Coimisiún na Scrúduithe Stáit
State Examination Commission

Scrúdu
an Teastais Shóisearaigh

JUNIOR CERTIFICATE EXAMINATION

2011

MARKING SCHEME

MATHEMATICS (PROJECT MATHS) FOUNDATION LEVEL

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Introduction

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

This document contains the complete marking scheme for the paper 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.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2011

Mathematics
(Project Maths – Phase 1)

Foundation Level

Friday 10 June Afternoon 2:00 – 4:00

300 marks

Marking Scheme and Model Solutions
(Questions 1 to 9)

Note that 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.

MARKING SCHEME – QUESTIONS 1 TO 9 (OLD SYLLABUS)

GENERAL GUIDELINES FOR EXAMINERS

1. Penalties of three types are applied to candidates' work as follows:
   - Blunders - mathematical errors/omissions (-3).
   - Slips - numerical errors (-1).
   - Misreadings (provided task is not oversimplified) (-1).

   Frequently occurring errors to which these penalties must be applied are listed in the scheme. They are labelled: B1, B2, B3,…, S1, S2,…, M1, M2,…etc. These lists are not exhaustive.

2. When awarding attempt marks, e.g. Att(3) 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 phrase "hit or miss" means that partial marks are not awarded – the candidate receives all of the relevant marks or none.

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

6. 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.

7. The sample solutions for each question are not intended to be exhaustive lists – there may be other correct solutions. .

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

9. The *same* error in the *same* section of a question is penalised *once* only.

10. Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks at most.

11. A serious blunder, omission or misreading results in the attempt mark at most.

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

QUESTION 1

Part (a)	**5 marks**	**Att 2**
Part (b)	**5 marks**	**Att 2**

(a) $34 + 66 =$ 100

(b) $21 \times 57 =$ 1197

(a)	**5 marks**	**Att 2**
100		

* *No penalty for work not shown: no* ✍

Blunders (-3)
B1 Uses incorrect operator (with work)

Slips (-1)
S1 *Numerical errors (once only)*

Misreadings (-1)
M1 Error in copying down a digit *(once only)*

Attempts (2 marks)
A1 Special cases: –32 (–), 2244 (×), 17/33 or 0.51 (i.e. ÷) without work

Worthless (0)
W1 Incorrect answer without work but check A1

(b)	**5 marks**	**Att 2**
1197		

* *No penalty for work not shown: no* ✍

Blunders (-3)
B1 Uses incorrect operator (with work)

Slips (-1)
S1 Numerical errors (once only)

Misreadings (-1)
M1 Error in copying down a digit (once only)

Attempts (2 marks)
A1 Special cases: 78 (+), -36 (–), 7/19 or 0.3684(÷) without work

Worthless (0)
W1 Incorrect answer without work but check A1

QUESTION 2

Part (a)	**5 marks**	**Att 2**
Part (b)	**5 marks**	**Att 2**
Part (c)	**5 marks**	**Att 2**
Part (d)	**5 marks**	**Att 2**

(a) Write 16·3 correct to the nearest whole number. 16

(b) Write 3·7 correct to the nearest whole number. 4

(c) Use the answers from parts **(a)** and **(b)** to estimate the value of $\frac{16{\cdot}3}{3{\cdot}7}$

$\frac{16{\cdot}3}{3{\cdot}7}$ is approximately equal to $\frac{16}{4} = 4$

(d) Using a calculator or otherwise find the value of $\frac{16{\cdot}3}{3{\cdot}7}$ correct to one decimal place.

Answer: $\frac{16{\cdot}3}{3{\cdot}7} = 4{\cdot}405 \approx 4{\cdot}4$

Part (a) **5 marks** **Att 2**

Write 16·3 correct to the nearest whole number.

* *No penalty for work not shown: no ✍*

Blunders (-3)
B1 Incorrect whole number other than S1

Slips (-1)
S1 17

Misreadings (-1)
M1 Error in copying down a digit (once only)

Worthless (0)
W1 Incorrect answer (not a whole number) without work

(b) **5 marks** **Att 2**

Write 3·7 correct to the nearest whole number.

* *No penalty for work not shown: no ✍*

Blunders (-3)
B1 Incorrect whole number other than S1

Slips (-1)
S1 3

Misreadings (-1)
M1 Error in copying down a digit (once only)

Worthless (0)
W1 Incorrect answer (not a whole number) without work

(c) **5 marks** **Att 2**

Use the answers from parts **(a)** and **(b)** to estimate the value of $\frac{16 \cdot 3}{3 \cdot 7}$

* Accept candidates incorrect answers from parts (a) and / or (b)

Blunders (-3)
B1 Correct answer without work (✍)
B2 Uses incorrect operator

Slips (-1)
S1 Arithmetic error in calculation
S2 Decimal error
S3 Incorrect rounding off

Misreadings (-1)
M1 Error in copying down a digit (once only)

Attempts (2 marks)
A1 Any attempt at division

Worthless (0)
W1 Incorrect answer without work

Part (d) **5 marks** **Att 2**

Using a calculator or otherwise find the value of $\frac{16 \cdot 3}{3 \cdot 7}$ correct to one decimal place.

* *No penalty for work not shown: no ✍*

Blunders (-3)
B1 Uses incorrect operator

Slips (-1)
S1 Arithmetic error in calculation (once only)
S2 Incorrect rounding off

Misreadings (-1)
M1 Error in copying down a digit (once only)

Attempts (2 marks)
A1 Special Cases : 20(+), 12.6(–), 64,60.3 or 60.31(×) or similar without work.
A2 Any attempt at division

Worthless (0)
W1 Incorrect answer without work but check A1

QUESTION 3

Part (a)	**10 marks**	**Att 3**
Part (b)	**10 marks**	**Att 3**

Part (a) **10 marks** **Att 3**

In a restaurant, dinner for an adult costs €25·50 and dinner for a child costs €15.
Find the cost of dinner for two adults and three children.

Adults:	2× €25·50	= € 51
Children:	3× €15	= € 45
Total		= € 96

Blunders (-3)
B1 Correct answer without work (✍)
B2 Ignores multiples of items shown (once only). Answer given as €40·50
B3 Fails to add subtotals
B4 Subtracts subtotals

Slips (-1)
S1 Arithmetic error in calculation each time (to a maximum of –3)
S2 Decimal error each time
S3 Final total left as an improper fraction or mixed number

Misreadings (-1)
M1 error in copying down a digit (once only)

Attempts (3 marks)
A1 Any attempt at multiplication/division

Worthless (0)
W1 Incorrect answer without work

Part (b) **10 marks** **Att 3**

Dinner is paid for with two €50 notes. How much change should there be?

*Accept candidate's answer from (a)
* Accept answer in cent.

