Specimen Assessment Materials 2 GCSE Mathematics 2017

Question papers

Unit 1: Non-calculator, Foundation tier
Unit 1: Non-calculator, Intermediate tier
Unit 1: Non-calculator, Higher tier
Unit 2: Calculator-allowed, Foundation tier
Unit 2: Calculator-allowed, Intermediate tier
Unit 2: Calculator-allowed, Higher tier

Mark schemes

Unit 1: Non-calculator, Foundation tier
Unit 1: Non-calculator, Intermediate tier
Unit 1: Non-calculator, Higher tier
Unit 2: Calculator-allowed, Foundation tier
Unit 2: Calculator-allowed, Intermediate tier
Unit 2: Calculator-allowed, Higher tier

Assessment grids

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
FOUNDATION TIER

2nd 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.

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

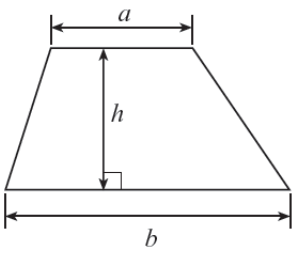
Scale drawing solutions will not be acceptable where you are asked to calculate.

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 **8.**

Formula list

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



1. *(a)* Write the number 6 342 000 in words. [1]

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(b) Write the number fifty–three thousand and six in figures. [1]

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(c) What is the sum of 647 and 285? [1]

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(d) Write down the multiple of 8 which lies between 50 and 60. [1]

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(e) Write down all the factors of 21. [2]

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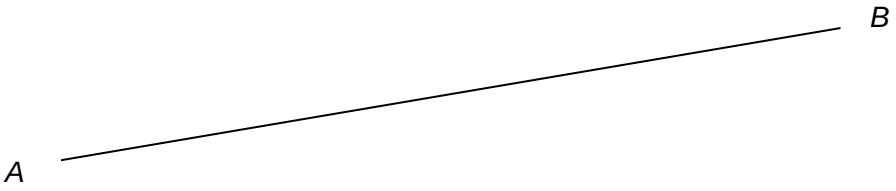
2. *(a)* Measure and write down the length of the line *AB*.
Clearly state the units you are using. [2]



Length of *AB* = ……

(b) In the space below, draw a circle with diameter 8 cm. [1]

3. Using each of the numbers 6, 7, 8 and 9 once only, fill in the blanks to make each statement correct. [2]

(a) $\square \times \square - 5 = 43$

(b) $36 \div \square + \square = 11$

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4. *(a)* Jonny travelled from Holyhead to Swansea.
Circle the answer which shows the best metric unit to measure the distance he has travelled. [1]

centimetre mile metre kilometre millimetre

(b) Rosie wanted to cook leek soup for St David's Day.
She needed to buy 3 kg of leeks for her recipe.
Circle the answer which gives the best approximation in pounds (lbs) for that weight of leeks. [1]

6 lb 3.3 lb $\frac{1}{3}$ lb 30 lb 6.6 lb

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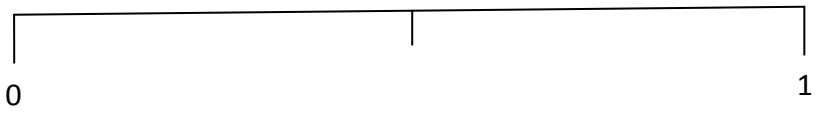
5. Ifan has a bag with red and green balls in it.
There are 40 red balls and 60 green balls.
Ifan chooses one ball at random from his bag.

On the probability scale below, mark the points A and B where:

A is the probability that Ifan chooses a green ball,

B is the probability that Ifan chooses a yellow ball. [2]



6. Lucy recorded the number of times some football teams in the Welsh Alliance League won a match during a season. The teams were Bethesda Athletic (B), Caernarfon Town (C), Llanberis (L) and Nefyn United (N).

The data she collected is shown below.

B B N C C C L C N L B C C C C L B B C N N C B

(a) Complete the following table using the above data. [2]

Football team	Tally	Frequency
Bethesda Athletic (B)	𝍸 I	
Caernarfon Town (C)		
Llanberis (L)		
Nefyn United (N)		

(b) Draw a suitable graph to show this data on the grid below. [3]

7. *(a)* Work out 3% of £800. [2]

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(b) Work out $\frac{2}{5}$ of 450. [2]

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(c) Simplify 16*h* − *18h* + 9*h*. [1]

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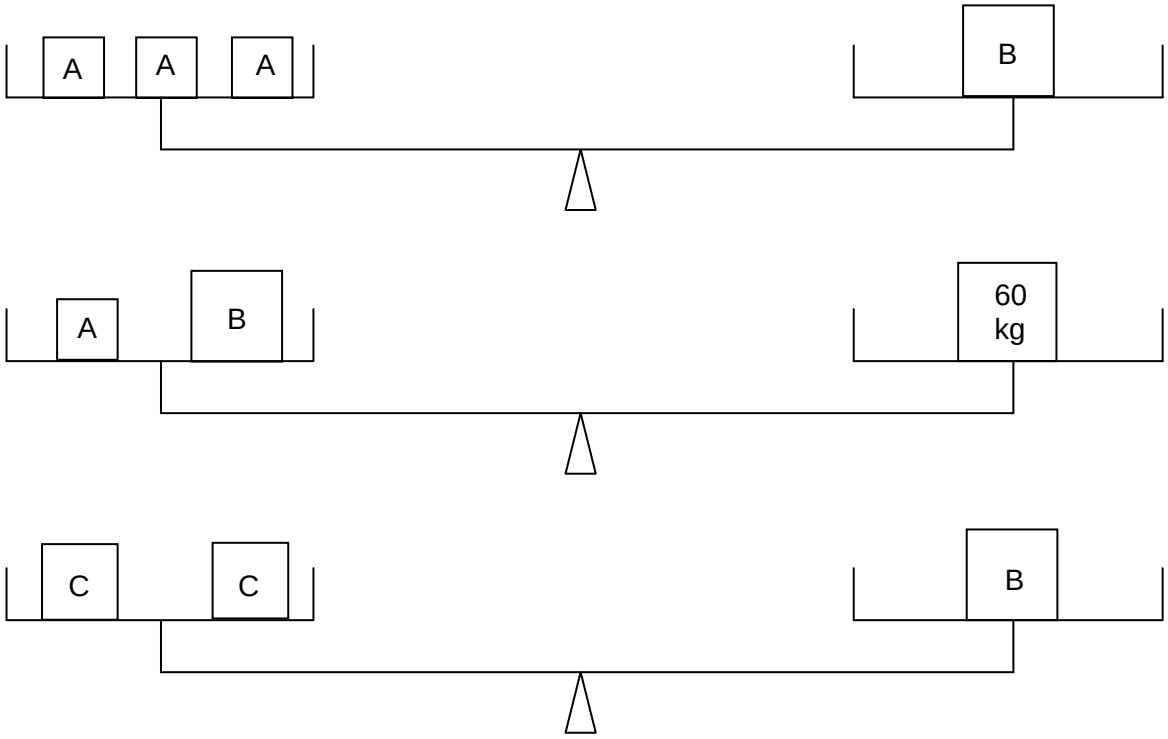
8. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

Hussein has a set of scales.
He has some weights which are labelled A, B and C.
Hussein places different weights on his scales three times so that they balance each time.
Find the values of A, B and C.

[5 + OCW 2]



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A = ……kg B = ……kg C = ……kg

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

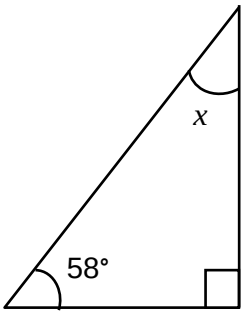

Diagram not drawn to scale

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x = ...°

(b) ABC is an isosceles triangle with $AB = AC$ and $B\hat{A}C = 34°$.
BCD is a straight line.
Find the size of $A\hat{C}D$.

[3]

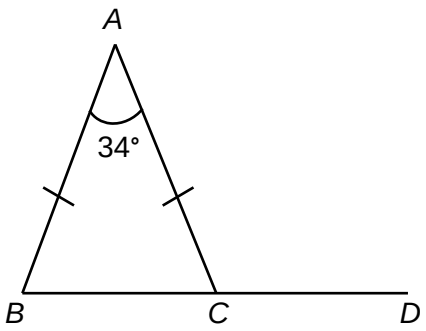

Diagram not drawn to scale

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$A\hat{C}D$ = ...°

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

(a) 0·2 is equivalent to

2% 20% 0·2% $\frac{1}{5}$% $\frac{2}{10}$%

[1]

(b) 5·4 – 2·16 is equal to

2·24 3·24 3·34 3·36 7·56

[1]

(c) $\frac{5}{6} - \frac{1}{3}$ is equal to

$\frac{51}{63}$ $\frac{4}{3}$ $\frac{1}{2}$ $\frac{4}{6}$ 0·43

[1]

11. Sian states,

'When a fair coin is tossed and a fair dice is thrown,
the probability of getting a head and an even number is $\frac{1}{2}$.'

Is Sian correct?
You must show enough working to justify your answer.

[4]

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12. *(a)* A rectangle, *R*, has sides of 5 m and 3 m.

Draw a sketch of a different rectangle that has the same perimeter as rectangle *R*.
Write down the length of each of the four sides of your rectangle.

[2]

(b) Both the length and width of rectangle *R* are exactly doubled.
Does this mean that the area is also exactly doubled?
You must show enough working to justify your answer.

[2]

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13. Solve each of the following equations.

(a) $\frac{x}{4} = 8$ [1]

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(b) $\frac{7}{x} = 14$ [1]

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(c) $9x + 4 = 2x + 39$ [3]

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14. *(a)* The median value of three numbers is 6.
The three numbers are x, 6 and y, in ascending order.
Both the range and the mean of these three numbers are also 6.

Find the value of x and the value of y. [2]

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x = …… y =……

(b) (i) Find the mode of the following set of numbers, and show that the range, median and mean of the numbers are all the same as the mode.

7 11 6 4 7 [3]

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Range ……

Mode ……

Median ……..

Mean ……

(ii) Each of the five numbers is increased by 1.
Circle either TRUE or FALSE for each of the following statements.

[2]

The range is increased by 1.	TRUE	FALSE
The mode is increased by 1.	TRUE	FALSE
The median is increased by 1.	TRUE	FALSE
The mean is increased by 1.	TRUE	FALSE

15. A right-angled triangle *ADE* is attached to a trapezium *ABCD* as shown below.

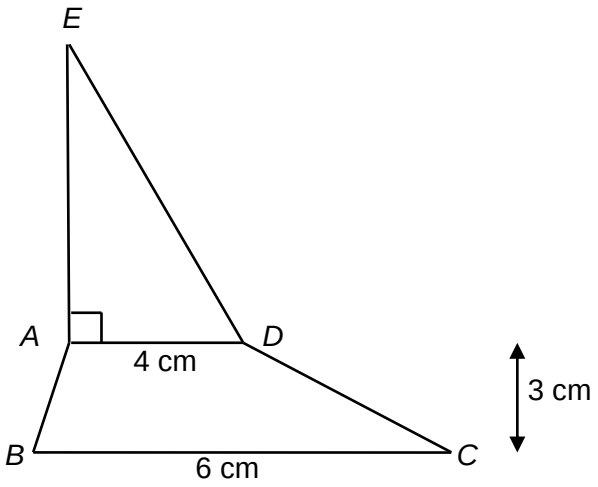

Diagram not drawn to scale

AD = 4 cm, *BC* = 6 cm, and the perpendicular height of the trapezium is 3 cm.
The triangle and the trapezium have equal area.

Calculate the length of *AE*. [5]

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END OF PAPER

Candidate Name	Centre Number					Candidate Number				
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GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
INTERMEDIATE TIER

2nd 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
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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.

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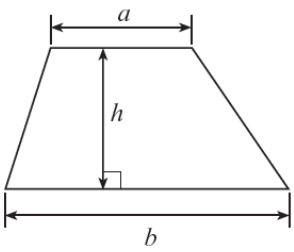
2.	**3**	
3.	**4**	
4.	**4**	
5.	**4**	
6.	**5**	
7.	**7**	
8.	**7**	
9.	**6**	
10.	**7**	
11.	**3**	
12.	**6**	
13.	**3**	
14.	**4**	
15.	**6**	
16.	**6**	
TOTAL	**80**	

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

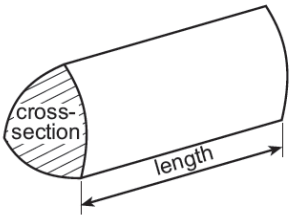
The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **8**.

Formula list

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



Volume of a prism = area of cross section × length



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

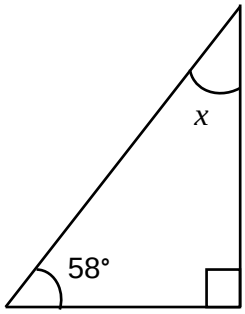


Diagram not drawn to scale

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x = ...°

(b) ABC is an isosceles triangle with $AB = AC$ and $B\hat{A}C = 34°$.
BCD is a straight line.
Find the size of $A\hat{C}D$.

[3]

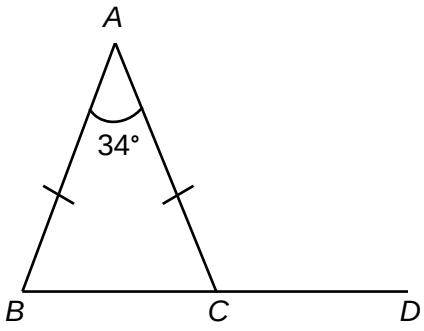

Diagram not drawn to scale

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$A\hat{C}D$ = ...°

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

(a) 0·2 is equivalent to

2% 20% 0·2% $\frac{1}{5}$% $\frac{2}{10}$%

[1]

(b) 5·4 – 2·16 is equal to

2·24 3·24 3·34 3·36 7·56

[1]

(c) $\frac{5}{6} - \frac{1}{3}$ is equal to

$\frac{51}{63}$ $\frac{4}{3}$ $\frac{1}{2}$ $\frac{4}{6}$ 0·43

[1]

3. Sian states,

'When a fair coin is tossed and a fair dice is thrown,
the probability of getting a head and an even number is $\frac{1}{2}$.'

Is Sian correct?
You must show enough working to justify your answer.

[4]

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4. *(a)* A rectangle, *R*, has sides of 5 m and 3 m.

Draw a sketch of a different rectangle that has the same perimeter as rectangle *R*.
Write down the length of each of the four sides of your rectangle.

[2]

(b) Both the length and width of rectangle *R* are exactly doubled.
Does this mean that the area is also doubled?
You must show enough working to justify your answer.

[2]

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5. Calculate 20 % of $\frac{1}{4}$ of 120.

[4]

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6. Solve each of the following equations.

(a) $\frac{x}{4} = 8$ [1]

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(b) $\frac{7}{x} = 14$

[1]

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(c) $9x + 4 = 2x + 39$ [3]

……

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7. *(a)* The median value of three numbers is 6.
The three numbers are x, 6 and y, in ascending order.
Both the range and the mean of these three numbers are also 6.

Find the value of x and the value of y. [2]

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x = …… y =……

(b) (i) Find the mode of the following set of numbers, and show that the range, median and mean of the numbers are all the same as the mode.

7 11 6 4 7 [3]

……

……

……

Range ……

Mode ……

Median ……..

Mean ……

(ii) Each of the five numbers is increased by 1.
Circle either TRUE or FALSE for each of the following statements.

[2]

The range is increased by 1.	TRUE	FALSE
The mode is increased by 1.	TRUE	FALSE
The median is increased by 1.	TRUE	FALSE
The mean is increased by 1.	TRUE	FALSE

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

A right-angled triangle *ADE* is attached to a trapezium *ABCD* as shown below.

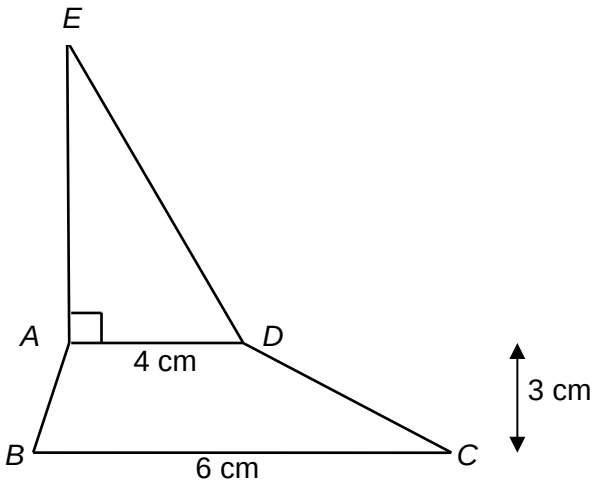

Diagram not drawn to scale

AD = 4 cm, *BC* = 6 cm, and the perpendicular height of the trapezium is 3 cm.
The triangle and the trapezium have equal area.

Calculate the length of *AE*.

[5 + OCW 2]

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9. At lunchtime on any given day, Alun has one of the following drinks:
coffee, tea, mineral water or fruit juice.
His choice of drink each day is independent of his choice of drink on any other day.
The table below shows the probabilities for three of his choices of drink on any randomly chosen day.

Drink	Coffee	Tea	Mineral Water	Fruit Juice
Probability	0·5	0·18	0·27	

(a) Calculate the probability that, on any randomly chosen day, Alun has a fruit juice at lunchtime.

[2]

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(b) What is the probability that, on any randomly chosen day, he has either tea or mineral water at lunchtime?

[2]

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(c) What is the probability that, in any randomly chosen week, Alun has coffee on the Tuesday and has tea on the Friday?

[2]

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10. *(a)* The table below shows some of the values of $y = 3x^2 - 4x - 10$ for values of x from -2 to 3.

