 5B (0, 3, 5)
Partial credit: Correct mode or reason.

(c) Scale 10C (0, 5, 8, 10)
High partial credit: Answer left as $\frac{40}{4}$
Low partial credit: 40 or 4

(d) Scale 5B (0, 3, 5)
Partial credit: Some use of 100.

(e) Scale 10C (0, 5, 8, 10)
High partial credit: 3 bars correct
Low partial credit: 1 or 2 bars correct

(f) Scale 5B (0, 3, 5)
Partial credit: Difference or reason only given.

Question 13

(a) Scale 5B (0, 3, 5)
Partial credit: One point correctly plotted.

(b) Scale 5B (0, 3, 5)
Partial credit: Some substitution into the correct formula.

(c) Scale 5B (0, 3, 5)
Partial credit: Some substitution into the correct formula.

Question 14

(a) Scale 15C (0, 10, 12, 15)
High partial credit: 1 height incorrect or omitted.
Low partial credit: 1 correct height.

(b) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

Question 15

Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

Question 16

Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

Question 17

(a) Scale 5B (0, 3, 5)
Partial credit: Some correct substitution.

(b) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

(c) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

Question 18

(a) Scale 5A (0, 5)

(b) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

(c) Scale 5C (0, 3, 4, 5)
High partial credit: Answer left as $x = \frac{44}{4}$

Low partial credit: Some work of merit.

Question 19

(a) Scale 5B (0, 3, 5)
Partial credit: Some work of merit.

(b) Scale 5B (0, 3, 5)
Partial credit: $600 \div 1.96$

(c) Scale 5B* (0, 3, 4, 5)
Partial credit: Calculates the perimeter.

(d) Scale 5B* (0, 3, 4, 5)
Partial credit: Calculates the circumference.

(e) Scale 5B* (0, 3, 4, 5)
Partial credit: Some work of merit.

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***

(e.g. 198 marks × 5% = 9.9, bonus = 9 marks).

If the mark awarded is above 225 the following table applies:

Bunmharc (Marks obtained)	**Marc Bónais (Bonus mark)**	**Bunmharc (Marks obtained)**	**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