Blunders (-3)
B1 Correct answer without work (✍)
B2 Adds instead of subtracts
B3 Order of subtraction reversed but accept 96 – 100 = 4

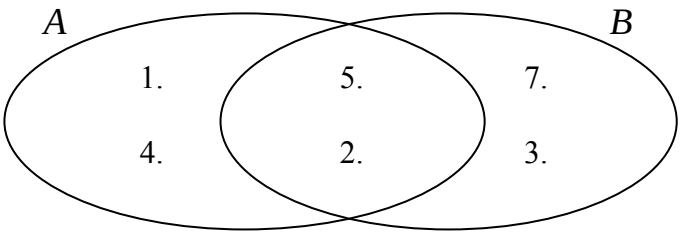
Slips (-1)
S1 Arithmetic error in calculation (once only)
S2 Final answer left as an improper fraction or mixed number
S3 Decimal error

Misreadings (-1)
M1 Error in copying down a digit (once only)

Worthless (0)
W1 Incorrect answer without work.

QUESTION 4

Part (i)	**5 marks**	**Att 2**
Part (ii)	**10 marks**	**Att 3**



(i) $B = \{ 2, 3, 5, 7 \}$

(ii) $A \cup B = \{ 1, 2, 3, 4, 5, 7 \}$

Part (i) **5 marks** **Att 2**

$B = \{2, 3, 5, 7\}$

* Accept appropriate shading.

Slips (-1)
S1 Each incorrect or omitted element (to max -3)

Attempts (2 marks)
A1 An element of A\B

Worthless (0)
W1 No element of A or B in answer

Part (ii) **10 marks** **Att 3**

$A \cup B = \{1, 2, 3, 4, 5, 7\}$

* Accept appropriate shading.

Blunders (-3)
B1 Shades or lists intersection

Slips (-1)
S1 Each incorrect or omitted element (to max -3)

Attempts (3 marks)
A1 Defines union

Worthless (0)
W1 No element of A or B in answer

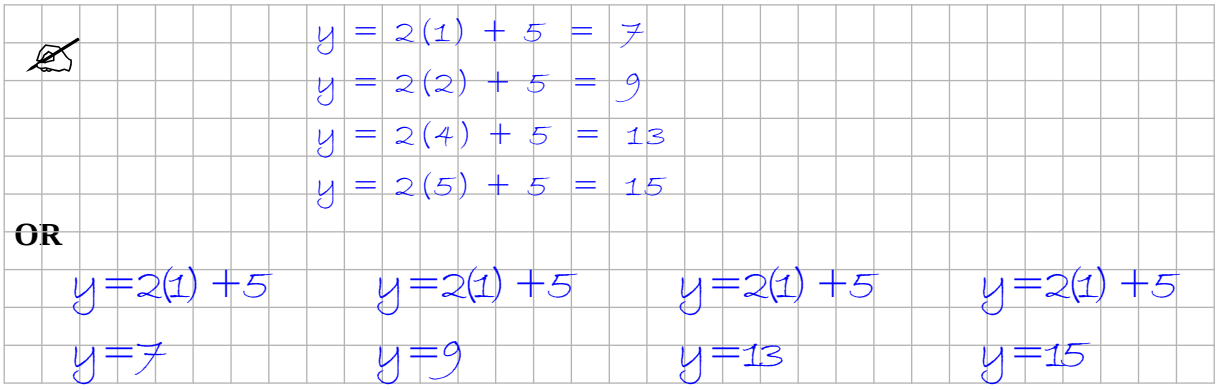
QUESTION 5

Part (a)	**5 marks**	**Att 2**
Part (b)	**10 marks**	**Att 3**
Part (c)	**5 marks**	**Att 2**

Part (a) **5 marks** **Att 2**

(a) Given that $y = 2x + 5$, complete the table below. Show all your work.

x	1	2	3	4	5
y	7	9	11	13	15



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

Blunders (-3)
B1 Omitted or incorrect entry
B2 Error e.g. $y = 2x$ or $y = x + 5$

Slips (-1)
S1 Adds in top line of table (8, 11, 14, 17, 20) or (8, 11, 11, 17, 20)
S2 Arithmetic error in calculation (Max –3)

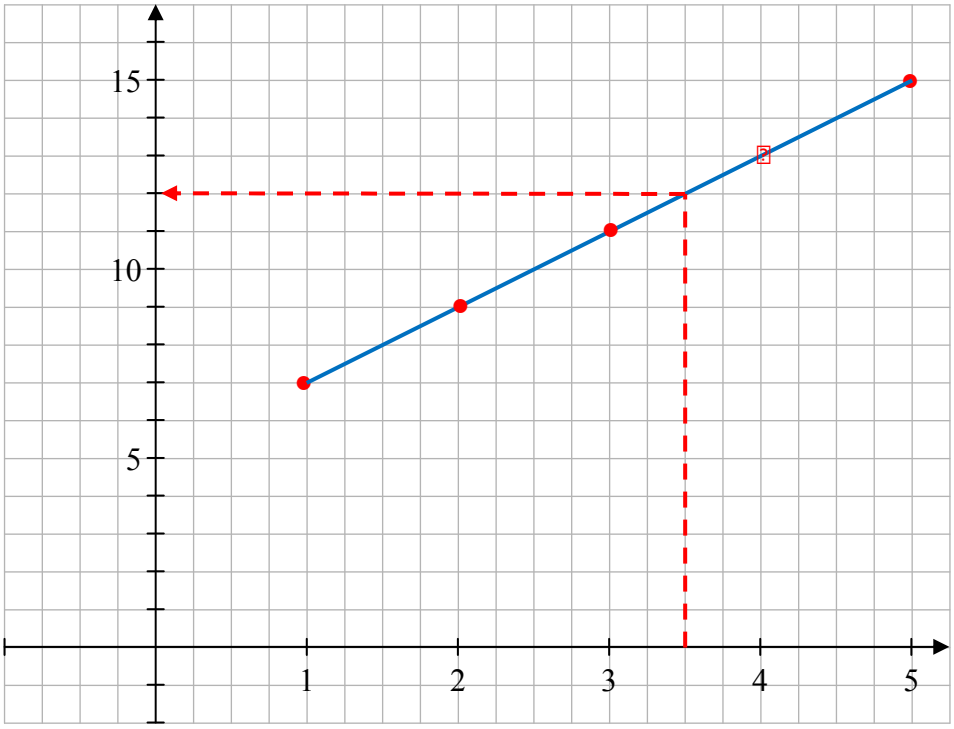
Misreadings (-1)
M1 Error in copying down equation if task is not over-simplified

Attempts (2 marks)
A1 Any one correct entry other than 11 with or without work
A2 $x = 3$ (only one worked out correctly) i.e. $y = 11$
A3 9, 10, 11, 12, 13

Worthless (0)
W1 Table completed with spurious numbers

Part (b) **10 marks** **Att 3**

Using your answers from **(a)**, draw the graph of $y = 2x + 5$ from $x = 1$ to $x = 5$.



* Tolerance ± 0·5cm (± 1 box on grid).
* Allow candidate's work from (a)
* Ignore join to origin

Blunders (-3)
B1 Scale error (once only)

Slips (-1)
S1 (y, x) consistently drawn (penalise once only).
S2 All points not joined.
S3 Each incorrectly plotted point [subject to S1] or omitted end point.

