Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2012

Marking Scheme

Mathematics
(Project Maths – Phase 2)

Foundation Level

JUNIOR CERTIFICATE EXAMINATION MARKING SCHEME MATHEMATICS (PROJECT MATHS – PHASE 2)

FOUNDATION LEVEL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

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Introduction

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

This document contains the complete marking scheme for the candidates in the 24 schools. Readers should note that, as with all marking schemes used in the state examinations, the detail required in any answer is determined by the context and the manner in which the question is asked, and by the number of marks assigned to the question or part. Requirements and mark allocations may vary from year to year.

Question 1

(a) 2·8 + 1·5 = _____**4·3**_____

(b) 2·8 × 1·5 = _____**4·2**_____

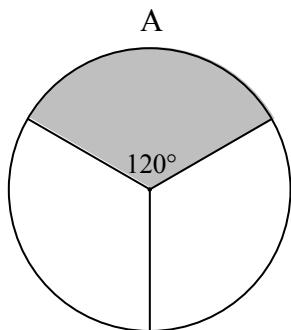**(c)** Round 376 to the nearest 100. _____**400**_____

(d) Which one of the numbers 7, 8 and 9 is a prime number? Give a reason for your answer.

> Answer: **7**
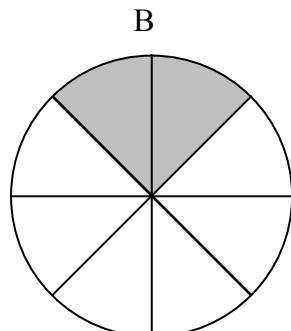> Reason: 7 has no divisors other than itself and 1.

Question 2

(a) What fraction of circle A is shaded?

A

120°

$$\frac{1}{3}$$

(b) What fraction of circle B is shaded? Give your answer in its simplest form.

B

$$\frac{2}{8} = \frac{1}{4}$$

Question 3

(a) A computer costs €500 plus VAT. If the VAT rate is 23%, find the total cost of the computer.

Cost of the Computer =	€500
VAT @ 23% =	€115
Total Cost =	**€615**

(b) Alex is going to England. He has €250 and he wants to change it to sterling (£). The rate is €1 = £0·86. How much sterling will he get?
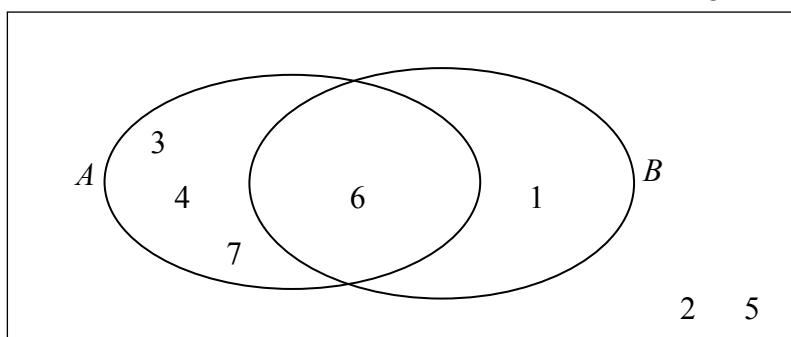
Given that　€1 = £0·86
　　　　　　€250 = £x

∴ x = 250(0·86)　=　**£215**

Question 4

$U = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{3, 4, 6, 7\}$, $B = \{1, 6\}$.
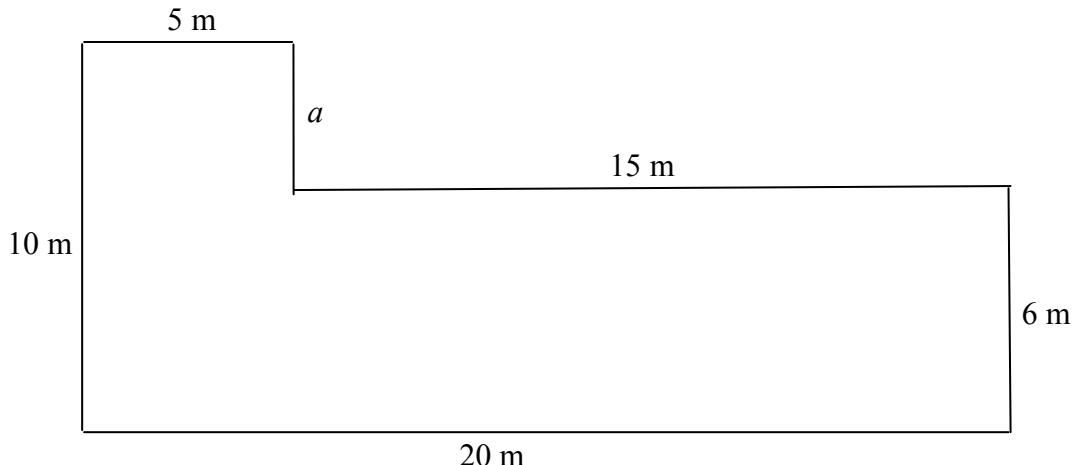
(a) Fill in the Venn diagram below.

U

A (3　4　7)　6　(1) B

2　5

(b) List the elements of $A \cup B$.　　$A \cup B = \{$　1 , 3 , 4 , 6 , 7　$\}$
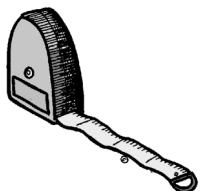
Question 5

A farmyard, with its measurements, is shown in the diagram.