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

[1]

x	-2	-1	0	1	2	3
$y = 3x^2 - 4x - 10$	10	-3	-10	-11		5

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(b) On the graph paper opposite, draw the graph of $y = 3x^2 - 4x - 10$ for values of x from -2 to 3.

[2]

(c) Using your graph, write down the values of x when $y = 0$.
Give your answers correct to 1 decimal place.

[1]

Values are ..... and .....

(d) Give the coordinates of the point on your curve at which the y-values stop decreasing and begin to increase.
Write each coordinate correct to 1 decimal place.

[2]

x = ……. y = ……..

(e) If you needed to draw the graph of $y = 3x^2 - 4x - 10$ for values of x from -3 to 4 using the same size of graph paper, what would you need to alter on the graph?

[1]

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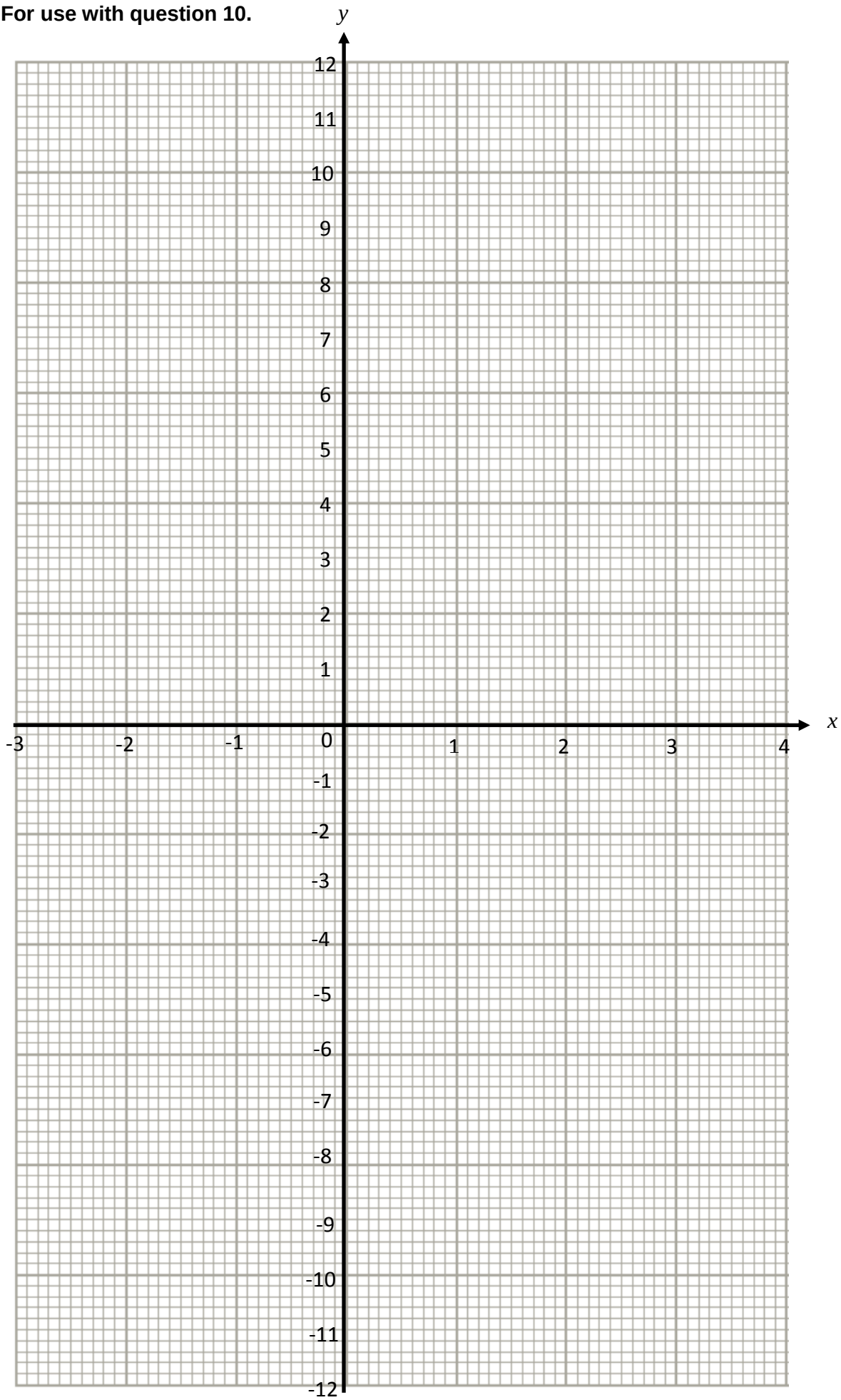
For use with question 10.



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

(a)

$a^2 + b^2$ is always an even number when a and b are whole numbers.

[1]

true / false

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(b)

$a^2 b^2$ is always an odd number when a and b are odd numbers.

[2]

true / false

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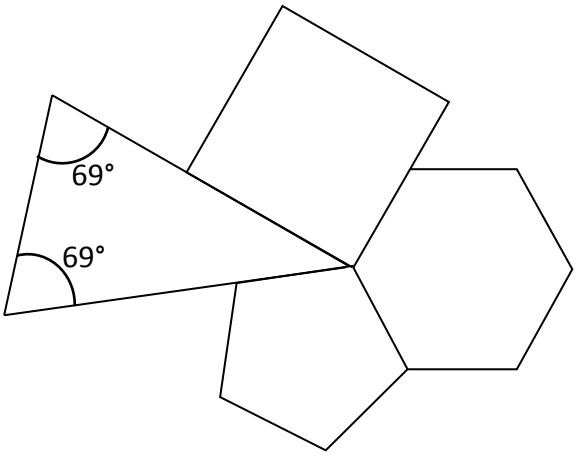
12. Prove that it is possible for a square, a regular pentagon, a regular hexagon and an isosceles triangle with two equal angles of 69° to meet at a point as shown below.

[6]



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

(a) The gradient of the line $2y = 4x + 3$ is

$\frac{1}{2}$ $\frac{3}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ 2

[1]

(b) The line $3y = 5x - 6$ crosses the y-axis *at*

$y = -2$ $y = -\frac{1}{2}$ $y = 2$ $y = \frac{5}{3}$ $y = \frac{1}{2}$

[1]

(c) The line $y = 3x - 2$ has a point with coordinates

(3 , –2) (0 , 2) (-3 , 2) (2 , 3) (3 , 7)

[1]

14. Find, in standard form, the value of

(a) $\frac{2 \cdot 7 \times 10^{10}}{6000}$,

[2]

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(b) $(4{\cdot}5 \times 10^{-2}) \times (3 \times 10^{-3})$.

[2]

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15. For a particular visitor to Gwynedd, taking a trip up Snowdon is independent of visiting Caernarfon Castle.
The probability that the visitor takes a trip up Snowdon **and** visits Caernarfon Castle is 0·12.

(a) Complete the following tree diagram.

[4]

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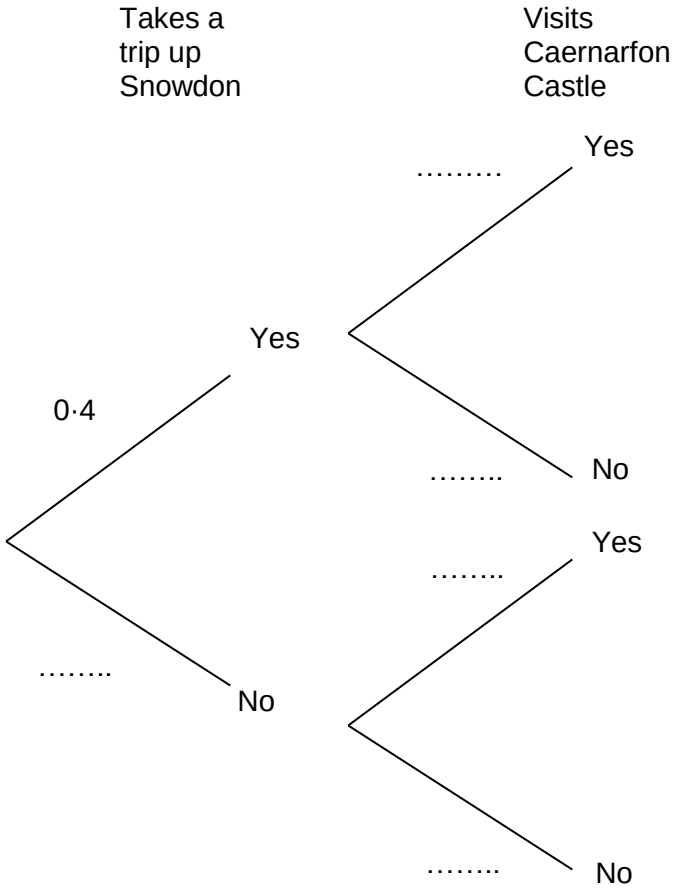

(b) Calculate the probability that the visitor does not go up Snowdon and does not visit Caernarfon Castle.

[2]

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16. *(a)* Solve the equation $\frac{8-x}{3} = 5-x$.

[3]

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(b) Factorise $6a^2 - 8ab$.

[2]

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(c) Simplify $\frac{(3x-4)^6}{(3x-4)^3}$.

[1]

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END OF PAPER

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
HIGHER TIER

2nd SPECIMEN PAPER SUMMER 2017

1 HOUR 45 MINUTES

ADDITIONAL MATERIALS
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Take π as 3·14.

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8.	**6**	
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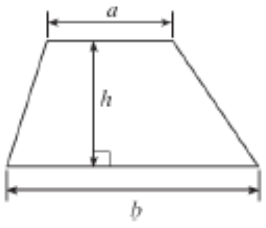
10.	**4**	
11.	**4**	
12.	**2**	
13.	**7**	
14.	**3**	
15.	**5**	
16.	**6**	
17.	**3**	
TOTAL	**80**	

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

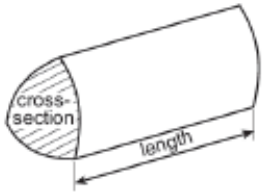
The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **4**.

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 = $\frac{1}{3}\pi r^2 h$

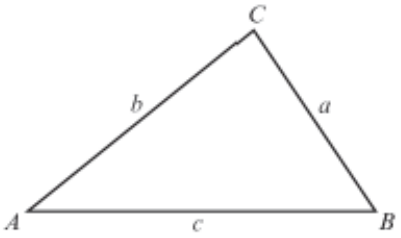
Curved surface area of a cone = $\pi r l$

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. At lunchtime on any given day, Alun has one of the following drinks:
coffee, tea, mineral water or fruit juice.
His choice of drink each day is independent of his choice of drink on any other day.
The table below shows the probabilities for three of his choices of drink on any randomly chosen day.

Drink	Coffee	Tea	Mineral Water	Fruit Juice
Probability	0·5	0·18	0·27	

(a) Calculate the probability that, on any randomly chosen day, Alun has a fruit juice at lunchtime.

[2]

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(b) What is the probability that, on any randomly chosen day, he has either tea or mineral water at lunchtime?

[2]

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(c) What is the probability that, in any randomly chosen week, Alun has coffee on the Tuesday and has tea on the Friday?

[2]

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2. *(a)* The table below shows some of the values of $y = 3x^2 - 4x - 10$ for values of x from -2 to 3.

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

[1]

x	-2	-1	0	1	2	3
$y = 3x^2 - 4x - 10$	10	-3	-10	-11		5

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(b) On the graph paper opposite, draw the graph of $y = 3x^2 - 4x - 10$ for values of x from -2 to 3.

[2]

(c) Using your graph, write down the values of x when $y = 0$.
Give your answers correct to 1 decimal place.

[1]

Values are ..... and .....

(d) Give the coordinates of the point on your curve at which the y-values stop decreasing and begin to increase.
Write each coordinate correct to 1 decimal place.

[2]

x = ……. y = ……..

(e) If you needed to draw the graph of $y = 3x^2 - 4x - 10$ for values of x from -3 to 4 using the same size of graph paper, what would you need to alter on the graph?

[1]

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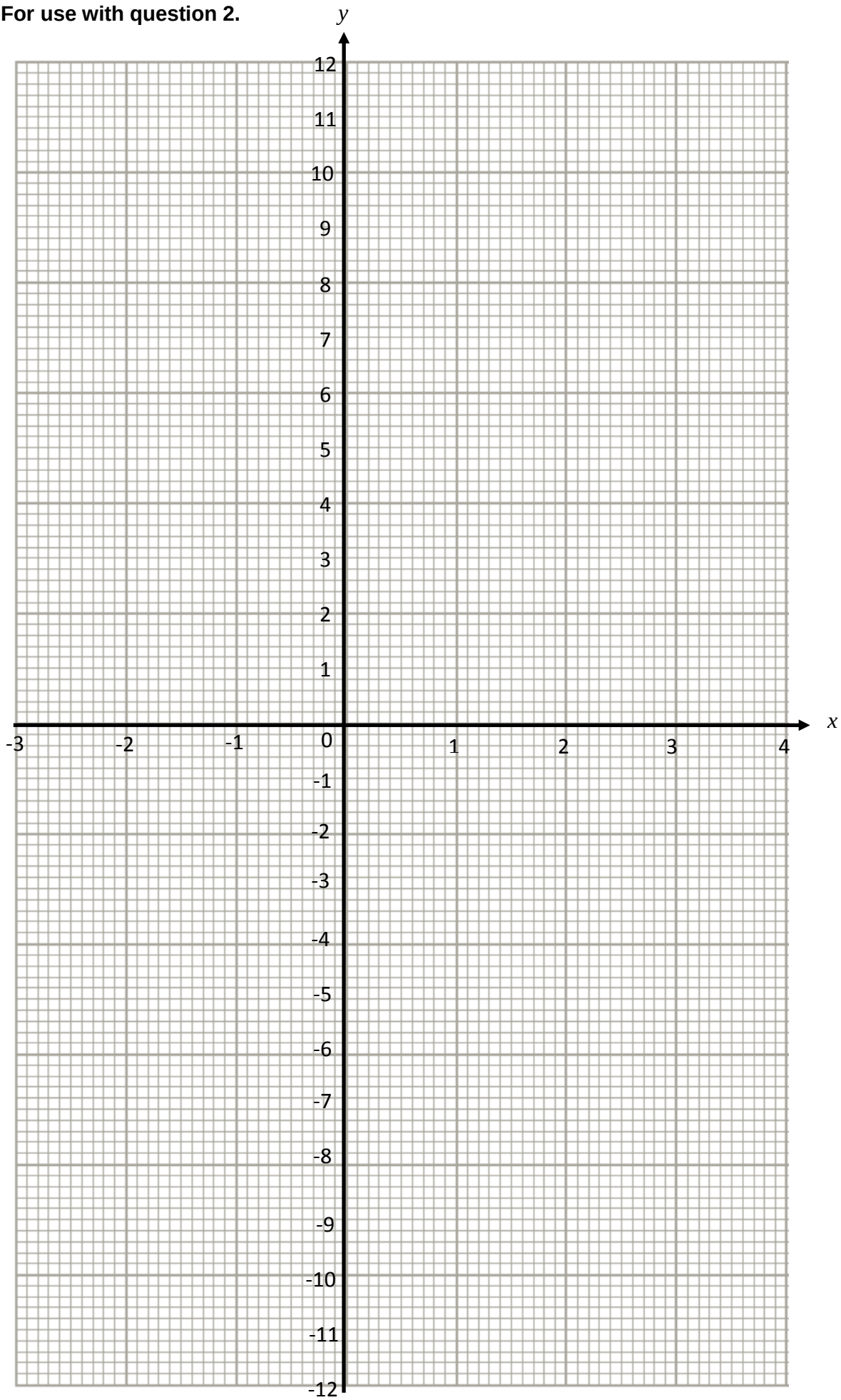
For use with question 2.



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

(a)

$a^2 + b^2$ is always an even number when a and b are whole numbers.

[1]

true / false

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(b)

$a^2 b^2$ is always an odd number when a and b are odd numbers.

[2]

true / false

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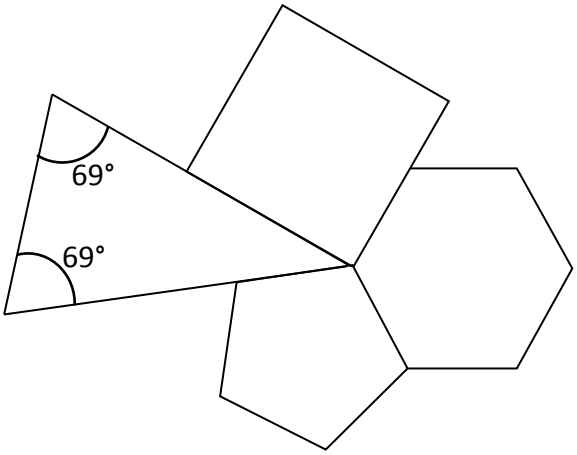
4. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

Prove that it is possible for a square, a regular pentagon, a regular hexagon and an isosceles triangle with two equal angles of 69° to meet at a point as shown below.

[6 + OCW 2]



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

(a) The gradient of the line $2y = 4x + 3$ is

$\frac{1}{2}$ $\frac{3}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ 2

[1]

(b) The line $3y = 5x - 6$ crosses the y-axis *at*

$y = -2$ $y = -\frac{1}{2}$ $y = 2$ $y = \frac{5}{3}$ $y = \frac{1}{2}$

[1]

(c) The line $y = 3x - 2$ has a point with coordinates

(3 , –2) (0 , 2) (-3 , 2) (2 , 3) (3 , 7)

[1]

6. Find, in standard form, the value of

(a) $\frac{2 \cdot 7 \times 10^{10}}{6000}$,

[2]

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(b) $(4{\cdot}5 \times 10^{-2}) \times (3 \times 10^{-3})$.

[2]

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7. For a particular visitor to Gwynedd, taking a trip up Snowdon is independent of visiting Caernarfon Castle.
The probability that the visitor takes a trip up Snowdon **and** visits Caernarfon Castle is 0·12.

