GCSE

wjec cbac

WJEC GCSE in

MATHEMATICS

ACCREDITED BY WELSH GOVERNMENT

SPECIMEN ASSESSMENT MATERIALS

Teaching from 2015

This Welsh Government regulated qualification is not available to centres in England.

FOR TEACHING FROM 2015
FOR AWARD FROM NOVEMBER 2016

GCSE MATHEMATICS

SPECIMEN ASSESSMENT MATERIALS

CONTENTS

QUESTION PAPERS

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
HIGHER TIER

SPECIMEN PAPER SUMMER 2017

1 HOUR 45 MINUTES

ADDITIONAL MATERIALS
The use of a calculator is not permitted in this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

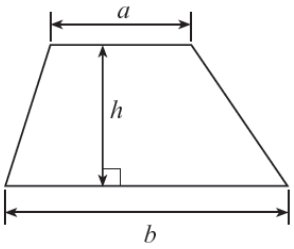
The number of marks is given in brackets at the end of each question or part-question.

The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **11**.

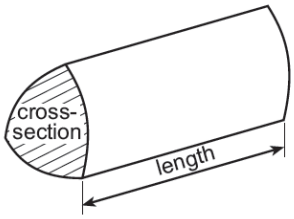
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**7**	
3.	**7**	
4.	**4**	
5.	**3**	
6.	**4**	
7.	**4**	
8.	**2**	
9.	**3**	
10.	**5**	
11.	**9**	
12.	**2**	
13.	**7**	
14.	**6**	
15.	**4**	
16.	**7**	
TOTAL	**80**	

Formula list – Higher tier

Area of a trapezium = $\frac{1}{2}(a+b)h$



Volume of a prism = area of cross section × length

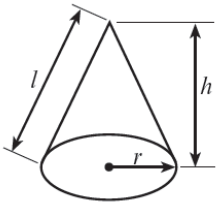


Volume of a sphere $= \frac{4}{3}\pi r^3$

Surface area of a sphere $= 4\pi r^2$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of a cone $= \pi r l$

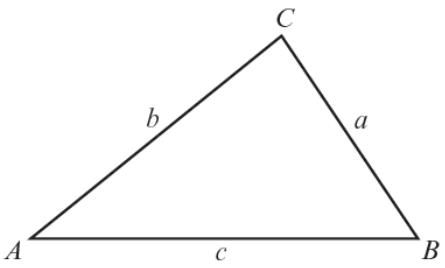


In any triangle ABC,

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

1. Mair either walks, cycles, travels by car or travels by bus to work each day.
Her method of travel each day is independent of her method of travel on any other day.

The table below shows the probability for three of her methods of travel on any randomly chosen day.

Method of travel	Walk	Bike	Car	Bus
Probability		0·45	0·1	0·25

(a) Calculate the probability that, on any randomly chosen day, she walks to work. [2]

……

……

(b) What is the probability that, on any randomly chosen day, she either travelled to work by car or by bus? [2]

……

……

(c) What is the probability that, in any randomly chosen week, Mair travelled to work by car on the Monday and by bus on the Tuesday? [2]

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2. *(a)* The table below shows some of the values of $y = x^2 - 3x - 2$ for values of x from -2 to 4.

Complete the table by finding the value of y for $x = 2$. [1]

x	-2	-1	0	1	2	3	4
$y = x^2 - 3x - 2$	8	2	-2	-4		-2	2

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(b) On the graph paper opposite, draw the graph of $y = x^2 - 3x - 2$ for values of x from -2 to 4. [2]

(c) Using your graph, write down the two solutions of the equation $x^2 - 3x - 2 = 0$.
Give your answers correct to 1 decimal place. [1]

Solutions are ..... and .....

(d) By drawing a suitable line on your graph, write down the two solutions of the equation $x^2 - 3x + 1 = 0$.
Give your answers correct to 1 decimal place. [3]

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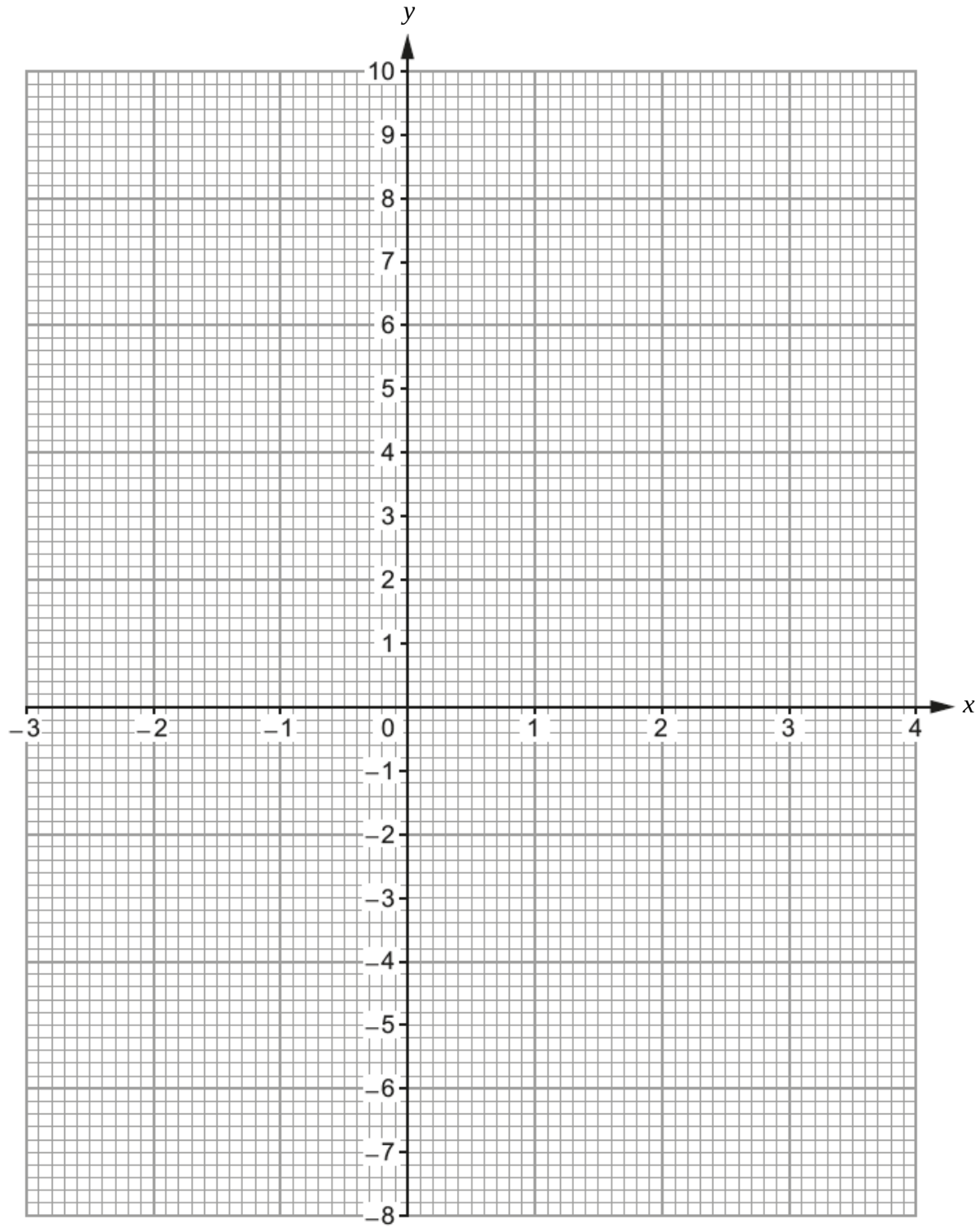
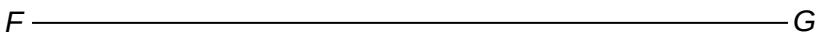
Solutions are ..... and .....

For use with question 2.



3. *(a)* Use a ruler and a pair of compasses to construct an angle $F\hat{G}H$ of size 30° at point *G*. [3]



(b) A regular polygon has interior angles of 135°.
How many sides does this polygon have? [3]

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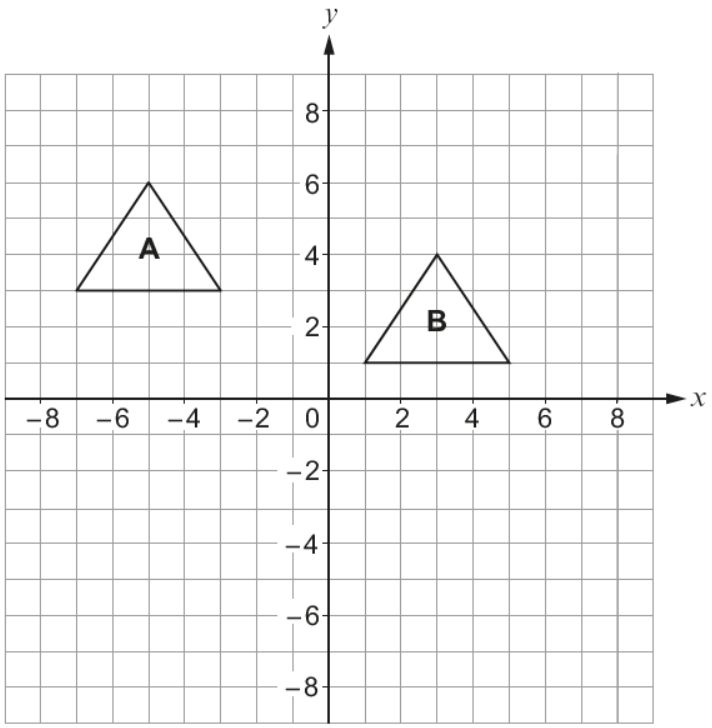
(c) Shape A is translated onto Shape B.



Which one of the following vectors describes the translation?
Circle your answer. [1]

$\begin{pmatrix} 8 \\ -2 \end{pmatrix}$ $\begin{pmatrix} 2 \\ -8 \end{pmatrix}$ $\begin{pmatrix} -8 \\ -2 \end{pmatrix}$ $\begin{pmatrix} -2 \\ 8 \end{pmatrix}$ $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$

4. *(a)* Calculate the largest share when £400 is shared in the ratio 1 : 2 : 5. [2]

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(b) A price of £63 includes VAT at a rate of 5%.
What was the price before VAT was added? [2]

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5. Circle your answer in each of the following.

(a) The value of 2^{-3} as a fraction in its simplest form is

$\frac{1}{6}$ $-\frac{1}{6}$ $-\frac{1}{8}$ $\frac{1}{8}$ $-\frac{2}{3}$

[1]

(b) $\frac{2}{9}$ as a recurring decimal is

0·2929…… 0·2999……. 0·9292….. 0·9222…. 0·2222….

[1]

(c) 17^0 is equal to

17 1 0 $\frac{1}{17}$ 1·7

[1]

6. A six-sided dice was thrown repeatedly.
After every 100 throws, the **cumulative** number of sixes thrown was recorded.

(a) Complete the table below, which gives a summary of the results obtained. [1]

Number of throws	100	200	300	400	500
Number of sixes	8	28	60	72	80
Relative frequency	0·08	0·14		0·18	

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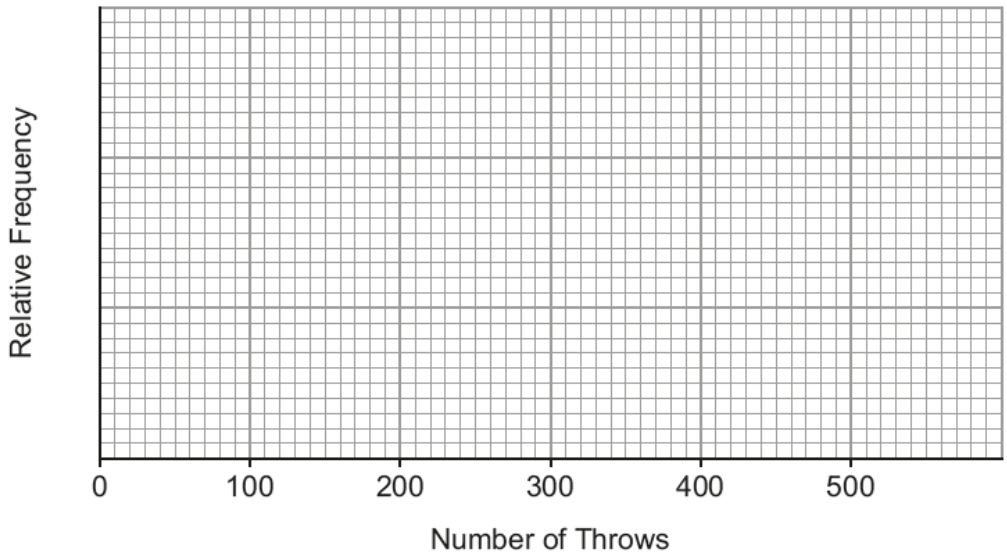
(b) Draw a relative frequency diagram to show the information given in the table. [1]



(c) From the table, which value gives the best estimate for the probability of throwing a six? You must give a reason for your choice. [1]

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(d) Do you think this is a fair dice? You must give a reason for your choice. [1]

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7. Find, in standard form, the value of

(a) $(4{\cdot}1 \times 10^{-5}) \times 3000$, [2]

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(b) $(1{\cdot}5 \times 10^{3}) \div (3 \times 10^{6})$. [2]

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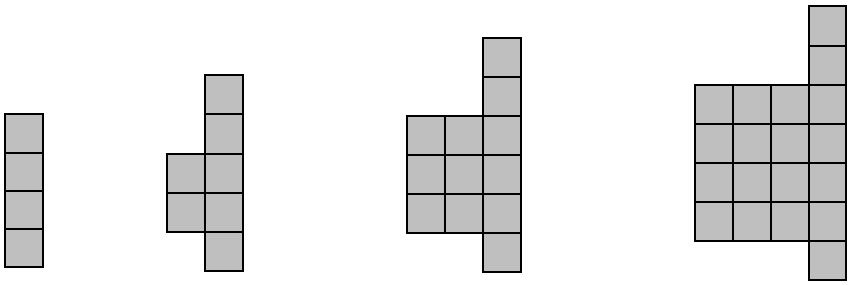
8. The diagram shows the first four patterns of a sequence.



1 2 3 4

Find an expression for the number of squares in the *n*th pattern of the sequence. [2]

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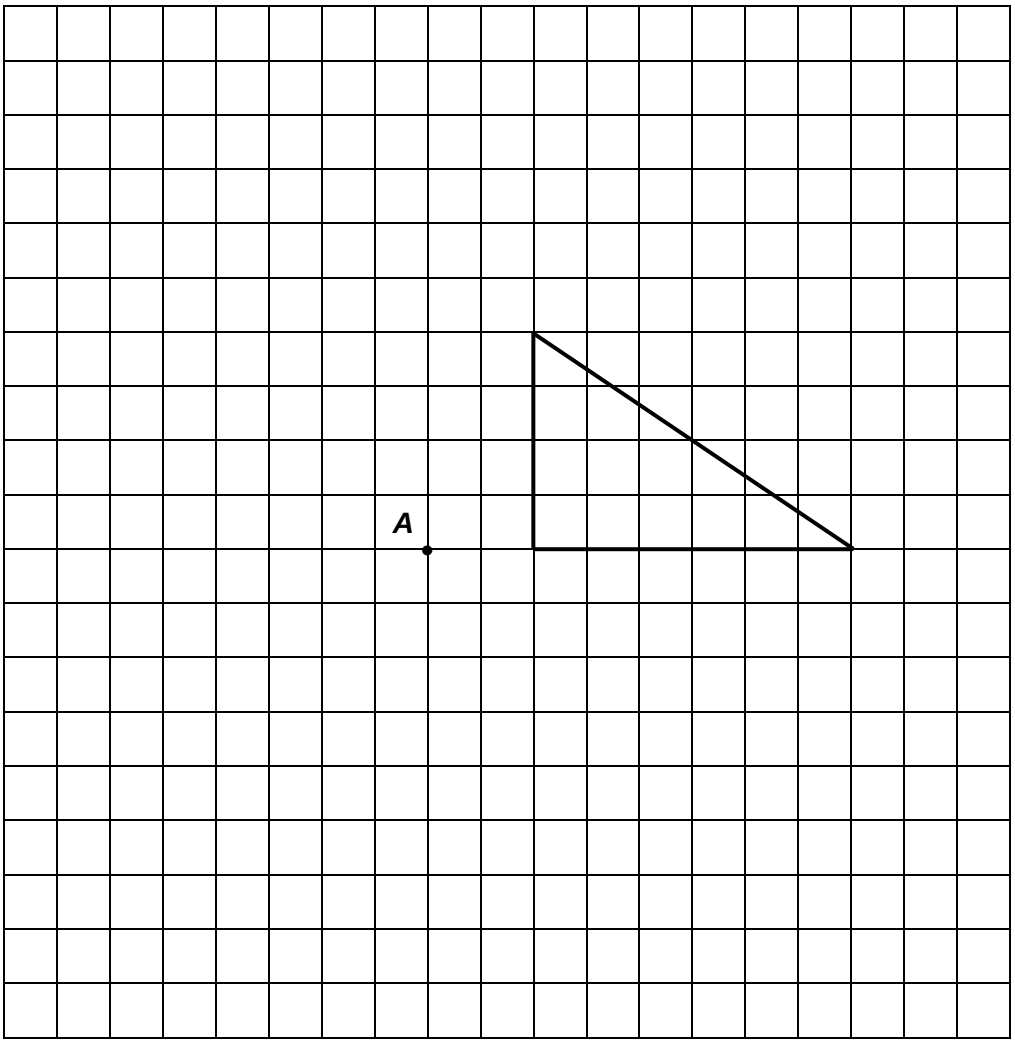
9. On the grid below, draw an enlargement of the given shape using a scale factor of $-\frac{1}{2}$ and centre ***A***.

[3]



10. Given that y is inversely proportional to x^2, and that $y = 5$ when $x = 2$,

(a) find an expression for y in terms of x. [3]

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(b) Use the expression you found in *(a)* to complete the following table. [2]

x	2	0·5	
y	5		0·2

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11. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

A cuboid with a volume of 912 cm^3 has dimensions 4 cm, $(x + 2)$ cm and $(x + 9)$ cm.

Show that $x^2 + 11x - 210 = 0$.

Solve this equation and find the dimensions of the cuboid.
You must justify any decisions that you make. [9]

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12. Circle your answer in each of the following.

(a) $(2a^3)^4$ is equal to

$2a^{12}$ $8a^{12}$ $16a^7$ $16a^{12}$ $24a^{34}$

[1]

(b) Given that $h^2 = a^2 + b^2$, then b is equal to

$h - a$ $\pm\sqrt{(h^2 - a^2)}$ $h^4 - a^4$ $\frac{(h^2 - a^2)}{2}$ $\frac{\pm\sqrt{(h^2 - a^2)}}{2}$

[1]

13. *(a)* Express $0{\cdot}4\dot{7}\dot{8}$ as a fraction. [2]

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(b) Find the values of a and b, given that $\left(4-\sqrt{3}\right)^2 = a + b\sqrt{3}$. [3]

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a = ... b = ...