(a) Find a, the missing distance.
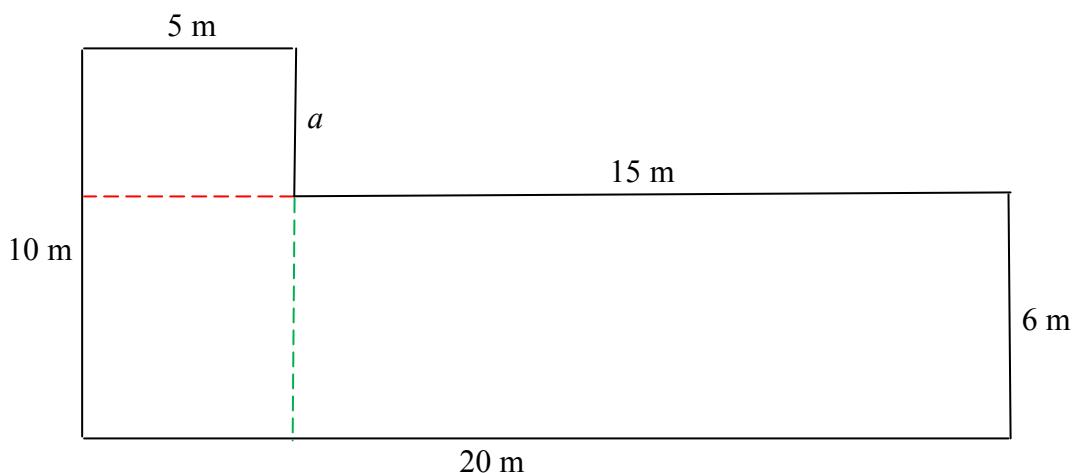
$$|a| = 10 - 6 = \textbf{4 m}.$$

(b) Find the perimeter of the farmyard.

$$\text{Perimeter} = 15 + 6 + 20 + 10 + 5 + \boxed{4} = \textbf{60 m}.$$

(c) On the diagram, draw a line that divides the farmyard into two rectangles.

(d) Find the area of the farmyard in m^2.

$$\text{Area} = (5 \times 4) + (20 \times 6) = \textbf{140 m}^2.$$
$$\text{Or} \quad (10 \times 5) + (15 \times 6) = \textbf{140 m}^2.$$
$$\text{Or} \quad (20 \times 10) - (15 \times 4) = \textbf{140 m}^2.$$

Question 6

Amanda left her home to go to a shop to order a new freezer. She met Carla, her friend, along the way and stopped to speak with her. She then continued on to the shop. She ordered a freezer. Then she returned home.

The graph of this story is shown below.

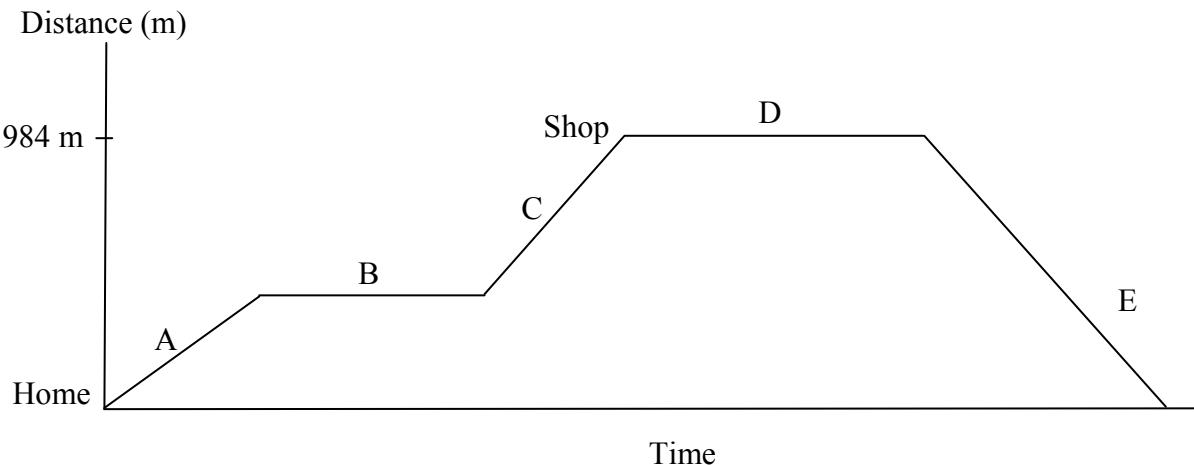**(a)** Match the different parts of the graph to the statements shown below.
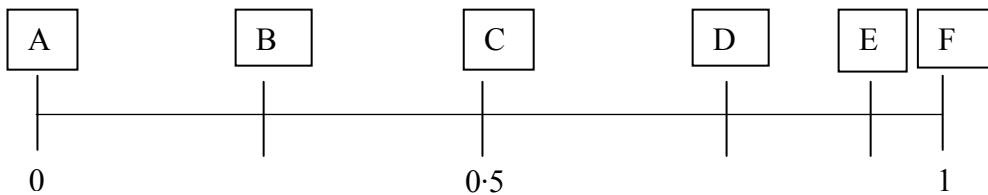
Part of Graph (Put letter in here)	Statement
E	Amanda returned home.
D	Amanda is in the shop.
A	Amanda has just left home.
B	Amanda stopped to speak to Carla.
C	Amanda, after speaking with Carla, continued on to the shop.