(a) Complete the following tree diagram.

[4]

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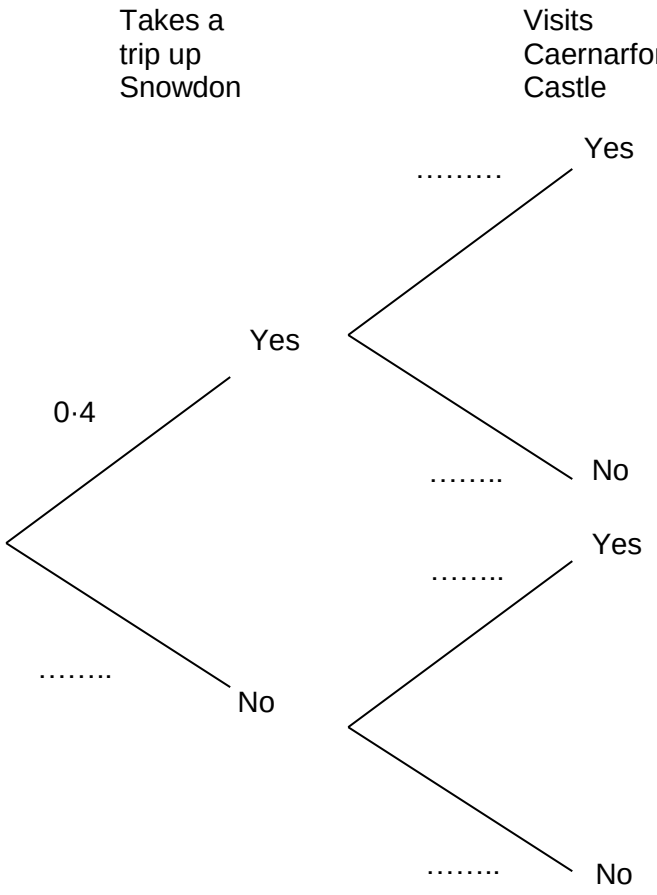

(b) Calculate the probability that the visitor does not go up Snowdon and does not visit Caernarfon Castle.

[2]

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8. *(a)* Solve the equation $\frac{8-x}{3} = 5-x$.

[3]

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(b) Factorise $6a^2 - 8ab$.

[2]

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(c) Simplify $\frac{(3x-4)^6}{(3x-4)^3}$.

[1]

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9. On the graph paper below, draw the region that satisfies **all** of the following inequalities.

$$x \geq -1$$

$$x + 2y \leq 8$$

$$y \geq 2x + 1$$

Make sure that you clearly indicate the region that represents your answer.

[3]

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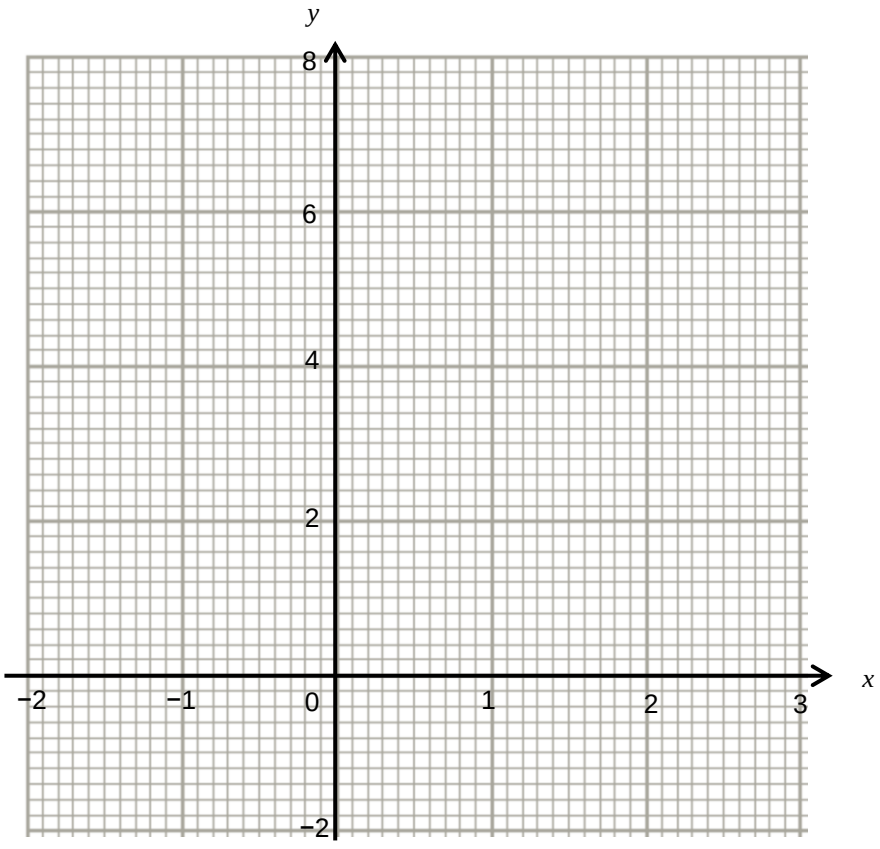

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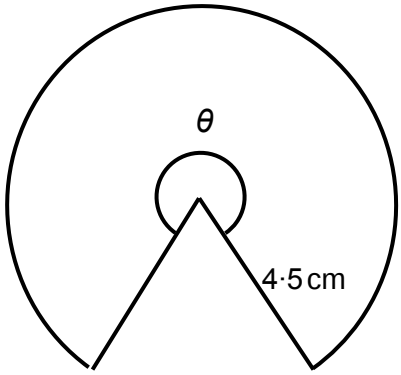

Diagram not drawn to scale

The diagram shows a sector of a circle of radius 4·5 cm. The perimeter of the sector is 34 cm.
Write an expression for angle θ, in terms of π.
Give your answer, in degrees, in its simplest form.

[4]

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11. A metal bar can be melted down to form 875 solid ornaments of height 6·3 cm.
How many similar ornaments of height 31·5 cm could have been formed from the same metal bar?

[4]

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12.
(a) Which one of the following numbers is rational? Circle your answer.

[1]

π $\sqrt{2}$ $\sqrt[3]{16}$ $\sqrt[3]{\frac{125}{8}}$ $\sqrt[4]{20}$

(b) Which one of the following numbers is irrational? Circle your answer.

[1]

$\left(\frac{3}{8}\right)^2$ $\sqrt{144}$ $\sqrt[3]{64}$ $0 \cdot \dot{7}912\dot{5}$ π^2

13. A breakfast cereal manufacturer decides to weigh samples of its products.

(a) The table below shows the weight of its samples of "Corn Chip" cereal.

Weight, x grams	Frequency	Frequency density
$480 < x \leq 490$	6	
$490 < x \leq 495$	22	
$495 < x \leq 497{\cdot}5$	15	
$497{\cdot}5 < x \leq 500$	17	
$500 < x \leq 510$	15	

Complete the frequency density column in the table and draw a histogram of this data.

[3]

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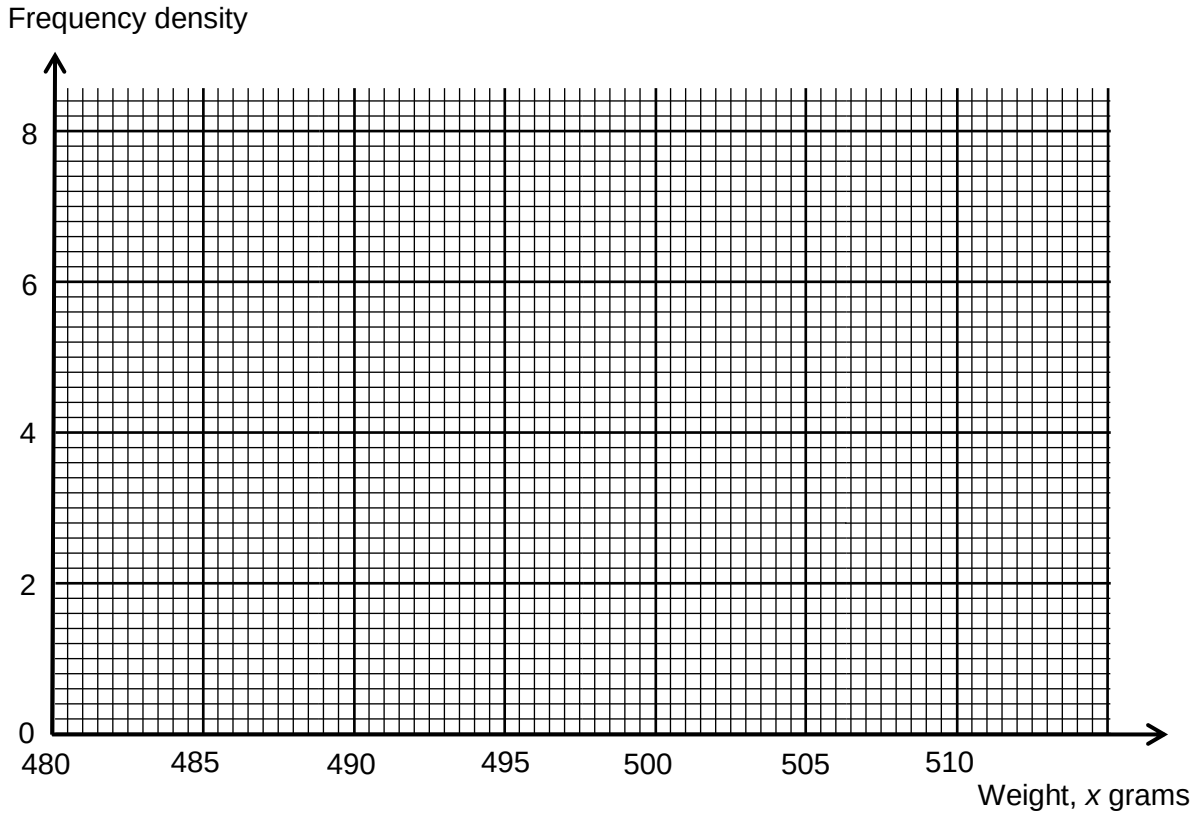
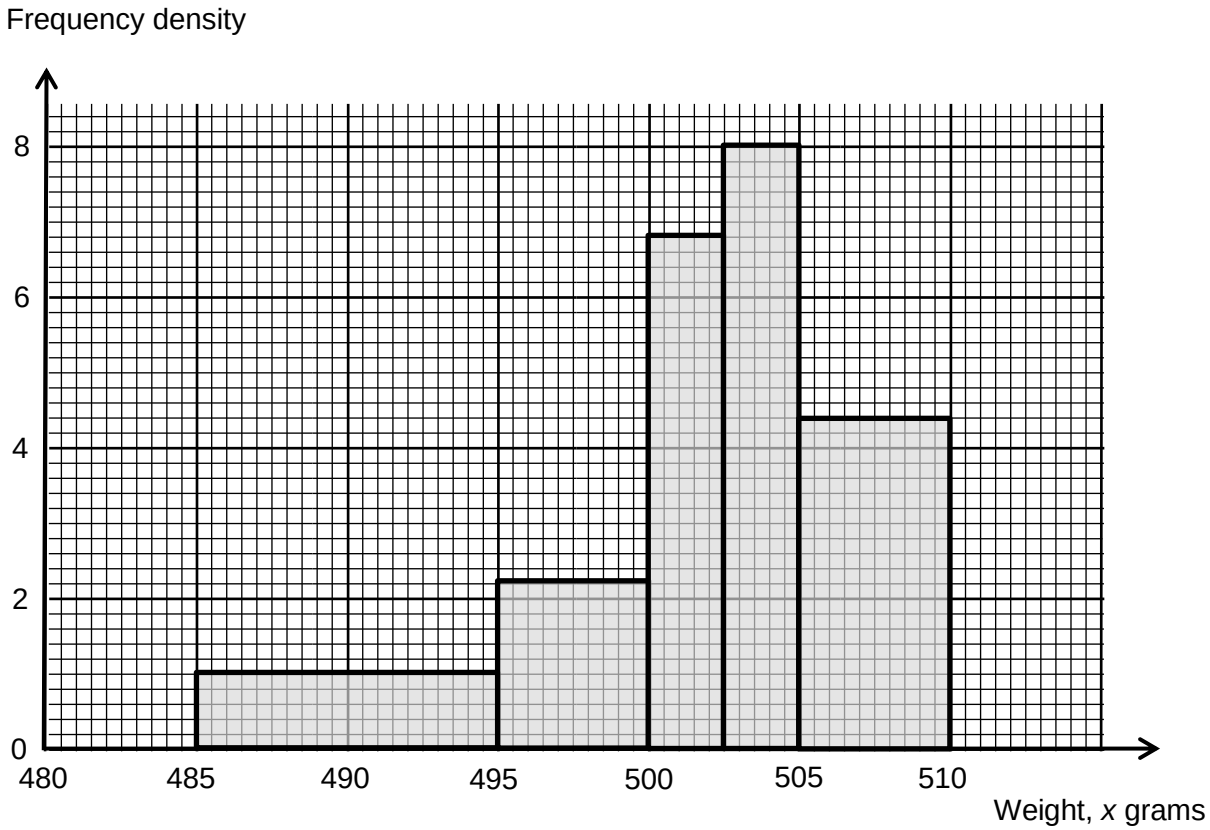


(b) The histogram for the samples of “Oat Crunch” is shown below.



Use the histogram to estimate the median weight of the “Oat Crunch” samples.

[4]

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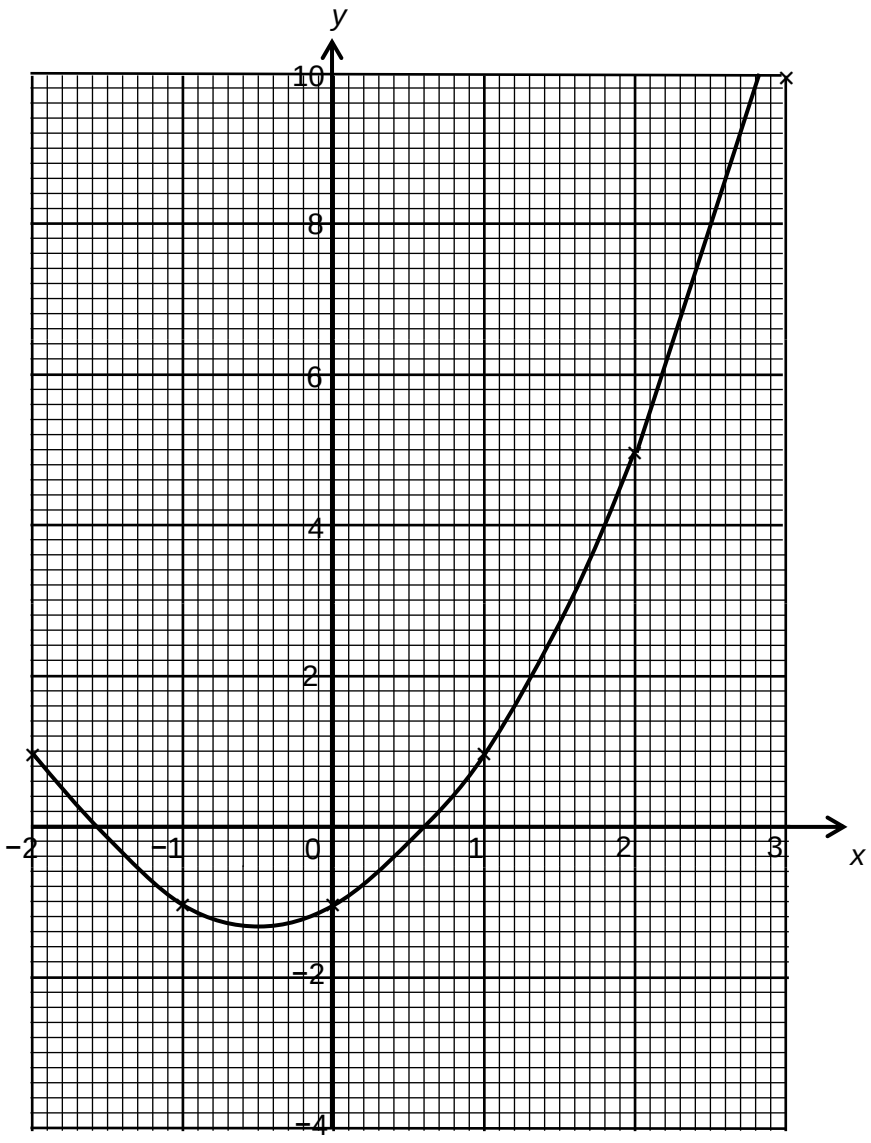
14. The graph of $y = x^2 + x - 1$ is shown below for values of x from −2 to 3.



By drawing an appropriate straight line, use the graph to solve the equation $x^2 + 0 \cdot 5x - 2 = 0$.

[3]

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15. Simplify $\frac{2x^2 + 13x + 21}{4x^2 - 49}$.

[5]

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16. In a box of chocolates, there are 10 milk chocolates, 6 dark chocolates and 4 white chocolates.
Two chocolates are chosen at random from the box, without replacement.

(a) Calculate the probability that the chocolates chosen are both white chocolates.

[2]

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(b) Calculate the probability that the chocolates chosen are of different types.