(c) Evaluate $27^{-\frac{2}{3}}$. [2]

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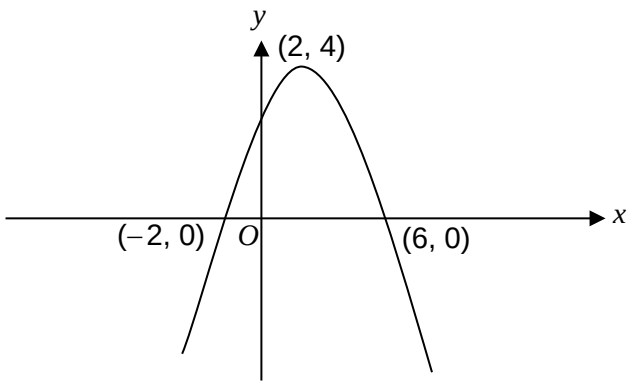
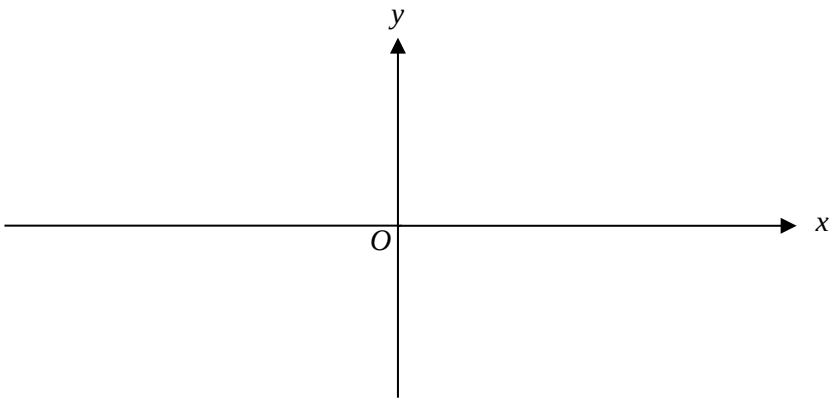
14. *(a)* The diagram shows a sketch of the graph $y = f(x)$.
The graph passes through the points $(-2, 0)$ and $(6, 0)$ and its highest point is at $(2, 4)$.

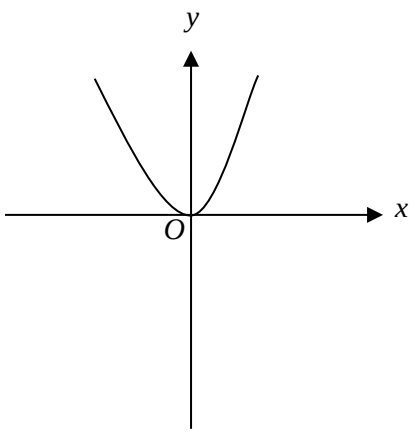


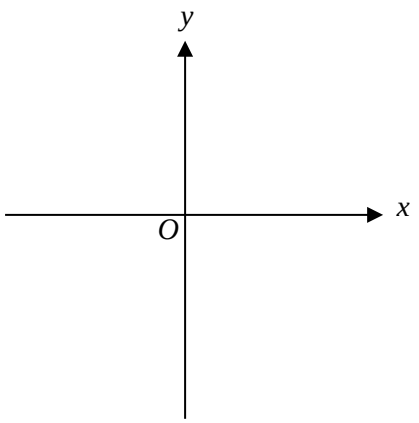
Sketch the graph of $y = f(x + 5)$ on the axes below.
You must indicate the coordinates of its highest point and the coordinates of the points of intersection of the graph with the x-axis. [3]



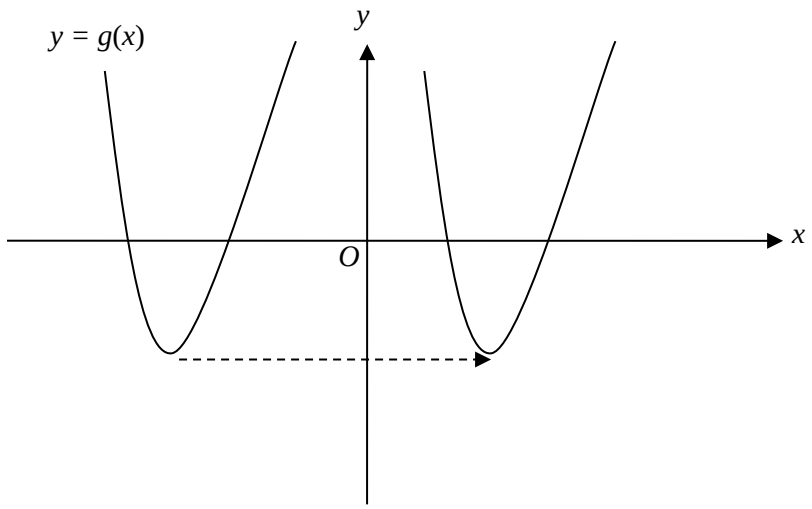
(b) The diagram below on the left shows a sketch of the graph of $y = x^2$.

Sketch the graph of $y = -x^2 + 3$ on the axes on the right.
You must indicate the coordinates of the point where the curve crosses the y-axis. [2]





(c) Explain why it is not possible to determine the translation used on the function $g(x)$ in the diagram below. [1]



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15. The points *A*, *B* and *C* lie on the circumference of a circle.

The straight line *PBT* is a tangent to the circle.
AB = *AC*.
$C\hat{B}P = x$, where x is measured in degrees.

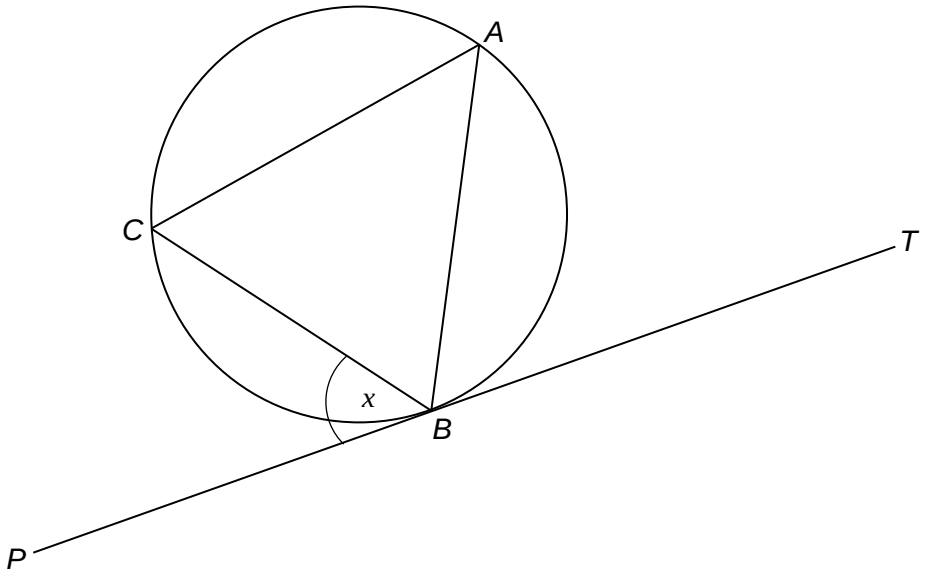

Diagram not drawn to scale

Show, giving reasons in your answer, that the size of $A\hat{B}C$, in degrees, is $90 - \frac{1}{2}x$.

[4]

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16. *(a)* When Anna shoots an arrow, the probability that she hits the target is 0·3. Each attempt is independent of any previous shot.

(i) What is the probability that Anna hits the target for the first time on her third attempt? [3]

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(ii) Evaluate whether or not there is more than a 50% chance of Anna hitting the target **exactly once** on her **first three** attempts. [3]

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(b) Siôn selects two balls, at random, from a box containing 15 blue balls and 5 red balls.

He calculates that the probability of selecting two red balls is

$$\left(\frac{1}{4}\right)^2 = \frac{1}{16}.$$

What assumption has Siôn made for his answer to be correct? [1]

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Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
INTERMEDIATE TIER

SPECIMEN PAPER SUMMER 2017

1 HOUR 45 MINUTES

ADDITIONAL MATERIALS
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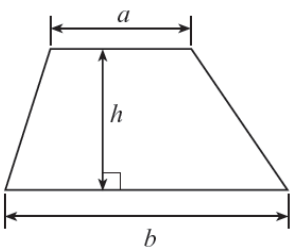
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**6**	
3.	**3**	
4.	**2**	
5.	**6**	
6.	**6**	
7.	**3**	
8.	**5**	
9.	**2**	
10.	**6**	
11.	**7**	
12.	**7**	
13.	**4**	
14.	**3**	
15.	**4**	
16.	**4**	
17.	**2**	
18.	**4**	
TOTAL	**80**	

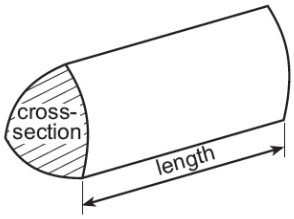
The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **8**.

Formula list

Area of a trapezium = $\frac{1}{2}(a+b)h$



Volume of a prism = area of cross section × length



1. Calculate the following.

(a) $5^2 \times 2^3$ [2]

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(b) $0{\cdot}3 \times 0{\cdot}6$ [1]

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(c) $8{\cdot}7 - 5{\cdot}25$ [1]

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(d) $\frac{7}{8} - \frac{1}{4}$ [2]

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2. (*a*) Write down the next two numbers in the following sequence. [2]

18 17 14 9 ....

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(*b*) Simplify the expression $7x + 3y - 5x - 6y$. [2]

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(*c*) Using the formula $N = 7D + 3E$, find the value of E when $N = 26$ and $D = 2$. [2]

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3. Circle the correct answer for each of the following statements.

(a) The area of the right-angled triangle drawn below is

240 cm^2 60 cm^2 260 cm^2 120 cm^2 6240 cm^2

[1]

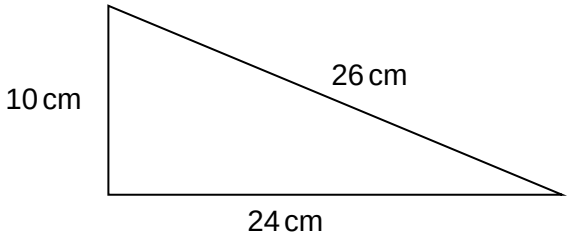

Diagram not drawn to scale

(b) The value of x shown in the triangle below is

40° 20° 9° 180° $\frac{1}{9}$°

[1]

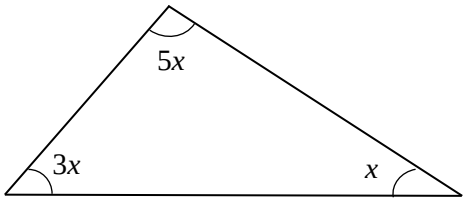

Diagram not drawn to scale

(c) The volume of the cuboid shown below is

30 m^3 10 m^3 31 m^3 62 m^3 235 m^3

[1]

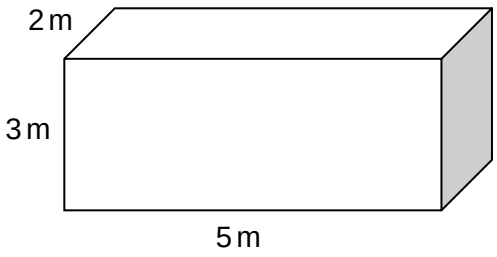

Diagram not drawn to scale

4. Beti is twice as old as Afraz.
Huw is three years younger than Beti.
The sum of the ages of these three people is 37 years.

Calculate the age of each of these three people. [2]

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Afraz is .....years old Beti is .....years old Huw is .....years old

5. In a game, cards are chosen at random from two boxes.
One card is chosen at random from box A and one card is chosen at random from box B.

Box A contains these two cards. | **−3** | | **+3** |

Box B contains these five cards. | **−2** | | **−1** | | **0** | | **+1** | | **+2** |

The two numbers on the chosen cards are multiplied together to give a score.
The person choosing the cards wins a prize if the score is more than zero.

Complete the table below to show all the possible scores and calculate an estimate for the number of prize winners when 70 people play the game once. [6]

		Box B				
		−2	−1	0	+1	+2
Box A	−3				**−3**	**−6**
	+3				**+3**	**+6**

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6. Solve each of the following equations.

(a) $7x - 4 = 2x + 11$ [3]

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(b) $3(2x + 7) = 9$ [3]

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7. Are the following statements true or false? Circle the correct answer.
You must give a full explanation of your decision in each case.

(a)
When a number that ends in 8 is divided by 2, the answer is always a multiple of 4. [1]

true / false

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(b)
When two consecutive whole numbers are multiplied together, the answer is always an even number. [2]

true / false

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8. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

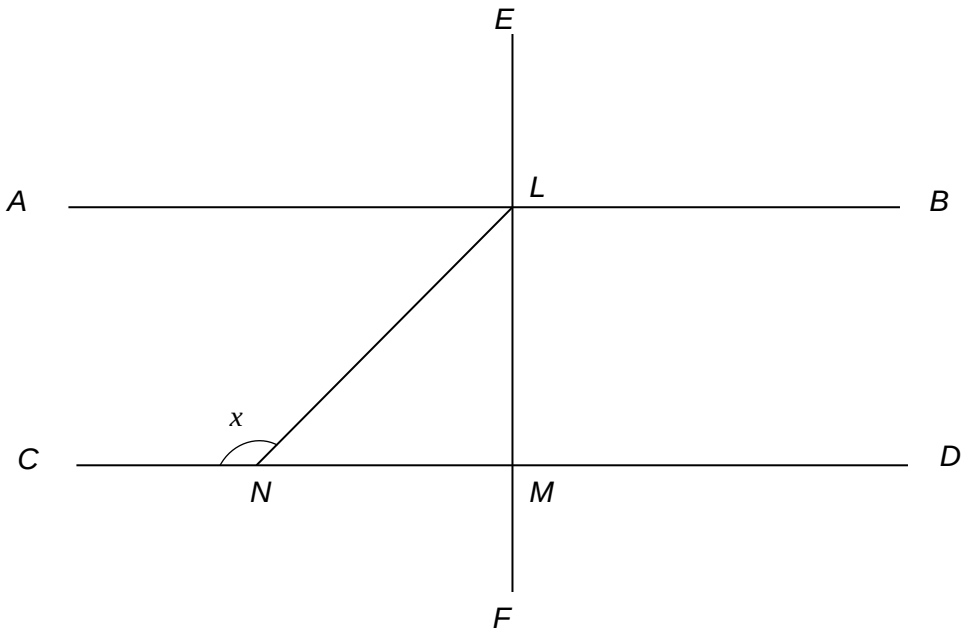

Diagram not drawn to scale

The line *AB* is parallel to the line *CD*.
The line *CD* is perpendicular to the line *EF*.
Triangle *LMN* is an isosceles triangle.
Find the size of angle *x.*
You must show all your working. [5]

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9. Select four **different** whole numbers between 1 and 9 inclusive such that,

- their mean is 6
- their range is 5. [2]

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Answer: ……. ……. ……. …….

10. Mair either walks, cycles, travels by car or travels by bus to work each day.
Her method of travel each day is independent of her method of travel on any other day.

The table below shows the probability for three of her methods of travel on any randomly chosen day.

Method of travel	Walk	Bike	Car	Bus
Probability		0·45	0·1	0·25

(a) Calculate the probability that, on any randomly chosen day, she walks to work. [2]

……

……

(b) What is the probability that, on any randomly chosen day, she either travelled to work by car or by bus? [2]

……

……

(c) What is the probability that, in any randomly chosen week, Mair travelled to work by car on the Monday and by bus on the Tuesday? [2]

……

……

11. *(a)* The table below shows some of the values of $y = x^2 - 3x - 2$ for values of x from -2 to 4.

Complete the table by finding the value of y for $x = 2$. [1]

x	-2	-1	0	1	2	3	4
$y = x^2 - 3x - 2$	8	2	-2	-4		-2	2

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……

(b) On the graph paper opposite, draw the graph of $y = x^2 - 3x - 2$ for values of x from -2 to 4. [2]

(c) Using your graph, write down the two solutions of the equation $x^2 - 3x - 2 = 0$.
Give your answers correct to 1 decimal place. [1]

Solutions are ..... and .....

(d) By drawing a suitable line on your graph, write down the two solutions of the equation $x^2 - 3x + 1 = 0$.
Give your answers correct to 1 decimal place. [3]

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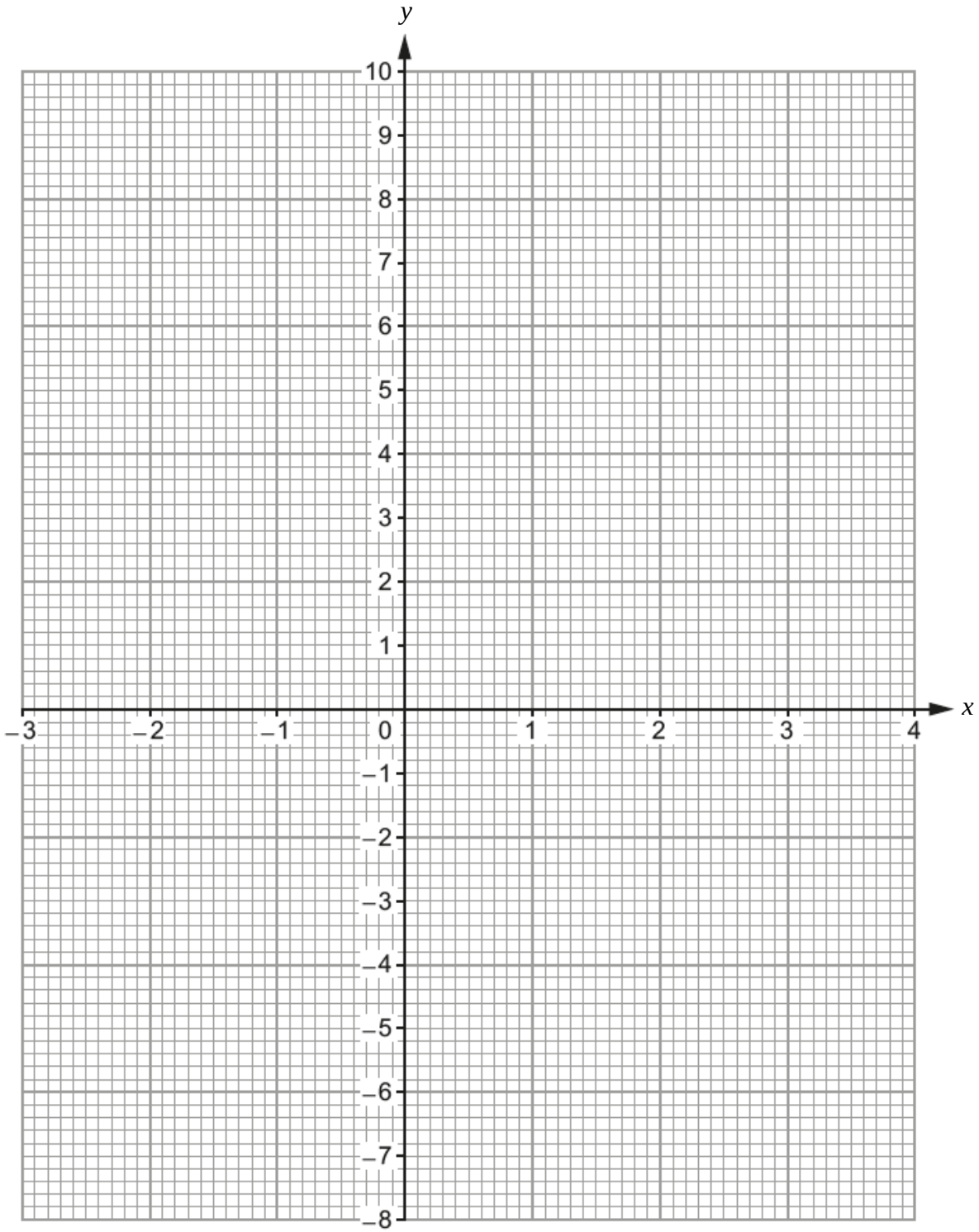
Solutions are ..... and .....

For use with question 11.