(b) The distance from the shop to Amanda's home is 984 m. She walks home in 8 minutes. Find her speed in metres per minute.

$$\frac{984}{8} \ = \ \textbf{123 m per minute}.$$

Question 7

The probability that each of the events A, B, C, D, E and F happens is shown on the scale below.

A	B	C	D	E	F

```
0                    0·5                   1
```

Match the event with the word or phrase which best describes its probability:

Word or Phrase	Event
Fifty-fifty chance	C
Certain	F
1 in 4 chance	B
Almost certain	E
Impossible	A

Question 8

A bag of jelly sweets was opened. The number of sweets of each colour is shown in the table below.

Colour of sweet	Orange	Yellow	Red	Black
Number in bag	6	3	4	2

(a) How many sweets were in the bag?   _____**15**_____

(b) A sweet was taken from the bag.

  (i) What is the probability that it was red?

$$\frac{4}{15}$$

  (ii) What is the probability that it was orange or yellow?
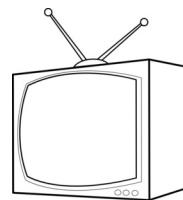
$$\frac{9}{15}$$

Question 9

The answers to survey questions can be classified as follows.
  A   Categorical data where the categories are not ordered
  B   Ordered categorical data
  C   Discrete numerical data
  D   Continuous numerical data

(a)   For each question below, tick (✔) what type of data the answer represents.

Question	Type of Data			
	A	B	C	D
What is your height in centimetres?			✔	
Are you male or female?	✔			
How much money do you earn per week?				✔
Tick when you were born. Before 1990 ☐ 1990 to 2000 ☐ After 2000 ☐		✔		

(b)   A school had 500 boys and 300 girls. A first-year class in the school wanted to find out if students in their school liked a certain TV programme. They decided to do a survey by asking the 16 girls in their class. Give two reasons why this is not a good way to pick the sample.
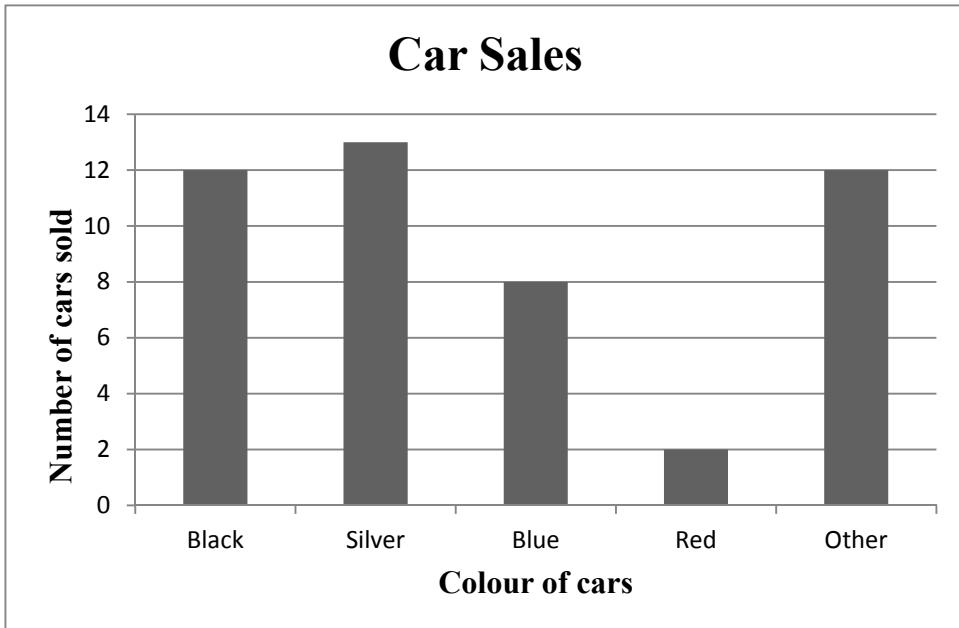
Sample too small.

Sample from one first year class only.

Girls only in the sample.

Question 10

The following bar chart shows the colours of cars sold by a garage during one month.

Car Sales

Number of cars sold vs Colour of cars

Colour	Number of cars sold
Black	12
Silver	13
Blue	8
Red	2
Other	12

(a) How many cars were sold during the month?