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

Part (c) **5 marks** **Att 2**

(c) Use your graph to find the value of y when $x = 3{\cdot}5$.

Work to be shown on the graph and answer to be written here. 12 .

* Tolerance ± 0·5cm (one box)

Blunders (-3)
B1 Answer within tolerance, but no indication on graph or substitution

Slips (-1)
S1 Indicates the correct answer on graph but does not specify the y value.
S2 Correct answer got from substituting into equation

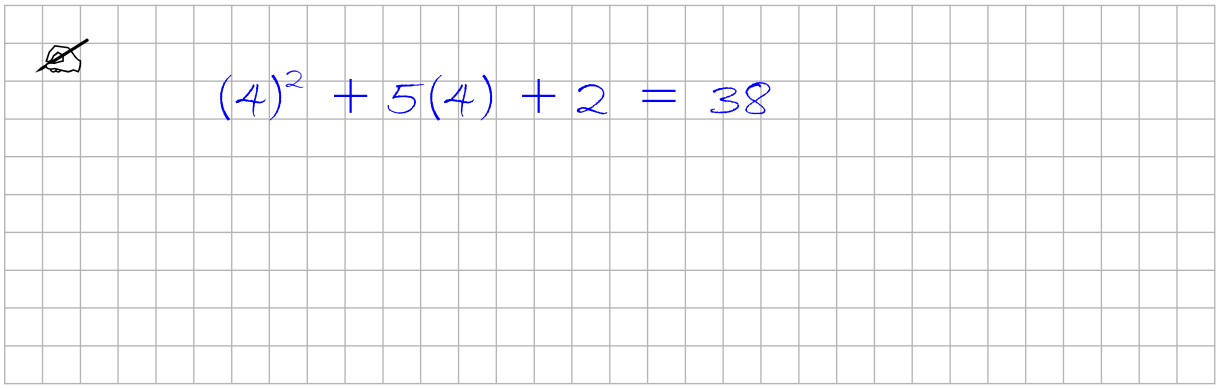
Attempts (2)
A1 Locates 3·5 on either axis.
A2 Draws any line on graph.

QUESTION 6

Part (a)	**10 marks**	**Att 3**
Part (b)	**10 marks**	**Att 3**

Part (a) **10 marks** **Att 3**

(a) Find the value of $x^2 + 5x + 2$ when $x = 4$.



Blunders (-3)

B1 Correct answer without work (✍)

B2 $(4)^2$ +5(4) + 2 and stops

B2 Association error, e.g. $(4)^2$ +5(4) + 2 =16+ 5(4+2) = 16+30=46

B3 Mathematical error e.g. $(4)^2$ + 5(4) + 2 = 16+ 54+2 and continues

B4 4^2 = 8 or similar and continues (8+20+2=30)

Slips (-1)

S1 Arithmetic error in calculation, max –3

S2 Fails to finish, no addition (stops at 16+20+2)

Misreadings (-1)

M1 Error in copying down a component, provided it doesn't oversimplify question

Attempts (3 marks)

A1 $x^2 + 4x + 5 = 4$ and continues

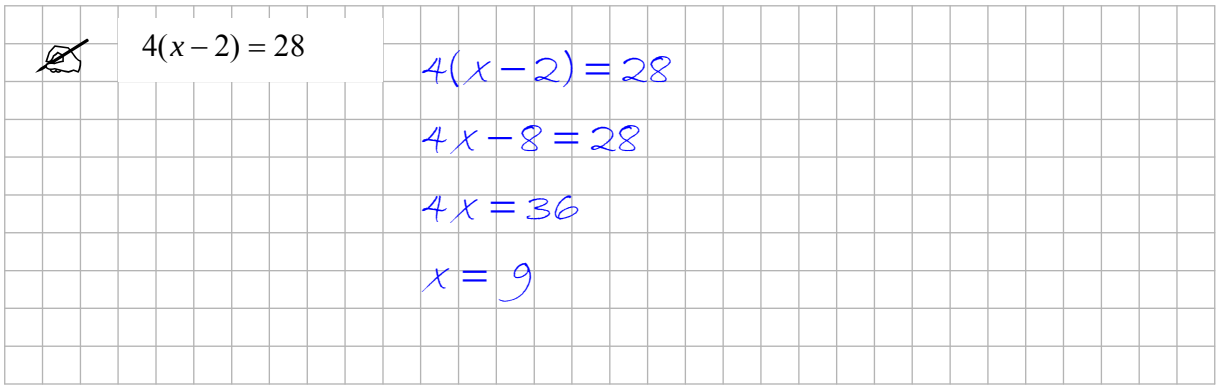
A2 Any correct step *e.g.* $(4)^2$ or 5×4 and stops

Worthless (0)

W1 Incorrect answer without work

Part (b) **10 marks** **Att 3**

(b) Solve for x:



Blunders (-3)

B1 Correct answer without work ( )
B2 Error in distributive law ($4x – 2 = 28$)
B3 Error in transposition
B4 Stops at $4x = 36$

Slips (-1)

S1 Numerical errors to a max of – 3
S2 Leaves answer as 36/4 or similar

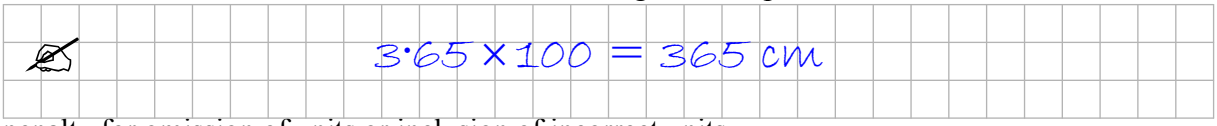
QUESTION 7

Part (a)	**5 marks**	**Att 2**
Part (b)	**5 marks**	**Att 2**

Part (a) **5 marks** **Att 2**

A piece of wood is 3·65 metres in length.

(a) Given that 1 metre = 100 cm, write down the length of the piece of wood in centimetres.



* No penalty for omission of units or inclusion of incorrect units

Blunders (-3)
B1 Correct answer without work (✍)
B2 1m not equal to 100 cm
B3 Divides by 100

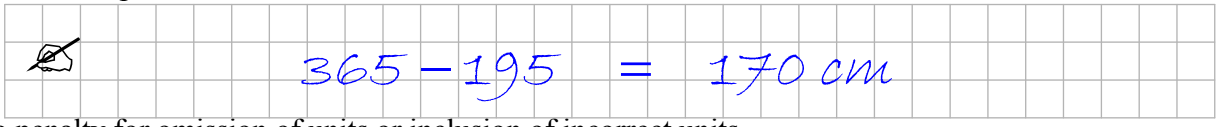
Slips (-1)
S1 Arithmetic error in calculation (once only)
S2 Decimal error

Misreadings (-1)
M1 Error in copying down a digit

Attempts (2)
A1 Answer with correct digits but incorrect decimal location (with no work)

Part (b) **5 marks** **Att 2**

(b) This piece of wood is cut in two. The longer piece is 195 cm long. Calculate the length of the shorter piece in cm.