12. *(a)* Use a ruler and a pair of compasses to construct an angle $F\hat{G}H$ of size 30° at point *G*. [3]

F ——————————————————————— *G*

(b) A regular polygon has interior angles of 135°.
How many sides does this polygon have? [3]

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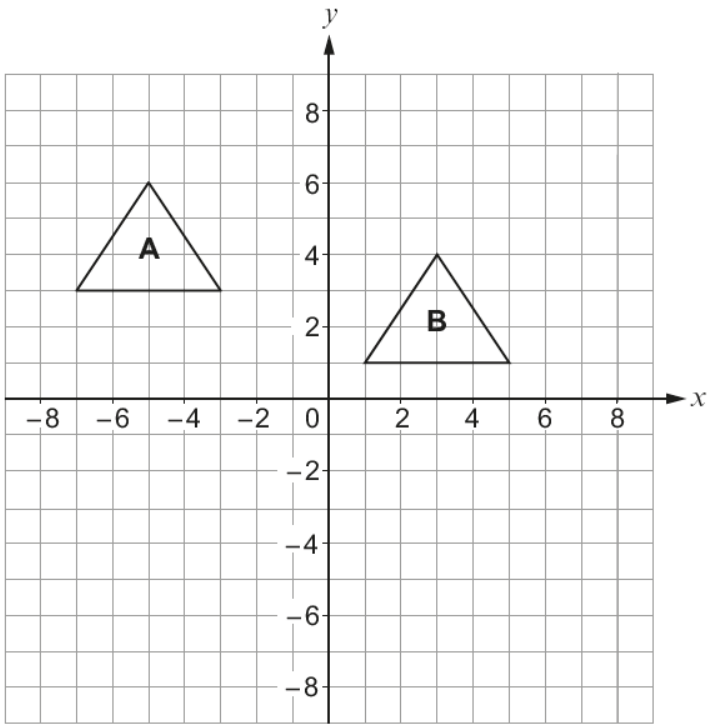
(c) Shape A is translated onto Shape B.



Which one of the following vectors describes the translation?
Circle your answer. [1]

$\begin{pmatrix} 8 \\ -2 \end{pmatrix}$ $\begin{pmatrix} 2 \\ -8 \end{pmatrix}$ $\begin{pmatrix} -8 \\ -2 \end{pmatrix}$ $\begin{pmatrix} -2 \\ 8 \end{pmatrix}$ $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$

13. *(a)* Calculate the largest share when £400 is shared in the ratio 1 : 2 : 5. [2]

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(b) A price of £63 includes VAT at a rate of 5%.
What was the price before VAT was added? [2]

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14. Circle your answer in each of the following.

(a) The value of 2^{-3} as a fraction in its simplest form is

$\frac{1}{6}$ $-\frac{1}{6}$ $-\frac{1}{8}$ $\frac{1}{8}$ $-\frac{2}{3}$

[1]

(b) $\frac{2}{9}$ as a recurring decimal is

0·2929…… 0·2999……. 0·9292….. 0·9222…. 0·2222….

[1]

(c) 17^0 is equal to

17 1 0 $\frac{1}{17}$ 1·7

[1]

15. A six-sided dice was thrown repeatedly.
After every 100 throws, the **cumulative** number of sixes thrown was recorded.

(a) Complete the table below, which gives a summary of the results obtained. [1]

Number of throws	100	200	300	400	500
Number of sixes	8	28	60	72	80
Relative frequency	0·08	0·14		0·18	

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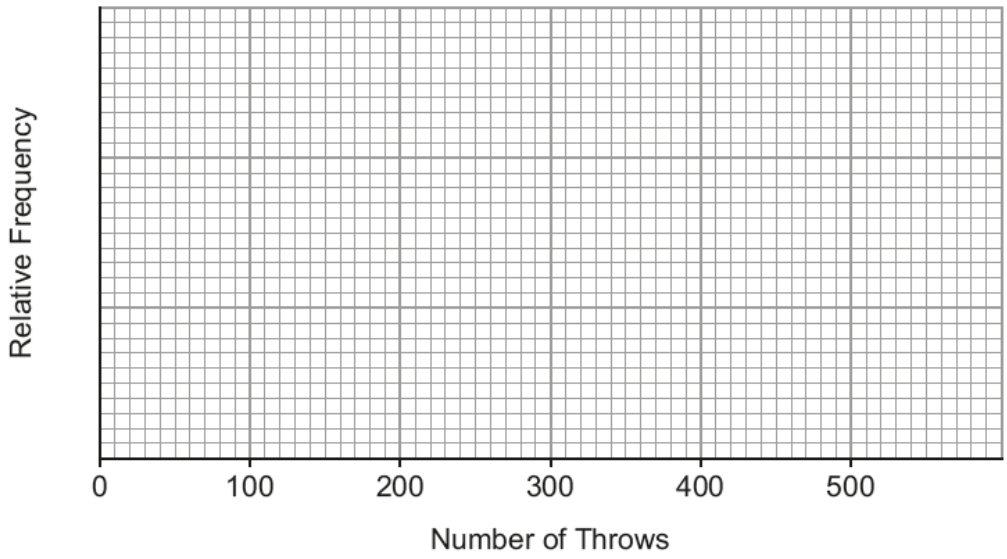
(b) Draw a relative frequency diagram to show the information given in the table. [1]



(*c*) From the table, which value gives the best estimate for the probability of throwing a six? You must give a reason for your choice. [1]

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(*d*) Do you think this is a fair dice? You must give a reason for your choice. [1]

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16. Find, in standard form, the value of

(a) $(4{\cdot}1 \times 10^{-5}) \times 3000$, [2]

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(b) $(1{\cdot}5 \times 10^{3}) \div (3 \times 10^{6})$. [2]

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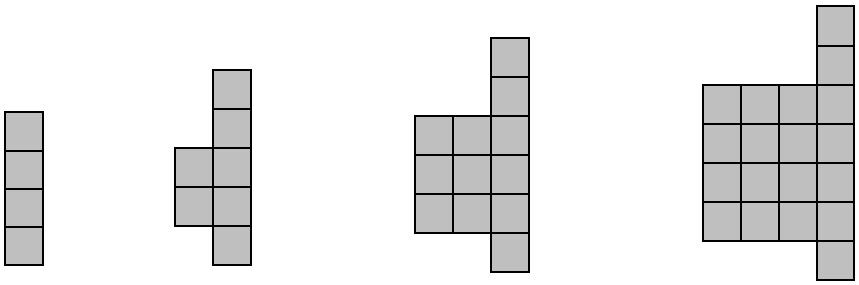
17. The diagram shows the first four patterns of a sequence.



1 2 3 4

Find an expression for the number of squares in the *n*th pattern of the sequence. [2]

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18. The points *A*, *B*, *C* and *D* lie on the circumference of a circle centre *O* and $B\hat{C}D = 62°$.

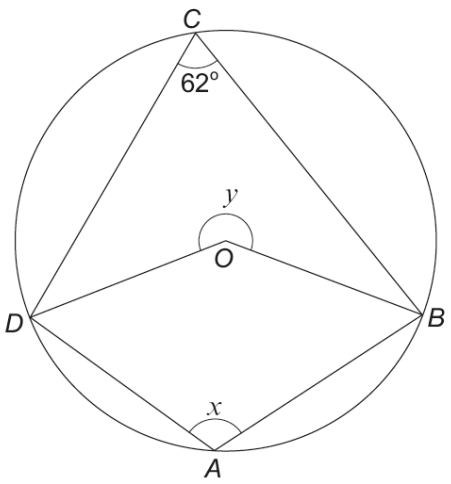

Diagram not drawn to scale

(a) Find the size of angle x, giving a reason for your answer. [2]

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(b) Find the size of angle y, giving a reason for your answer. [2]

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Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
FOUNDATION TIER

SPECIMEN PAPER SUMMER 2017

1 HOUR 30 MINUTES

ADDITIONAL MATERIALS
The use of a calculator is not permitted in this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

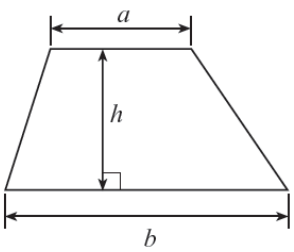
The number of marks is given in brackets at the end of each question or part-question.

The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **1**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**4**	
3.	**3**	
4.	**4**	
5.	**4**	
6.	**5**	
7.	**3**	
8.	**3**	
9.	**6**	
10.	**4**	
11.	**3**	
12.	**6**	
13.	**6**	
14.	**3**	
15.	**3**	
16.	**2**	
TOTAL	**65**	

Formula list

Area of a trapezium = $\frac{1}{2}(a+b)h$



1. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

The prices of tickets for the Anglesey Show in 2014 were as follows:

Adults	£15
Seniors (60+)	£13
Children (5 to 15)	£5

Mrs Williams paid for 2 adults, 1 senior and 1 child with three £20 notes.

How much change did Mrs Williams receive? [6]

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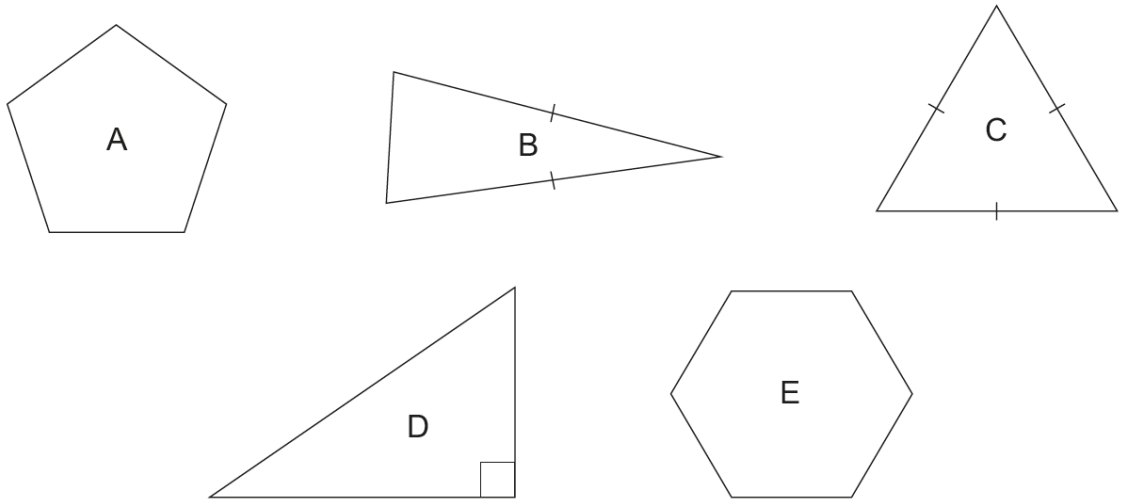

(a) What special name is given to shape **E**?
Circle your answer. [1]

Pentagon Sixagon Hexagon Nonagon Heptagon

(b) What special name is given to shape **B**?
Circle your answer. [1]

Isosceles triangle | Right-angled triangle | Triagon | Equilateral triangle | Scalene triangle

(c) Circle either TRUE or FALSE for each of the following statements. [2]

Shape **A** is a pentagon	TRUE	FALSE
Shape **B** has a pair of parallel sides	TRUE	FALSE
Shape **D** has two sides that are perpendicular	TRUE	FALSE
Shape **E** has six lines of symmetry	TRUE	FALSE
Shape **A** has no lines of symmetry	TRUE	FALSE

3. Circle the correct answer for each of the following questions.

(a) The fraction $\frac{408}{1224}$ is the same as

$\frac{500}{1200}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{40}{122}$ $\frac{48}{14}$

[1]

(b) When $a = 3$ and $b = 5$, then $2a + b$ is equal to

28 235 16 11 38

[1]

(c) Half of $7\frac{1}{2}$ is

3·55 $3\frac{1}{2} \cdot 5$ $3\frac{3}{4}$ $3\frac{1}{4}$ 3·525

[1]

4. *(a)* Choose one term from the list below to describe the chance of each of the following events happening.

impossible unlikely even chance likely certain

(i) You will obtain a ten when a fair six-sided dice numbered 1 to 6 is rolled. [1]

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(ii) A person chosen at random was born on a weekend. [1]

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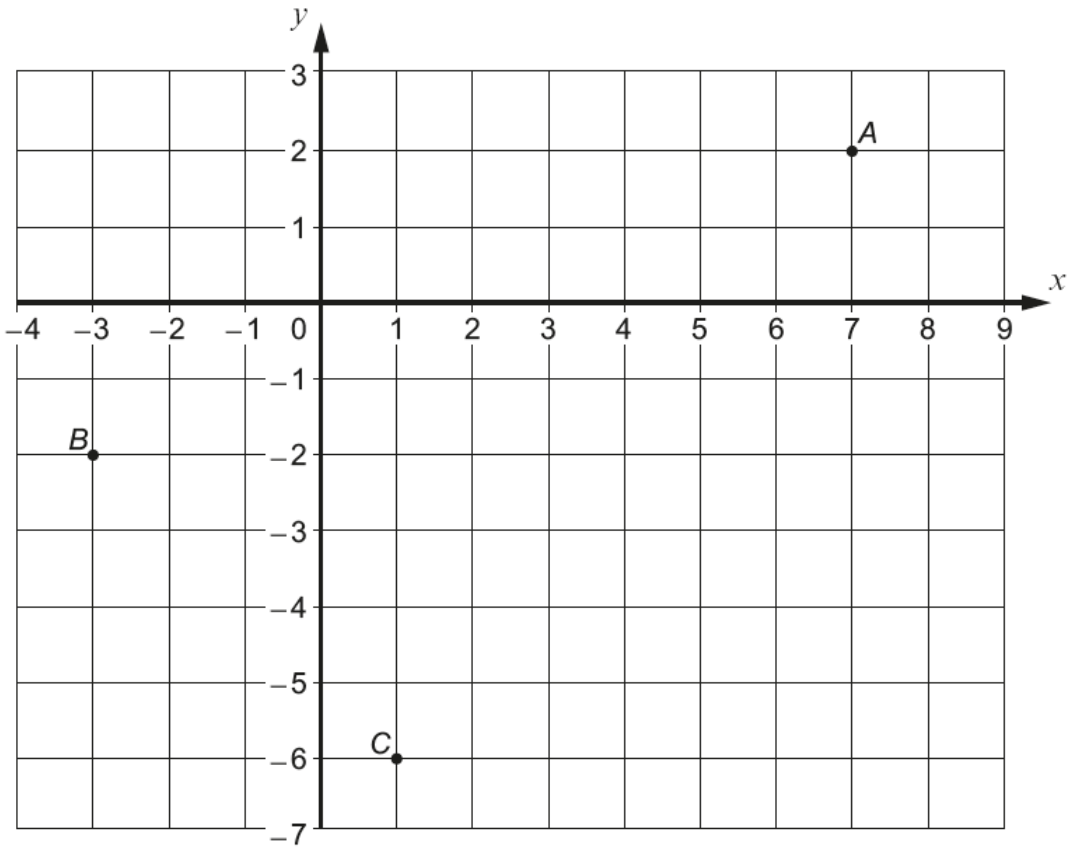
(b) Fill in the blanks to match each event to its chance of happening. [2]

Obtaining a red ball when choosing a ball at random from a bag containing 7 blue balls and …….. red balls.	**Even chance**
Obtaining a ticket numbered less than ..... when choosing a ticket at random from a box containing tickets numbered 1 to 100.	**Certain**

5. *(a)* Write down the coordinates of the points *A*, *B* and *C* shown on the grid below. [3]



A (..... , ...) *B* (..... , ...) *C* (..... , ...)

(b) Write down the coordinates of the mid-point of line *AC*. [1]

Mid-point at (....., ...)

6. *(a)* Use the following clues to find the missing number.

- The number is between 1 and 20
- It is not an even number
- It is a multiple of 3
- It is a square number

[3]

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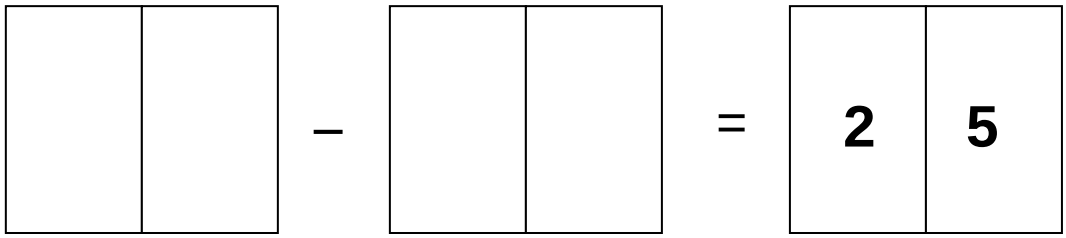
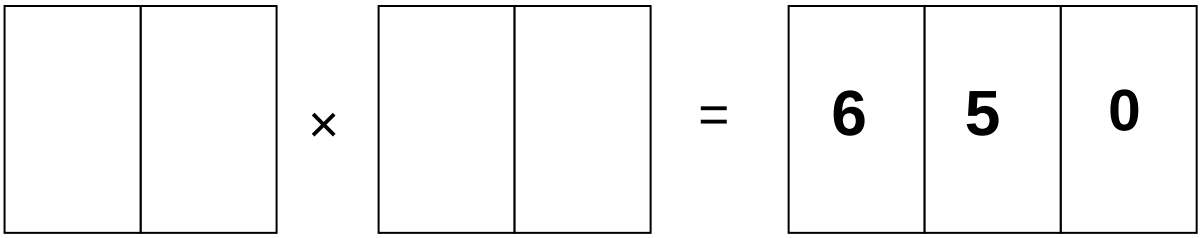
Missing number is .....

(b) (i) Using all the numbers 0, 1, 3 and 5, fill in the blanks. [1]



(ii) Using all the numbers 0, 1, 3 and 5, fill in the blanks. [1]



7. Calculate the floor area of a rectangular room that is 8 metres long and 3 metres wide.
You must give the units of your answer. [3]

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8. In the following table, the letters a, b and c represent different numbers.
The total for each row is given at the side of the table.
Find the values of a, b and c. [3]

a	$2a$	a	12
a	b	b	13
a	b	c	6

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a = ... b = ... c = ...

9. Calculate the following.

(a) $5^2 \times 2^3$ [2]

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(b) $0{\cdot}3 \times 0{\cdot}6$ [1]

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(c) $8{\cdot}7 - 5{\cdot}25$ [1]

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(d) $\frac{7}{8} - \frac{1}{4}$ [2]

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10. *(a)* Write down the next two numbers in the following sequence. [2]

18 17 14 9 ....

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(b) Simplify the expression $7x + 3y - 5x - 6y$. [2]

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11. Circle the correct answer for each of the following statements.

(a) The area of the right-angled triangle drawn below is

240 cm^2 60 cm^2 260 cm^2 120 cm^2 6240 cm^2

[1]

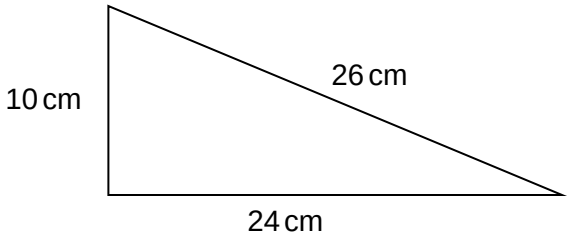

Diagram not drawn to scale

(b) The value of x shown in the triangle below is

40° 20° 9° 180° $\frac{1}{9}$°

[1]

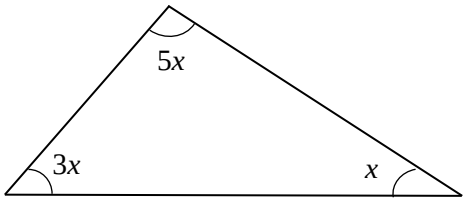

Diagram not drawn to scale

(c) The volume of the cuboid shown below is

30 m^3 10 m^3 31 m^3 62 m^3 235 m^3

[1]

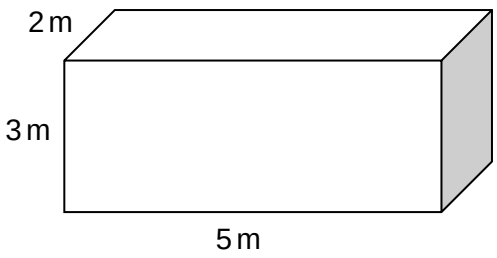

Diagram not drawn to scale

12. In a game, cards are chosen at random from two boxes.
One card is chosen at random from box A and one card is chosen at random from box B.

