Candidate Name	Centre Number					Candidate Number				
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GCSE

MATHEMATICS
UNIT 1: NON-CALCULATOR
HIGHER 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

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

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

Take π as 3·14.

INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

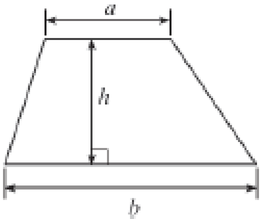
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**7**	
3.	**3**	
4.	**8**	
5.	**3**	
6.	**4**	
7.	**6**	
8.	**6**	
9.	**3**	
10.	**4**	
11.	**4**	
12.	**2**	
13.	**7**	
14.	**3**	
15.	**5**	
16.	**6**	
17.	**3**	
TOTAL	**80**	

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

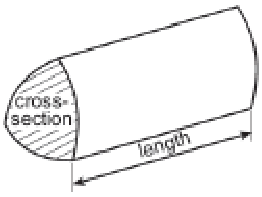
The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question **4**.

Formula list – Higher tier

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

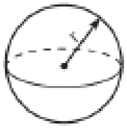


Volume of a prism = area of cross section × length



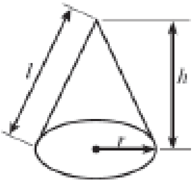
Volume of a sphere $= \frac{4}{3}\pi r^3$

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 $= \pi r l$

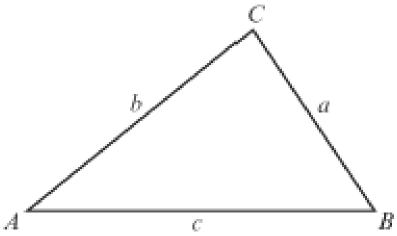


In any triangle ABC,

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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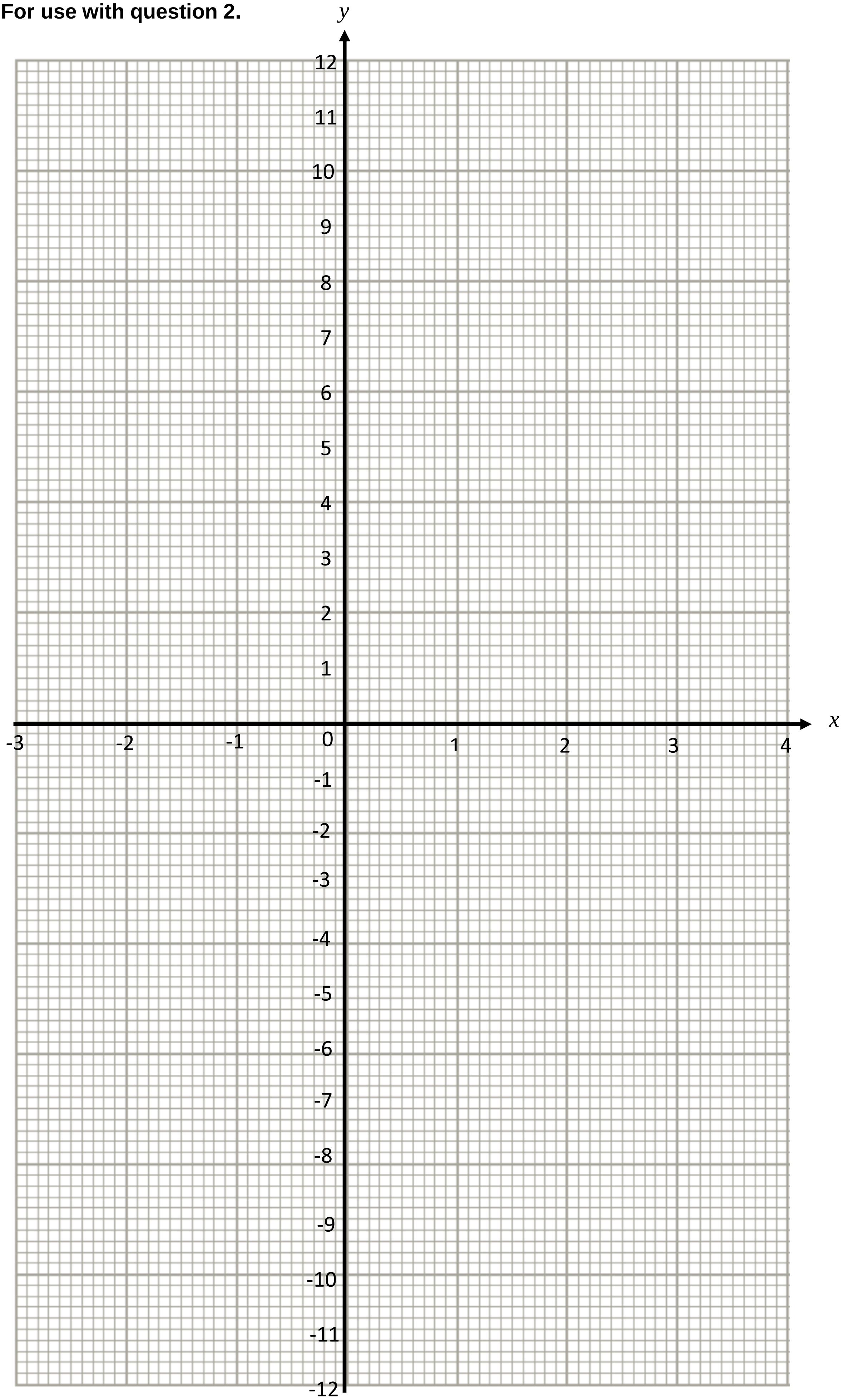
For use with question 2.