* No penalty for omission of units or inclusion of incorrect units

Blunders (-3)
B1 Correct answer without work. (✍)
B2 Adds instead of subtracts
B3 Order of subtraction reversed but accept 195–365=170

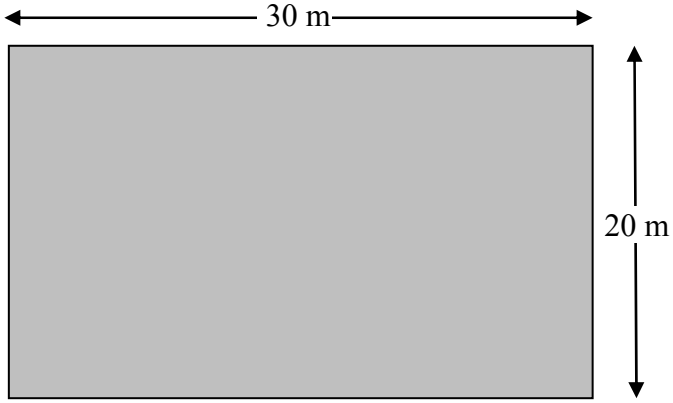
Slips (-1)
S1 Arithmetic error in calculation (once only)
Misreadings (-1)
M1 Error in copying down a digit(once only)

Attempts (2)
A1 Answer to (a) written in this part
Worthless (0)
Incorrect answer without work, but see A1

QUESTION 8

Part (a)	**5 marks**	**Att 2**
Part (b)	**10 marks**	**Att 3**
Part (c)	**5 marks**	**Att 2**

A rectangular garden is 30 metres long and 20 metres wide.



Part (a) **5 marks** **Att 2**

(a) Find the area of the garden in m^2.

area
30×20
$= 600\ m^2$

***** No penalty for omission of units or inclusion of incorrect units

Blunders (-3)

B1 Correct answer without work (✍)
B2 Answer left as 20×30
B3 Mathematical error e.g. incorrect operator (with work shown):
50 (+), 10(-), 1·5(÷), 0·666 (÷), 360000($30^2 \times 20^2$)
B4 Incorrect formula used with work e.g. $2 \times 30 + 2 \times 20 = 100$m or ½ base × height = 300

Slips (-1)

S1 Arithmetic error in calculation to a max (–3)
S2 Decimal error (*e.g.* 6, 60, *etc*)

Misreadings (-1)

M1 Error in copying down a digit once only

Attempts (2 marks)

A1 Mentions length, width, breadth, base or height.
A2 Copies diagram with indication of further knowledge (*e.g.* internal shading or subdivides diagram)
A3 0·66, 1·5, 10, 20, 30, 360000 (without work).

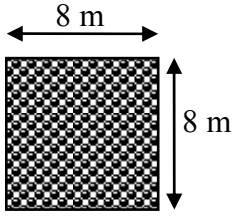
Worthless (0)

W1 Copies diagram as is.
W2 Incorrect answer without work, but note A3.
W3 Incorrect formula with π, and stops.

Part (b) **10 marks** **Att 3**

(b) A square flowerbed is dug in the garden. The side of the flowerbed is 8 metres long. Find the area of the flowerbed in m^2.

area = 8×8
= 64 m^2



***** No penalty for omission of units or inclusion of incorrect units

Blunders (-3)
B1 Correct answer without work ( )
B2 Answer left as 8 × 8
B3 Mathematical error e.g. incorrect operator (with work shown): e.g. 1(÷), 16(+), 4096($8^2 \times 8^2$)
B4 Incorrect formula used with work 2×8 + 2×8= 32m or ½ base × height = 32
Slips (-1)
S1 Arithmetic error in calculation to a max -3
S2 Decimal error
Misreadings (-1)
M1 Error in copying down a digit (once only)

Attempts (3 marks)
A1 Mentions length, width, breadth, base or height
A2 1, 16, 32, 4096 without work

Part (c) **5 marks** **Att 2**

(c) The rest of the garden is covered in grass. Find the area under grass in m^2.

grass area
600 − 64
= 536 m^2

***** Accept candidates answers from (a) and / or (b)

Blunders (-3)
B1 Correct answer without work( )
B2 Adds instead of subtracts
B3 Order of subtraction reversed but accept 64– 600=536
Slips (-1)
S1 Arithmetic error in calculation (once only)
Misreadings (-1)
M1 Error in copying down a digit (once only)
Worthless (0)
W1 Incorrect answer without work

QUESTION 9

Part (a)	**10 marks**	**Att 4**
Part (b)	**10 marks**	**Att 3**

Part (a) **(5, 5) marks** **Att (2, 2)**

(a) A table in a furniture store was bought for €500. It was sold for €700. Calculate the percentage profit on the cost price.

Selling Price = 700

Cost Price = 500

Profit = €200

[5 marks]

Percentage Profit

$\frac{200}{500} \times \frac{100}{1} = 40\%$

[5 marks]

Blunders (-3)
B1 Correct answer without work ( )
B2 Adds €500 to €700
B4 Mishandles the calculation of profit as a percentage.
B5 Incorrect cancellation(s)
B6 Fails to multiply by 100
B7 Fails to finish

Slips (-1)
S1 Numerical errors to a max of –3
S2 Calculates profit as a percentage of the selling price

Attempts (3 marks)
A1 Some indication of subtraction
A2 Some use of 100

Part (b) **10 marks** **Att 3**

(b) Another table in the store is priced at €800. The price will be reduced by 20% in a sale. Calculate the sale price.

✍ $800 \times \frac{80}{100} = €640$ **OR** 20% of 800 = 160

800 - 160 = €640

*800–20% = 640→ **10 marks**
* 800 × 20% = 160 and stops → **7 marks**
* 800 –20% and stops → **4 marks** or 800× 20% and stops → **4 marks**
* 160 without work and stops merits **4** marks

Blunders (-3)

B1 Correct answer without work ✍
B2 Mishandles %
B3 No subtraction (as per candidates work)
B4 Adds the reduction (as per candidates work)
B5 800 x 1·2 = 960

Slips (-1)
S1 Numerical errors to a max of –3
S2 Decimal error

Misreadings (-1)
M1 Error in copying down a digit (once only)