Box A contains these two cards. | **−3** | | **+3** |

Box B contains these five cards. | **−2** | | **−1** | | **0** | | **+1** | | **+2** |

The two numbers on the chosen cards are multiplied together to give a score.
The person choosing the cards wins a prize if the score is more than zero.

Complete the table below to show all the possible scores and calculate an estimate for the number of prize winners when 70 people play the game once. [6]

		Box B				
		−2	−1	0	+1	+2
Box A	−3				**−3**	**−6**
	+3				**+3**	**+6**

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13. Solve each of the following equations.

(a) $7x - 4 = 2x + 11$ [3]

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(b) $3(2x + 7) = 9$ [3]

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14. Are the following statements true or false? Circle the correct answer.
You must give a full explanation for your decision in each case.

(a)
When a number that ends in 8 is divided by 2, the answer is always a multiple of 4. [1]

true / false

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(b)
When two consecutive whole numbers are multiplied together, the answer is always an even number. [2]

true / false

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15.

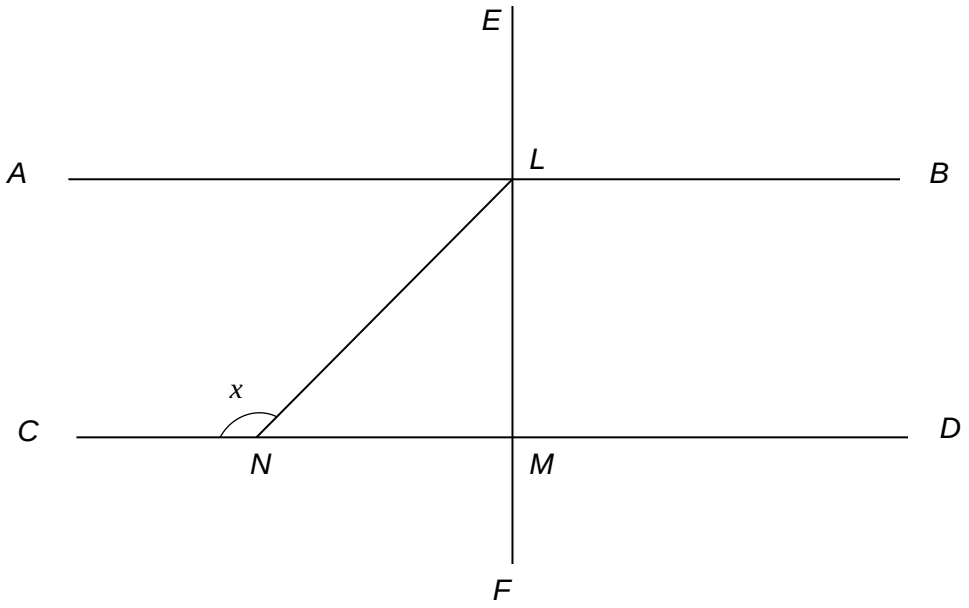

Diagram not drawn to scale

The line *AB* is parallel to the line *CD*.
The line *CD* is perpendicular to the line *EF*.
Triangle *LMN* is an isosceles triangle.
Find the size of angle *x*.
You must show all your working. [3]

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16. Select four **different** whole numbers between 1 and 9 inclusive such that,

- their mean is 6
- their range is 5. [2]

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Answer: ……. ……. ……. …….

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER

SPECIMEN PAPER SUMMER 2017

1 HOUR 45 MINUTES

ADDITIONAL MATERIALS
A calculator will be required for this paper.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

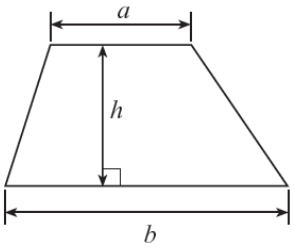
The number of marks is given in brackets at the end of each question or part-question.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**5**	
3.	**3**	
4.	**4**	
5.	**4**	
6.	**6**	
7.	**3**	
8.	**3**	
9.	**8**	
10.	**5**	
11.	**4**	
12.	**3**	
13.	**7**	
14.	**4**	
15.	**3**	
16.	**2**	
17.	**6**	
18.	**5**	
TOTAL	**80**	

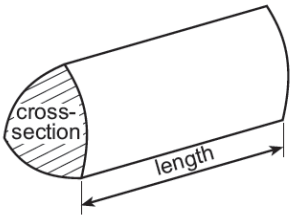
The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **9***(b)*.

Formula list – Higher tier

Area of a trapezium = $\frac{1}{2}(a+b)h$



Volume of a prism = area of cross section × length

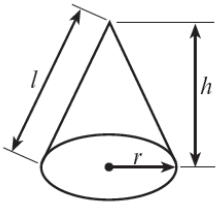


Volume of a sphere $= \frac{4}{3}\pi r^3$

Surface area of a sphere $= 4\pi r^2$

Volume of a cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of a cone $= \pi r l$

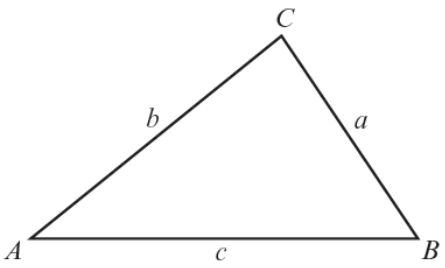


In any triangle ABC,

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

1. Four of the interior angles of a seven-sided polygon are 114°, 150°, 160° and 170°.
The other three interior angles of this polygon are equal.
Calculate the size of each of the other three interior angles. [5]

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2. *(a)* Express 144 as the product of its prime factors in index form. [3]

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(b) Given that $60 = 2^2 \times 3 \times 5$, find

(i) the highest common factor (HCF) of 144 and 60, [1]

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(ii) the lowest common multiple (LCM) of 144 and 60. [1]

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3. *(a)* Solve the inequality given below. [2]

$$7n < 5n + 11$$

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(b) Give the largest integer value for n that satisfies this inequality. [1]

n = ...

4. A solution to the equation

$$x^3 - 7x - 75 = 0$$

lies between 4 and 5.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

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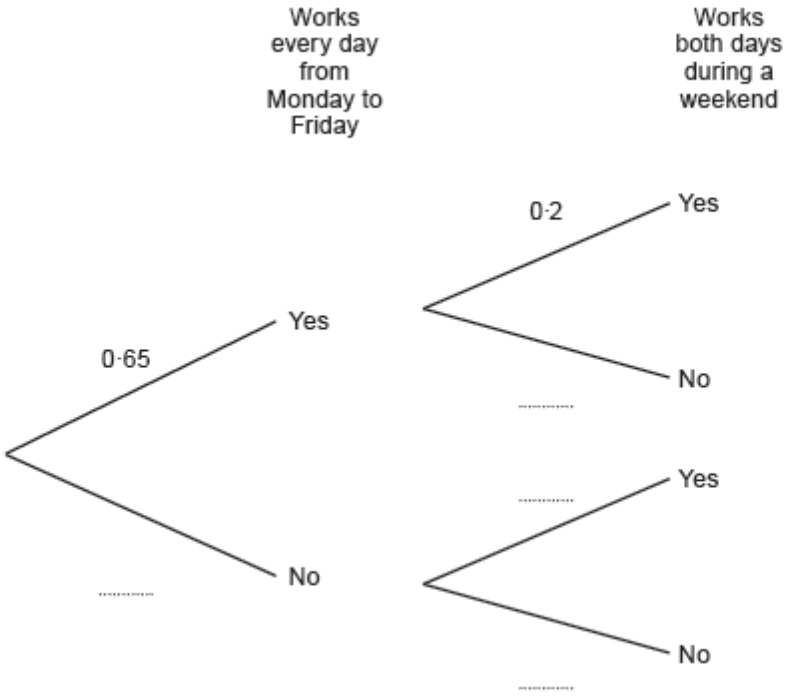
5. Carys has a Monday to Friday job and a weekend job.
Working Monday to Friday and working weekends are independent events.
In any given week, the probability that Carys works every day from Monday to Friday is 0·65.
The probability that she works both days during a weekend is 0·2.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that next week Carys will work every day from **Monday to Sunday**. [2]

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6. An allotment has two rectangular flower beds A and B.

Flower bed A is x metres long and y metres wide.
Flower bed B is twice as long as flower bed A and is 3 metres wider than flower bed A.

The perimeter of flower bed A is 18 metres.
The perimeter of flower bed B is 34 metres.

Use an algebraic method to calculate the area of flower bed B.
You must show all your working. [6]

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7. Factorise $x^2 - x - 20$, and hence solve $x^2 - x - 20 = 0$. [3]

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8. A sketch of the graph of the straight line $y = 7x + 2$ is shown below.

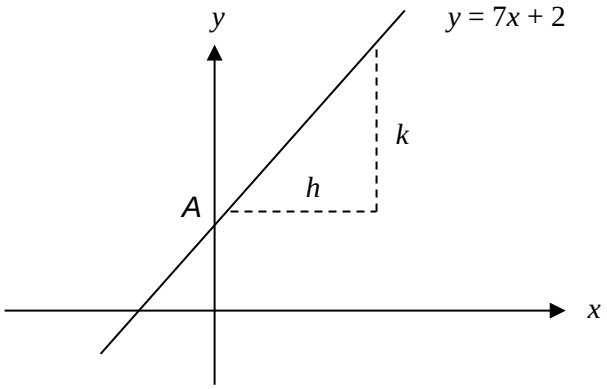

Diagram not drawn to scale

(a) What are the coordinates of the point *A*, where the line cuts the *y*-axis?
Circle your answer. [1]

(2 , 0) (7, 0) (0, 2) (0, 7) (7, 2)

(b) When *h* is equal to 1 unit, what is the value of *k?*
Circle your answer. [1]

2 units 7 units 1 unit 3·5 units 14 units

(c) Which of the following equations is an equation of a straight line that is perpendicular to $y = 7x + 2$?
Circle your answer. [1]

$y = 7x + 3$ $y = \frac{x}{7} + 3$ $y = 7x + 3$ $y = -\frac{x}{7} + 3$ $y = 2x + 7$

9.

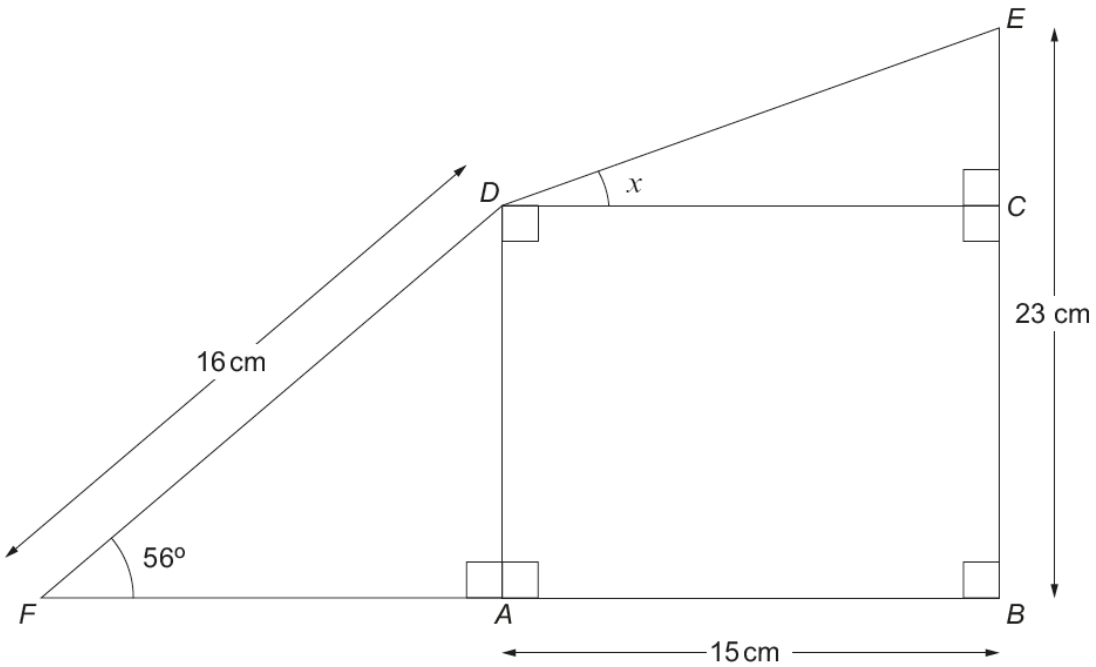

Diagram not drawn to scale

(a) Calculate the length *AD*. [3]

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(b) *You will be assessed on the quality of your organisation, communication and accuracy in writing in this part of the question*

Find the size of the angle x. [5]

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10. *(a)* Make c the subject of the following formula. [2]

$$\frac{1}{a} = \frac{1}{b} + \frac{1}{c}$$

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(b) Solve $3x^2 + 4x - 18 = 0$, giving your answers correct to two decimal places. You must show all your working. [3]

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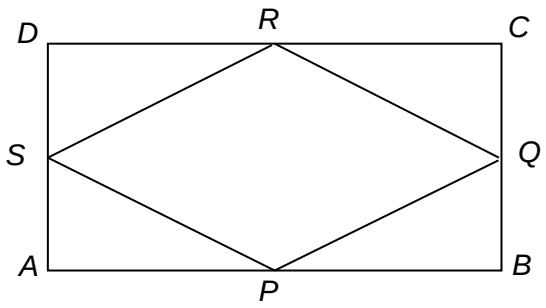
11. *ABCD* is a rectangle. *P*, *Q*, *R* and *S* are the mid-points of the sides.



(a) Prove that triangles *APS* and *CRQ* are congruent. [3]

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(b) Use your proof in part *(a)* to decide what is the special name given to the quadrilateral *PQRS*.
Give your reason. [1]

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12. The square and the sector of a circle shown below have equal areas.

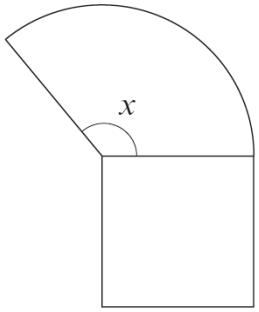

Diagram not drawn to scale

Calculate the size of angle x. [3]

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13. *(a)* Express $\frac{x}{x-3} - \frac{x}{x+6}$ as a single fraction in its simplest form. [3]

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(b) Simplify $\frac{49x^2 - 100}{14x + 20}$. [4]

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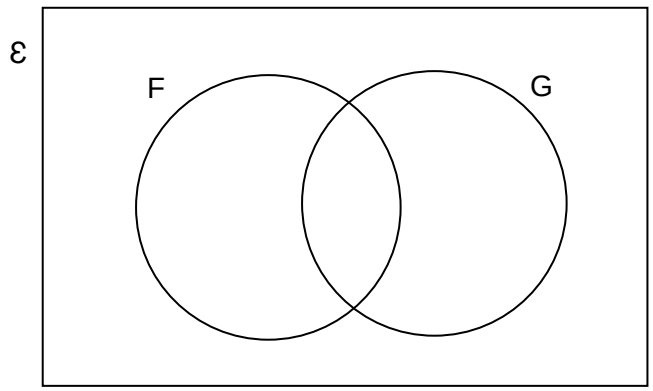
14. 30 students in a Year 11 class have decided which subjects they are going to study next year.

- 21 have decided to study French (F)
- 12 have decided to study German (G)
- 5 have decided not to study either French or German.

(a) Complete the Venn diagram below to show this information.
The universal set Ɛ contains all the students in the class. [2]



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(b) Given that a student, chosen at random, has decided to study French, what is the probability that this student has also decided to study German? [2]

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15. Circle the correct answer for each of the following questions.

(a) tan 30° is equal to,

$\frac{-1}{\sqrt{3}}$ $\frac{1}{\sqrt{3}}$ $\frac{2}{\sqrt{3}}$ $\frac{\sqrt{3}}{2}$ $\sqrt{3}$

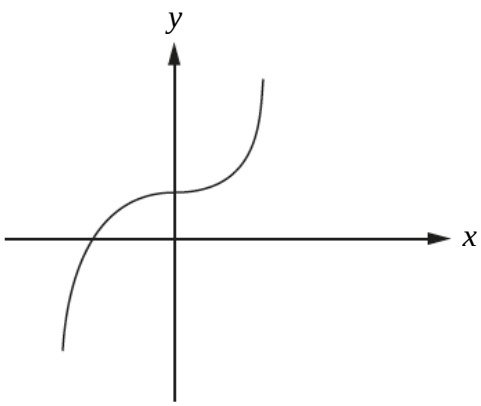
[1]

(b) cos 150° is equal to,

$\frac{1}{2}$ $\frac{\sqrt{3}}{2}$ $-\frac{1}{2}$ $-\frac{\sqrt{3}}{2}$ $\frac{1}{\sqrt{3}}$

[1]

(c) The graph



can be represented by the equation,

$y = ax^3 + b$ $y = ax^2 + b$ $y = ax + b$ $y = \frac{a}{x} + b$ $y = ax^2 + bx$

where a and b are both positive numbers. [1]

16. Using the axes below, **sketch** the graph of $y = \sin x + 3$ for values of x from 0° to 360°. [2]

17.

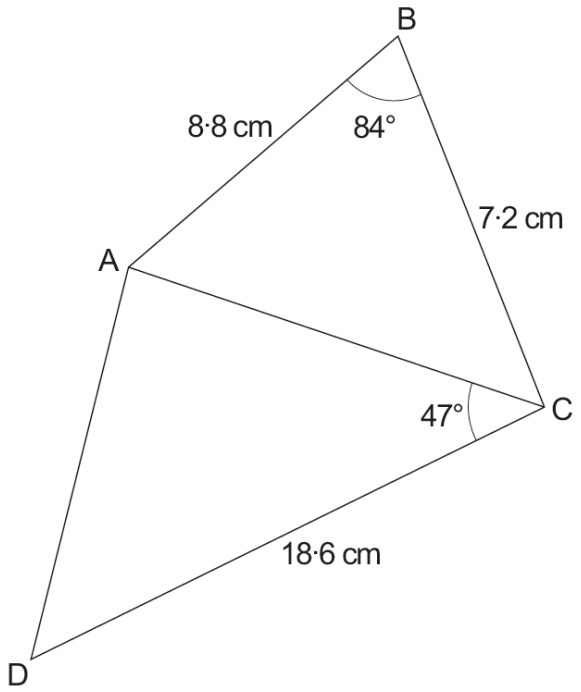


Diagram not drawn to scale

Calculate the area of triangle *ACD*. [6]

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18. A factory produces a very large number of beads which are either coloured red or coloured blue.
The beads are identical in all other respects.
The probability of a randomly chosen bead being red is 0·7.
The beads are randomly packed in boxes of 20 beads.

(a) What is the expected number of red beads in a box? [1]

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(b) A particular box is known to contain the expected number of red and blue beads.
Two beads are chosen, at random, from this box without replacement.
Show that there is less than an 8% chance that both beads are blue. [3]

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(c) Two beads are chosen at random from the factory production line without replacement.
Will the probability that both beads are blue be the same as for part (*b*)?
You must justify your answer. [1]

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Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

SPECIMEN PAPER SUMMER 2017

1 HOUR 45 MINUTES

ADDITIONAL MATERIALS
A calculator will be required for this paper.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

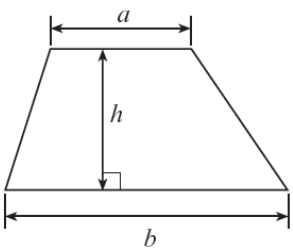
The number of marks is given in brackets at the end of each question or part-question.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**3**	
3.	**4**	
4.	**4**	
5.	**7**	
6.	**3**	
7.	**6**	
8.	**4**	
9.	**5**	
10.	**5**	
11.	**5**	
12.	**3**	
13.	**4**	
14.	**4**	
15.	**8**	
16.	**3**	
17.	**3**	
18.	**6**	
TOTAL	**80**	

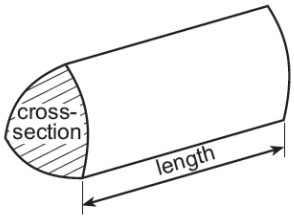
The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **15**.