$12 + 13 + 8 + 2 + 12 = \mathbf{47}$

(b) What was the most popular colour of car sold? **Silver**
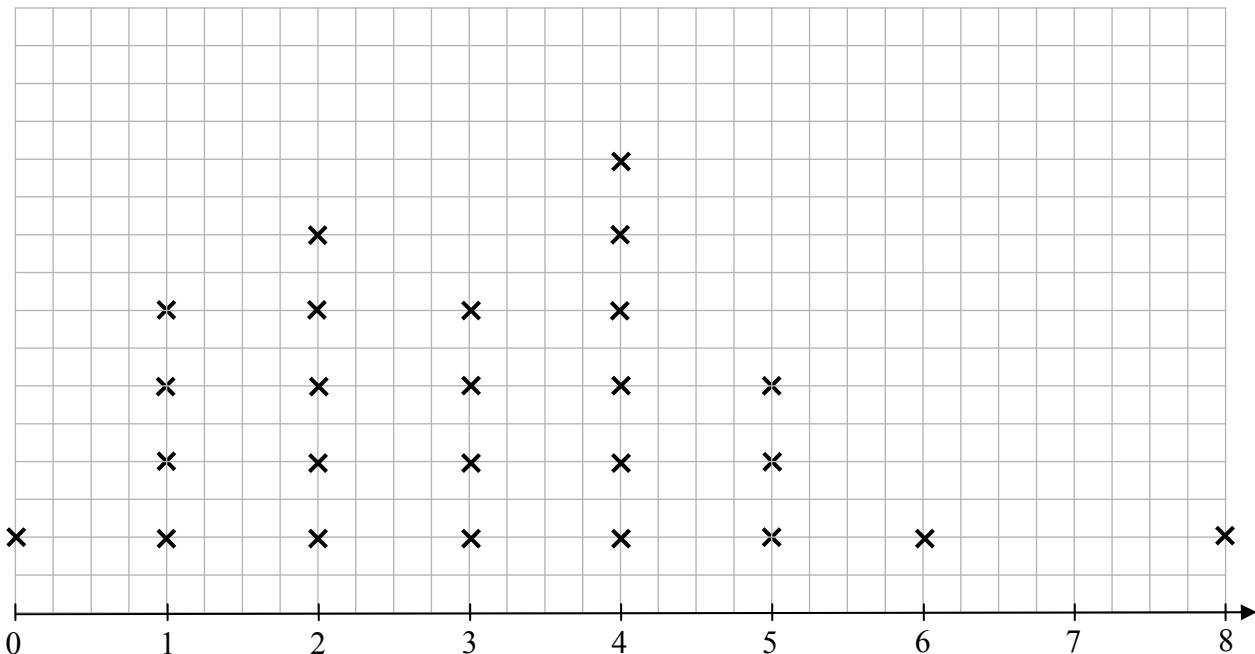
(c) What percentage of cars sold were blue?

$\frac{8}{47} \times 100 = \mathbf{17 \cdot 02\%}$

Question 11

In a *CensusAtSchool* survey, 25 students were asked how many soft drinks they had in the previous two days. The results are shown in the line plot below.

(a) What is the mode of the data? _____**4**_____

(b) What is the range of the data? _____$0 - 8$ = **8**_____

(c) How many students had more than 3 soft drinks? _____**11**_____

(d) What is the probability that a student chosen at random from this class had less than 2 soft drinks?

$$\frac{5}{25}$$

Question 12

(a) Find the value of $2a + 3b$, where $a = 5$ and $b = 2$.
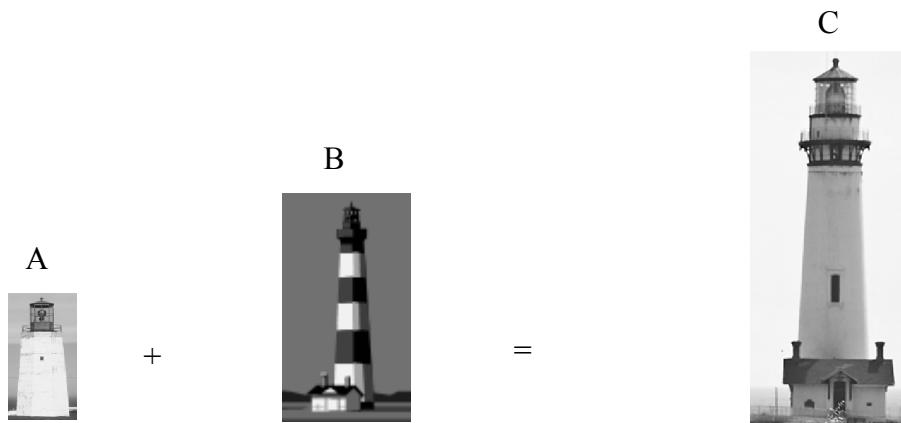
$2\big(\quad 5 \quad \big) +3\big(\quad 2 \quad \big) = \quad 10 + 6 \ = \ \mathbf{16}$

(b) Simplify $(5x + 3y) + 2(2x - y)$.

$$5x + 3y + 4x - 2y \ = \ \mathbf{9x + y.}$$

Question 13

The diagram shows three different lighthouses A, B and C.

C

B

A

+ =

(a) B is twice as high as A. If the height of A is x m, write down the height of B in terms of x.