[4]

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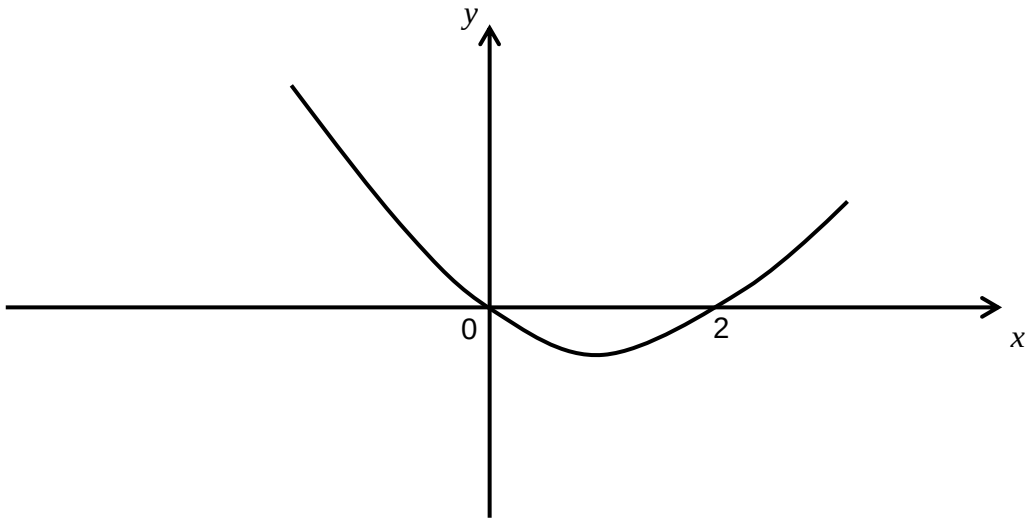
17. The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curves $y = f(x + 3)$ and $y = -f(x + 3)$.
Clearly label each curve with its function, and indicate the coordinate of any point where a curve crosses an axis.

[3]



END OF PAPER

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
FOUNDATION TIER

2nd 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.

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

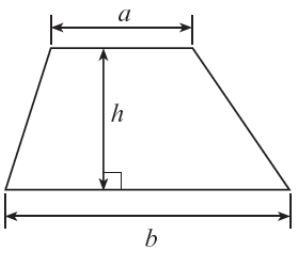
The number of marks is given in brackets at the end of each question or part-question.

The assessment will take into account the quality of your linguistic and mathematical organisation and communication in question **5*(c).***

The assessment will take into account the accuracy of your writing (linguistic and mathematical) in question **14.**

Formula list

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



1. Aneurin and Branwen arranged a party after winning their event at the Urdd.
Complete the four entries in the following table to show part of their bill for the food they bought.

Amount	Item	Cost
4 bags	Nuts @ £1.35 a bag	£5.40
7	Pizzas @ £1.75 per pizza	……
3	Chocolate cakes @ £ ……. per cake	£7.47
…… cartons	Orange juice @ 99p per carton	£8.91
Total		……

[4]

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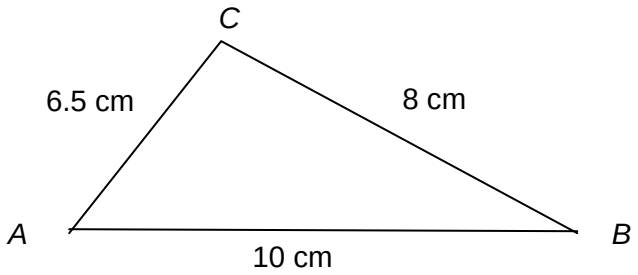
2. Use a ruler and a pair of compasses to make an accurate drawing of this triangle.

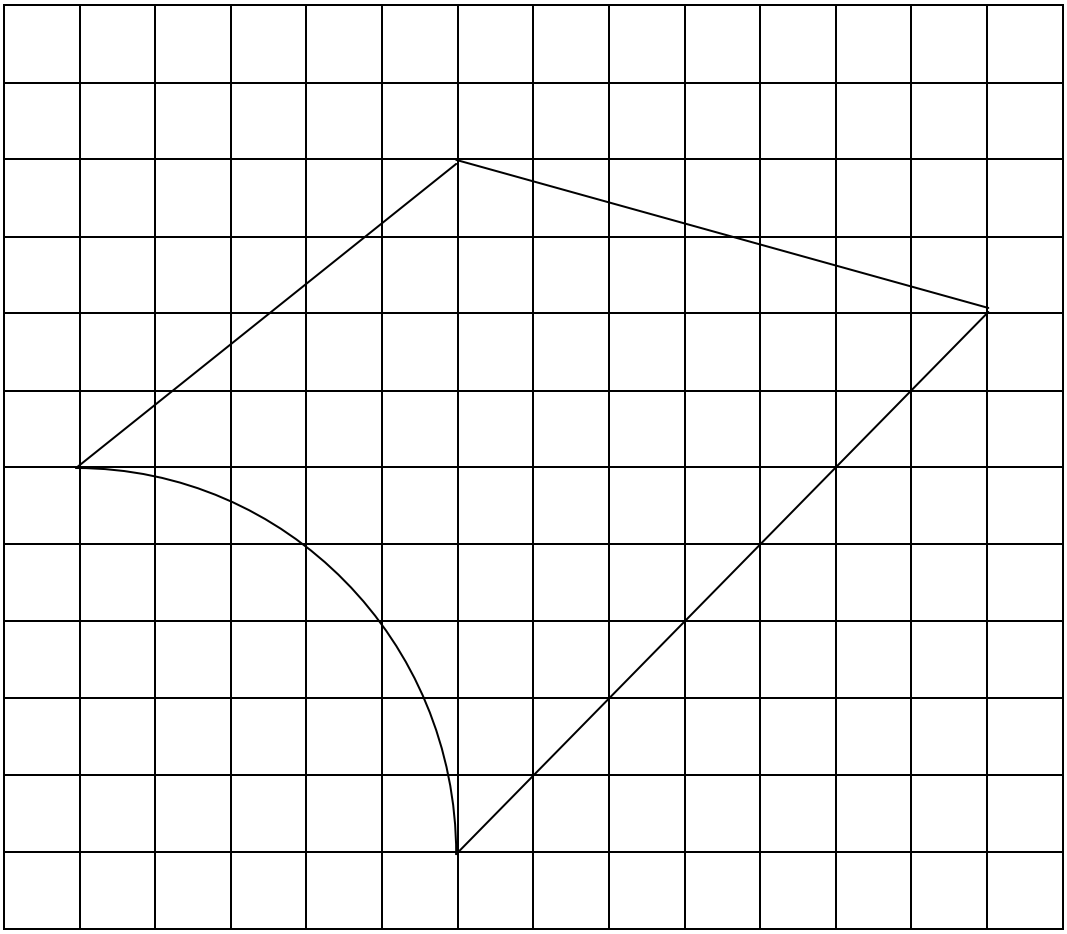


[3]

The line *AB* has been drawn for you.

A _____ *B*

3.



Estimate the area of the shape drawn above on a square grid if the area of each square is 1 cm ^{2}.

[2]

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Area of the shape = …….. cm ^{2}

4. *(a)* Circle the correct word to describe the chance of each of the following events happening.

(i) Mai has a box containing 100 different cards.
Each card has one number written on it from 1 to 100.
Mai chooses a card at random from the box.
The chance that the number on the chosen card is a 2-digit number is

[1]

impossible **unlikely** **even chance** **likely** **certain**

(ii) Dafydd chooses a card at random from a box containing 50 cards.
There are 16 yellow cards in the box.
The chance that the chosen card is yellow is

[1]

. **impossible** **unlikely** **even chance** **likely** **certain**

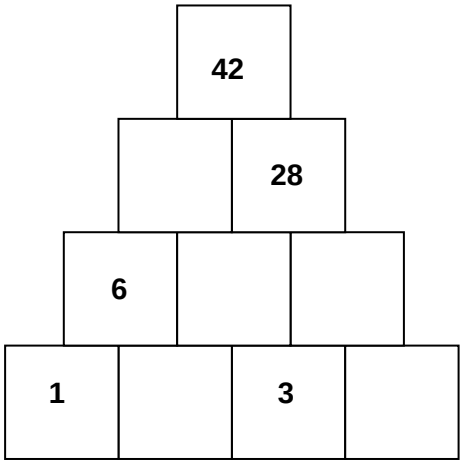
(b) Write down the mode of these numbers.

4 5 4 7 8 4 5 9 3 [1]

……

5. *(a)* Glyn has made a tower of bricks as shown below.
Each brick has a number on it.
For each pair of bricks that are next to each other in the same row, the number on the brick above them is the total of the numbers on the two bricks.

Glyn has already shown some of the numbers.
Fill in all the other numbers on the bricks. [3]



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(b) Hari caught a bus into town.
His bus fare was £2.85.
He had only £1 coins with him.
The bus company's rules state that no change can be given.

In order to avoid losing any money, what coins should Hari make sure he has with him the next time he catches this bus?
Give the shortest possible list of coins.

[1]

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(c) You will be assessed on the quality of your organisation and communication in this part of the question.

In a factory which makes 'ready meals', 2205 kg of potatoes are used every day.

There are 9 different types of these meals that are made and each of these uses the same weight of potatoes.

What weight of potatoes is used to make 4 of the types of meals that are made each day?

[3 + OC 1]

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6. Solve the following equations.

(a) $17 + x = 35$ [1]

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(b) $8x = 480$ [1]

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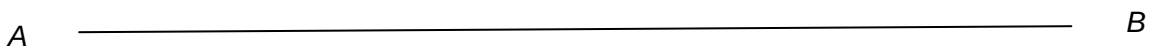
7. On the diagram, mark the point T with a cross so that

- $T\hat{A}B = 64°$
- $AT = 7$ cm. [2]



8. *(a)* Circle either TRUE or FALSE for each statement given below. [2]

STATEMENT		
A cuboid has 6 vertices.	TRUE	FALSE
A tetrahedron is a pyramid with 4 triangular faces only.	TRUE	FALSE
A cube has 12 equal edges.	TRUE	FALSE
A triangular prism has 3 rectangular faces.	TRUE	FALSE

(b) In the space below, draw **one** shape which has both

- rotational symmetry of order 3, **and**
- 3 lines of symmetry.

You must draw in the lines of symmetry. [2]

9. Here are two sequences of numbers.
Some of the numbers have been left out of each sequence.
Fill in numbers to make correct sequences.
After each sequence, write down the rule used to find the next term in your sequence.

(a) 5, ……., ……., 14, [2]

……..

. ……..

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Rule ……

……..

(b) 40, ……., ……., 5, [2]

……..

. ……..

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Rule ……

……..

10. *(a)* Simplify the expression $9g - 5f - 2g + 3f$.

[2]

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(b) Find the value of $3x + 4y$ when $x = -2$ and $y = 4$.

[2]

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(c) Write down the next two numbers in the following sequence.

20 14 9 5 2 ……. …….

[2]

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……

11. *(a)* Circle the correct answer for each of the following statements.

(i) Helen has bought one of the eighty tickets sold in a raffle. The probability that Helen wins the top prize in the raffle is

$\frac{1}{79}$ 1% 1:80 $\frac{1}{80}$ 80%

[1]

(i) One ball is selected at random form a box containing 5 blue balls, 4 red balls and 1 yellow ball. The probability that the selected ball is blue is

$\frac{5}{5}$ $\frac{1}{2}$ $\frac{5}{41}$ $\frac{10}{5}$ 5%

[1]

(b) A bag contains some red, green and black beads.
One bead is selected at random from the bag.
The probability of selecting a green bead from the bag is $\frac{1}{3}$.

Which of the following sets of beads could have been in the bag?
Circle the correct answer.

2 red 1 green 1 black	3 red 6 green 3 black	3 red 3 green 4 black	7 red 4 green 1 black	5 red 3 green 4 black

[1]

12. Calculate 38% of 15·6.

[2]

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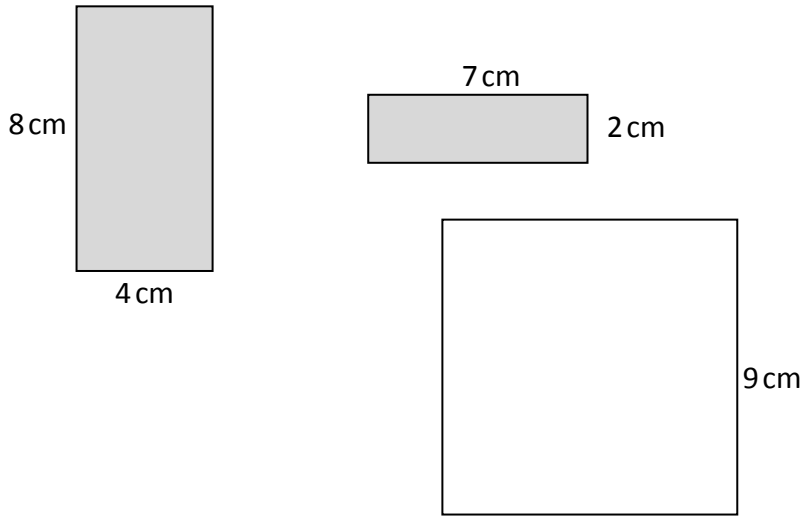
13. The two shaded rectangles shown below are to be drawn on a white, square card of side length 9 cm.
The two rectangles should not overlap.



Diagrams not drawn to scale

Show clearly how this can be done, and calculate the area of the square card that will be unshaded.

[4]

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14. *You will be assessed on the quality of your accuracy in writing in this question.*

The frequency table shows the number of points gained by a football team in each of its matches in the Welsh Premier League.

Points scored	Number of matches
0	6
1	5
3	11

Calculate the mean number of points gained per match by this team.
Give your answer correct to 2 decimal places.

[4 + W 1]

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15. The diagram shows 2 identical parallelograms and the coordinates of four vertices. Find the coordinates of the vertices marked *A, B* and *C.*

[6]

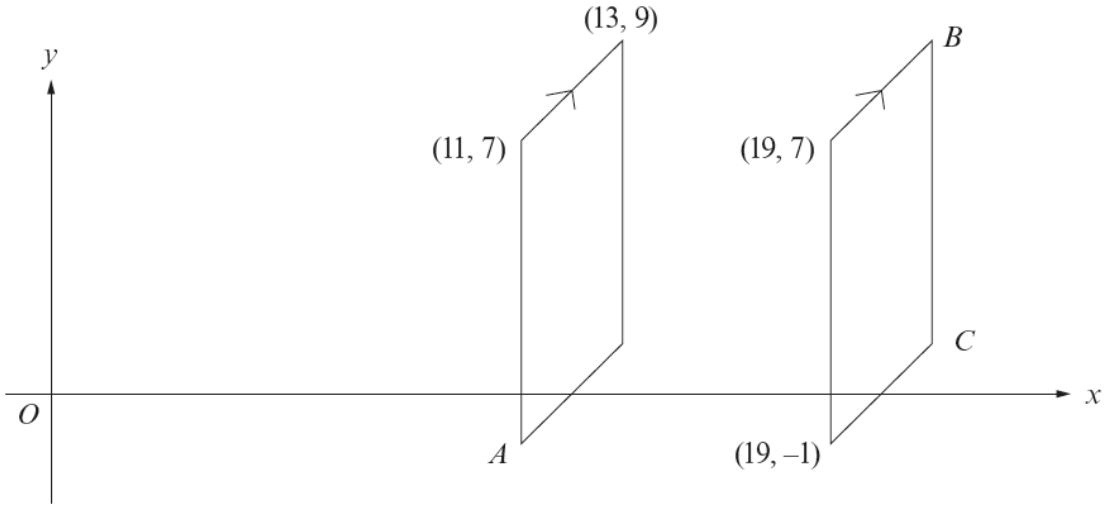

Diagram not drawn to scale

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A (…… , ……) *B* (…… , ……) *C* (…… , ……)

16. Calculate the average speed of a car which travelled 80 miles in 2 hours and 30 minutes.

[3]

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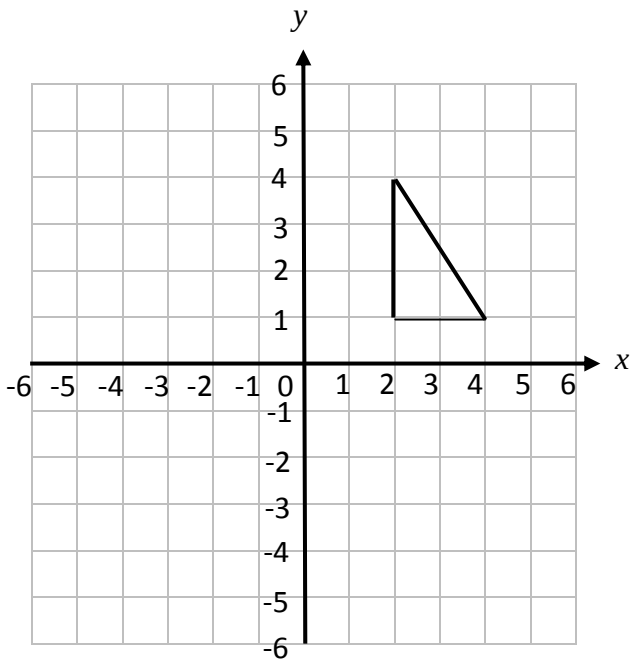
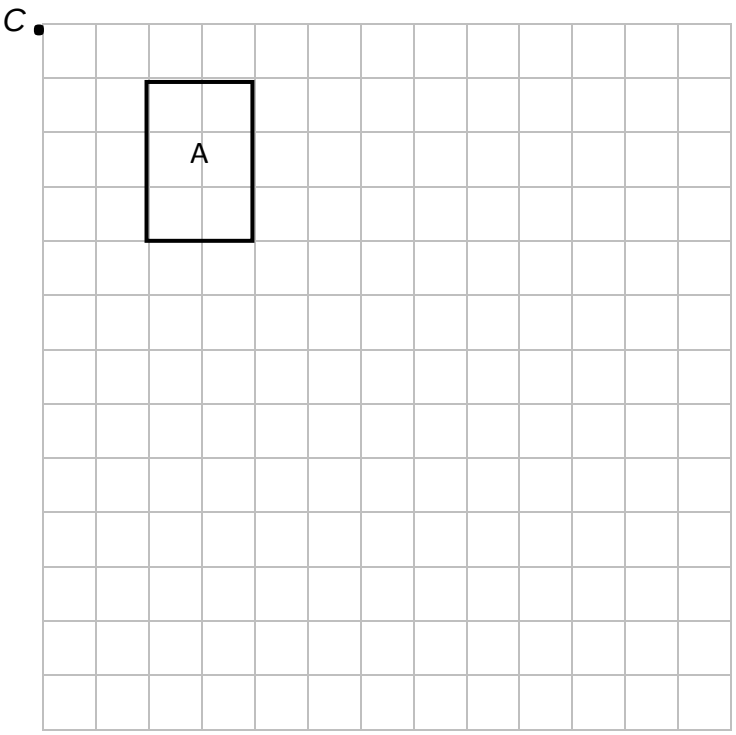
17. *(a)* Rotate the triangle 90 º anticlockwise about the origin.