Formula list

Area of a trapezium = $\frac{1}{2}(a+b)h$



Volume of a prism = area of cross section × length



1. Find the size of angle x. [3]

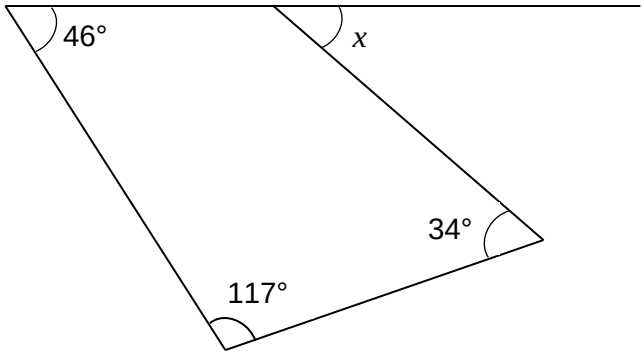


Diagram not drawn to scale

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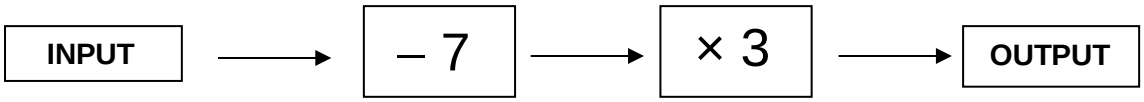
x = ...°

2. A number machine is shown below.



Circle your answer in each of the following.

(a) When the INPUT is 4 the OUTPUT is

33 –9 –17 9 17

[1]

(b) When the OUTPUT is 15 the input is

38 –38 –12 12 –2

[1]

(c) When the INPUT is n the OUTPUT is

$3n - 7$ $n - 21$ $7(n - 3)$ $-21n$ $3(n - 7)$

[1]

3. A fifth number is to be added to the four numbers shown below.

6 10 15 21

The mean of this new larger set of numbers is bigger than the mean of the original set of four numbers by 1.

What is the value of the new number? [4]

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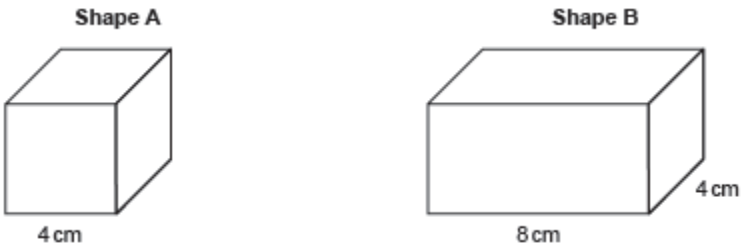
New number = ...

4. Shape A is a cube.
Shape B is a cuboid.
Both shape A and shape B have the same volume.
What is the height of shape B? [4]



Diagrams not drawn to scale

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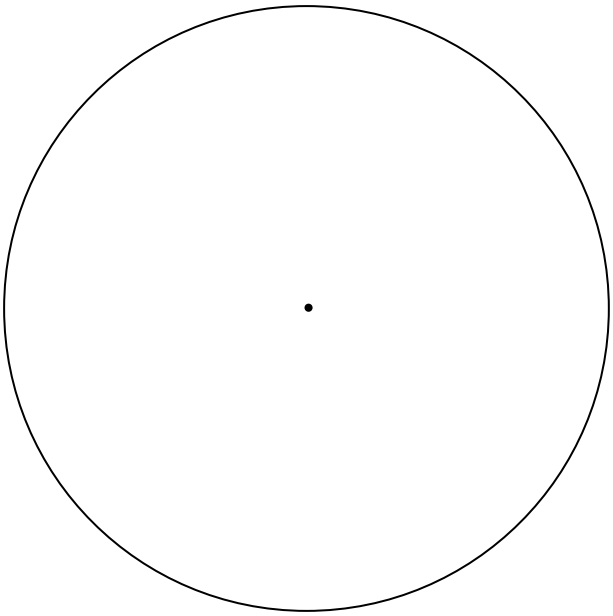
5. *(a)* A hospital collected data on the age group of each of 120 people that were treated as outpatients on a particular day.

The results are summarised below.

Age Group	**Number of people**
Pre-school	18
School	24
60 and over	35
Others	43

Draw a pie chart to illustrate these results.
You should show how you calculated the angles of your pie chart. [4]



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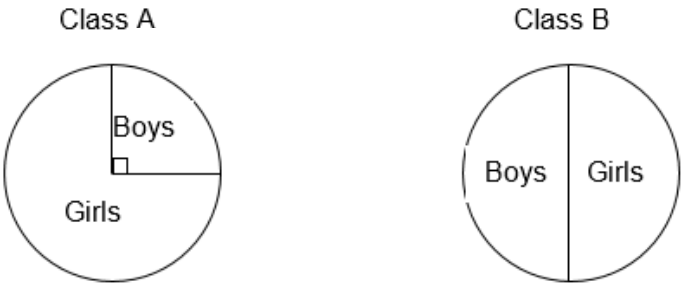
(b) The two pie charts below show the ratio between the number of girls and the number of boys in each of two different classes.



There are **more** girls in class B than in class A.

Complete the table below to show a **possible** set of numbers that will satisfy all of the above information. [3]

	Girls	**Boys**
Class A		
Class B		

Working space:

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6. The angles of a triangle are $x°$, $2x°$ and $3x°$.
Form an equation in x, and use your equation to find the sizes of the three angles.

[3]

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7. The universal set, Ɛ = {6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17,18}

Set A is the multiples of 3.
Set B is the multiples of 4.

(a) Complete the Venn diagram. [4]

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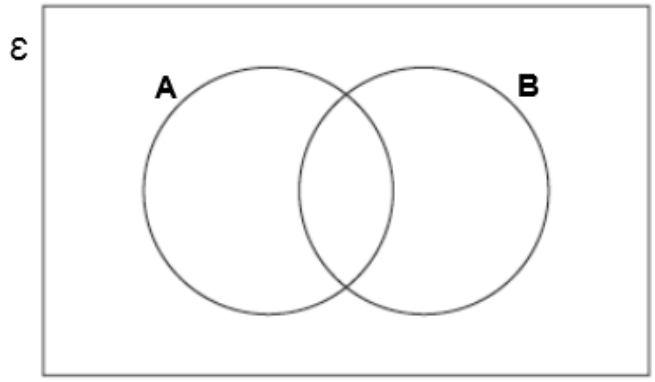

(b) What is the probability that a number selected at random from this universal set is a multiple of 3 but not a multiple of 4? [2]

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8. *(a)* Calculate $\frac{8{\cdot}4 \times 3{\cdot}7}{5{\cdot}3 + 1{\cdot}8}$. Give your answer correct to 2 decimal places. [2]

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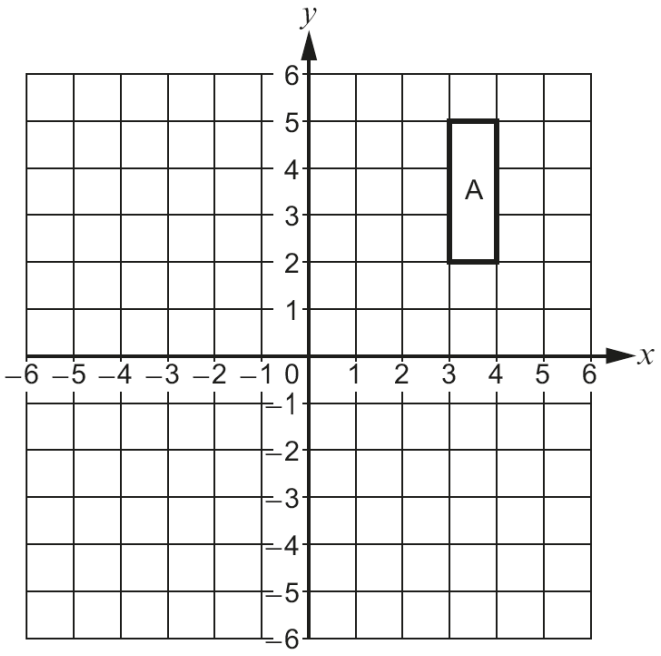
(b) What is the number 80 953 written correct to 3 significant figures?
Circle your answer. [1]

810 80 900 80 000 81 000 953

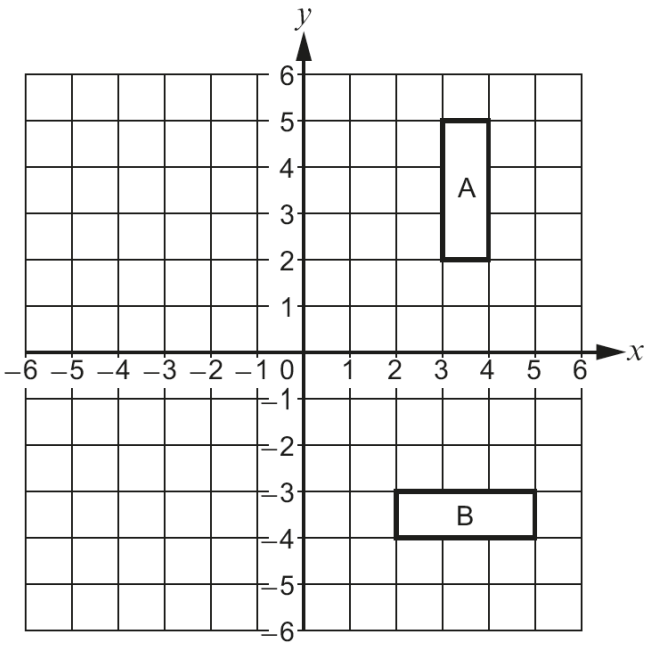
(c) What is the number 0·07415 written correct to 2 significant figures?
Circle your answer. [1]

0·07 0·1 0·08 0·0 0·074

9. *(a)* Reflect the shape A in the line $x = 1$. [2]



(b) Describe **fully** the transformation that transforms shape A onto shape B. [3]



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10. Four of the interior angles of a seven-sided polygon are 114°, 150°, 160° and 170°.
The other three interior angles of this polygon are equal.
Calculate the size of each of the other three interior angles. [5]

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11. *(a)* Express 144 as the product of its prime factors in index form. [3]

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(b) Given that $60 = 2^2 \times 3 \times 5$, find

(i) the highest common factor (HCF) of 144 and 60, [1]

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(ii) the lowest common multiple (LCM) of 144 and 60. [1]

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12. *(a)* Solve the inequality given below. [2]

$$7n < 5n + 11$$

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(b) Give the largest integer value for n that satisfies this inequality. [1]

n = ...

13. A solution to the equation

$$x^3 - 7x - 75 = 0$$

lies between 4 and 5.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

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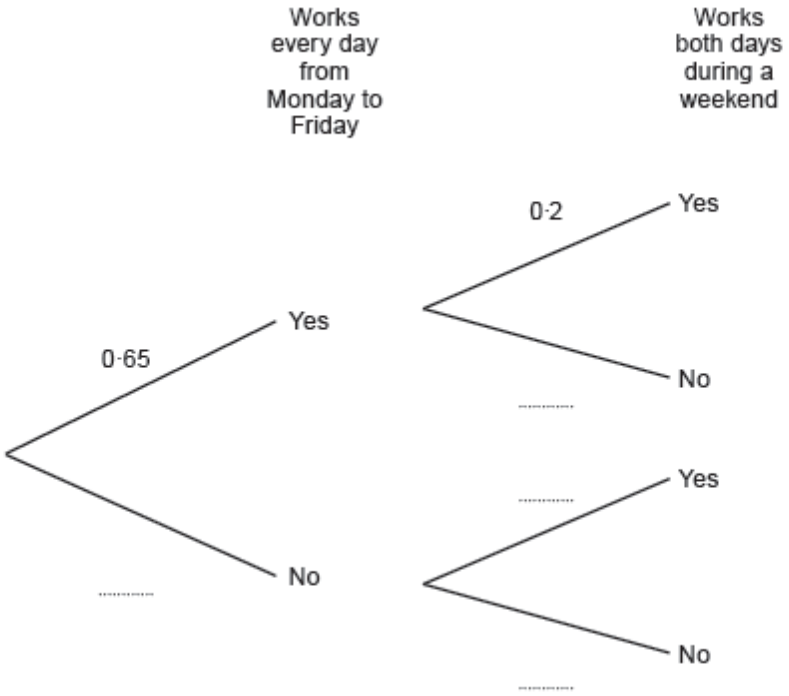
14. Carys has a Monday to Friday job and a weekend job.
Working Monday to Friday and working weekends are independent events.
In any given week, the probability that Carys works every day from Monday to Friday is 0·65.
The probability that she works both days during a weekend is 0·2.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that next week Carys will work every day from **Monday to Sunday**. [2]

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15. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

Flower bed A is x metres long and y metres wide.
Flower bed B is twice as long as flower bed A and is 3 metres wider than flower bed A.

The perimeter of flower bed A is 18 metres.
The perimeter of flower bed B is 34 metres.

Use an algebraic method to calculate the area of flower bed B.
You must show all your working. [8]

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16. Factorise $x^2 - x - 20$, and hence solve $x^2 - x - 20 = 0$. [3]

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17. A sketch of the graph of the straight line $y = 7x + 2$ is shown below.

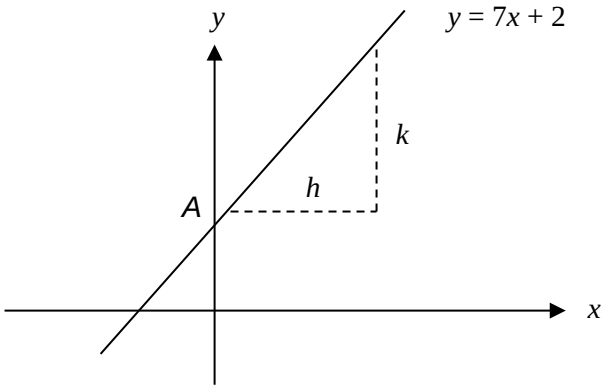

Diagram not drawn to scale

(a) What are the coordinates of the point *A*, where the line cuts the *y*-axis?
Circle your answer. [1]

(2 , 0) (7, 0) (0, 2) (0, 7) (7, 2)

(b) When *h* is equal to 1 unit, what is the value of *k?*
Circle your answer. [1]

2 units 7 units 1 unit 3·5 units 14 units

(c) Which of the following equations is an equation of a straight line that is perpendicular to $y = 7x + 2$?
Circle your answer. [1]

$y = 7x + 3$ $y = \frac{x}{7} + 3$ $y = 7x + 3$ $y = -\frac{x}{7} + 3$ $y = 2x + 7$

18.

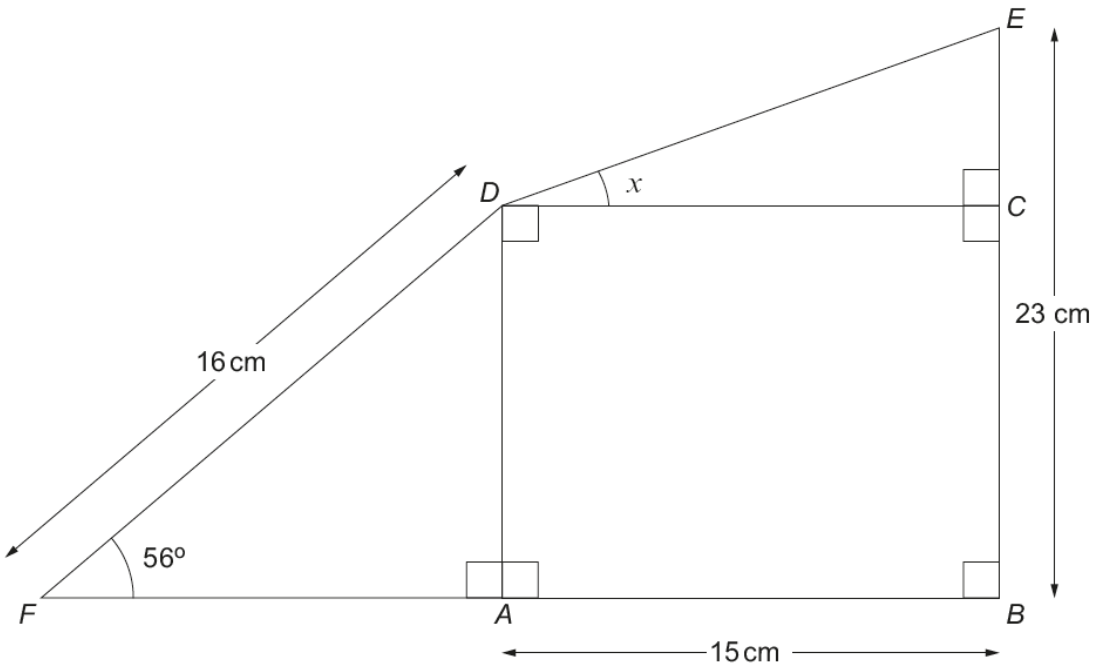

Diagram not drawn to scale

(a) Calculate the length *AD*. [3]

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(b) Find the size of the angle *x*. [3]

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Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
FOUNDATION TIER

SPECIMEN PAPER SUMMER 2017

1 HOUR 30 MINUTES

ADDITIONAL MATERIALS
A calculator will be required for this paper.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

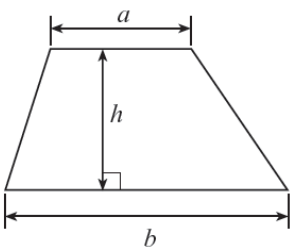
The number of marks is given in brackets at the end of each question or part-question.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**3**	
3.	**4**	
4.	**3**	
5.	**3**	
6.	**4**	
7.	**5**	
8.	**4**	
9.	**6**	
10	**3**	
11.	**3**	
12.	**4**	
13.	**4**	
14.	**3**	
15.	**3**	
16.	**6**	
17.	**2**	
18.	**3**	
TOTAL	**65**	

The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **9**.

Formula list

Area of a trapezium = $\frac{1}{2}(a+b)h$



1. The profit made by a charity event is given by the formula

profit = number of tickets sold × £5 − cost of expenses.

Calculate the profit made when 84 tickets were sold and the cost of the expenses was £120. [2]

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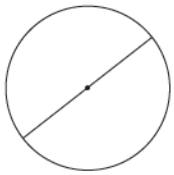
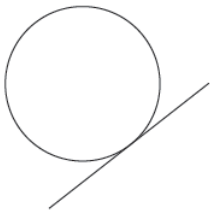
2. *(a)* What is the special name given to the straight line shown in the diagram below? [1]



Circle your answer.

Radius Diameter Arc Circumference Tangent

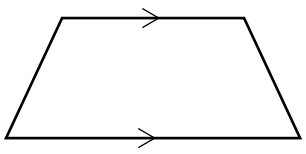
(b) What is the special name given to the straight line shown in the diagram below? [1]



Circle your answer.

Radius Diameter Arc Circumference Tangent

(c) What is the special name given to the shape below? [1]



Circle your answer.

Parallelogram Rectangle Rhombus Kite Trapezium

3.

WALES	ENGLAND	WALES	SCOTLAND
ENGLAND	WALES	IRELAND	WALES

Alun has the eight cards shown above. He chooses one card at random.