2x metres

(b) The height of A added to the height of B is equal to the height of C. C is 18 m high.
Write down an equation in x to represent the above information.

$$x + 2x = 18$$

(c) Solve your equation to find the height of lighthouse A.

$$3x = 18$$

$$x = 6$$

Question 14

The first four numbers of a pattern are
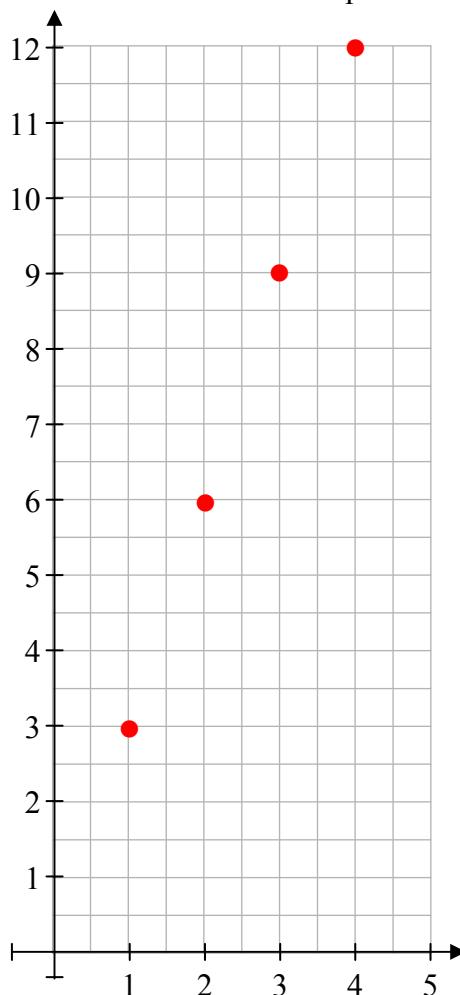
Position	First	Second	Third	Fourth
Number	3	6	9	12

(a)   What is the fifth number in the pattern?   **15**

(b)   In what position will the number 36 be?

> **12th** position.

(c)   Plot the points from the table on the co-ordinate plane below.
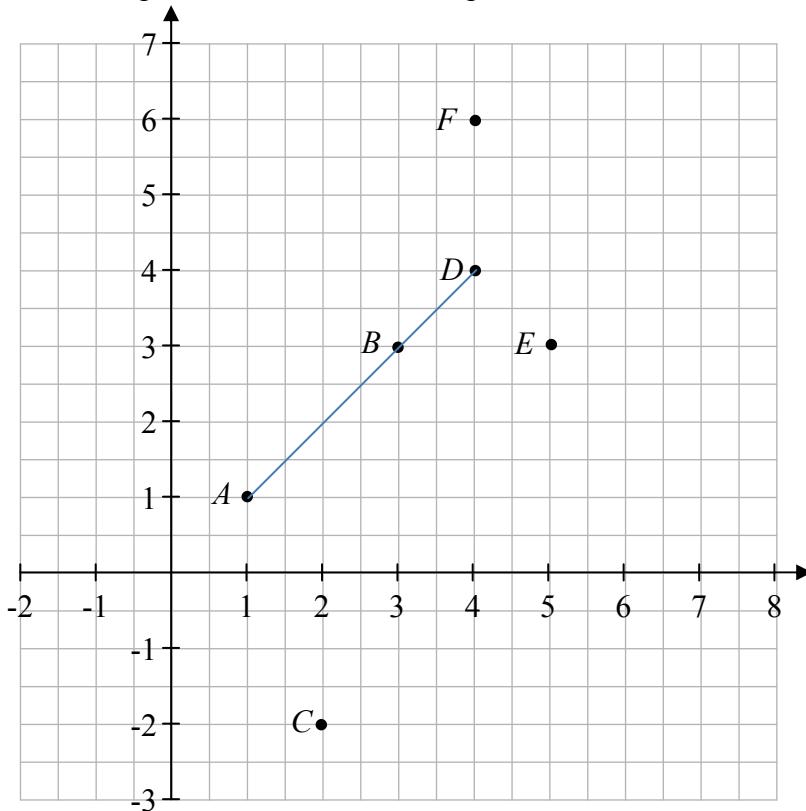
(d)   Write down how you would show that the relationship between the position and the number is linear.

> - Straight line.
> - 1st difference is the same.
> - Common difference.
> - Same Rise over Run.
>
>   One of the above, or similar, is sufficient (list is not exhaustive).

Question 15

The diagram shows six points on the co-ordinate plane.

(a) Write down the co-ordinates of each point described in the table below.

Description	Co-ordinates
The point *E*.	**(5, 3)**
The point of intersection of *DA* and *DE*.	**(4, 4)**
The vertex of the angle *CAB*	**A(1, 1)**
A point on the same line as *A* and *D*.	e.g. **(3, 3)**

(b) Find the mid-point of [*AE*].

A(1, 1) and E(5, 3)

$$\text{Mid point: } \left(\frac{1+5}{2}, \frac{1+3}{2} \right) = \textbf{(3, 2)}$$
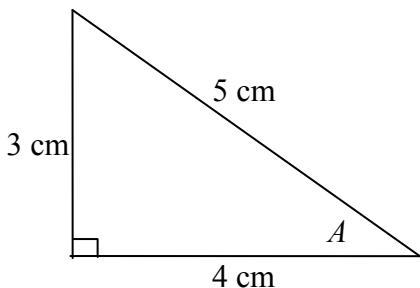
(c) Find the slope of *BF*.

B(3, 3) and F(4, 6).

$$\text{Slope: } \frac{6-3}{4-3} = \textbf{3} \quad \underline{\text{OR}} \quad \text{Slope: } \frac{\text{Rise}}{\text{Run}} = \frac{6}{2} = \textbf{3.}$$

Question 16

The diagram shows the angle A in a right-angled triangle.