[2]



(b) Enlarge rectangle *A* using centre *C* and scale factor 2.

[2]



END OF PAPER

Candidate Name	Centre Number					Candidate Number				
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GCSE

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

2nd 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.

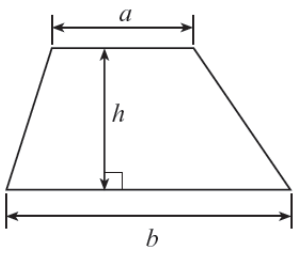
The number of marks is given in brackets at the end of each question or part-question.

The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **5**.

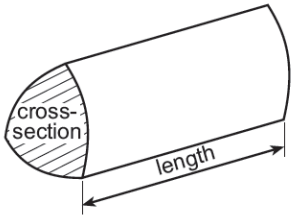
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**6**	
3.	**3**	
4.	**4**	
5.	**6**	
6.	**4**	
7.	**6**	
8.	**3**	
9.	**6**	
10.	**5**	
11.	**2**	
12.	**4**	
13.	**6**	
14.	**3**	
15.	**6**	
16.	**7**	
17.	**5**	
TOTAL	**80**	

Formula list

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



Volume of a prism = area of cross section $\times$ length



1. Using only the numbers in the following list,

26 27 28 29 30 31 32 33 34

write down

(a) a factor of 96,

[1]

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(b) a cube number,

[1]

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(c) a multiple of 8·5,

[1]

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(d) a prime number.

[1]

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2. *(a)* Simplify the expression $9g - 5f - 2g + 3f$.

[2]

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(b) Find the value of $3x + 4y$ when $x = -2$ and $y = 4$.

[2]

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(c) Write down the next two numbers in the following sequence.

20 14 9 5 2 ……. …….

[2]

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3. *(a)* Circle the correct answer for each of the following statements.

(i) Helen has bought one of the eighty tickets sold in a raffle. The probability that Helen wins the top prize in the raffle is

$\frac{1}{79}$ 1% 1:80 $\frac{1}{80}$ 80%

[1]

(ii) One ball is selected at random form a box containing 5 blue balls, 4 red balls and 1 yellow ball. The probability that the selected ball is blue is

$\frac{5}{5}$ $\frac{1}{2}$ $\frac{5}{41}$ $\frac{10}{5}$ 5%

[1]

(b) A bag contains some red, green and black beads.
One bead is selected at random from the bag.
The probability of selecting a green bead from the bag is $\frac{1}{3}$.

Which of the following sets of beads could have been in the bag?
Circle the correct answer.

2 red 1 green 1 black	3 red 6 green 3 black	3 red 3 green 4 black	7 red 4 green 1 black	5 red 3 green 4 black

[1]

4. *(a)* Calculate 38% of 15·6.

[2]

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(b) Express 52 as a percentage of 80.

[2]

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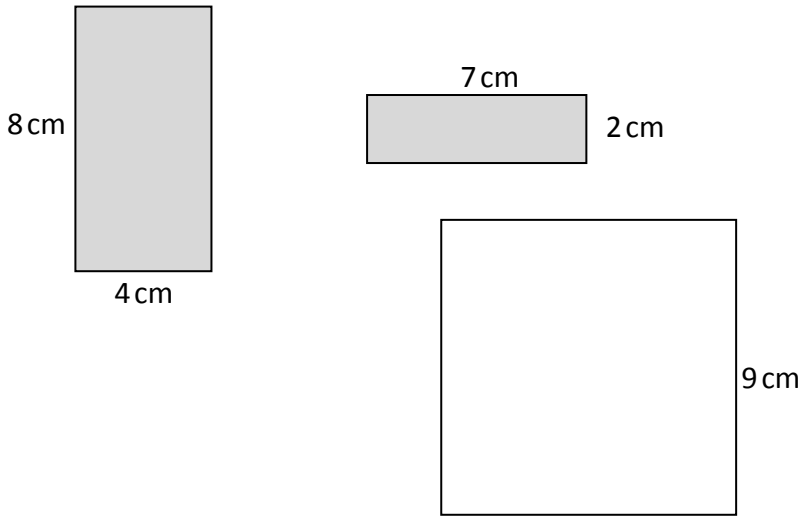
5. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

The two shaded rectangles shown below are to be drawn on a white, square card of side length 9 cm.
The two rectangles should not overlap.



Diagrams not drawn to scale

Show clearly how this can be done, and calculate the area of the square card that will be unshaded.

[4 + OCW 2]

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6. The frequency table shows the number of points gained by a football team in each of its matches in the Welsh Premier League.

Points scored	Number of matches
0	6
1	5
3	11

Calculate the mean number of points gained per match by this team.
Give your answer correct to 2 decimal places.

[4]

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7. The diagram shows 2 identical parallelograms and the coordinates of four vertices. Find the coordinates of the vertices marked *A, B* and *C.*

[6]

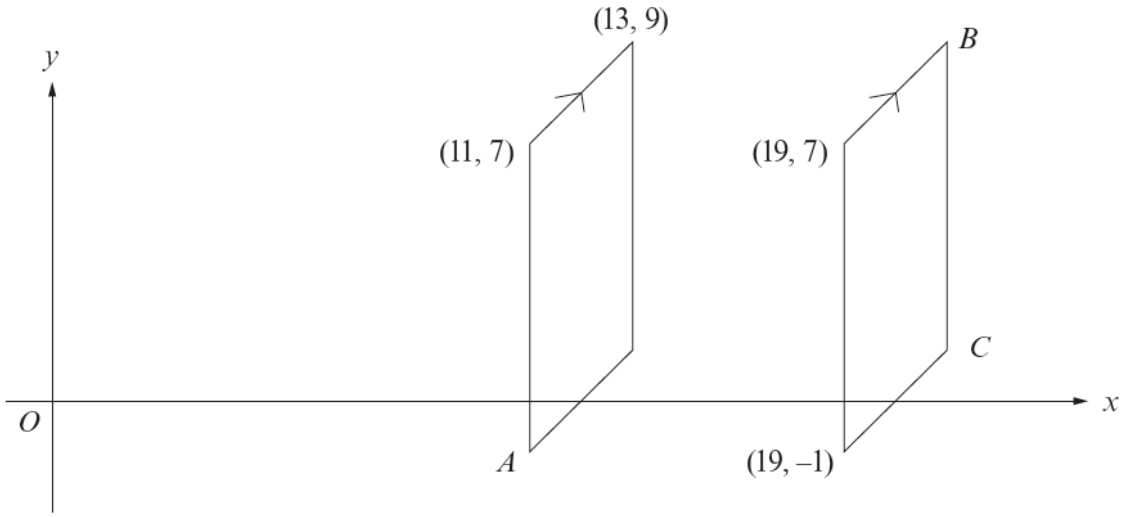

Diagram not drawn to scale

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

8. Calculate the average speed of a car which travelled 80 miles in 2 hours and 30 minutes.

[3]

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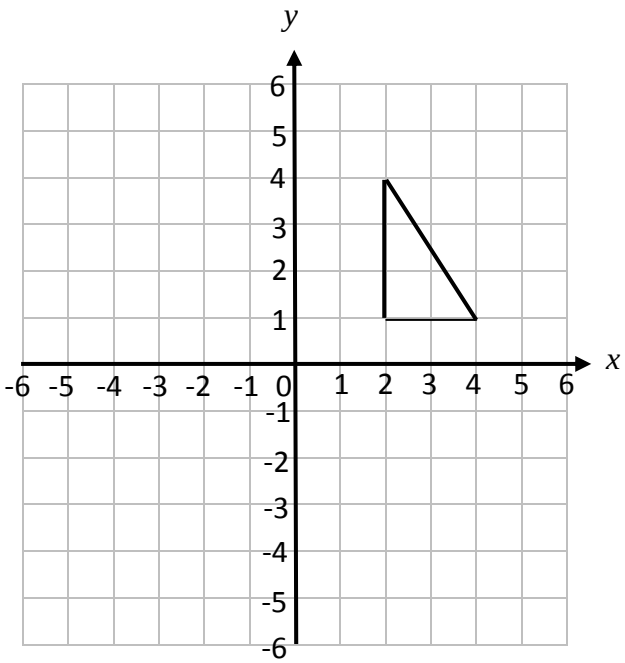
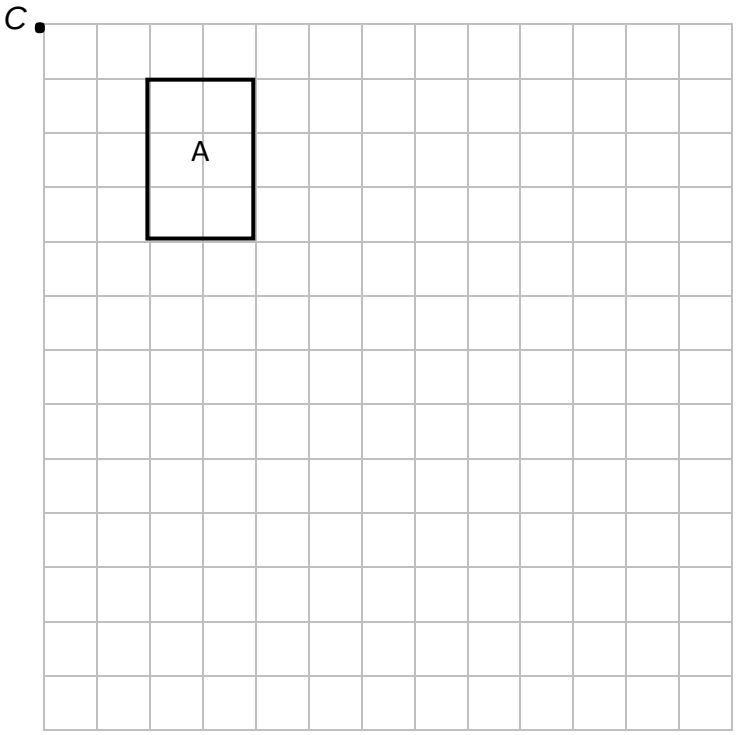
9. *(a)* Rotate the triangle 90 º anticlockwise about the origin.

[2]



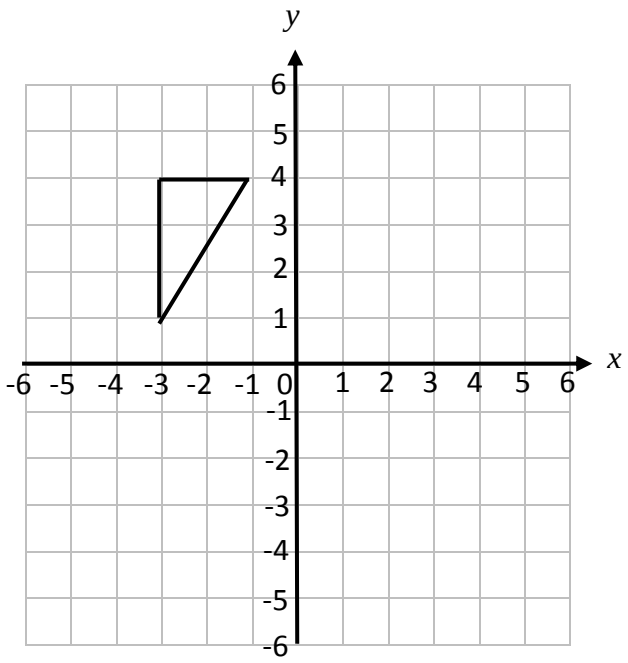
(b) Enlarge rectangle *A* using centre *C* and scale factor 2.

[2]



(c)(i) Translate the triangle using the column vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$.

[1]



(ii) Write down the column vector that will **reverse** the translation in part (i).

[1]

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10. Use a ruler and a pair of compasses to construct triangle *ABC* where $AC = 10{\cdot}5$ cm, $A\hat{C}B = 60°$ and $C\hat{A}B = 45°$.
Line *AC* has been drawn for you.

[5]

A ——————————————————— *C*

11. Circle either TRUE or FALSE for each statement given below.

[2]

STATEMENT		
Circles with diameters of equal length are congruent.	TRUE	FALSE
Regular pentagons whose perimeters are of equal length are congruent.	TRUE	FALSE
Scalene triangles that have the same three angles are congruent.	TRUE	FALSE
Rectangles with equal areas are congruent.	TRUE	FALSE

12. A solution to the equation

$$x^3 - 6x - 4 = 0$$

lies between 2 and 3.

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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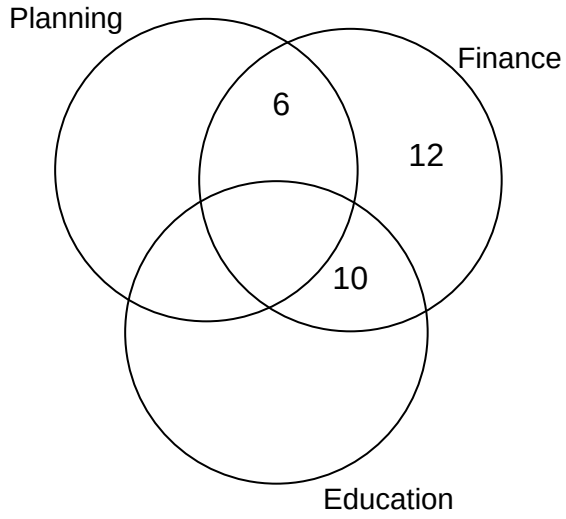
13. A total of 45 councillors make up the Planning, Finance and Education committees of a local council.
Some of the councillors sit on two of these committees.
No councillor sits on all three committees.

2 councillors sit on both the Planning Committee and the Education Committee.
There are 18 councillors on the Education Committee.

(a) Complete the Venn diagram.

[3]



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(b) How many councillors sit on both the Planning and Finance committees?

[1]

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(c) One of these 45 councillors is chosen at random.
What is the probability that this councillor is on the Planning Committee?

[2]

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14.

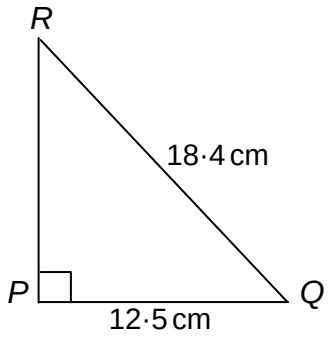

Diagram not drawn to scale

Calculate the length of *PR*, giving your answer correct to 1 decimal place.

[3]

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15. A bus company advertises two prices for a return journey between Aberystwyth and Cardiff: an adult price and the price for a child.

A family of 2 adults and 3 children paid a total of £71.50 for their tickets.
A group consisting of 3 adults and 4 children paid a total of £101 for their tickets.

Use an algebraic method to calculate the total amount paid by a group of 4 adults and 2 children.

[6]

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16. *(a)* Factorise $x^2 - 4x - 21$, and hence solve $x^2 - 4x - 21 = 0$.

[3]

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(b) Solve the equation $\frac{x-7}{4} + \frac{2x+5}{8} = \frac{1}{2}$.

[4]

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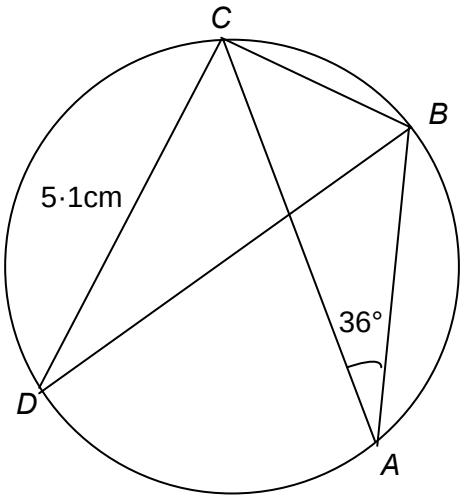

Diagram not drawn to scale

Points *A*, *B*, *C* and *D* lie on the circumference of a circle. *BD* is the diameter of the circle, *CD* = 5·1 cm and $B\hat{A}C$ = 36º.

Calculate the length of the chord *BC*.
You must give reasons as part of your solution.

[5]

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END OF PAPER

Candidate Name	Centre Number					Candidate Number				
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GCSE

MATHEMATICS
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER

2nd 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.

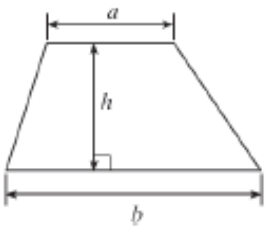
The number of marks is given in brackets at the end of each question or part-question.

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

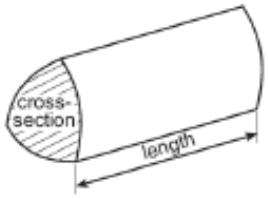
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**2**	
3.	**4**	
4.	**6**	
5.	**3**	
6.	**6**	
7.	**7**	
8.	**5**	
9.	**7**	
10.	**5**	
11.	**3**	
12.	**7**	
13.	**6**	
14.	**7**	
15.	**7**	
TOTAL	**80**	

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 = $\frac{1}{3}\pi r^2 h$

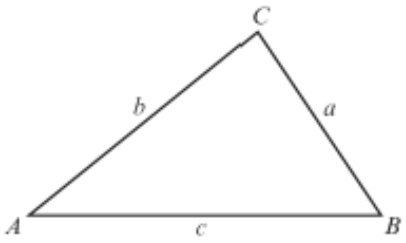
Curved surface area of a cone = $\pi r l$

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

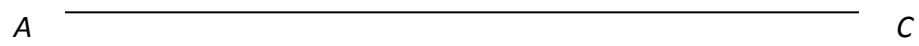
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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. Use a ruler and a pair of compasses to construct triangle *ABC* where *AC* = 10·5 cm, $A\hat{C}B$ = 60° and $C\hat{A}B$ = 45°.
Line *AC* has been drawn for you.