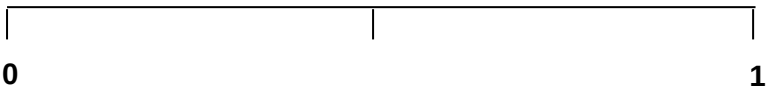
(a) On the probability scale below, mark the points A, B and C where:

A is the probability of Alun choosing a card with WALES written on it.

B is the probability of Alun choosing a card with FRANCE written on it.

C is the probability of Alun choosing a card with ENGLAND written on it.

[3]



(b) The probability of Alun choosing a card at random with SCOTLAND written on it is $\frac{1}{8}$.

What is the probability of Alun choosing a card that does **not** have SCOTLAND written on it? [1]

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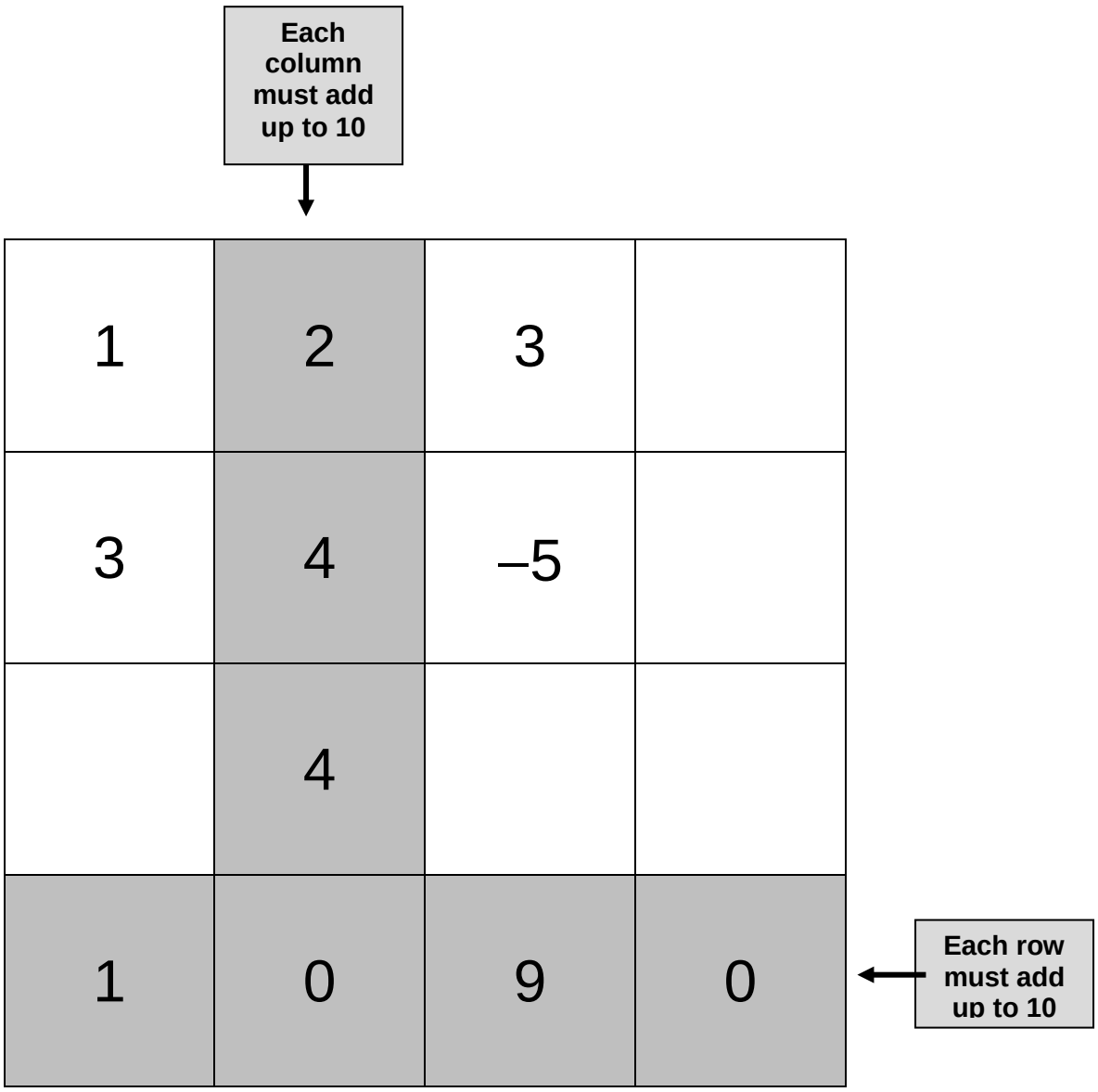
4. Using the two instructions given, fill in the blanks in the grid below. [3]



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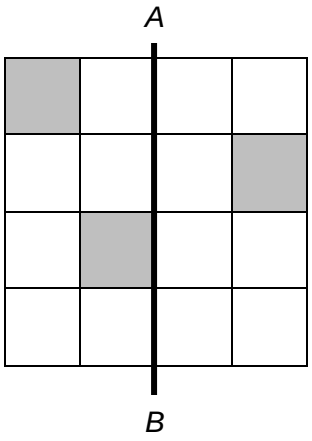
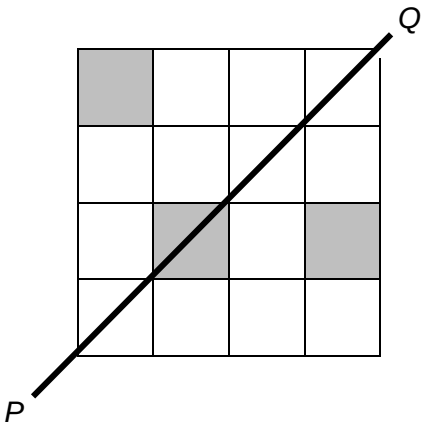
5. *(a)* In each of the following diagrams, shade **the smallest number** of squares required to answer the question.

(i) Shade the smallest number of squares required to make the line *AB* a line of symmetry. [1]



(ii) Shade the smallest number of squares required to make the line *PQ* a line of symmetry. [1]



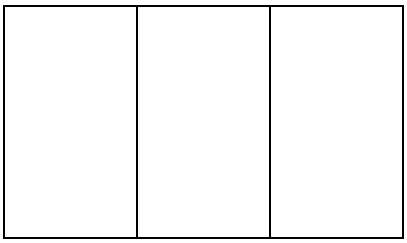
(b) What is the order of rotational symmetry of the shape shown below? [1]

Order of rotational symmetry = …….

6. *(a)*

Choose any three cards from those shown above to make a three-digit number that is a multiple of 9.

Give the answer to your calculation. [2]



÷ 9 = ...

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(b) Dylan is 12 years older than Lois.
Dylan is also three times as old as Lois.
How old are Dylan and Lois? [2]

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Dylan is …….years old

Lois is …….years old.

7. *(a)* Solve the following equations.

(i) $7x = 21$ [1]

.....

.....

(ii) $x + 5 = 9$ [1]

.....

.....

(b) Evaluate $2a - b + \frac{1}{2}c$, given that $a = 3$, $b = 4$ and $c = 10$. [2]

.....

.....

.....

.....

(c) Scarves are sold outside a football ground at £8 each.
Write an expression for the cost, in pounds, of n of these scarves. [1]

.....

.....

8. *(a)* Find the size of angle a. [2]

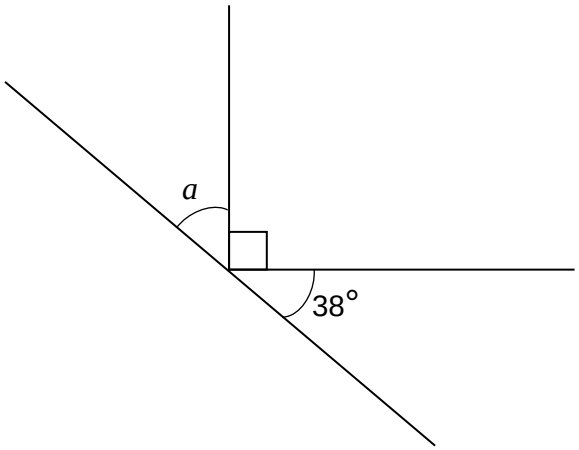

Diagram not drawn to scale

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(b) Find the size of angle b [2]

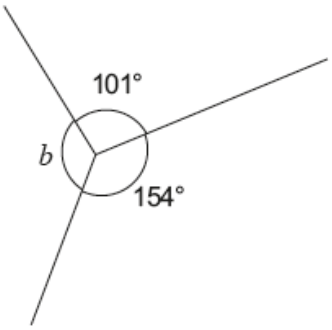

Diagram not drawn to scale

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9. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

Dewi visited a souvenir shop in order to buy some key rings.
The key rings cost 68p each.
Dewi bought as many as was possible with a £10 note.

How many key rings was Dewi able to buy, and what change did he get from £10? [6]

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10. Find the size of angle x. [3]

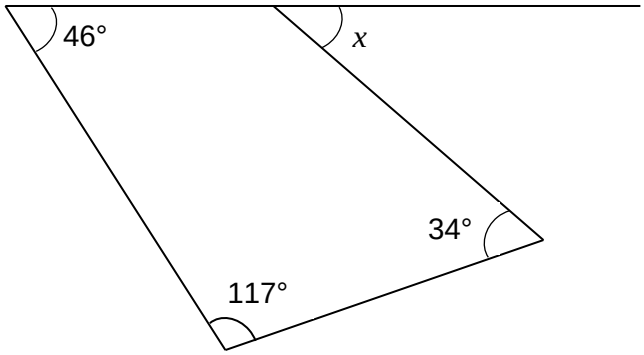

Diagram not drawn to scale

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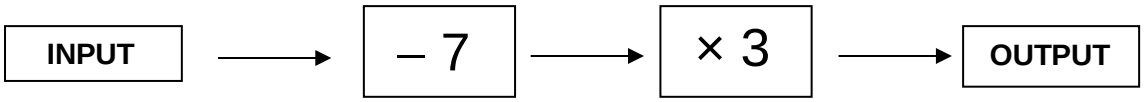
x = ...°

11. A number machine is shown below.



Circle your answer in each of the following.

(a) When the INPUT is 4 the OUTPUT is

33 –9 –17 9 17

[1]

(b) When the OUTPUT is 15 the input is

38 –38 –12 12 –2

[1]

(c) When the INPUT is n the OUTPUT is

$3n - 7$ $n - 21$ $7(n - 3)$ $-21n$ $3(n - 7)$

[1]

12. A fifth number is to be added to the four numbers shown below.

6 10 15 21

The mean of this new larger set of numbers is bigger than the mean of the original set of four numbers by 1.

What is the value of the new number? [4]

.....

.....

.....

.....

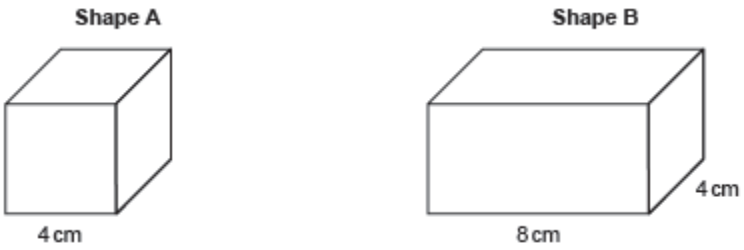
.....

.....

.....

New number = ...

13. Shape A is a cube.
Shape B is a cuboid.
Both shape A and shape B have the same volume.
What is the height of shape B? [4]



Diagrams not drawn to scale

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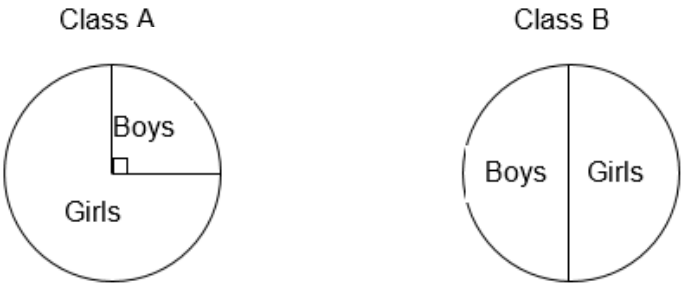
14. The two pie charts below show the ratio between the number of girls and the number of boys in each of two different classes.



There are **more** girls in class B than in class A.

Complete the table below to show a **possible** set of numbers that will satisfy all of the above information. [3]

	Girls	**Boys**
Class A		
Class B		

Working space:

.....

.....

.....

.....

.....

15. The angles of a triangle are $x°$, $2x°$ and $3x°$.
Form an equation in x, and use your equation to find the sizes of the three angles.

[3]

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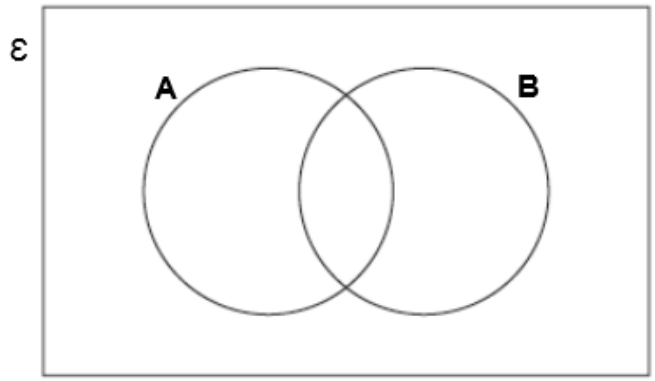
16. The universal set, Ɛ = {6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17,18}

Set A is the multiples of 3.
Set B is the multiples of 4.

(a) Complete the Venn diagram. [4]

.....

.....



(b) What is the probability that a number selected at random from this universal set is a multiple of 3 but not a multiple of 4? [2]

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.....

17. Calculate $\frac{8{\cdot}4 \times 3{\cdot}7}{5{\cdot}3 + 1{\cdot}8}$. Give your answer correct to 2 decimal places. [2]

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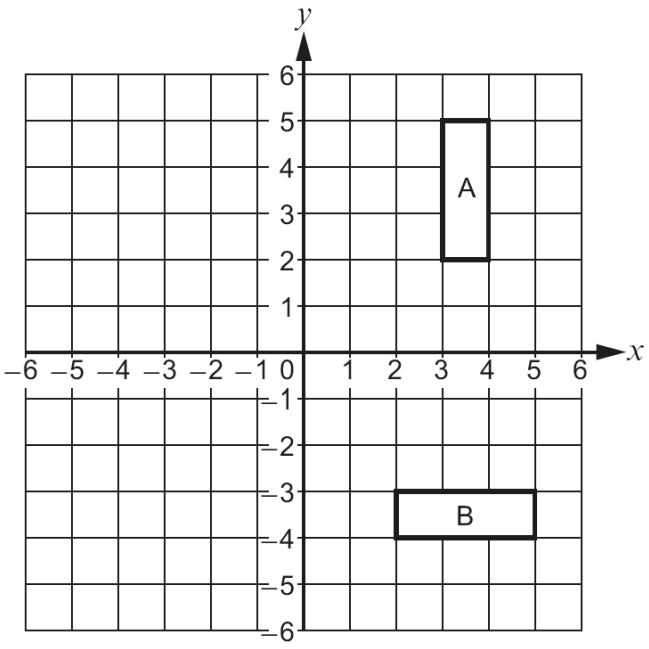
.....

.....

18. Describe **fully** the transformation that transforms shape A onto shape B. [3]



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MARKING SCHEMES

UNIT 1: NON-CALCULATOR, HIGHER TIER
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cao = correct answer only
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bod = benefit of doubt
oe = or equivalent
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ISW = ignore subsequent working

F.T. = follow through ($\surd$ indicates correct working following an error and $\not\surd$ indicates a further error has been made)

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- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

UNIT 1: NON-CALCULATOR, HIGHER TIER

GCSE Mathematics Unit 1: Higher Tier	Mark	Comments
1. (a) $1 - (0{\cdot}45 + 0{\cdot}1 + 0{\cdot}25)$ $= 0{\cdot}2$	M1 A1	
(b) $0{\cdot}1 + 0{\cdot}25$ $= 0{\cdot}35$	M1 A1	
(c) $0{\cdot}1 \times 0{\cdot}25$ $= 0{\cdot}025$	M1 A1 6	
2. (a) -4	B1	
(b) Six correct plots.	B1	F.T 'their $(2, -4)$'.
Curve drawn.	B1	F.T. 'their plots'.
(c) Correct solutions <u>from their graph</u>.	B1	Answers should be accurate to within 1 small square.
(d) Line $y = -3$ drawn	B2	B1 for sight of $x^2 - 3x - 2 = -3$ or $y = -3$
Correct roots <u>from their graphs</u>.	B1	F.T. if a straight line is drawn that intersects their curve twice. Answers should be accurate to within 1 small square.
	7	
3. (a) Correct construction of 60°.	B2	With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately.
Correct bisector of 60°.	B1	F.T. 'their 60°'. With sight of accurate 'method arcs'. Penalise –1 if not drawn in correct position.
(b) Exterior angle = $45^{(\circ)}$	B1	
(Number of sides =) $\frac{360}{45}$	M1	
$= 8$	A1	
(c) $\begin{pmatrix} 8 \\ -2 \end{pmatrix}$	B1 7	
4. (a) (£)250	B2	B1 for sight of (£)400/8 or (£)50.
(b) $\frac{(£)63 \times 100}{105}$ or equivalent e.g. $63 \div 1{\cdot}05$	M1	
$= (£)60$	A1 4	
5. (a) 1/8	B1	
(b) 0·2222….	B1	
(c) 1	B1 3	

GCSE Mathematics Unit 1: Higher Tier	Mark	Comments
6. (a) 0·2 AND 0·16 (b) Suitable uniform scale AND correct plots. (c) 0·16 AND e.g. 'because calculated from the greatest number of throws'. (d) Yes AND e.g. 'because 0·16 (or 80/500) is close to 1/6.	B1 B1 B1 B1 4	 F.T 'their 0·2 and 0·16'. F.T 'their 0·16'. F.T 'their 0·16'.
7. (a) $1{\cdot}23 \times 10^{-1}$ (b) 5×10^{-4}	B2 B2 4	B1 for a correct value not in standard form. e.g. $12{\cdot}3 \times 10^{-2}$ B1 for a correct value not in standard form. e.g. $0{\cdot}5 \times 10^{-3}$
8. $n^2 + 3$ or equivalent.	B2 2	B1 for $n^2 \pm$ …… (not for n^2).
9. Correct enlargement	B3 3	B2 for scale factor of ½ with centre A. B1 for scale factor of ±½ anywhere.
10. (a) $y \propto 1/x^2$ OR $y = k/x^2$ $5 = k/2^2$ $y = 20/x^2$ (b) x | 2 | 0·5 | **(±)10** y | 5 | **80** | 0·2	B1 M1 A1 B2 5	Must be in correct form, not a F.T. F.T. non-linear only. B1 for each value.
11. Sight of $4(x + 2)(x + 9)$ $(x + 2)(x + 9) = 912/4$ OR $4(x^2 + 2x + 9x + 18) = 912$ $x^2 + 11x - 210 = 0$ $(x + 21)(x - 10) = 0$ $x = 10$ or $x = -21$ Dimensions (4cm), 12(cm) and 19(cm) Statement about ignoring $x = -21$ as it leads to negative lengths Organisation and communication Accuracy of writing	B1 M1 A1 M1 A1 A1 EI OC1 W1 9	 Must be in this form. Correct intermediate steps required before A1 awarded. F.T. from equivalent level of quadratic. Must have both solutions.
12. (a) $16a^{12}$ (b) $\pm\sqrt{(h^2 - a^2)}$	B1 B1 2	