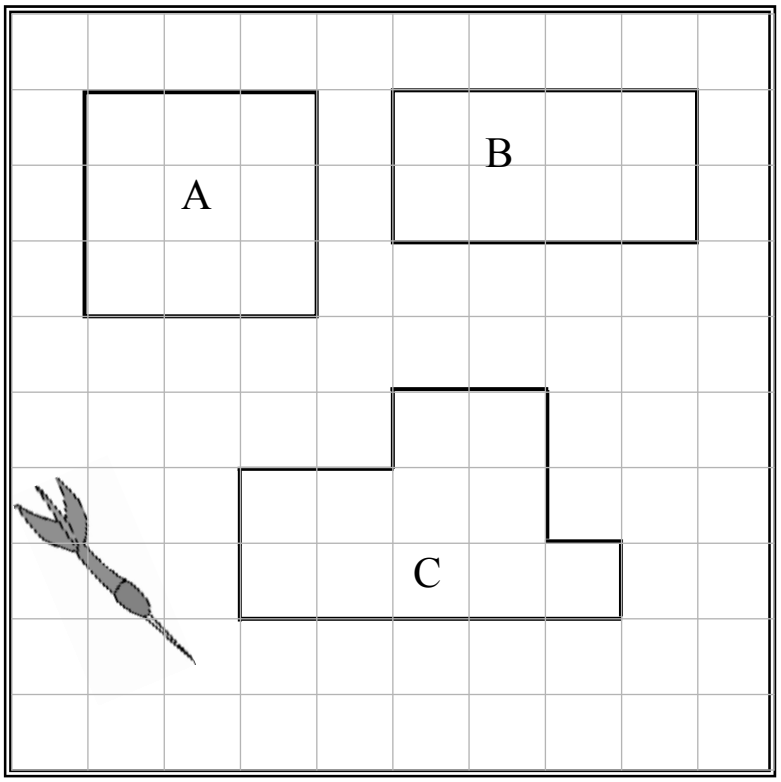
Worthless (0)
W1 Incorrect answer without work

Model Solutions
(Questions 10 to 19)

Note that 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.

Question 10

The diagram shows a 10 cm by 10 cm target in a computerised dart game. It contains three shapes, a square A of side 3 cm, a rectangle B measuring 4 cm by 2 cm and a shape C. The dart always lands inside one of the 1 cm squares in the target. It is equally likely to land in any of the squares.



(a) How many 1 cm squares are in the target?

Ans.: 100

(b) How many 1 cm squares are in shape C?

Ans.: 11

(c) In the game a dart is thrown at the target and lands at random on one of the squares. Find the probability that the dart lands in shape C.

Ans.: $\frac{11}{100}$ **OR** An answer consistent with (a) and (b) above.

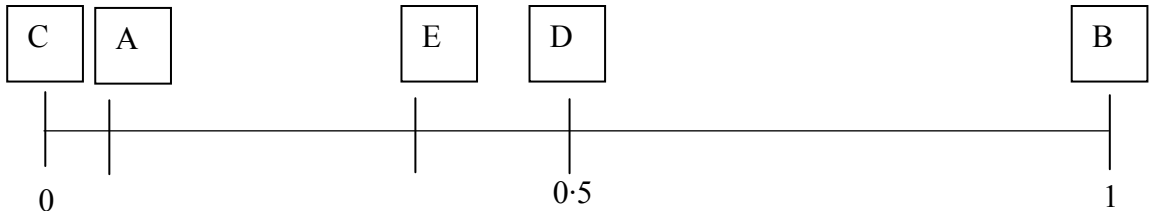
(d) Find the probability that the dart does not land inside any of the three shapes A, B or C.

A + B + C = 28 $\Rightarrow$ outside of A + B + C = 72

Probability = $\frac{72}{100} = \frac{36}{50} = \frac{18}{25}$

Question 11

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



The statements below refer to three of these events. Place one of the events A, B, C, D or E beside the statement that best describes it.

	Event
This event is certain to happen.	B
This event is very unlikely to happen.	A
This event has a 50% chance of happening.	D

Question 12 **(suggested maximum time: 10 minutes)**

The number of planning permissions approved for new houses and apartments in Ireland (to the nearest thousand) from 2006 to 2009 is shown in the table below.

Number of Planning Permissions Approved			
Year	Houses	Apartments	Total (Units)
2006	60 000	19 000	79 000
2007	63 000	22 000	85 000
2008	48 000	20 000	68 000
2009	27 000	14 000	41 000

Source: Central Statistics Office

(a) Complete the table to show the total number of units approved each year.

60 000 + 19 000 = 79 000

63 000 + 22 000 = 85 000

48 000 + 20 000 = 68 000

27 000 + 14 000 = 41 000

(b) How many fewer units were approved in 2009 compared to 2007?

85 000 − 41 000 = 44 000

(c) Calculate the percentage decrease in the total number of approvals between 2007 and 2009. Give your answer correct to two decimal places.

$$\frac{\text{Decrease}}{\text{Total Units (2007)}} \times \frac{100}{1} = \frac{44\,000}{85\,000} \times \frac{100}{1} = 51{\cdot}764 \approx 51{\cdot}76\%$$

OR

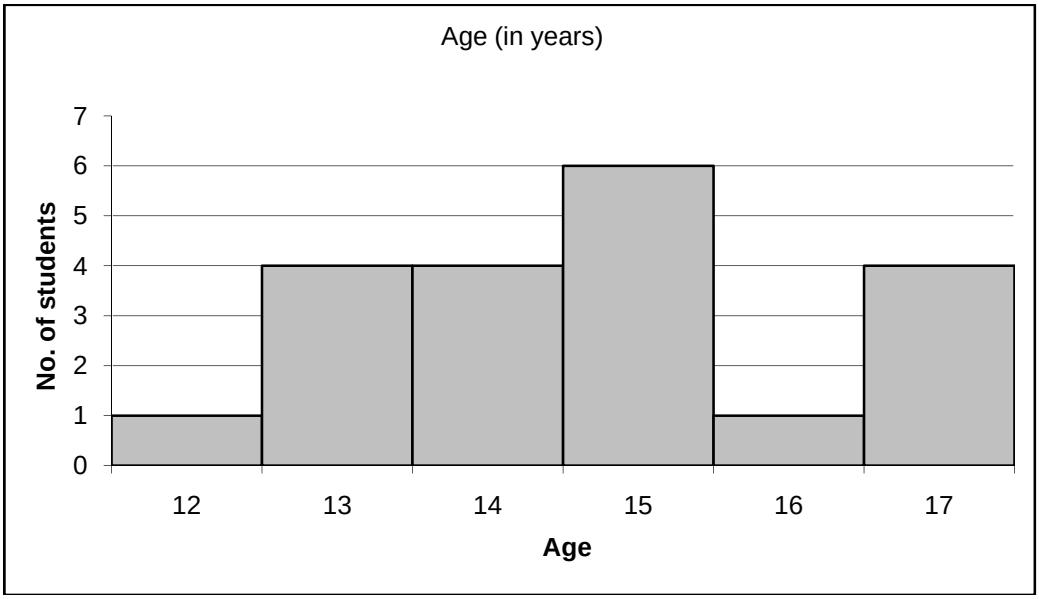
$$\frac{\text{Ans (b)}}{\text{Ans (2007)}} \times \frac{100}{1} = \text{Ans}$$

(d) In which year did the largest decrease in the number of approvals take place when compared to the previous year?

Year = 2009

Question 13

The ages of a random sample of students who completed the *CensusAtSchool* survey in 2010 are shown in the chart below.



(a) How many students were in the sample?