(a) What is the length of the side opposite the angle A? _____**3 cm**_____

(b) What is the length of the hypotenuse of the triangle? _____**5 cm**_____
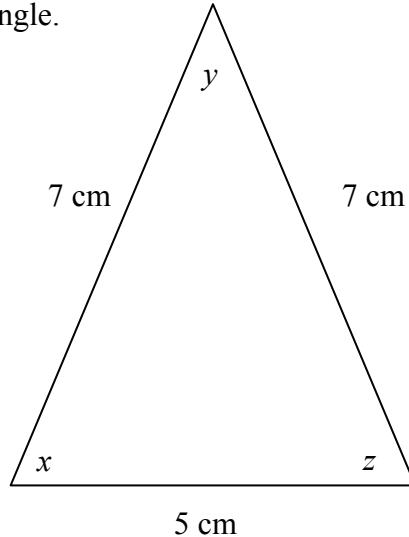
(c) Write down $\sin A$. $\quad\quad\quad\quad \sin A =$ $\dfrac{3}{5}$

Question 17

The diagram shows the lengths of three sides of a triangle.

(a) Which two angles are equal? ___$\angle$ **X**___ and ___$\angle$ **Z**___

(b) Why do you think they should be equal?

> e.g. Isosceles triangle.

(c) Use your protractor to measure the three angles in the triangle.

$|\angle x| =$ _____**67°**_____ $\quad |\angle y| =$ ____**46°**____ $\quad |\angle z| =$ ____**67°**____

Question 18

The following questions refer to the shapes shown below.
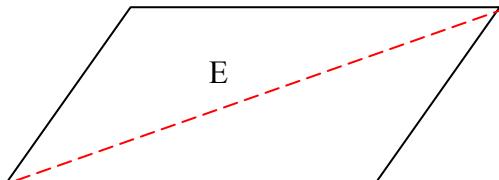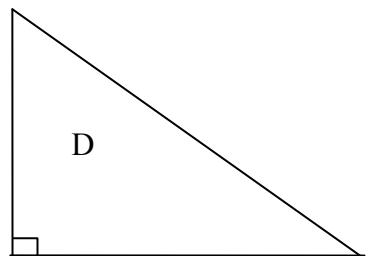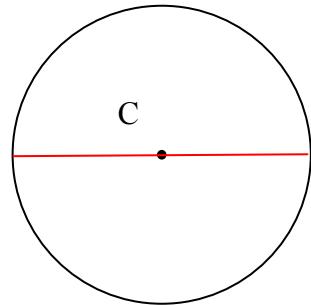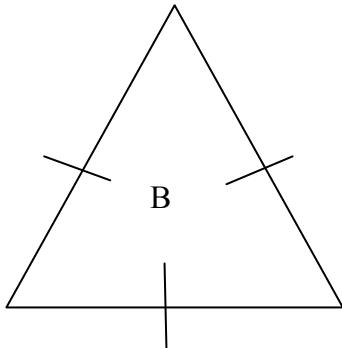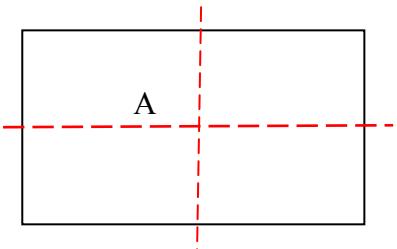
(a) Draw a diameter in the circle C.

(b) One of the angles in triangle D is 90°. What kind of triangle is this?

Right-angled triangle

(c) Draw a line in the parallelogram E to divide it into 2 congruent triangles.

(d) The three sides of triangle B are equal. What kind of triangle is this?

Equilateral

(e) Draw in the 2 axes of symmetry of the rectangle A.

(f) Which shape does not have any vertices?   C

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 only.

7.   The phrase "and stops" means that no more work is shown by the candidate.

8.   Unless otherwise indicated in the scheme, accept the best of two or more attempts – even when attempts have been cancelled.

9.   Do not penalise the use of a comma for a decimal point, e.g. €5.50 may be written as €5,50.

Question 19 20 marks (10,10) Att (3,3)

Part (a) 10 marks Att 3

Given that $y = 3x + 4$, complete the table below.

x	1	2	3	4
y			13	

x	1	2	3	4
y	**7**	**10**	13	**16**

$y = 3x + 4$
$x = 1 \Rightarrow y = 3(1) + 4$ $\therefore y = 7$
$x = 2 \Rightarrow y = 3(2) + 4$ $\therefore y = 10$
$x = 4 \Rightarrow y = 3(4) + 4$ $\therefore y = 16$

* Answers need not be written in table.
* Correct answers without work merit full marks.

Blunders (-3)
B1 Omitted or incorrect y entry in the given table (each time).
B2 Error e.g. uses $y = 2x$ or $y = x + 5$ and completes correctly (task over-simplified).

Slips (-1)
S1 Adds in top line of table (8, 12, 16, 20) or (8, 12, 13, 20).
S2 Arithmetic error in calculation (Max -3).

Misreadings (-1)
M1 Error in copying down equation if task is not over-simplified, e.g. uses $y = 2x + 4$.