GCSE Mathematics Unit 1: Higher Tier	Mark	Comments
13. (a) $x = 0{\cdot}47878.....$ **and** $100x = 47{\cdot}878...$ with an attempt to subtract.	M1	Or $10x$ **and** $1000x$ with an attempt to subtract, or equivalent.
$474 / 990$ ISW.	A1	An answer of $\frac{47.4}{99}$ gains M1 only.
(b) $16 - 4\sqrt{3} - 4\sqrt{3} + 3$	B1	
$= 19 - 8\sqrt{3}$	B1	F.T. for addition of at least two irrational numbers.
$a = 19$ AND $b = -8$	B1	C.A.O.
(c) $\frac{1}{9}$	B2	B1 for 9^{-1} or $\frac{1}{3^2}$ or $\frac{1}{\sqrt[3]{729}}$
	7	
14.(a) Concave down curve with		*Allow appropriate marking of axes if coordinates not given.*
y-coordinate of maximum = 4	B1	
x-coordinate of maximum = -3	B1	
Points $(-7,0)$ AND $(1, 0)$ shown.	B1	
(b) Concave **down** curve that is symmetrical about the y-axis.	B1	
(0, 3) indicated.	B1	
(c) A comment regarding no scale or coordinates shown.	B1	
	6	
15. Angle CAB = x	B1	May be indicated on the diagram.
(Reason) Alternate segment theorem.	E1	E1 dependent on previous B1.
Angle ABC = $\frac{180 - x}{2}$ $\left(= 90 - \frac{1}{2}x\right)$	B1	
(Reason) isosceles triangle.	E1	E1 dependent on previous B1.
	4	
16.(a) (i) Indicates sequence as 'Miss', 'Miss', 'Hit'.	S1	
$0{\cdot}7 \times 0{\cdot}7 \times 0{\cdot}3$	M1	
$= 0{\cdot}147$	A1	
(ii) Indicates three possible situations		May be indicated by $0{\cdot}3 \times 0{\cdot}7 \times 0{\cdot}7 \times 3$ or equivalent.
HMM or MHM or MMH	M1	F.T. 'their 0·147' × 3
0·441	A1	F.T. 'their 0·441'
Less than a 50% chance.	A1	
(b) Indicates that the first ball selected is returned to the box before the second ball is selected OR the two attempts are independent.	B1	
	7	

UNIT 1: NON-CALCULATOR, INTERMEDIATE TIER
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UNIT 1: NON-CALCULATOR, INTERMEDIATE TIER

GCSE Mathematics Unit 1: Intermediate Tier	Mark	Comments
1. (a) 200 (b) 0·18 (c) 3·45 (d) Correctly using common denominator. 5/8 or equivalent.	B2 B1 B1 M1 A1 6	B1 for sight of 25 or 8 M1 for 0·875 – 0·25 A1 for 0·625
2. (a) 2 and -7 (b) $2x - 3y$ (c) $\frac{26 - 7 \times 2}{3} = E$ $(E =)$ 4	B2 B2 B1 B1 6	B1 for 2 Must be in an expression for B2 B1 for $2x$ or $-3y$
3. (a) 120 cm^2 (b) 20° (c) 30 m^3	B1 B1 B1 3	
4. Afraz is 8, Beti is 16 and Huw is 13.	B2 2	B1 for '*x, 2x and 2x–3*' but total $\neq 37$ B1 for 'total = 37' but not '*x, 2x and 2x–3*'
5. <table><tr><td>**(+)6**</td><td>**(+)3**</td><td>**0**</td><td>(–3)</td><td>(–6)</td></tr><tr><td>**–6**</td><td>**–3**</td><td>**0**</td><td>(+3)</td><td>(+6)</td></tr></table> (Probability > 0 =) 4/10 or equivalent. 4/10 × 70 =28 (people)	B2 B2 M1 A1 6	For 6 correct entries otherwise, B1 for the two zeros OR B1 for the (+)6 AND (+)3. F.T. their table B1 for a numerator of 4 OR a denominator of 10 in a fraction less than 1 F.T. 'their 4/10'
6. (a) $7x - 2x = 11 + 4$ $5x = 15$ $x = 3$ (b) $6x + 21 = 9$ OR $2x + 7 = 3$ $6x = -12$ OR $2x = -4$ $x = -2$	B1 B1 B1 B1 B1 B1 6	F.T. until 2nd error F.T. until 2nd error
7. (a) False AND a counter example given. (b) True AND a statement that refers to both 'one of the numbers will be even' and 'any integer multiplied an even number will result in another even number.'	E1 E2 3	 Accept any equivalent intention to refer to both facts E1 for reference to one of the two facts

GCSE Mathematics Unit 1: Intermediate Tier	Mark	Comments
8. Appropriate sight of $90^{(o)}$ Appropriate sight of $45^{(o)}$ or 90/2 $x = 135^{(o)}$ Organisation and communication Accuracy of writing	B1 B1 B1 OC1 W1 5	 Implies 1st B1 F.T. only from a clearly identifiable angle *LNM*
9. 3, 6, 7, 8 OR 4, 5, 6, 9	B2 2	B1 for sum of four selected numbers = 24 OR range of four selected numbers = 5
10. (a) $1 - (0{\cdot}45 + 0{\cdot}1 + 0{\cdot}25)$ $= 0{\cdot}2$ (b) $0{\cdot}1 + 0{\cdot}25$ $= 0{\cdot}35$ (c) $0{\cdot}1 \times 0{\cdot}25$ $= 0{\cdot}025$	M1 A1 M1 A1 M1 A1 6	
11. (a) -4 (b) Six correct plots. Curve drawn. (c) Correct solutions <u>from their graph</u>. (d) Line $y = -3$ drawn Correct roots <u>from their graphs</u>.	B1 B1 B1 B1 B2 B1 7	 F.T 'their $(2, -4)$'. F.T. 'their plots'. Answers should be accurate to within 1 small square. B1 for sight of $x^2 - 3x - 2 = -3$ or $y = -3$ F.T. if a straight line is drawn that intersects their curve twice. Answers should be accurate to within 1 small square.
12. (a) Correct construction of 60°. Correct bisector of 60°. (b) Exterior angle = $45^{(o)}$ (Number of sides =) $\frac{360}{45}$ $= 8$ (c) $\begin{pmatrix} 8 \\ -2 \end{pmatrix}$	B2 B1 B1 M1 A1 B1 7	With sight of accurate 'method arcs' B1 for sight of 'method arcs' but not drawn accurately F.T. 'their 60°'. With sight of accurate 'method arcs' Penalise –1 if not drawn in correct position
13. (a) (£)250 (b) $\frac{(£)63 \times 100}{105}$ or equivalent e.g. $63 \div 1{\cdot}05$ = (£)60	B2 M1 A1 4	B1 for sight of (£)400/8 or (£)50
14. (a) 1/8 (b) 0·2222…. (c) 1	B1 B1 B1 3	

GCSE Mathematics Unit 1: Intermediate Tier	Mark	Comments
15. (a) 0·2 AND 0·16 (b) Suitable uniform scale AND correct plots. (c) 0·16 AND e.g. 'because calculated from the greatest number of throws'. (d) Yes AND e.g. 'because 0·16 (or 80/500) is close to 1/6.	B1 B1 B1 B1 4	 F.T 'their 0·2 and 0·16' F.T 'their 0·16' F.T 'their 0·16'
16. (a) $1{\cdot}23 \times 10^{-1}$ (b) 5×10^{-4}	B2 B2 4	B1 for a correct value not in standard form. e.g. $12{\cdot}3 \times 10^{-2}$ B1 for a correct value not in standard form. e.g. $0{\cdot}5 \times 10^{-3}$
17. $n^2 + 3$ or equivalent.	B2 2	B1 for $n^2 \pm$ …… (not for n^2)
18. (a) (x =) $118^{(\circ)}$ 'Opposite angles of a cyclic quadrilateral' (b) (y =) $236^{(\circ)}$ 'Angle at the centre is twice the angle at the circumference'	B1 E1 B1 E1 4	 If using 118°. F.T. 'their 118'×2 *If using 62° to find 124°, then 'angle at a point' also needs to be stated*

UNIT 1: NON-CALCULATOR, FOUNDATION TIER
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UNIT 1: NON-CALCULATOR, FOUNDATION TIER

GCSE Mathematics Unit 1: Foundation Tier	Mark	Comments
1. (Cost of tickets =) 2 × (£)15 + (£)13 + (£)5 = (£)48 (Change =) (£)60 – (£)48 =(£)12 Organisation and communication Accuracy of writing	M1 A1 M1 A1 OC1 W1 6	 F.T. £60 – 'their £48'
2. (a) Hexagon (b) Isosceles triangle (c) TRUE FALSE TRUE TRUE FALSE	B1 B1 B2 4	 B1 for 4 correct
3. (a) 1/3 (b) 11 (c) 3¾	B1 B1 B1 3	
4. (a) (i) impossible. (ii) unlikely. (b) 7 Any number greater than 100.	B1 B1 B1 B1 4	
5. (a) A (7 , 2) B (–3 , –2) C (1 , –6) (b) Mid-point (4 , –2)	B3 B1 4	B1 for each
6. (a) 9 (b) (i) 35 – 10 (ii) 13 × 50 or 50 × 13	B3 B1 B1 5	B2 for meeting any three clues e.g. 1, 3, 15, 81, ... (or 3, 15, 81, (from not including 1 and 20) B1 for meeting any two clues e.g. 1, 4, 5, 6, 7, 11, 12, ...
7. (Area =) 8 × 3 = 24 m^2	M1 A1 U1 3	 Independent of other marks
8. $a = 3$ $b = 5$ $c = -2$	B1 B1 B1 3	C.A.O. F.T. $(13 - a) / 2$ F.T. $6 - a - b$

<table>
<tr><th>GCSE Mathematics
Unit 1: Foundation Tier</th><th>Mark</th><th>Comments</th></tr>
<tr><td>9. (a) 200
(b) 0·18
(c) 3·45
(d) Correctly using common denominator.
5/8 or equivalent.</td><td>B2
B1
B1
M1
A1
6</td><td>B1 for sight of 25 or 8

M1 for 0·875 – 0·25
A1 for 0·625</td></tr>
<tr><td>10. (a) 2 and – 7
(b) $2x - 3y$</td><td>B2
B2

4</td><td>B1 for 2
Must be in an expression for B2
B1 for $2x$ or $-3y$</td></tr>
<tr><td>11(a) 120 cm^2
(b) 20°
(c) 30 m^3</td><td>B1
B1
B1
3</td><td></td></tr>
<tr><td>12.
<table>
<tr><td>(+)6</td><td>(+)3</td><td>0</td><td>(–3)</td><td>(–6)</td></tr>
<tr><td>–6</td><td>–3</td><td>0</td><td>(+3)</td><td>(+6)</td></tr>
</table>
(Probability > 0 =) 4/10 or equivalent.
4/10 × 70
=28 (people)</td><td>B2

B2

M1
A1
6</td><td>For 6 correct entries otherwise,
B1 for the two zeros OR B1 for the (+)6 AND (+)3

F.T. their table
B1 for a numerator of 4 OR a denominator of 10 in a fraction less than 1
F.T. ‘their 4/10’</td></tr>
<tr><td>13. (a) $7x - 2x = 11 + 4$
$5x = 15$
$x = 3$
(b) $6x + 21 = 9$ OR $2x + 7 = 3$
$6x = -12$ OR $2x = -4$
$x = -2$</td><td>B1
B1
B1
B1
B1
B1
6</td><td>F.T. until 2nd error

F.T. until 2nd error
</td></tr>
</table>

GCSE Mathematics Unit 1: Foundation Tier	Mark	Comments
14. (a) False AND a counter example given. (b) True AND a statement that refers to both 'one of the numbers will be even' and 'any integer multiplied an even number will result in another even number.'	E1 E2 3	 Accept any equivalent intention to refer to both facts E1 for reference to one of the two facts
15. Appropriate sight of $90^{(\circ)}$ Appropriate sight of $45^{(\circ)}$ or 90/2 $x = 135^{(\circ)}$	B1 B1 B1 3	 Implies 1st B1 F.T. only from a clearly identifiable angle *LNM*
16. 3, 6, 7, 8 OR 4, 5, 6, 9	B2 2	B1 for sum of four selected numbers = 24 OR range of four selected numbers = 5

UNIT 2: CALCULATOR-ALLOWED, HIGHER TIER
GENERAL INSTRUCTIONS for MARKING GCSE Mathematics

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made.

2. Marking Abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
MR = misread
PA = premature approximation
bod = benefit of doubt
oe = or equivalent
si = seen or implied
ISW = ignore subsequent working

F.T. = follow through ( indicates correct working following an error and  indicates a further error has been made)

Anything given in brackets in the marking scheme is expected but, not required, to gain credit.

3. Premature Approximation

A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.

4. Misreads

When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.
This is only applicable if a wrong value, is used consistently throughout a solution; if the correct value appears anywhere, the solution is not classed as MR (but may, of course, still earn other marks).

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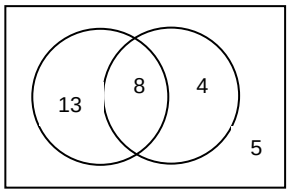
- 'm' marks are dependant method marks. They are only given if the relevant previous 'M' mark has been earned.
- 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

UNIT 2: CALCULATOR-ALLOWED, HIGHER TIER

GCSE Mathematics Unit 2: Higher Tier	Marks	Comments
1. Total of interior angles $5 \times 180(°)$ $= 900(°)$ 900 – sum of 4 angles given (594°) (=306) ÷3 (Each of the 3 angles is) 102(°)	M1 A1 M1 m1 A1 5	Or equivalent full method F.T. 'their 900' provided >594 Unique division by 3, no further operations Alternative: Corresponding exterior angles are 66(°), 30(°), 20(°) and 10(°) B1 Remaining exterior angles = 360 – sum of exterior angles found (126°) (=234°) M1 ÷ 3 m1 (Each of the remaining 3 exterior angles =) 78(°) A1 (Each of the remaining 3 interior angles =) 102(°) A1 *F.T. provided B1, M1, m1, 180 – 'their 78'*
2. (a) 2, 2, 2, 2, 3, 3. $2^4 \times 3^2$ (b) (i) 12 OR $2^2 \times 3$ (ii) 720 OR $2^4 \times 3^2 \times 5$	M1 A1 B1 B1 B1 5	For a method that produces 2 prime factors from the set {2,2,2,2,3,3}. C.A.O. for the sight of the six correct factors and no extras (ignore 1s). F.T. their answer if at least one index form used with at least a square. Allow $(2^4)(3^2)$ or $2^4 . 3^2$. Inclusion of 1 as a factor is B0. F.T. 'their answer to (a)' if of equivalent difficulty. F.T. 'their answer to (a)' if of equivalent difficulty.
3(a) $2n < 11$ $n < 11/2$ OR $n < 5{\cdot}5$ (b) 5	B1 B1 B1 3	Use of '=' is B0 unless restored for final answer. Implies 1st B1. F.T. their answer to (.a)
4. One correct evaluation $4 \leq x \leq 5$ 2 correct evaluations $4{\cdot}65 \leq x \leq 4{\cdot}85$, one < 0 one > 0. 2 correct evaluations $4{\cdot}75 \leq x \leq 4{\cdot}85$, one < 0 one > 0. $x = 4{\cdot}8$	 B1 B1 M1 A1 4	*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.* x $x^3 - 7x - 75$ 4 –39 4·1 –34·779 4·2 –30·312 4·3 –25·593 4·4 –20·616 4·5 –15·375 4·6 –9·864 4·65 –7·005... 4·7 –4·077 4·75 –1·078... 4·8 1·992 4·85 5·134... 4·9 8·349 5 15
5.(a) 0.35 0.8 0.2 0.8 on the correct branches (b) 0.65×0.2 $= 0.13$	B2 M1 A1 4	B1 for any two correct entries. Accept fractions

GCSE Mathematics Unit 2: Higher Tier	Marks	Comments
6. Sight of (Perimeter of bed A=) $2x + 2y = 18$ AND (Perimeter of bed B=) $4x + 2y + 6 = 34$ or equivalent Correct method to solve equations simultaneously. $x = 5$ $y = 4$ (Area of B =) 10×7 $= 70(m^2)$	B1 M1 A1 A1 M1 A1 6	 F.T. 'their equations' if of equivalent difficulty. Both values consistent with 'their equations'. F.T. 'their derived values for x and y'. $2x \times (y + 3)$
7. $(x - 5)(x + 4)$ $x = 5$ AND $x = -4$	B2 B1 3	B1 for $(x \ldots 5)(x \ldots 4)$. Strict F.T. from their brackets
8 (a) (0 , 2) (b) 7 units (c) $y = \frac{-x}{7} + 3$	B1 B1 B1 3	
9(a) $AD = 16 \times \sin 56°$ $= 13{\cdot}2(64...)$(cm) OR 13·3(cm) (b) (EC =) 9·7(...) $\tan x = \frac{9{\cdot}7(...)}{15}$ $x = 32{\cdot}9...(°)$ or 33(°) Organisation and communication Accuracy of writing	M2 A1 B1 M1 A1 OC1 W1 8	M1 for $\sin 56° = AD/16$ C.A.O. Allow 13 from correct work but penalise final answer –1 for premature approximation. F.T. 23 – 'their AD'. F.T. 'their EC'
10.(a) $\frac{b-a}{ab} = \frac{1}{c}$ $c = \frac{ab}{b-a}$ (b) $x = \{-4 \pm \sqrt{(4^2 - 4\times3\times-18)}\} / 2\times3$ $= [-4 \pm \sqrt{232}] / 6$ $x = 1{\cdot}87$ and $x = -3{\cdot}21$	B1 B1 M1 A1 A1 5	 Allow one slip in substitution in correct formula. C.A.O.
11(a) $AP = CR$ AND $AS = CQ$ $S\hat{A}P = Q\hat{C}A$ (So triangles are congruent because of) SAS (b) Rhombus because of equal sides.	B1 B1 B1 B1 4	With reference to mid-points. With reference to 90°. Must refer to equal sides.
12. $\frac{x}{360} \times \pi \times r^2 = r^2$ $x = \frac{360}{\pi}$ $= 114(·5..°)$ or $115^{(o)}$	M1 A1 A1 3	Accept their symbol or word for 'r'.

GCSE Mathematics Unit 2: Higher Tier	Marks	Comments
13 (a) $x(x + 6) - x(x - 3)$ as a <u>numerator.</u>	M1	Accept intention of brackets when working not shown, e.g. $x^2 + 6x - x^2 - 3x$.
$(x - 3)(x + 6)$ as a <u>denominator.</u>	M1	
$9x / (x - 3)(x + 6)$	A1	C.A.O. If $(x - 3)(x + 6)$ expanded, must be correct. If M1, M1, A1 awarded penalise further incorrect work –1. If no marks then SC1 for $9x$.
(b) $(7x + 10)(7x - 10)$	B2	B1 for $(7x \ldots 10)(7x \ldots\ldots 10)$
$2(7x + 10)$	B1	
$\frac{(7x - 10)}{2}$	B1	F.T. provided no more than 1 previous error and provided simplification required. Mark final answer. Accept $3{\cdot}5x - 5$
	7	
14(a) 	B2	For all correct. B1 for two or three correct.
(b) 8/21	B2	F.T. their complete Venn diagram. B1 for a numerator of 8 in a fraction < 1. B1 for a denominator of 21 in a fraction < 1.
	4	
15 (a) $\frac{1}{\sqrt{3}}$	B1	
(b) $\frac{-\sqrt{3}}{2}$	B1	
(c) $y = ax^3 + b$	B1	
	3	
16. Sine curve	M1	Intention to sketch a portion of a sine curve with minimum period of 360°.
Correct sine curve with 2, 3 and 4 shown on the y-axis and 0°, 180° and 360° shown or implied.	A1	
	2	
17. Use of cosine rule with triangle ABC **AND** ½ab sinC with triangle ACD.	S1	Or alternative full strategy.
$AC^2 = 8{\cdot}8^2 + 7{\cdot}2^2 - 2 \times 8{\cdot}8 \times 7{\cdot}2 \times \cos 84$	M1	
$AC = 10{\cdot}77(.....)$(cm)	A2	A1 for $AC^2 = 116(\cdot 03...)$
(Area ACD =) $\frac{1}{2} \times 18{\cdot}6 \times AC \times \sin 47$	M1	F.T. their derived AC
$= 73{\cdot}2(6....)(cm^2)$	A1	
	6	
18.(a) 14	B1	
(b) $6/20 \times 5/19$	M1	
$0{\cdot}078\ldots.$	A1	
Statement that this is less than 8%	A1	
(c) NO and use of $0{\cdot}3 \times 0{\cdot}3$ or equivalent.	E1	Accept explanation based on large sample size.
	5	

UNIT 2: CALCULATOR-ALLOWED, INTERMEDIATE TIER GENERAL INSTRUCTIONS for MARKING GCSE Mathematics

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PA = premature approximation
bod = benefit of doubt
oe = or equivalent
si = seen or implied
ISW = ignore subsequent working

F.T. = follow through ($\surd$ indicates correct working following an error and $\surd\!\!\!/$ indicates a further error has been made)

Anything given in brackets in the marking scheme is expected but, not required, to gain credit.