[5]



2. Circle either TRUE or FALSE for each statement given below.

[2]

STATEMENT		
Circles with diameters of equal length are congruent.	TRUE	FALSE
Regular pentagons whose perimeters are of equal length are congruent.	TRUE	FALSE
Scalene triangles that have the same three angles are congruent.	TRUE	FALSE
Rectangles with equal areas are congruent.	TRUE	FALSE

3. A solution to the equation

$$x^3 - 6x - 4 = 0$$

lies between 2 and 3.

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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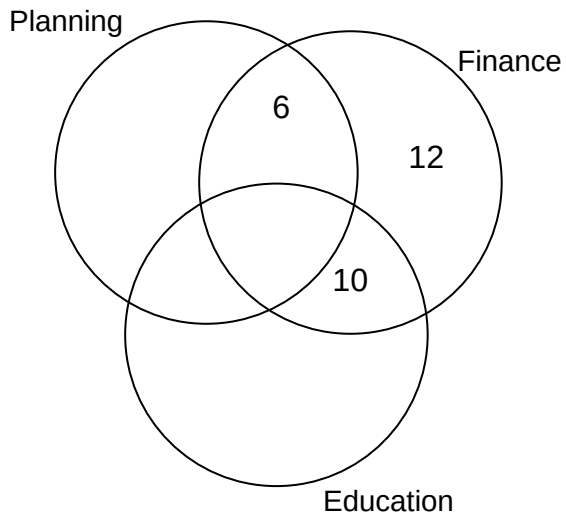
4. A total of 45 councillors make up the Planning, Finance and Education committees of a local council.
Some of the councillors sit on two of these committees.
No councillor sits on all three committees.

2 councillors sit on both the Planning Committee and the Education Committee.
There are 18 councillors on the Education Committee.

(a) Complete the Venn diagram.

[3]



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(b) How many councillors sit on both the Planning and Finance committees?

[1]

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(c) One of these 45 councillors is chosen at random.
What is the probability that this councillor is on the Planning Committee?

[2]

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5.

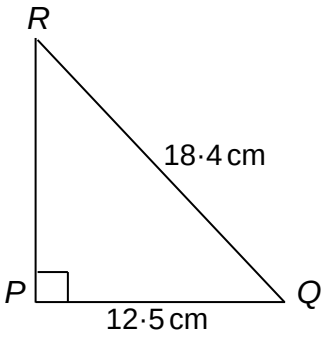

Diagram not drawn to scale

Calculate the length of *PR*, giving your answer correct to 1 decimal place.

[3]

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6. A bus company advertises two prices for a return journey between Aberystwyth and Cardiff: an adult price and the price for a child.

A family of 2 adults and 3 children paid a total of £71.50 for their tickets.
A group consisting of 3 adults and 4 children paid a total of £101 for their tickets.

Use an algebraic method to calculate the total amount paid by a group of 4 adults and 2 children.

[6]

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7. *(a)* Factorise $x^2 - 4x - 21$, and hence solve $x^2 - 4x - 21 = 0$.

[3]

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(b) Solve the equation $\frac{x-7}{4} + \frac{2x+5}{8} = \frac{1}{2}$.

[4]

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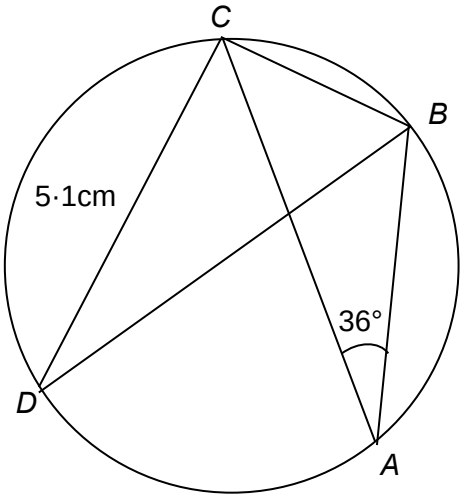

Diagram not drawn to scale

Points *A*, *B*, *C* and *D* lie on the circumference of a circle. *BD* is the diameter of the circle, *CD* = 5·1 cm and $B\hat{A}C$ = 36º.

Calculate the length of the chord *BC*.
You must give reasons as part of your solution.

[5]

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

Geralllt ran the 400 m race in an Urdd sports event. This distance was measured correct to the nearest 0·5 m.
The time it took him was 74 seconds, measured correct to the nearest second.

Calculate Geralllt's least possible average speed **and** greatest possible average speed.
Give your answers to 3 significant figures.
You must show your working.

[5 + OCW 2]

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10. *(a)* Express $0 \cdot 4\dot{9}\dot{1}$ as a fraction.

[2]

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(b) Is the following statement true or false? Circle the correct answer.
You must give a full explanation of your decision.

The evaluation of $a^{\frac{2}{3}}$ will always be an integer provided a is a multiple of 3.

[1]

true / false

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(c) Circle your answer in each of the following.

(i) $\sqrt{200}$ simplifies to

20 $10\sqrt{2}$ $20\sqrt{10}$ $100\sqrt{2}$ $2\sqrt{10}$

[1]

(ii) $\sqrt{5} + \sqrt{45}$ simplifies to

$\sqrt{50}$ $\sqrt{225}$ $4\sqrt{5}$ $10\sqrt{5}$ $4\sqrt{10}$

[1]

11. The table below shows the number of people employed by a graphic design company.

	Male	Female
Full-time	125	30
Part-time	18	87

The company plans to take a stratified sample of 40 members of staff, to find out their views on how the company could be improved.
Calculate the number of staff from each of the four categories that should be in the sample.

[3]

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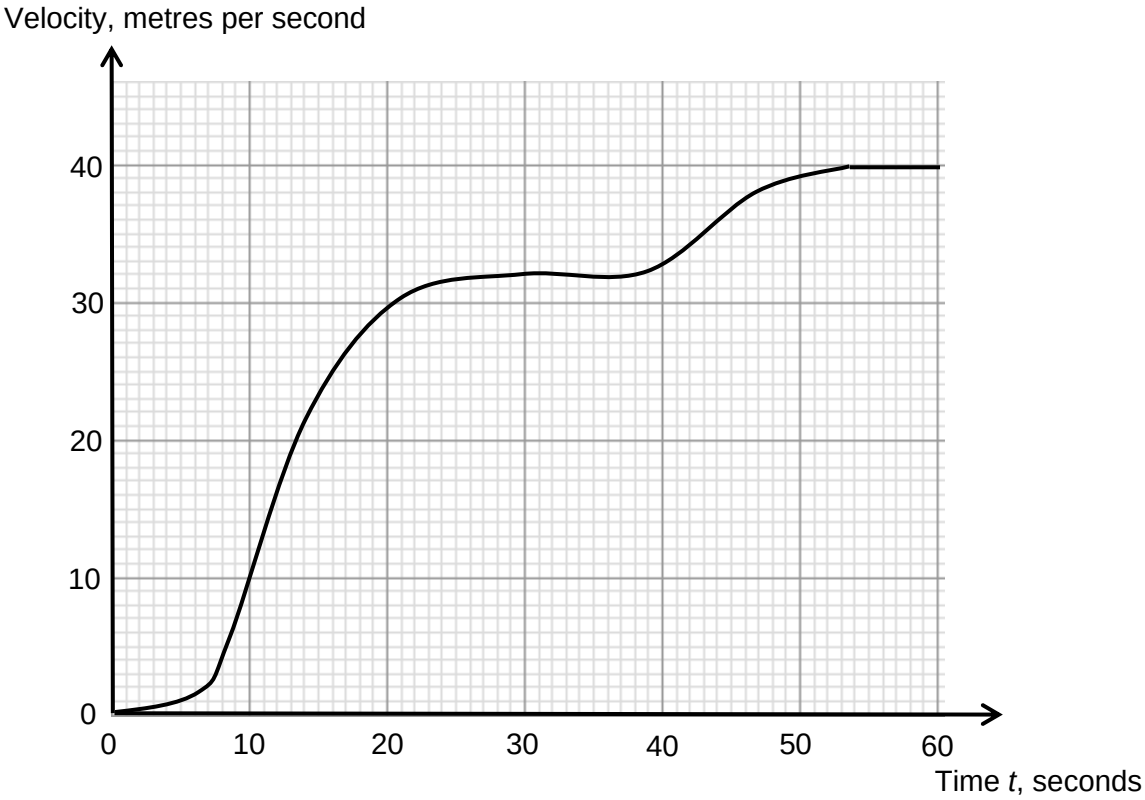
12. The velocity-time graph shows the first 60 seconds of a train's journey from a station.



(a) Calculate an estimate of the acceleration of the train when $t = 20$ seconds.
State the units of your answer.

[4]

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(b) Use the trapezium rule with ordinates t = 0, t = 10, t = 20, t = 30, t = 40, t = 50 and t = 60 to calculate an estimate of the distance travelled by the train in the first 60 seconds of its journey.

[3]

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13. A right-circular cone of vertical height 10 cm and base radius 5 cm is attached to a cylinder of the same radius and height 8 cm.

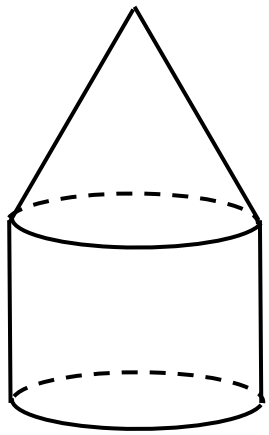

Diagram not drawn to scale

Calculate the total surface area of the shape.

[6]

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14.

(a) Show that the equation $\frac{3}{2x-1} - \frac{5}{x+4} = 6$ can be written as $12x^2 + 49x - 41 = 0$.

[4]

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(b) Hence solve the equation $\frac{3}{2x-1} - \frac{5}{x+4} = 6$.

Give your answers correct to 2 decimal places. [3]

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15. In the parallelogram *ABCD*, *AB* = 12·7 cm and *DÂB* = 132°.

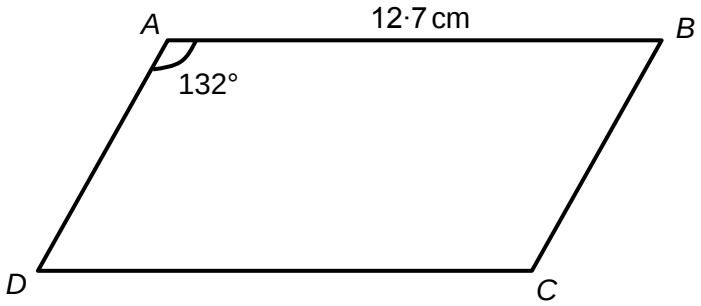

Diagram not drawn to scale

The area of the parallelogram is 48·5 cm^2.
Calculate the length of the diagonal *DB*.

[7]

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END OF PAPER

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Foundation Tier	Mark	MARK SCHEME Comments (Page 1)
1. (a) six million, three hundred and forty-two thousand (b) 53 006 (c) 932 (d) 56 (e) 1, 3, 7, 21	 B1 B1 B1 B1 B2 6	 B1 for 3 or 4 correct factors and no more than 1 wrong factor
2. (a) 10.3 (cm) or 103 (mm) Correct units (b) Circle drawn with radius 4 cm	B1 B1 B1 3	± 2 mm ± 2 mm
3. (a) 6 and 8 in either order (b) 9 and 7 in that order	B1 B1 2	
4. (a) kilometre (b) 6.6.lb	B1 B1 2	
5. *B* *A* (0) (0.6)	B1 B1 2	Allow 6/10 and 0 to represent A and B respectively. A should be between 0.5 and 0.7 exclusive. B should be at 0.
6. (a) Bethesda 6 Caernarfon 10 Llanberis 3 Nefyn 4 (b) Both axes suitably labelled. Four bars at correct heights.	 B2 B2 B1 5	B1 for two or three correct frequencies. If frequencies score 0, then B1 for all 4 correct tallies. B1 if one square implicitly represents 1 unit (with no scale given); or B1 for correct scale with no 'frequency' label on vertical axis. Bars can be in any order. FT 'their table of frequencies'.
7. (a) 3/100 × (£) 800 (£) 24 (b) 450 ÷ 5 × 2 180 (c) 7*h*	M1 A1 M1 A1 B1 5	

MATHEMATICS 2nd SAMs 2017 **Unit 1 (Non-calculator) Foundation Tier**	**Mark**	**MARK SCHEME** **Comments (Page 2)**
8. 3A = B 4A = 60 (kg) (A =) 15 (kg) (B =) 45 (kg) (C =) 22.5 (kg) Organisation and communication Accuracy of writing	B1 M1 A1 B1 B1 OC1 W1 7	Seen or implied
9. (a) x + 58 + 90 = 180 OR x = 90 - 58 or equivalent. (x =) 32 (°) (b) ($A\hat{C}B$ =) $\frac{180 - 34}{2}$ (=) 73 (°) ($A\hat{C}D$ =) 107(°)	M1 A1 M1 A1 B1 5	FT 180 – 'their 73' or 34 + 'their 73'.
10. (a) 20% (b) 3·24 (c) $\frac{1}{2}$	B1 B1 B1 3	
11. Attempt at a sample space or equivalent. H, even OR H2, H4 and H6 identified. (Probability =) 3/12 or equivalent. Statement that Sian is not correct and / or 3/12 ≠ 1/2	S1 B1 B1 B1 4	*Alternative method.* *P(H) =1/2 OR P(Ev) =1/2* *B1* *Use of P(H) × P(Ev)* *FT* *S1* *Sight of ¼* *B1* *Statement that Sian is not correct* *and / or 1/4 ≠ ½* *B1*
12. (a) Sketch of a rectangle with perimeter = 16m e.g. 6m by 2m, 7m by 1m, ……	B2	Allow giving two adjacent sides only. B1 if units of length not shown. B0 for sides of 5m and 3m. Accept a square of 4m by 4m.
(b) Sight of 5 × 3 OR 10 × 6 15(m^2) AND 60(m^2) AND 'No'.	B1 B1 4	Allow all marks if they use their rectangle from (a). Accept an argument that 2 × length and 2 × width will lead to 4 × area (2l × 2w = 4lw = 4A)
13. (a) (x =) 32 (b) (x =) $\frac{1}{2}$ or equivalent (e.g. 7/14) (c) $9x - 2x = 39 - 4$ $7x = 35$ $x = 5$	B1 B1 B1 B1 B1 5	 Mark final answer (e.g. x = 7/14 = 2 is B0) FT until 2nd error.

MATHEMATICS 2nd SAMs 2017 **Unit 1 (Non-calculator) Foundation Tier**	**Mark**	**MARK SCHEME** **Comments (Page 3)**
14. (a) $x = 3$ AND $y = 9$	B2	B1 if reversed. If no marks gained allow B1 for $x + y = 12$ or for $y - x = 6$.
(b) (i) Sight of 11 – 4 AND 35/5 AND numbers written in order with 7 in the middle AND 7 for each value	B3	B2 for 11 – 4 OR 35/5 OR numbers in order seen AND 7 for each value B1 for unsupported answer of 7 for each value.
(ii) FALSE TRUE TRUE TRUE	B2	All four correct. B1 for 3 correct.
	7	
15. (Area of *ABCD* =) $\frac{(4 + 6)}{2} \times 3$	M1	
$= 15(\text{cm}^2)$	A1	
(Area of *ADE* =) $\frac{4 \times AE}{2}$	B1	
$\frac{4 \times AE}{2} = 15$	M1	FT 'their derived 15'.
$AE = 7{\cdot}5(\text{cm})$	A1	
	5	

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Intermediate Tier	Mark	MARK SCHEME Comments (Page 1)
1(a) x + 58 + 90 = 180 OR x = 90 - 58 or equivalent. (x =) 32(°) (b) ($A\hat{C}B$ =) $\frac{180 - 34}{2}$ = 73(°) ($A\hat{C}D$ =) 107(°)	M1 A1 M1 A1 B1 5	FT 180 – 'their 73' or 34 + 'their 73'.
2(a) 20% (b) 3·24 (c) $\frac{1}{2}$	B1 B1 B1 3	
3. Attempt at a sample space or equivalent. H, even OR H2, H4 and H6 identified. (Probability =) 3/12 or equivalent. Statement that Sian is not correct and / or 3/12 ≠ 1/2	S1 B1 B1 B1 4	*Alternative method.* *P(H) =1/2 OR P(Ev) =1/2 B1* *Use of P(H) × P(Ev) FT S1* *Sight of ¼ B1* *Statement that Sian is not correct and / or 1/4 ≠ 1/2 B1*
4(a) Sketch of a rectangle with perimeter = 16m e.g. 6m by 2m, 7m by 1m, ……	B2	Allow giving two adjacent sides only. B1 if units of length not shown. B0 for sides of 5m and 3m. Accept a square of 4m by 4m.
(b) Sight of 5 × 3 OR 10 × 6 15(m^2) AND 60(m^2) AND 'No'.	B1 B1 4	Allow all marks if they use their rectangle from (a). Accept an argument that 2 × length and 2 × width will lead to 4 × area (2l × 2w = 4lw = 4A)
5. ¼ × 120 = 30 OR 0·2 × 120 = 24 OR 0·2 × 0·25 = 0·05 0·2 × 30 = 6 ¼ × 24 = 6 120 × 0·05 = 6	M1 A1 M1 A1 4	FT 'their previous answer'. An answer of 6% is awarded M1A1M1A0. *Alternative solution: 0·2 × 0·25 × 120 M2* *= 6 A2*
6(a) (x =) 32 (b) (x =) $\frac{1}{2}$ or equivalent (e.g. 7/14) (c) $9x - 2x = 39 - 4$ $7x = 35$ $x = 5$	B1 B1 B1 B1 B1 5	Mark final answer (e.g. x = 7/14 = 2 is B0) FT until 2nd error.
7(a) x = 3 AND y = 9 (b)(i) Sight of 11 – 4 AND 35/5 AND numbers written in order with 7 in the middle AND 7 for each value. (ii) FALSE TRUE TRUE TRUE	B2 B3 B2 7	B1 if reversed. If no marks gained allow B1 for $x + y$ =12 or for $y - x$ = 6. B2 for 11 – 4 OR 35/5 OR numbers in order seen AND 7 for each value B1 for unsupported answer of 7 for each value. All four correct. B1 for 3 correct.