Attempts (3 marks)
A1 11,12,13,14.
A2 Calculates for $x = 3$ (only one worked out correctly) i.e. $y = 13$.
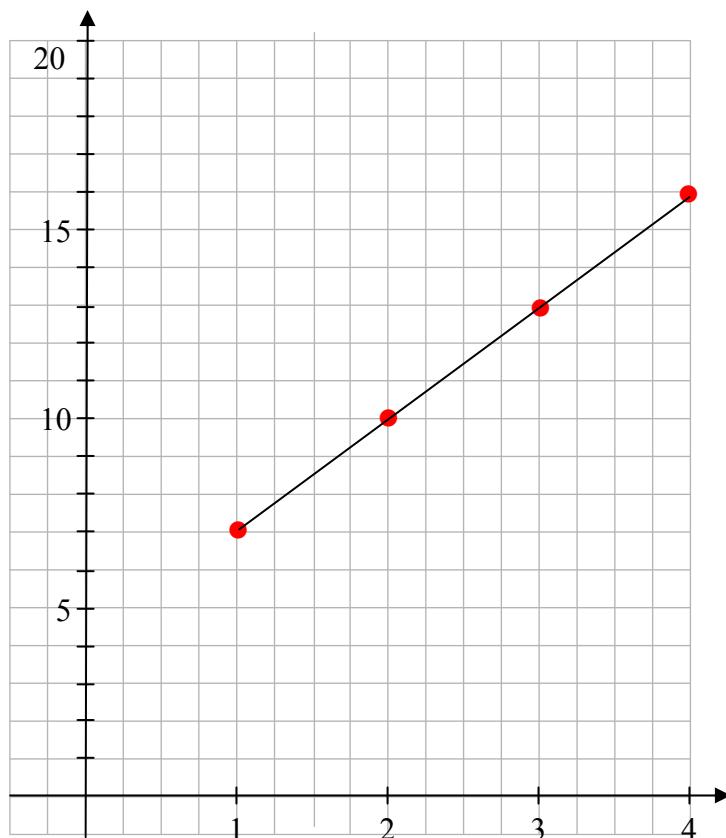
Worthless (0)
W1 Table completed with spurious numbers.

Using your answers from **(a)**, draw the graph of $y = 3x + 4$ from $x = 1$ to $x = 4$.

       * Tolerance (± 1 box on grid).
       * Allow candidate's work from part (a) above.
       * Ignore join to origin

Blunders (-3)

Slips (-1)
S1   All points not joined.
S2   Each incorrectly plotted point [subject to S1] or omitted end point.

Attempts (3marks)
A1   Random straight line or lines.
A2   One correct point.

Structure of the marking scheme (Questions 1 – 18)

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
2 mark scale	0, 2	0, 1, 2		
5 mark scale	0, 5	0, 3, 5	0, 2, 4, 5	0, 2, 3, 4, 5
10 mark scale	0, 10	0, 5, 10	0, 5, 8, 10	0, 4, 6, 8, 10
15 mark scale		0, 7, 15	0, 7, 12, 15	0, 6, 10, 13, 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 (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 (22)

(a) 10B

(b) 5B

(c) 2A

(d) 5B

Question 2 (15)

(a) 5B

(b) 10B*

Question 3 (15)

(a) 10B

(b) 5B

Question 4 (10)

(a) 5B

(a) 5B

Question 5 (25)

(a) 5B*

(b) 10B*

(c) 5A

(d) 5B*

Question 6 (20)

(a) 15C

(b) 5B

Question 7 (15)

15D

Question 8 (25)

(a) 10B

(b) 5B 10B

Question 9 (4)

(a) 2B

(b) 2B

Question 10 (17)

(a) 10D

(b) 2A

(c) 5B

Question 11 (15)

(a) & (b) 5B

(c) 5B

(d) 5B

Question 12 (15)

(a) 10C

(b) 5B

Question 13 (5)

5D

Question 14 (30)

(a) 5A

(b) 5A

(c) 10C

(d) 10B

Question 15 (10)

(a) 5C

(b) & (c) 5C

Question 16 (15)

(a) & (b) 10C*

(c) 5B

Question 17 (12)

(a) 5A

(b) 2A

(c) 5C

Question 18 (10)

10C

Question 19 (20)

(a) 10

(b) 10

Detailed marking notes

Question 1

(a)   Scale 10B (0, 5, 10)
            Partial credit: Subtracts instead of adds.

(b)   Scale 5B (0, 3, 5)
            Partial credit: Divides instead of multiplying.

(c)   Scale 2A (0, 2)

(d)   Scale 5B (0, 3, 5)
            Partial credit: Number correct but reason incorrect or omitted.
                                   Valid reason but number incorrect or omitted.

Question 2

(a)   Scale 5B (0, 3, 5)
            Partial credit: Any mention of 1 or 3.

(b)   Scale 10B* (0, 5, 9, 10)
            Partial credit: Any mention of 1, 2, 4 or 8.

Question 3

(a)   Scale 10B (0, 5, 10)
            Partial credit: Correct addition.
                                     €21·74 given as the VAT amount (division instead of multiplication)

(b)   Scale 5B (0, 3, 5)
            Partial credit: Answer given as €290 or €290·...
                                     i.e. (division instead of multiplication).
                                     Answer in the range £180 - £240.

Question 4

(a)   Scale 5B (0, 3, 5)
            Partial credit: Any correct entry.

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

Question 5

(a)   Scale 5B* (0, 3, 4, 5)
            Partial credit: Any mention of 10 or 6.
                                       Use of any of the measurements in the diagram.