20

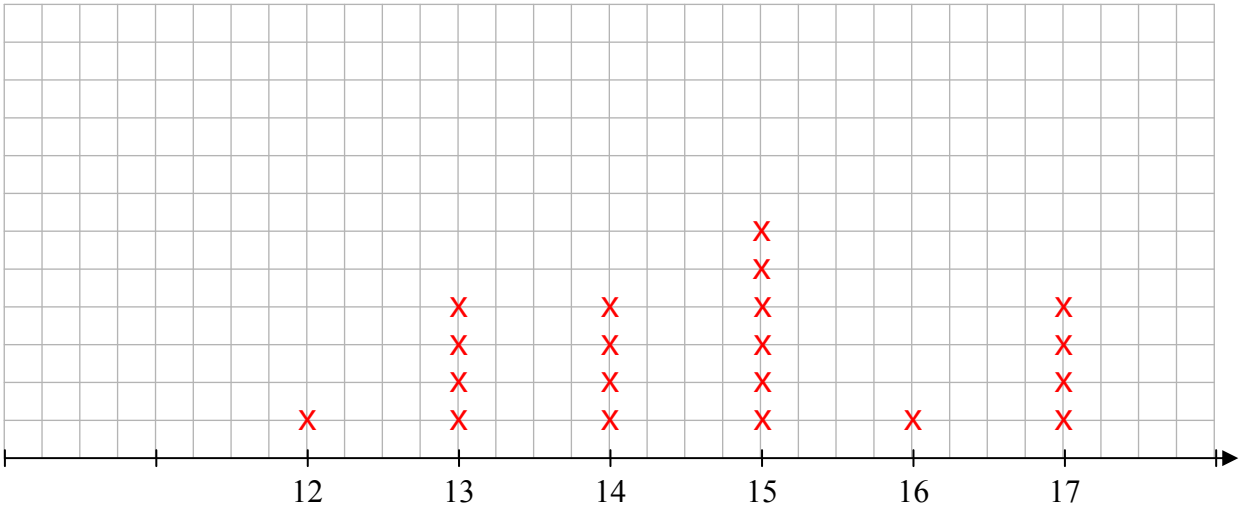
(b) The **mode** of the data is 15 and the **range** of the data is 5.

(c) How many students were younger than 15 years of age? 9

(d) What is the probability that a student chosen at random from this group is 17 years of age?

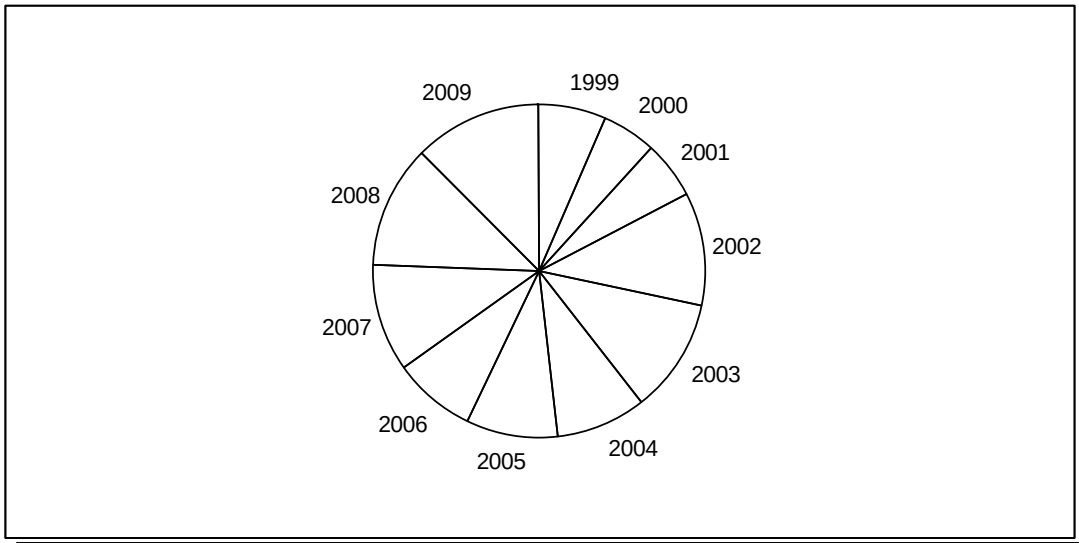
$\frac{4}{20}$

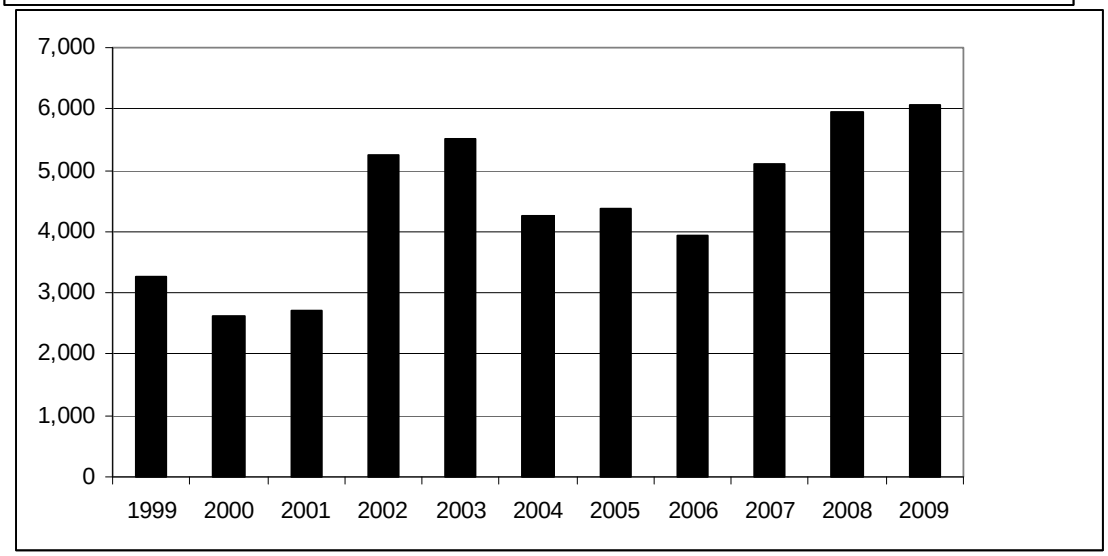
(e) Represent the above data on a line plot.



Question 14

The number of dog licences issued by Wicklow County Council from 1999 to 2009 is shown in the *pie chart* and in the *bar chart* below.





(a) Give two reasons why the bar chart is a better way of showing the data than the pie chart.