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Intermediate Tier	Mark	MARK SCHEME Comments (Page 2)
8. (Area of *ABCD* =) $\frac{(4+6)}{2} \times 3$ $= 15(cm^2)$ (Area of *ADE* =) $\frac{4 \times AE}{2}$ $\frac{4 \times AE}{2} = 15$ $AE = 7{\cdot}5(cm)$ Organisation and communication Accuracy of writing	M1 A1 B1 M1 A1 OC1 W1 7	 FT 'their derived 15'.
9. (a) $1 - (0{\cdot}5 + 0{\cdot}18 + 0{\cdot}27)$ $= 0{\cdot}05$ (b) $0{\cdot}18 + 0{\cdot}27$ $= 0{\cdot}45$ (c) $0{\cdot}5 \times 0{\cdot}18$ $= 0{\cdot}09$	M1 A1 M1 A1 M1 A1 6	Accept equivalent answers (percentages or fractions) throughout.
10. (a) - 6 (b) Six correct plots. Curve drawn (c) Correct values <u>from their graph</u>. (d) Correct coordinates <u>from their graph</u>. (e) 'The scale on the *y*-axis'.	B1 B1 B1 B1 B2 B1 7	 FT 'their (2,-6)'. FT 'their plots'. Minimum must be at (a, b) with 0<a<1 and b<-11. Answers should be $-1{\cdot}3$ and $2{\cdot}6$, but readings must from their graph. B1 for each. Should be (0·67, -11·3), but readings must from their <u>curved</u> graph. Accept unambiguous wording.
11(a) False AND a counter example given. (b) True AND a statement that refers to both '$(odd)^2$ being odd' AND 'odd × odd being odd'.	E1 E2 3	 Accept any equivalent intention to refer to both facts OR a single statement to cover both. E1 for reference to one of the two facts.
12. Use of $\frac{(2n-4)}{n} \times 90°$ OR $180° - \frac{360°}{n}$ Pentagon: 108(°) Hexagon: 120(°) Isosceles triangle: $180 - 2 \times 69$ $= 42(°)$ (Angle sum =) 90(°) + 108(°) + 120(°) + 42(°) $= 360(°)$	M1 A1 A1 M1 A1 B1 6	Used with n = 5 OR n = 6. Sight of either 108 or 120 implies M1.
13(a) 2 (b) $y = -2$ (c) (3, 7)	B1 B1 B1 3	

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Intermediate Tier	Mark	MARK SCHEME Comments (Page 3)
14(a). $4{\cdot}5 \times 10^{6}$	B2	B1 for $0{\cdot}45 \times 10^{7}$ or 4 500 000.
(b) $1{\cdot}35 \times 10^{-4}$	B2	B1 for $13{\cdot}5 \times 10^{-5}$ or (0)·000135
	4	
15(a) $0{\cdot}4 \times x = 0{\cdot}12$	M1	
$x = 0{\cdot}3$	A1	
0·6 on correct branch ('Snowdon – No')	B1	
0·3, 0·7, 0·3 and 0·7 on correct branches.	B1	FT consistent pairing for 'their 0·3' but not for use of 0·6 and 0·4. B0 if 0·5 used on all four branches.
(b) $0{\cdot}6 \times 0{\cdot}7$	M1	FT 'their values'.
$= 0{\cdot}42$	A1	
	6	
16(a) $8 - x = 3(5 - x)$ or $8 - x = 15 - 3x$	B1	FT until 2nd error.
$2x = 7$	B1	
$x = 3½$ or 7/2	B1	Mark final answer.
(b) $2a(3a - 4b)$	B2	B1 for $2a(3a - \ldots..)$ or $2a(\ldots. - 4b)$ B1 for $2(3a^2 - 4ab)$ or $a(6a - 8b)$
(c) $(3x - 4)^3$	B1	Do not accept with missing brackets.
	6	

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Higher Tier	Mark	MARK SCHEME Comments (Page 1)
1.(a) $1 - (0{\cdot}5 + 0{\cdot}18 + 0{\cdot}27)$ $= 0{\cdot}05$ (b) $0{\cdot}18 + 0{\cdot}27$ $= 0{\cdot}45$ (c) $0{\cdot}5 \times 0{\cdot}18$ $= 0{\cdot}09$	M1 A1 M1 A1 M1 A1 6	Accept equivalent answers (percentages or fractions) throughout.
2.(a) - 6 (b) Six correct plots. Curve drawn. (c) Correct values <u>from their graph</u>. (d) Correct coordinates <u>from their graph</u>. (e) 'The scale on the y-axis'.	B1 B1 B1 B1 B2 B1 7	 FT 'their (2,-6)'. FT 'their plots'. Minimum must be at (a, b) with 0<a<1 and b<-11. Answers should be $-1{\cdot}3$ and $2{\cdot}6$, but readings must from their graph. B1 for each. Should be (0·67, -11·3), but readings must from their <u>curved</u> graph. Accept unambiguous wording.
3.(a) False AND a counter example given. (b) True AND a statement that refers to both '$(\text{odd})^2$ being odd' AND 'odd × odd being odd'.	E1 E2 3	 Accept any equivalent intention to refer to both facts OR a single statement to cover both. E1 for reference to one of the two facts.
4. Use of $\frac{(2n-4)}{n} \times 90°$ OR $180° - \frac{360°}{n}$ Pentagon: 108(°) Hexagon: 120(°) Isosceles triangle: $180 - 2 \times 69$ $= 42(°)$ (Angle sum =) $90(°) + 108(°) + 120(°) + 42(°)$ $= 360(°)$ Organisation and communication Accuracy of writing	M1 A1 A1 M1 A1 B1 OC1 W1 8	Used with n = 5 OR n = 6. Sight of either 108 or 120 implies M1.
5.(a) 2 (b) $y = -2$ (c) (3 , 7)	B1 B1 B1 3	
6.(a) $4{\cdot}5 \times 10^6$ (b) $1{\cdot}35 \times 10^{-4}$	B2 B2 4	B1 for $0{\cdot}45 \times 10^7$ or 4 500 000. B1 for $13{\cdot}5 \times 10^{-5}$ or (0)·000135

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Higher Tier	Mark	MARK SCHEME Comments (Page 2)
7.(a) $0{\cdot}4 \times x = 0{\cdot}12$ $x = 0{\cdot}3$ 0·6 on correct branch ('Snowdon – No') 0·3, 0·7, 0·3 and 0·7 on correct branches. (b) $0{\cdot}6 \times 0{\cdot}7$ $= 0{\cdot}42$	M1 A1 B1 B1 M1 A1 6	FT consistent pairing for 'their 0·3' but not for use of 0·6 and 0·4. B0 if 0·5 used on all four branches. FT 'their values'.
8.(a) $8 - x = 3(5 - x)$ or $8 - x = 15 - 3x$ $2x = 7$ $x = 3½$ or $7/2$ (b) $2a\,(3a - 4b)$ (c) $(3x - 4)^3$	B1 B1 B1 B2 B1 6	FT until 2nd error. Mark final answer. B1 for $2a\,(3a - \ldots..)$ or $2a\,(\ldots. - 4b)$ B1 for $2\,(3a^2 - 4ab)$ or $a\,(6a - 8b)$ Do not accept with missing brackets.
9. Any 2 of the lines $x = -1$, $x+2y=8$ and $y = 2x+1$ correct. Correct region shaded.	B2 B1 3	B1 for any 1 correct line. If $x = -1$ and $y = -1$ are both shown do not award a mark unless $x = -1$ is selected for the region or clearly labelled. CAO. Accept indication by 'shading out'.
10. $\frac{\Theta}{360} \times 2\pi r + 2r$ $\frac{\Theta}{360} \times 2\pi \times 4{\cdot}5 + 2 \times 4{\cdot}5 = 34$ $\Theta = \frac{25 \times 360}{9\pi}$ $\Theta = \frac{1000}{\pi}$	S1 B1 B1 B1 4	 FT for the correct manipulation of their equation with r in two terms, equivalent level of difficulty.
11. Sight of the volume scale factor or 5^3 OR $0{\cdot}2^3$. (Number of ornaments =) $875 \div 125$ OR $875 \times 0{\cdot}008$. $= 7$	B2 M1 A1 4	B1 for sight of 5 OR 0·2.
12. (a) $\sqrt[3]{\frac{125}{8}}$ (b) π^2	B1 B1 2	
13. (a) Frequency densities of 0·6, 4·4, 6, 6·8, 1·5 Histogram of their frequency densities drawn. (b) An attempt to add the areas of the bars. $(10 + 11 + 17 + 20 + 22) = 80$ Search for the median within the 502·5 – 505 group e.g. 502·5 + 2/20 × 2 ·5 = 502·75(g)	M2 A1 M1 A1 M1 A1 7	M1 for any 3 or 4 correct. Provided M1 awarded. CAO. FT 'their 80' provided a clear attempt made to add the areas of the bars.

MATHEMATICS 2nd SAMs 2017 Unit 1 (Non-calculator) Higher Tier	Mark	MARK SCHEME Comments (Page 3)
14. Rearranging equation to $x^2 + x - 1 = 0{\cdot}5x + 1$ Line $y = 0{\cdot}5x + 1$ drawn Solution of approximately −1·7 AND 1·2.	M1 A1 A1 3	 A solution obtained using the formula gets M0A0A0.
15. Numerator of $(2x + 7)(x + 3)$ Denominator of $(2x + 7)(2x - 7)$ $\frac{x + 3}{2x - 7}$	B2 B2 B1 5	B1 for $(2x\ldots7)(x\ldots3)$. B1 for $(2x\ldots7)(2x\ldots7)$. FT provided no more than 1 previous error and provided simplification required.
16. (a) 4/20 × 3/19 = 12/380 (= 3/95) (b) Strategy 1 – P(MM) – P(DD) – P(WW) OR equivalent. P(MM) = 10/20 × 9/19 or P(DD) = 6/20 × 5/19 or P(WW) = 4/20 × 3/19 or other non-replacement product. 1 – {(10/20×9/19) + (6/20×5/19) + (4/20×3/19)} = 248/380 (= 62/95)	M1 A1 S1 M1 A1 A1 6	 For the idea, not notation. Accept missing brackets. Or alternative full calculation shown. Allow missing brackets if intention clear. ISW. Ignore incorrect cancelling.
17. Horizontal translation to the left with the curve crossing the x-axis to the left of zero. y=f(x +3) crossing the x-axis at −3 and −1. Reflection about the x-axis.	B1 B1 B1 3	 FT their y = f(x + 3).

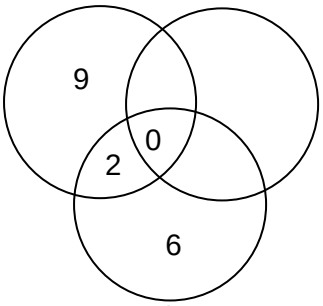
MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Foundation Tier	Mark	MARK SCHEME Comments (Page 1)
1. (£)12.25 (£) 2.49 9 (cartons) (£) 34.03	B1 B1 B1 B1 4	
2. AC = 6·5 cm BC = 8 cm Completed triangle	 M1 M1 A1 3	Allow ± 2 mm Dependent on at least one M1
3. Evidence of counting squares 46 – 52 (cm^2)	M1 A1 2	Inside the shape
4. (a) (i) likely (ii) unlikely (b) 4	B1 B1 B1 3	
5. (a) 42 **14** 28 6 **8** **20** 1 **5** 3 **17** (b) £1, 50p, 20p, 10p, 5p (c) (Weight of potatoes for 1 type of meal =) 2205 ÷ 9 (Weight of potatoes for 4 types of meal = 245) × 4 980 (kg) Organisation and communication	B3 B1 M1 M1 A1 OC1 8	B3 for 5 correct answers B2 for 3 or 4 correct entries on FT B1 for 2 correct entries on FT OR 2205 × 4 (= 8820) (8820) ÷ 9 CAO
6. (a) (x =) 18 (b) (x =) 60	B1 B1 2	Accept embedded answers
7. ($T\hat{A}B$ =) 64° (AT =) 7 cm	B1 B1 2	± 2° ± 2 mm
8. (a) FALSE TRUE TRUE TRUE (b) Shape with rotational symmetry of order 3 Same shape showing 3 correct lines of symmetry	B2 B1 B1 4	B1 for 3 correct

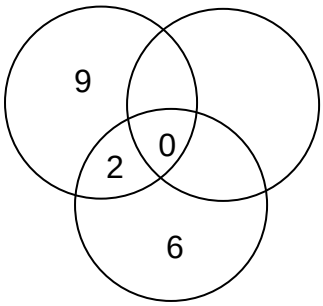
MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Foundation Tier	Mark	MARK SCHEME Comments (Page 2)
9. (a) 5, **8**, **11**, 14 Add 3 to the previous number OR 5, **7·05**, **9·93**, 14, Multiply previous term by $\sqrt[3]{14/5}$ = 1·67… (b) 40, **20**, **10**, 5 Divide previous term by 2 OR 40**, 28** $\frac{1}{3}$**, 16** $\frac{2}{3}$**,** 5 Subtract 11 $\frac{2}{3}$ from the previous term	 B2 (B1) (B1) B1 B1 (B1) (B1) 4	For both (a) and (b), B2 for both spaces filled AND rule given. B1 for either filling the spaces or giving a rule (from those on the left). For both entries For both entries
10. (a) $7g - 2f$ (b) 10 (c) 0 and –1	B2 B2 B2 6	Must be in an expression for B2. B1 for sight of $7g$ or $-2f$. B1 for –6 + 16. B1 for 0.
11. (a) (i) $\frac{1}{80}$ (ii) $\frac{1}{2}$ (b) 7 red 4 green 1 black	B1 B1 B1 3	
12. 0·38 × 15·6 or equivalent = 5·928 (ISW)	M1 A1 2	Unsupported 5·9 or 5·92 or 5·93 is M1A0.
13. Unambiguous sketch (i.e. rectangles identified) OR Unambiguous description of possible layout. Correct use of 'Area = length × width' (Uncovered area =) 9 × 9 – 8 × 4 – 7 × 2 35(cm^2)	E1 B1 M1 A1 4	Allow E1 if intent clear. On any one of the three given shapes.
14. (6 × 0) + 5 × 1 + 11 × 3 ÷ 22 1·73 Accuracy of writing	M1 m1 A2 W1 5	For attempt at $\sum fx$ or sight of 38. A1 for 1·72(……)

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Foundation Tier	Mark	MARK SCHEME Comments (Page 3)
15. A (11, −1) B (21, 9) C (21, 1)	B2 B2 B2 6	B1 for each ordinate. B1 for each ordinate. B1 for each ordinate. FT 'their 21'. Accept answers on the diagram.
16. Use of 'Speed = Distance ÷ Time' (Average speed =) $\frac{80}{2{\cdot}5}$ = 32(mph)	M1 m1 A1 3	Allow M1 for 80 / 2(hr) 30(min) or 80 / 2·3 CAO
17.(a) Correct rotation (b) Correct enlargement with scale factor 2	B2 B2 4	B1 for clockwise rotation. B1 for correctly sized rectangle in incorrect position OR consistent use of wrong scale factor OR 2 correct vertices

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Intermediate Tier	Mark	MARK SCHEME Comments (Page 1)
1.(a) 32 (b) 27 (c) 34 (d) 29 or 31	B1 B1 B1 B1 4	 Still only B1 if both given (with no incorrect value(s)).
2.(a) $7g - 2f$ (b) 10 (c) 0 and –1	B2 B2 B2 6	Must be in an expression for B2. B1 for sight of $7g$ or $-2f$. B1 for –6 + 16. B1 for 0.
3.(a) (i) $\frac{1}{80}$ (ii) $\frac{1}{2}$ (b) 7 red 4 green 1 black	B1 B1 B1 3	
4.(a) 0·38 × 15·6 or equivalent = 5·928 (ISW) (b) $\frac{52}{80} \times 100$ = 65(%)	M1 A1 M1 A1 4	 Unsupported 5·9 or 5·92 or 5·93 is M1A0.
5. Unambiguous sketch (i.e. rectangles identified) OR Unambiguous description of possible layout. Correct use of 'Area = length × width' (Uncovered area =) 9 × 9 – 8 × 4 – 7 × 2 = 35(cm^2) Organisation and communication Accuracy of writing	E1 B1 M1 A1 OC1 W1 6	Allow E1 if intent clear. May be penalised on OCW if poorly expressed. On any one of the three given shapes.
6. (6 × 0) + 5 × 1 + 11 × 3 ÷ 22 = 1·73	M1 m1 A2 4	For attempt at $\sum fx$. or sight of 38. A1 for 1·72(……)
7. A (11, −1) B (21, 9) C (21, 1)	B2 B2 B2 6	B1 for each ordinate. B1 for each ordinate. B1 for each ordinate. FT 'their 21'. Accept answers on the diagram.
8. Use of 'Speed = Distance ÷ Time' (Average speed =) $\frac{80}{2{\cdot}5}$ = 32(mph)	M1 m1 A1 3	Allow M1 for 80 / 2(hr) 30(min) or 80 / 2·3 CAO