(b)   Scale 10B* (0, 5, 9, 10)
            Partial credit: Formulates some addition of relevant lengths.

(c)   Scale 5A (0, 5)

(d)   Scale 5B* (0, 3, 4, 5)
            Partial credit: No marks were secured in (b) and correct perimeter here.
                                       Any relevant area formulated.

Question 6

(a)   Scale 15C (0, 7, 12, 15)
            High partial credit: 3 or 4 correct entries.

            Low partial credit: 1 or 2 correct entries.

(b)   Scale 5B (0, 3, 5)
            Partial credit: Any relevant work.

Question 7

            Scale 15D (0, 6, 10, 13, 15)
            High partial credit: 3 or 4 correct entries.

            Partial credit: 1 or 2 correct entries.

            Low partial credit: Some work of merit.

Question 8

(a)   Scale 10B (0, 5, 10)
            Partial credit: Formulates addition of relevant numbers.

(b)(i)   Scale 5B (0, 3, 5)
            P*artial credit:*   4 or 15 written.

(b)(ii)   Scale 10B (0, 5, 10)
            Partial credit: 3, 6, 9 or 15 written.

Question 9

(a)   Scale 2B (0, 1, 2)
               Partial credit: 1, 2 or 3 correct entries.

(b)   Scale 2B (0, 1, 2)
               *Note: Award 1 mark for each of 2 correct reasons.

Question 10

(a)   Scale 10D (0, 4, 6, 8, 10)
               High partial credit: 5 correct frequencies but not added.

               Partial credit: 3 or 4 correct frequencies.

               Low partial credit: 1 or 2 correct frequencies.

(b)   Scale 2A (0, 2)

(c)   Scale 5B (0, 3, 5)
               Partial credit: 8 or candidates total written.

Question 11

(a) & (b)   Scale 5B (0, 3, 5)
               Partial credit: Part (a) or part (b) correct.
                              Some work of merit, e.g. 6 used in part (a) or part (b).

(c)   Scale 5B (0, 3, 5)
                Partial credit: 4 or 15 written.

(d)   Scale 5B (0, 3, 5)
                Partial credit: 5, 10 or 25 written.

Question 12

(a)   Scale 10C (0, 5, 8, 10)
               High partial credit: 2 correct substitutions or $10 + 6$ written.

               Low partial credit: 1 correct substitution or 10 or 6 written.

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

Question 13

      Scale 5D (0, 2, 3, 4, 5)
      High partial credit: 2 parts correct.

      Partial credit: 1 part correct.

      Low partial credit: Any work of merit.

Question 14

(a)   Scale 5A (0, 5)

(b)   Scale 5A (0, 5)

(c)   Scale 10C (0, 5, 8, 10)
      High partial credit: 2 or 3 of the given points plotted correctly.

      Low partial credit: 1 of the given points plotted correctly.

(d)   Scale 10B (0, 5, 10)
      Partial credit: Any mention of slope or Rise over Run.

Question 15

(a)   Scale 5C (0, 2, 4, 5)
      High partial credit: 2 or 3 entries correct.

      Low partial credit: 1 correct entry.

(b) & (c)   Scale 5C (0, 2, 4, 5)
      High partial credit: 1 of the 2 parts correct.

      Low partial credit: Any substitution into a correct formula.

Question 16

(a) & (b)   Scale 10C* (0, 5, 8, 9, 10)
      High partial credit: Part (a) or part (b) correct.

      Low partial credit: Incorrect side used in part (a) or in part (b).

(c)   Scale 5B (0, 3, 5)
      Partial credit: Incorrect **relevant** sides used.

Question 17

(a)   Scale 5A (0, 5)

(b)   Scale 2A (0, 2)

(c)   Scale 5C (0, 2, 4, 5)
              *Note: Allow tolerance of ±3º.

              High partial credit: 2 correct angle measures.

              Low partial credit: 1 correct angle measure.

Question 18

        Scale 10C (0, 5, 8, 10)

        High partial credit: 3, 4 or 5 parts correct.

        Low partial credit: 1 or 2 parts correct.

Marcanna Breise as ucht Freagairt trí Ghaeilge

(Bonus marks for answering through Irish)

Ba chóir marcanna de réir an ghnáthráta a bhronnadh ar iarrthóirí nach ngnóthaíonn níos mó ná 75% d'iomlán na marcanna don pháipéar.   Ba chóir freisin an marc bónais sin a shlánú **síos**.

Déantar an cinneadh agus an ríomhaireacht faoin marc bónais i gcás gach páipéir ar leithligh.

Is é 5% an gnáthráta agus is é 300 iomlán na marcanna don pháipéar. Mar sin, bain úsáid as an ngnáthráta 5% i gcás iarrthóirí a ghnóthaíonn 225 marc nó níos lú, e.g. 198 marc $\times$ 5% = 9·9 $\Rightarrow$ bónas = 9 marc.

Má ghnóthaíonn an t-iarrthóir níos mó ná 225 marc, ríomhtar an bónas de réir na foirmle [300 – bunmharc] $\times$ 15%, agus an marc bónais sin a shlánú **síos**. In ionad an ríomhaireacht sin a dhéanamh, is féidir úsáid a bhaint as an tábla thíos.

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