3. Premature Approximation

A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.

4. Misreads

When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.
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- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

UNIT 2: CALCULATOR-ALLOWED, INTERMEDIATE TIER

GCSE Mathematics Unit 2: Intermediate Tier	Marks	Comments
1. 360 – (46 + 117 + 34) = 163° (x =) 17°	M1 A1 B1 3	F.T. 180 – 'their 163'.
2.(a) –9 (b) 12 (c) $3(n-7)$	B1 B1 B1 3	
3. (Original mean =) 13 (New total =) 5 × 14 = 70 New number = 18	B1 M1 A1 B1 4	F.T. 5 × 'their 13 + 1'. F.T. 'their derived new total' – 'their original total'.
4. 4 × 4 × 4 64 (cm³) 64 / (8×4) or 32h=64 2 (cm)	M1 A1 M1 A1 4	*Alternative method:* *4 × 4 M1* *16 (cm²) A1* *16/8 M1* *2 (cm) A1*
5. (a) 3 or 4 angles correct and correctly labelled. 3 or 4 angles correct, labels not fully correct. 2 angles correct and correctly labelled. 2 angles correct, labels not fully correct. 1 angle correct and correctly labelled. OR If 0 OR 1 for their diagram or no diagram, 360/120 Angles are 54°, 72°, 105° and 129° (b) More girls in class B than in class A. Equal number of girls and boys in class B. Ratio of Girls : Boys = 3 : 1 in class A.	 B4 OR (B3) (B3) (B2) (B1) (M1) (A1) B1 B1 B1 7	Use overlay Allow ±2° Correct labels (Words NOT the frequency OR angle). If only B1 is scored for the diagram, and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks. If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded. (1 is) 3° gets the M1. OR SC1 for all correct percentages: 15, 20, 29·2 or 29, 35·8 or 36.
6. $x + 2x + 3x = 180$ $x = 30$ Three angles are 30(°), 60(°), 90(°)	M1 A1 A1 3	*SC1 for the answers of 30*(°), *60*(°) *and 90*(°) *without forming an equation* *SC1 for the answers of 60*(°), *120*(°) *and 180*(°) *from equating to 360*
7.(a) All 13 numbers placed correctly and no extra. (b) $\frac{4}{13}$	B4 B2 6	B3 for 10,11 or 12 correct OR all correct but omission of numbers outside A∪B. B2 for 8 or 9 correct. B1 for 6 or 7 correct. *Any duplicates are marked as incorrect.* F.T. 'their diagram'. B1 for a numerator of 4 OR a denominator of 13 in a fraction less than 1.

GCSE Mathematics Unit 2: Intermediate Tier	Marks	Comments
8. (a) 4·38 (b) 81 000 (c) 0.074	B2 B1 B1 4	B1 for 4·37(7.....)
9. (a) Correct reflection in $x = 1$ (b) Clockwise rotation of 90° about the origin.	B2 B3 5	B1 for reflection in $y = 1$ or for sight of line $x = 1$. For all four components. B2 for any three, B1 for any two. (Penalise '¼ turn' –1 only.)
10. Total of interior angles 5 × 180(°) = 900(°) 900 – sum of 4 angles given (594°) (=306) ÷3 (Each of the 3 angles is) 102(°)	M1 A1 M1 m1 A1 5	Or equivalent full method F.T. 'their 900' provided >594 Unique division by 3, no further operations Alternative: Corresponding exterior angles are 66(°), 30(°), 20(°) and 10(°) B1 Remaining exterior angles = 360 – sum of exterior angles found (126°) (=234°) M1 ÷ 3 m1 (Each of the remaining 3 exterior angles =) 78(°) A1 (Each of the remaining 3 interior angles =) 102(°) A1 *F.T. provided B1, M1, m1, 180 – 'their 78'*
11. (a) 2, 2, 2, 2, 3, 3. $2^4 \times 3^2$ (b) (i) 12 OR $2^2 \times 3$ (ii) 720 OR $2^4 \times 3^2 \times 5$	M1 A1 B1 B1 B1 5	For a method that produces 2 prime factors from the set {2,2,2,2,3,3}. C.A.O. for the sight of the six correct factors and no extras (ignore 1s). F.T. their answer if at least one index form used with at least a square. Allow $(2^4)(3^2)$ or $2^4 . 3^2$. Inclusion of 1 as a factor is B0. F.T. 'their answer to (a)' if of equivalent difficulty. F.T. 'their answer to (a)' if of equivalent difficulty.
12.(a) $2n < 11$ $n < 11/2$ OR $n < 5{\cdot}5$ (b) 5	B1 B1 B1 3	Use of '=' is B0 unless restored for final answer. Implies 1st B1. F.T. their answer to (.a)
13. One correct evaluation $4 \leq x \leq 5$ 2 correct evaluations $4{\cdot}65 \leq x \leq 4{\cdot}85$, one < 0 one > 0. 2 correct evaluations $4{\cdot}75 \leq x \leq 4{\cdot}85$, one < 0 one > 0. $x = 4{\cdot}8$	 B1 B1 M1 A1 4	*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.* x $x^3 - 7x - 75$ 4 –39 4·1 –34·779 4·2 –30·312 4·3 –25·593 4·4 –20·616 4·5 –15·375 4·6 –9·864 4·65 –7·005... 4·7 –4·077 4·75 –1·078... 4·8 1·992 4·85 5·134... 4·9 8·349 5 15

GCSE Mathematics Unit 2: Intermediate Tier	Marks	Comments
14.(a) 0.35 0.8 0.2 0.8 on the correct branches	B2	B1 for any two correct entries. Accept fractions
(b) 0.65×0.2	M1	
$= 0.13$	A1	
	4	
15. Sight of (Perimeter of bed A=) $2x + 2y = 18$ AND	B1	
(Perimeter of bed B=) $4x + 2y + 6 = 34$ or equivalent		
Correct method to solve equations simultaneously.	M1	F.T. 'their equations' if of equivalent difficulty.
$x = 5$	A1	
$y = 4$	A1	Both values consistent with 'their equations'.
(Area of B =) 10×7	M1	F.T. 'their derived values for x and y'.
$= 70(m^2)$	A1	$2x \times (y + 3)$
Organisation and communication	OC1	
Accuracy of writing	W1	
	8	
16. $(x - 5)(x + 4)$	B2	B1 for $(x \ldots 5)(x \ldots 4)$.
$x = 5$ AND $x = -4$	B1	Strict F.T. from their brackets
	3	
17. (a) (0 , 2)	B1	
(b) 7 units	B1	
(c) $y = \frac{-x}{7} + 3$	B1	
	3	
18. (a) $AD = 16 \times \sin 56°$	M2	M1 for $\sin 56° = AD/16$
$= 13{\cdot}2(64...)$(cm) OR 13·3(cm)	A1	C.A.O. Allow 13 from correct work but penalise final answer –1 for premature approximation
(b) (EC =) 9·7(...)	B1	F.T. 23 – 'their AD'.
$\tan x = \frac{9{\cdot}7(...)}{15}$	M1	F.T. 'their EC'
$x = 32{\cdot}9...(°)$ or 33(°)	A1	
	6	

UNIT 2: CALCULATOR-ALLOWED, FOUNDATION TIER
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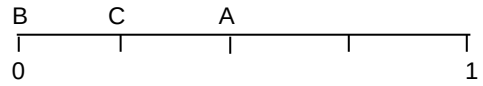
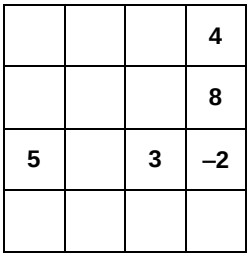
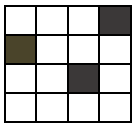
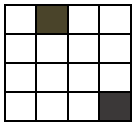
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

UNIT 2: CALCULATOR-ALLOWED, FOUNDATION TIER

GCSE Mathematics Unit 2: Foundation Tier	Marks	Comments
1. (Profit =) 84 × (£)5 – (£)120 = (£)300	M1 A1 2	For correct substitution.
2. (a) Diameter (b) Tangent (c) Trapezium	B1 B1 B1 3	
3. (a)  (b) $\frac{7}{8}$	 B3 B1 4	Accept names e.g. Wales (A), France (B), England (C) B1 for each. Accept C roughly between 1/8 and 3/8.
4.  	B3 3	For all five correct entries. B2 for three or four correct entries. B1 for two correct entries
5. (a) (i)  (ii)  (b) 2	B1 B1 B1 3	Only these three squares to be shaded. Only these two squares to be shaded. SC1 if reflections in <u>both</u> cases are correct but extra squares have been shaded.

GCSE Mathematics Unit 2: Foundation Tier	Marks	Comments
6.(a) Correct three-digit number shown. (i.e. sum of digits = 9) Correct answer for their three-digit number ÷ 9 (b) Dylan is 18 Lois is 6	B1 B1 B2 4	The numbers should have the digits 1, 3, 5 or 2, 3, 4. F.T. their three-digit number correct to the nearest whole number or 1 or more decimal places. e.g. sight of 412 ÷ 9 = 45·7 or 45·8 or 46 gains B0B1. SC1 for a correct evaluation if a three-digit multiple of 9 is used with a repeated digit. e.g. 441 ÷ 9 = 49 gains SC1. B1 for 'their Dylan' = 'their Lois' + 12. B1 for 'their Dylan' = 3 × 'their Lois'.
7.(a) (i) (x=) 3 (ii) (x=) 4 (b) 6 – 4 + 5 = 7 (c) (£)8n	B1 B1 M1 A1 B1 5	 Sight of 6, 4 and 5. C.A.O.
8.(a) (a =) 180 – 90 – 38 or equivalent. = 52$^{(o)}$ (b) (b =) 360 – 101 – 154 or equivalent. = 105$^{(o)}$	M1 A1 M1 A1 4	
9. $\frac{10}{0{\cdot}68}$ or equivalent. 14 (key rings) (Change =) (£)10 – 14 × (£)0·68 or equivalent = £0.48 or 48p Organisation and communication Accuracy of writing	M1 A1 M1 A1 OC1 W1 6	Allow M1 for repeated addition if aiming for £10 C.A.O. 14·7..... implies M1A0 F.T. 'their whole number of key-rings' Units must be given. Allow £0.48p
10. 360 – (46 + 117 + 34) = 163$^{(°)}$ (x =) 17$^{(°)}$	M1 A1 B1 3	 F.T. 180 – 'their 163'.
11.(a) –9 (b) 12 (c) $3(n-7)$	B1 B1 B1 3	
12. (Original mean =) 13 (New total =) 5 × 14 = 70 New number = 18	B1 M1 A1 B1 4	 F.T. 5 × 'their 13 + 1'. F.T. 'their <u>derived</u> new total' – 'their original total'.
13. 4 × 4 × 4 64 (cm³) 64 / (8×4) or 32h=64 2(cm)	M1 A1 M1 A1 4	*Alternative method:* *4 × 4 M1* *16 (cm²) A1* *16/8 M1* *2 (cm) A1*

GCSE Mathematics Unit 2: Foundation Tier	Marks	Comments
14. More girls in class B than in class A. Equal number of girls and boys in class B. Ratio of Girls : Boys = 3 : 1 in class A.	B1 B1 B1 3	
15. $x + 2x + 3x = 180$ $x = 30$ Three angles are 30(˚), 60(˚), 90(˚)	M1 A1 A1 3	*SC1 for the answers of 30*(˚), *60*(˚) *and 90*(˚) *without forming an equation* *SC1 for the answers of 60*(˚), *120*(˚) *and 180*(˚) *from equating to 360*
16.(a) All 13 numbers placed correctly and no extra. (b) $\frac{4}{13}$	B4 B2 6	B3 for 10,11 or 12 correct OR all correct but omission of numbers outside A∪B. B2 for 8 or 9 correct. B1 for 6 or 7 correct. *Any duplicates are marked as incorrect.* F.T. 'their diagram'. B1 for a numerator of 4 OR a denominator of 13 in a fraction less than 1.
17. 4·38	B2 2	B1 for 4·37(7.....)
18. Clockwise rotation of 90° about the origin.	B3 3	For all four components. B2 for any three, B1 for any two. (Penalise '¼ turn' –1 only.)

ASSESSMENT GRIDS

GCSE Mathematics

Unit 1: Higher tier

Qu.	Topic	Max mark	Assessment Objectives			Common (Interm)	OCW
			AO1	AO2	AO3		
1	Mutually exclusive and independent events	6	2	4		6 (Q10)	
2	Quadratic graph	7	4		3	7 (Q11)	
3	Construction of 30°, regular polygon and translation	7	7			7 (Q12)	
4	Money (Ratio and %)	4	4			4 (Q13)	
5	Number	3	3			3 (Q14)	
6	Relative frequency	4	1	1	2	4 (Q15)	
7	Standard form	4	4			4 (Q16)	
8	*n*th term	2			2	2 (Q17)	
9	Enlargement	3	3				
10	Inverse proportion	5	5				
11	Forming a quadratic and solving	9		6	3		*
12	Algebra	2	2				
13	Recurring decimal, surd and indices	7	7				
14	Transformation of functions	6	5		1		
15	Alternate segment	4			4		
16	Probability	7			7		
	Totals	**80**	**47**	**11**	**22**	**37**	

GCSE Mathematics

Unit 1: Intermediate Tier

Qu.	Topic	Max mark	Assessment Objectives AO1	AO2	AO3	Common (Found)	Common (Higher)	OCW
1	Calculations	6	6			6 (Q9)		
2	Sequences, simplifying and substitution.	6	6			4 (Q10)		
3	Geometry questions	3	3			3 (Q11)		
4	Ages	2			2			
5	Game	6		6		6 (Q12)		
6	Solving equations	6	6			6 (Q13)		
7	True or False	3			3	3 (Q14)		
8	Angles	5			5	3 (Q15)		*
9	Mean and Range	2			2	2 (Q16)		
10	Mutually exclusive and independent events	6	2	4			6 (Q1)	
11	Quadratic graph	7	4		3		7 (Q2)	
12	Construction of 30°, regular polygon and translation	7	7				7 (Q3)	
13	Money (Ratio and %)	4	4				4 (Q4)	
14	Number	3	3				3 (Q5)	
15	Relative frequency	4	1	1	2		4 (Q6)	
16	Standard form	4	4				4 (Q7)	
17	*n*th term	2			2		2 (Q8)	
18	Circle theorem	4			4			
	Totals	**80**	**46**	**11**	**23**	**33**	**37**	

GCSE Mathematics

Unit 1: Foundation Tier

			Assessment Objectives				
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Interm)**	**OCW**
1	Anglesey Show	6		6			*
2	Shapes	4	4				
3	Numbers	3	3				
4	Probability	4	2		2		
5	Coordinates	4	3		1		
6	Numbers	5			5		
7	Area	3	3				
8	Using algebra	3			3		
9	Calculations	6	6			6 (Q1)	
10	Sequences and simplifying	4	4			4 (Q2)	
11	Geometry questions	3	3			3 (Q3)	
12	Game	6		6		6 (Q5)	
13	Solving equations	6	6			6 (Q6)	
14	True or False	3			3	3 (Q7)	
15	Angles	3			3	3 (Q8)	
16	Mean and Range	2			2	2 (Q9)	
	Totals	**65**	**34**	**12**	**19**	**33**	

GCSE Mathematics

Unit 2: Higher Tier

			Assessment Objectives				
Qu	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Interm)**	**OCW**
1	Polygon angles	5			5	5 (Q10)	
2	Prime factors, HCF, LCM	5	5			5 (Q11)	
3	Inequalities	3	3			3 (Q12)	
4	Trial and improvement	4	4			4 (Q13)	
5	Probability tree	4		4		4 (Q14)	
6	Forming and solving simultaneous equation	6			6	6 (Q15)	
7	Factorising and solving	3	3			3 (Q16)	
8	Equation of a straight line	3	3			3 (Q17)	
9	Trigonometry (right-angled triangles)	8	3	5		6 (Q18)	*
10	Re-arrange formula and quadratic formula	5	5				
11	Proof of congruency	4			4		
12	Sector of a circle	3			3		
13	Algebraic fractions	7	7				
14	Venn diagram	4	2		2		
15	Angles and curves	3	3				
16	Sketch of trigonometric graph	2	2				
17	Cosine rule and area rule	6		6			
18	Sampling probability	5	1		4		
	Totals	**80**	**41**	**15**	**24**	**39**	

GCSE Mathematics

Unit 2: Intermediate Tier

Qu.	Topic	Max mark	Assessment Objectives			Common (Found)	Common (Higher)	OCW
			AO1	AO2	AO3			
1	Angles in a quadrilateral	3	3			3 (Q10)		
2	Number machine	3	3			3 (Q11)		
3	Understanding mean	4			4	4 (Q12)		
4	Volume problem	4			4	4 (Q13)		
5	Pie charts	7	4		3	3 (Q14)		
6	Triangle equation	3		3		3 (Q15)		
7	Venn diagram	6	4	2		6 (Q16)		
8	Decimal places + significant figures	4	4			2 (Q17)		
9	Transformations	5	2		3	3 (Q18)		
10	Polygon angles	5			5		5 (Q1)	
11	Prime factors, HCF, LCM	5	5				5 (Q2)	
12	Inequalities	3	3				3 (Q3)	
13	Trial and improvement	4	4				4 (Q4)	
14	Probability tree	4		4			4 (Q5)	
15	Forming and solving simultaneous equation	8			8		6 (Q6)	*
16	Factorising and solving	3	3				3 (Q7)	
17	Equation of a straight line	3	3				3 (Q8)	
18	Trigonometry (right-angled triangles)	6	3	3			6 (Q9)	
	Totals	**80**	**41**	**12**	**27**	**31**	**39**	

GCSE Mathematics

Unit 2: Foundation Tier

			Assessment Objectives				
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Interm)**	**OCW**
1	Formula in words	2	2				
2	Shapes	3	3				
3	Probability	4	4				
4	Number grid	3			3		
5	Symmetry	3	3				
6	Multiples and age problem	4			4		
7	Solving, evaluating and expressions	5	5				
8	Angles	4	4				
9	Key rings	6		6			*
10	Angles in a quadrilateral	3	3			3 (Q1)	
11	Number machine	3	3			3 (Q2)	
12	Understanding mean	4			4	4 (Q3)	
13	Volume problem	4			4	4 (Q4)	
14	Pie charts	3			3	3 (Q5b)	
15	Triangle equation	3		3		3 (Q6)	
16	Venn diagram	6	4	2		6 (Q7)	
17	Decimal places	2	2			2 (Q8a)	
18	Transformations	3			3	3 (Q9b)	
	Totals	**65**	**33**	**11**	**21**	**31**	