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Intermediate Tier	Mark	MARK SCHEME Comments (Page 2)
9.(a) Correct rotation	B2	B1 for clockwise rotation.
(b) Correct enlargement with scale factor 2	B2	B1 for correctly sized rectangle in incorrect position OR consistent use of wrong scale factor OR 2 correct vertices
(c) (i) Correct translation	B1	
(ii) $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$	B1	
	6	
10. Correct construction of 60°.	B2	With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately.
Correct construction of 90°.	B2	With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately.
Correct bisector of 90°.	B1	With sight of accurate 'method arcs'. FT 'their 90°' Penalise −1 if angles drawn at incorrect positions or if triangle not completed.
	5	
11. TRUE TRUE FALSE FALSE	B2	B1 for 3 correct.
	2	
12.		*Correct evaluation regarded as enough to identify if negative or positive. If evaluations not seen accept 'too high' or 'too low'.*
One correct evaluation $2 \le x \le 3$	B1	x : $x^3 - 6x - 4$
2 correct evaluations $2{\cdot}65 \le x \le 2{\cdot}85$, one < 0, one > 0.	B1	
2 correct evaluations $2{\cdot}65 \le x \le 2{\cdot}75$, one < 0, one > 0.	M1	
(x =) 2·7	A1	2 : −8 2·1 : −7·339 2·2 : −6·552 2·3 : −5·633 2·4 : −4·576 2·5 : −3·375 2·55 : −2·718... 2·6 : −2·024 2·65 : −1·290... 2·7 : −0·517 2·75 : 0·296... 2·8 : 1·152 2·9 : 2·989 3 : 5
	4	

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Intermediate Tier	Mark	MARK SCHEME Comments (Page 3)
13.(a)  2 in correct position. 6 in correct position. 9 in correct position. (b) 6 (c) (i) $\frac{17}{45}$	 B1 B1 B1 B1 B2 6	 FT 8 – 'their 2'. FT 17 – 'their 2' – 'their 6'. FT 'their total' for planning. B1 for a correct numerator only in a fraction <1. B1 for a denominator of 45 in a fraction <1.
14. Correct statement of Pythagoras' Theorem $PR^2 = 18{\cdot}4^2 - 12{\cdot}5^2$ $= 182{\cdot}31$ (PR=) 13·5(cm)	M1 A1 A1 3	 Also M1 for $18{\cdot}4^2 = PR^2 + 12{\cdot}5^2$. Or for sight of $\sqrt{182{\cdot}31}$
15. Sight of $2a + 3c = (£)71.5(0)$ AND $3a + 4c = (£)101$ or equivalent Correct method to eliminate one variable. First variable found $a = (£)17$ or $c = (£)12.5(0)$ Substitute to find 2nd variable Second variable found $c = (£)12.5(0)$ or $a = (£)17$ (4 adults and 2 children pay) £93	B1 M1 A1 M1 A1 A1 6	Accept their choice of variables for a and c. FT 'their equations' if of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients. FT 'their 1st variable'. FT their values if both M marks gained. '£' required.
16.(a) $(x - 7)(x + 3)$ $x = 7$ AND $x = -3$ (b) $\frac{2x - 14 + 2x + 5}{(8)} = \frac{4}{(8)}$ or equivalent. $4x - 9 = 4$ or equivalent. $x = \frac{13}{4}$ or $3\frac{1}{4}$ or equivalent.	B2 B1 B2 B1 B1 7	B1 for $(x \ldots 7)(x \ldots 3)$. Strict FT from their brackets. B1 for 1 error. FT until 2nd error. Mark final answer.
17. $D\hat{A}C = 36(°)$ Angles in the same segment are equal. $DC = 5{\cdot}1 \times \tan 36$ Angle subtended at the circumference by a semicircle is 90(°) . $DC = 3{\cdot}7(\ldots)$(cm)	B1 E1 M1 E1 A1 5	May be seen on diagram. Accept unambiguous statement of this fact. Accept $DC / 5{\cdot}1 = \tan 36$. Accept unambiguous statement of this fact.

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Higher Tier	Mark	MARK SCHEME Comments (Page 1)
1. Correct construction of 60°. Correct construction of 90°. Correct bisector of 90°.	B2 B2 B1 5	With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately. With sight of accurate 'method arcs'. B1 for sight of 'method arcs' but not drawn accurately. With sight of accurate 'method arcs'. FT 'their 90°' Penalise −1 if angles drawn at incorrect positions or if triangle not completed.
2. TRUE TRUE FALSE FALSE	B2 2	B1 for 3 correct.
3. One correct evaluation $2 \leq x \leq 3$ 2 correct evaluations $2{\cdot}65 \leq x \leq 2{\cdot}85$, one < 0 and one > 0. 2 correct evaluations $2{\cdot}65 \leq x \leq 2{\cdot}75$, one < 0 and one > 0. ($x$ =) 2·7	 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'.* $\underline{x}$ $\quad$ $\underline{x^3 - 6x - 4}$ 2 $\quad$ −8 2·1 $\quad$ −7·339 2·2 $\quad$ −6·552 2·3 $\quad$ −5·633 2·4 $\quad$ −4·576 2·5 $\quad$ −3·375 2·6 $\quad$ −2·024 2·55 $\quad$ −2·718... 2·7 $\quad$ −0·517 2·65 $\quad$ −1·290... 2·8 $\quad$ 1·152 2·75 $\quad$ 0·296... 2·9 $\quad$ 2·989 3 $\quad$ 5
4.(a)  2 in correct position. 6 in correct position. 9 in correct position. (b) 6 (c) $\frac{17}{45}$	 B1 B1 B1 B1 B2 6	 FT 8 – 'their 2'. FT 17 – 'their 2' – 'their 6'. FT 'their total' for planning. B1 for a correct numerator only in a fraction <1. B1 for a denominator of 45 in a fraction <1.

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Higher Tier	Mark	MARK SCHEME Comments (Page 2)
5. Correct statement of Pythagoras' Theorem $PR^2 = 18{\cdot}4^2 - 12{\cdot}5^2$ $= 182{\cdot}31$ $(PR=)$ 13·5(cm)	M1 A1 A1 3	Also M1 for $18{\cdot}4^2 = PR^2 + 12{\cdot}5^2$. Or for sight of $\sqrt{182{\cdot}31}$
6. Sight of $2a + 3c = (£)71.5(0)$ AND $3a + 4c = (£)101$ or equivalent Correct method to eliminate one variable. First variable found $a = (£)17$ or $c = (£)12.5(0)$ Substitute to find 2nd variable Second variable found $c = (£)12.5(0)$ or $a = (£)17$ (4 adults and 2 children pay) £93	B1 M1 A1 M1 A1 A1 6	Accept their choice of variables for *a* and *c.* FT 'their equations' if of equivalent difficulty. Allow 1 error in one term, not one with equal coefficients. FT 'their 1st variable'. FT their values if both M marks gained. '£' required.
7.(a) $(x - 7)(x + 3)$ $x = 7$ AND $x = -3$ (b) $\frac{2x - 14 + 2x + 5}{(8)} = \frac{4}{(8)}$ or equivalent. $4x - 9 = 4$ or equivalent. $x = \frac{13}{4}$ or $3\frac{1}{4}$ or equivalent.	B2 B1 B2 B1 B1 7	B1 for $(x \ldots 7)(x \ldots 3)$. Strict FT from their brackets. B1 for 1 error. FT until 2nd error. Mark final answer.
8. $D\hat{A}C = 36(°)$ Angles in the same segment are equal. $DC = 5{\cdot}1 \times \tan 36$ Angle subtended at the circumference by a semicircle is 90(°) . $DC = 3{\cdot}7(\ldots)$(cm)	B1 E1 M1 E1 A1 5	May be seen on diagram. Accept unambiguous statement of this fact. Accept $DC / 5{\cdot}1 = \tan 36$. Accept unambiguous statement of this fact.
9. (Least possible distance =) 399·75 (m) (Greatest possible distance =) 400·25 (m) (Least possible time =) 73·5 (seconds) (Greatest possible time =) 74·5 (seconds) (Least possible av. Speed =) $\frac{399{\cdot}75}{74{\cdot}5}$ OR (Greatest possible av. Speed =) $\frac{400{\cdot}25}{73{\cdot}5}$ = 5·36(5….) AND 5·44(55…) (m/s) Organisation and communication Accuracy of writing	B2 M1 A2 OC1 W1 7	All four correct values. B1 for any 2 correct values. One correct use of formula. FT their values. 2 **distinct** values.

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Higher Tier	Mark	MARK SCHEME Comments (Page 3)
10. (a) x = 0·49191… and $100x$ = 49·19191… with an attempt to subtract, OR equivalent (e.g. $1000x - 10x$) $\frac{487}{990}$ (b) False, AND a correct reason e.g. 'a needs to be a cube number for it to yield an integer' or a counter-example e.g. $6^{\frac{2}{3}} = \sqrt[3]{36}$ and 36 is not a cube number. (c) (i) $10\sqrt{2}$ (ii) $4\sqrt{5}$	M1 A1 B1 B1 B1 5	OR 48·7 / 99 Mark final answer.
11. $\frac{40}{260}$ × the number of employees in any category. Male / Female Full-time: 19 / 5 Part-time: 3 / 13	M1 A2 3	A1 for any 2 or 3 correct answers.
12. (a) Tangent drawn Idea of increase in y / increase in x Gradient from a reasonable tangent m/s^2 OR ms^{-2} (b) Split into 6 areas and attempt to sum (Area =) ½×10(0+2×10+2×30+2×32+2×33+2×39+40) = 1640(m)	S1 M1 A1 U1 M1 M1 A1 7	Or equivalent. Award for up to 1 error in reading scale. CAO.
13. (l^2 =) $10^2 + 5^2$ l^2 = 125 OR (l =) √125 (l =) 11·1(803…) or 11·2 (Surface area =) π×5×11·1(803…) + 2π×5×8 + π×5^2 = 505 to 506 (cm^2)	M1 A1 A1 M2 A1 6	FT *'their l'*. M1 for any 2 of the 3 terms.
14. (a) $3(x + 1) - 5(2x - 1)$ as numerator AND $(2x - 1)(x + 4)$ as denominator. OR multiply throughout by $(2x - 1)$ and $(x + 4)$ $3(x + 4) - 5(2x - 1) = 6(2x - 1)(x + 4)$ $0 = 12x^2 + 49x - 41$ (b) $x = \frac{-49 \pm \sqrt{49^2 - 4 \times 12 \times (-41)}}{2 \times 12}$ $x = \frac{-49 \pm \sqrt{4369}}{24}$ x = 0·71 and x = −4·80	M2 A1 A1 M1 A1 A1 7	Brackets required or implied later. M1 for either correct numerator or denominator, or multiply throughout with 1 error. Convincing i.e. need to see at least $12x^2 + 42x - 24$ Allow one error, in sign or substitution, but not in the formula. CAO. CAO.

MATHEMATICS 2nd SAMs 2017 Unit 2 (Calculator allowed) Higher Tier	Mark	MARK SCHEME Comments (Page 4)
15. Use of $\frac{1}{2}$absin*C* followed by cosine rule 24·25 = $\frac{1}{2}$ × 12·7 × *AD* × sin132° *AD* = (2 × 24·25)/(12·7 × sin132°) *AD* = 5·13(883…) or 5·14 (cm) $DB^2 = 12{\cdot}7^2 + AD^2 - 2 \times 12{\cdot}7 \times AD \times \cos 132(°)$ DB^2 = 275(·036…) *DB* = 16·5(842…) or 16·6 (cm)	S1 M1 m1 A1 M1 A1 A1 7	FT provided M1 awarded. *Alternative solution (using a new point E which is vertically above D):* *DE = area / 12·7 = 3·819(cm)* *S1* *AE = DE / tan48(º) = 3·439(cm)* *M1* *BE = AE + AB =16·139(cm)* *m1* *Using Pythagoras, $DE^2 + BE^2$ =* *M1* *275·05* *A1* *BD = 16·5(8…) or 16·6 (cm)* *A1*

GCSE Mathematics

Foundation Unit 1

			AOs				
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Interm)**	**OCW**
1	Number	6	6				
2	Line, circle	3	3				
3	Number puzzle	2			2		
4	Units	2	2				
5	Probability line	2	2				
6	Tally, graph	5	2	3			
7	Percentages, fractions, simplify	5	5				
8	Scales	7			7		✓
9	Angles	5	5			5 (Q1)	
10	Number work	3	3			3 (Q2)	
11	Probability	4			4	4 (Q3)	
12	Rectangle problem	4			4	4 (Q4)	
13	Solving equations	5	5			5 (Q6)	
14	Central tendency	7	5		2	7 (Q7)	
15	Area of triangle and trapezium	5		5		5 (Q8)	
	Totals	**65**	**38**	**8**	**19**	**33**	

GCSE Mathematics

Intermediate Unit 1

			AOs					
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Found)**	**Common (Higher)**	**OCW**
1	Angles	5	5			5 (Q9)		
2	Number work	3	3			3 (Q10)		
3	Probability	4			4	4 (Q11)		
4	Rectangle problem	4			4	4 (Q12)		
5	Percentage and fraction	4		4				
6	Solving equations	5	5			5 (Q13)		
7	Central tendency	7	5		2	7 (Q14)		
8	Area of triangle and trapezium	7		7		5 (Q15)		✓
9	Mutually exclusive and independent events	6	6				6 (Q1)	
10	Quadratic graph	7	6		1		7 (Q2)	
11	True or False	3			3		3 (Q3)	
12	Tessellation	6			6		8 (Q4)	
13	Equation of lines	3	3				3 (Q5)	
14	Standard form	4	4				4 (Q6)	
15	Tree diagram	6	2		4		6 (Q7)	
16	Solving, factorising and simplifying	6	6				6 (Q8)	
	Totals	**80**	**45**	**11**	**24**	**33**	**43**	

GCSE Mathematics

Higher Unit 1

			AOs				
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Interm)**	**OCW**
1	Mutually exclusive and independent events	6	6			6 (Q9)	
2	Quadratic graph	7	6		1	7 (Q10)	
3	True or False	3			3	3 (Q11)	
4	Tessellation	8			8	8 (Q12)	✓
5	Equation of lines	3	3			3 (Q13)	
6	Standard form	4	4			4 (Q14)	
7	Tree diagram	6	2		4	6 (Q15)	
8	Solving, factorising and simplifying	6	6			6 (Q16)	
9	Region satisfied by inequalities	3	3				
10	Perimeter of a sector	4			4		
11	Similar volumes - ornaments	4		4			
12	Rational numbers	2	2				
13	Histogram	7	3	4			
14	Graphical solution of a quadratic	3		3			
15	Simplify algebraic fraction	5	5				
16	Probability	6	2		4		
17	Transformation of graphs	3	3				
	Totals	**80**	**45**	**11**	**24**	**43**	

GCSE Mathematics

Foundation Unit 2

			AOs					
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Found)**	**OCW**	
1	Bill	4	4					
2	Triangle construction	3	3					
3	Estimating area	2	2					
4	Chance; mode	3	3					
5	Number tower; coins; ready meals	8		4	4		✓	OC
6	Equations	2	2					
7	Location	2	2					
8	True/false; symmetry	4		2	2			
9	Finding sequences	4			4			
10	Simplifying, substitution and sequence	6	6			6 (Q2)		
11	Probability	3	2		1	3 (Q3)		
12	Percentages	2	2			2 (Q4a)		
13	Shape problem	4		4		4 (Q5)		
14	Mean from discrete frequency table	5	5			4 (Q6)	✓	W
15	Coordinates problem	6			6	6 (Q7)		
16	Average speed	3	3			3 (Q8)		
17	Transformations	4	4			4 (Q9)		
	Totals	**65**	**38**	**10**	**17**	**32**		

GCSE Mathematics

Intermediate Unit 2

			AOs					
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Found)**	**Common (Higher)**	**OCW**
1	Factor, cube ,multiple and prime	4	4					
2	Simplifying, substitution and sequence	6	6			6 (Q10)		
3	Probability	3	2		1	3 (Q11)		
4	Percentages	4	4			2 (Q12)		
5	Shape problem	6		6		4 (Q13)		✓
6	Mean from discrete frequency table	4	4			4 (Q14)		
7	Coordinates problem	6			6	6 (Q15)		
8	Average speed	3	3			3 (Q16)		
9	Transformations	6	5		1	4 (Q17)		
10	Construction	5	5				5 (Q1)	
11	Congruency (True / False)	2		2			2 (Q2)	
12	Trial and improvement	4	4				4 (Q3)	
13	Venn diagram	6	1	2	3		6 (Q4)	
14	Pythagoras	3	3				3 (Q5)	
15	Forming and solving simultaneous equations	6			6		6 (Q6)	
16	Factorising and solving	7	7				7 (Q7)	
17	Circle theorem and trig.	5			5		5 (Q8)	
	Totals	**80**	**48**	**10**	**22**	**32**	**38**	

GCSE Mathematics

Higher Unit 2

			AOs				
Qu.	**Topic**	**Max mark**	**AO1**	**AO2**	**AO3**	**Common (Interm)**	**OCW**
1	Construction	5	5			5 (Q10)	
2	Congruency (True / False)	2		2		2 (Q11)	
3	Trial and improvement	4	4			4 (Q12)	
4	Venn diagram	6	1	2	3	6 (Q13)	
5	Pythagoras	3	3			3 (Q14)	
6	Forming and solving simultaneous equations	6			6	6 (Q15)	
7	Factorising and solving	7	7			7 (Q16)	
8	Circle theorem and trig.	5			5	5 (Q17)	
9	Greatest possible speed	7	7				✓
10	Recurring decimal to fraction, surds	5	4		1		
11	Stratified sample	3	3				
12	Train velocity-time graph	7	7				
13	Surface area cone and cylinder	6		6			
14	Fractional quadratic equation	7	7				
15	Sine Cosine rule	7			7		
	Totals	**80**	**48**	**10**	**22**	**38**	