Data readings from bar charts are more accurate

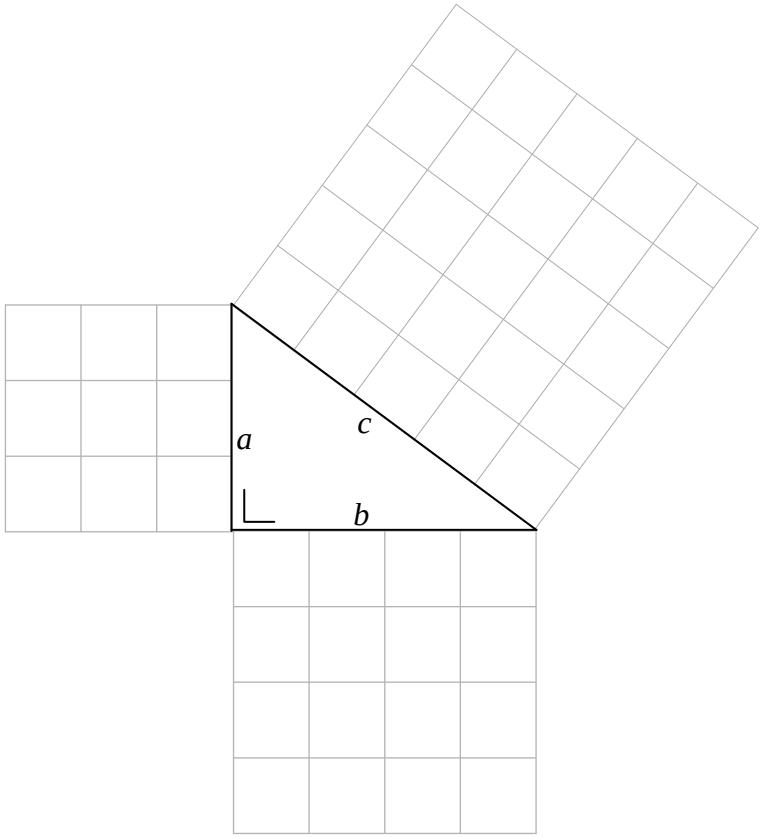
Trends / changes / patterns are easier to notice on a bar chart.

(b) Mary is looking at the bar chart. She points to one part of the graph and says, "that is interesting, I wonder why that happened." What part of the graph do you think Mary is talking about? Give a reason for your answer.

e.g. 2001 to 2002 - there is a big increase in the number of licences issued

Question 15

The diagram shows a right angled triangle with a square drawn on each side. Each small square box is 1 cm in length.



(a) State the length of each side of the triangle. $a =$ 3 cm $b =$ 4 cm $c =$ 5 cm

(b) Explain how the diagram can be used to demonstrate that the Theorem of Pythagoras can be applied to this triangle.

9 squares, 16 squares, 25 squares

$9 + 16 = 25$

$25 = 25$

OR

$3^2 + 4^2 = 5^2$

States "triangle is right-angled, so Pythagora's rule applies", or similar

(c) Find the area of the triangle.

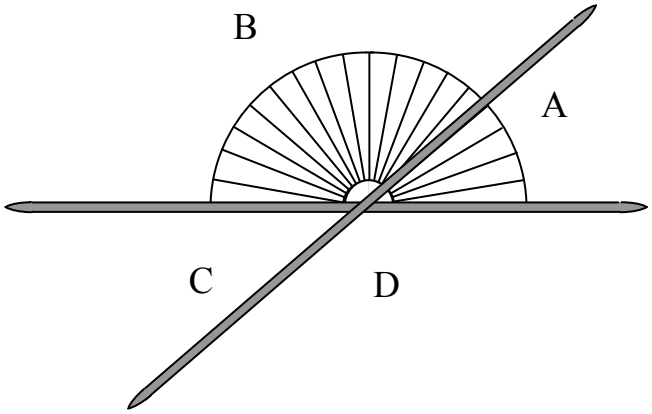
$\frac{1}{2}(4)(3) = 6\ cm^2$

OR

$\frac{1}{2}(12) = 6\ cm^2$ - (gets rectangle first)

Question 16

The diagram below shows two plastic strips, pinned at their mid points, and a protractor.



(a) From the diagram estimate the size of the angle A. 40°

(b) Use your estimate to calculate the size of angle B.

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

(c) Complete $|\angle B| + |\angle C|$ = 180°

(d) State the relationship between angle A and angle C. Give a reason for your answer.

Angle A = Angle C
because they are vertically opposite

Question 17

(a) Complete the table below. Give each answer correct to four decimal places.

A	$\sin A$	$\cos A$
30°	·5000	·8660
45°	·7071	·7071
60°	·8660	·5000

Use the values from the table to complete the statements below.

(b) If $A =$ 45° , then $\sin A = \cos A$

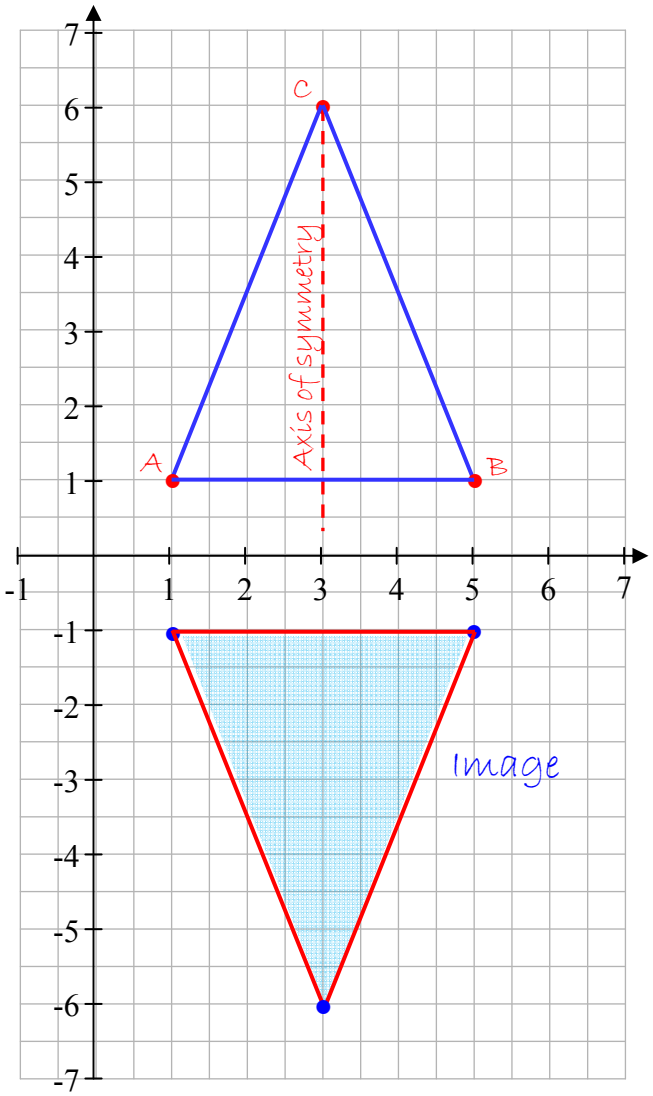
(c) If $A =$ 30° , then $\sin A < \cos A$

(d) If $A =$ 60° , then $\sin A > \cos A$

(e) As A gets bigger, cos A gets smaller.

Question 18

(a) Plot the points $A(1, 1)$, $B(5, 1)$ and $C(3, 6)$ on the co-ordinate plane below.



(b) Join the three points to form a triangle.

(c) On your diagram, draw the axis of symmetry of the triangle.

(d) On your diagram, draw the image of the triangle under an axial symmetry in the x axis.