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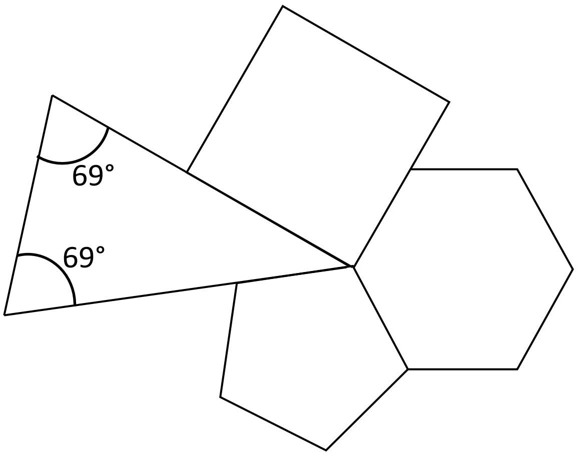
4. *You will be assessed on the quality of your organisation, communication and accuracy in writing in this question.*

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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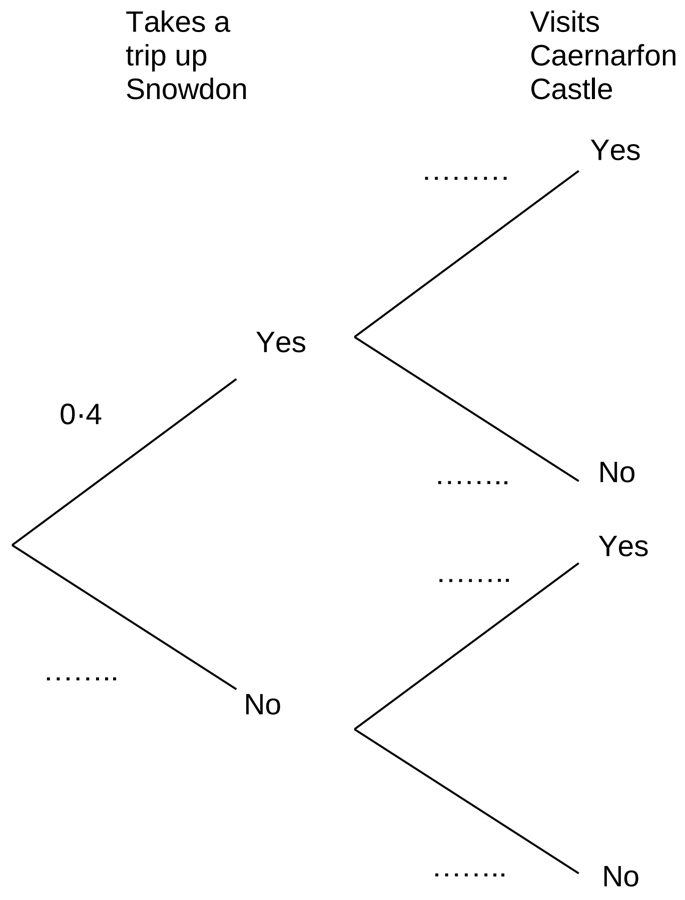
Takes a trip up Snowdon
Visits Caernarfon Castle
………
Yes
Yes
0·4
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No
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Yes
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No
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No