(e) Find the slope of AC.

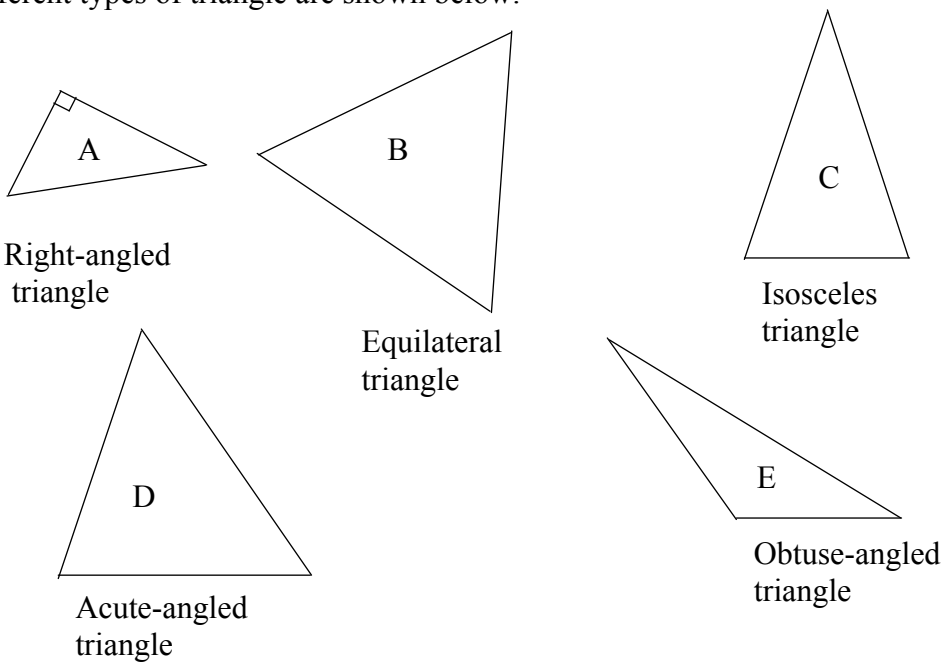
$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-1}{3-1} = \frac{5}{2}$$

OR

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{5}{2}$$

Question 19

Five different types of triangle are shown below.



For each statement below, tick (✓) the boxes to show the types of triangle for which the statement is always true.

	A	**B**	**C**	**D**	**E**
The three angles add up to 180°	✓	✓	✓	✓	✓
One angle is greater than 90°					✓
All three angles are equal		✓			
Exactly two sides are equal			✓		
No angle is greater than or equal to 90°		✓		✓	
Two angles added together could add up to less than 90°					✓

Marking scheme for Questions 10 – 19.

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
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, 6, 10	0, 6, 9, 10
15 mark scale			0, 9, 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)

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 (Q.10 – Q.19)

Question 10	(a) (b) (c) and (d)	10B 5B 5C
Question 11		5C
Question 12	(a) (b) (c) and (d)	15C 10B 5C*
Question 13	(a) (b) (c) (d) (e)	10C 5C 2A 2B 5B
Question 14	(a) (b)	5B 2B
Question 15	(a) (b) (c)	10C* 2B 2B*

Question 16	(a) and (b) (c) and (d)	5C 5B
Question 17		5C*
Question 18	(a) (b) (c) and (d) and (e)	15C 5B 5C
Question 19		5C

Detailed marking notes

Question 10

(a) Scale 10B

Partial credit: The number of squares in the 3 shapes counted.
Any work of merit.

(b) Scale 5B

Partial credit: Any work of merit.

(c) and (d)

Scale 5C

High partial credit: **Either** (c) **or** (d) correct.

Low partial credit: Work of merit in either part, e.g.
any fraction, decimal or ratio between 0 and 1 in part (c) or part (d), if not the correct answer;
correct probability method in (d) but with error(s).

Question 11

Scale 5C

High partial credit: 2 correct.

Low partial credit: 1 correct

Question 12

(a) Scale 15C

High partial credit: 3 correct.
Subtraction instead of addition for the four totals.

Low partial credit: 1 – 2 correct.
Indication of addition to find the total for any year.

(b) Scale 10B

Partial credit: Total number of units for 2007 or 2009 written for this part.

(c) and (d)

Scale 5C*

Note: Either work or explanation is required for full credit in (d).

High partial credit: **Either** (c) **or** (d) correct.

Low partial credit: Correct method in (c) but with error(s).
Correct partial substitution in (c).
In (d), other than 2009, any year from the table.

Question 13

(a) Scale 10C

High partial credit: Correct method but with error(s).

Low partial credit: Any work of merit.

(b) Scale 5C

High partial credit: Correct mode **and** 12 – 17 written.

Low partial credit: Mode **or** Range correct.
Range given as 12 – 17 but **without** the mode.

(c) Scale 2A

(d) Scale 2B

Partial credit: Correct #(E) **or** correct #(S)
Fraction / decimal answer such that $0 \leq \text{answer} \leq 1$.
A reasonable verbal description, e.g. “not likely”, “less likely”.

(e) Scale 5B

Partial credit: A plot other than a line plot broadly representative of the frequencies.
Correct work but with error(s).

Question 14

(a) Scale 5B

Partial credit: 1 relevant reason given.

(b) Scale 2B

Partial credit: Part of the graph identified but no reason given.
Some comment on a "trend" without referring to a part of the diagram.

Question 15

(a) Scale 10C*

High partial credit: 2 correct
Answer given as 9, 16, 25.
Answer given as 3, 4, 5 but in the wrong order.

Low partial credit: 1 correct.

(b) Scale 2B

Partial credit: Any meaningful work that appears to be leading towards Pythagoras theorem.

(c) Scale 2B*

Partial credit: Any multiplication of the correct dimensions;
12 without work.

Question 16

(a) and (b)

Scale 5C

High partial credit: **Either** (a) **or** (b) correct

Low partial credit: Anything of merit in either (a) **or** (b).

(c) and (d)

Scale 5C

High partial credit: **Either** (c) **or** (d) correct

Low partial credit: Anything of merit in **either** (c) **or** (d).

Question 17

Scale 5C*

High partial credit: At least 5 correct.

Low partial credit: At least 1 correct.

Question 18

Note: Allow tolerance of ±0·5 cms.

Note: Allow the use of (y, x), if consistent.

(a) Scale 15C

High partial credit: 2 points plotted correctly.

Low partial credit: 1 point plotted correctly.
Any 3 incorrect points plotted on the given co-ordinate plane.

(b) Scale 5B

Partial credit: Any 2 points joined correctly.

(c), (d) and (e)

Scale 5C

High partial credit: At least **one** of (c) **or** (d) **or** (e) correct.

Low partial credit: Any work of merit in **either** (c) **or** (d) **or** (e), e.g.
any attempted image in (d).
A correct substitution into the correct slope formula in (e).
"Rise / Run" written in part (e).

Question 19

Scale 5C

High partial credit: At least 5 correct.

Low partial credit: At least 1 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 × 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] × 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