(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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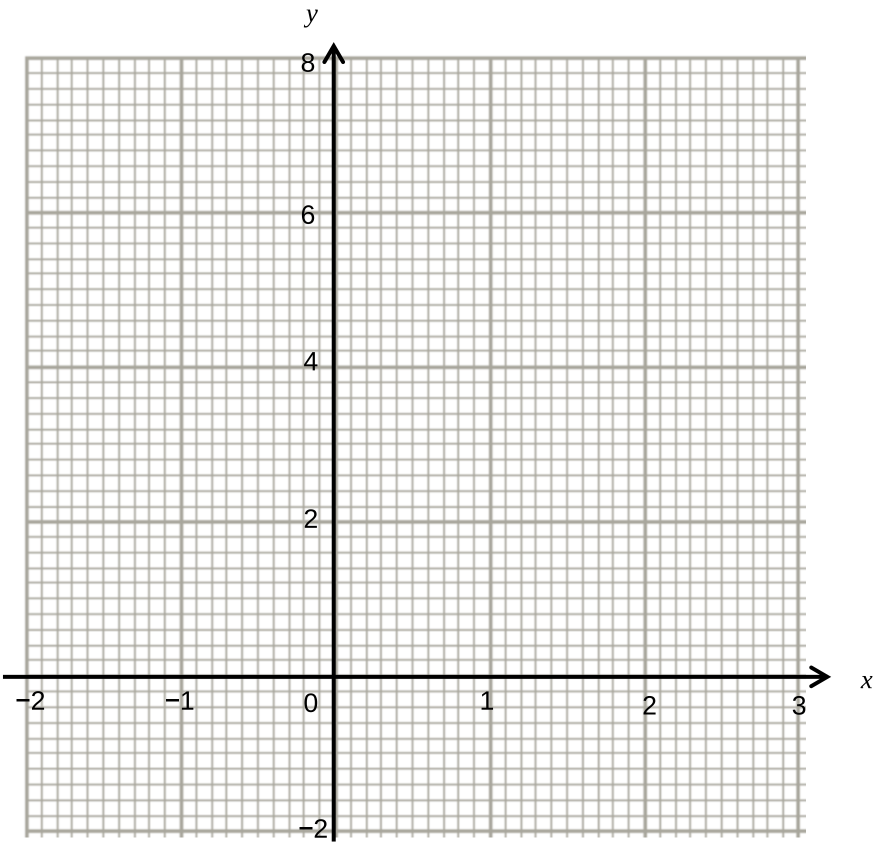

10.

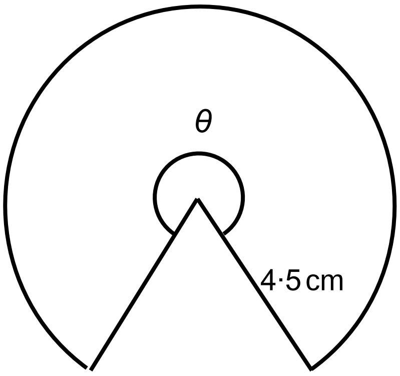

Diagram not drawn to scale

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

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

[1]

$\left(\frac{3}{8}\right)^2$ $\qquad\qquad$ $\sqrt{144}$ $\qquad\qquad$ $\sqrt[3]{64}$ $\qquad\qquad$ $0\cdot\dot{7}912\dot{5}$ $\qquad\qquad$ 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* ≤ 490	6	
490 < *x* ≤ 495	22	
495 < *x* ≤ 497·5	15	
497·5 < *x* ≤ 500	17	
500 < *x* ≤ 510	15	

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

[3]

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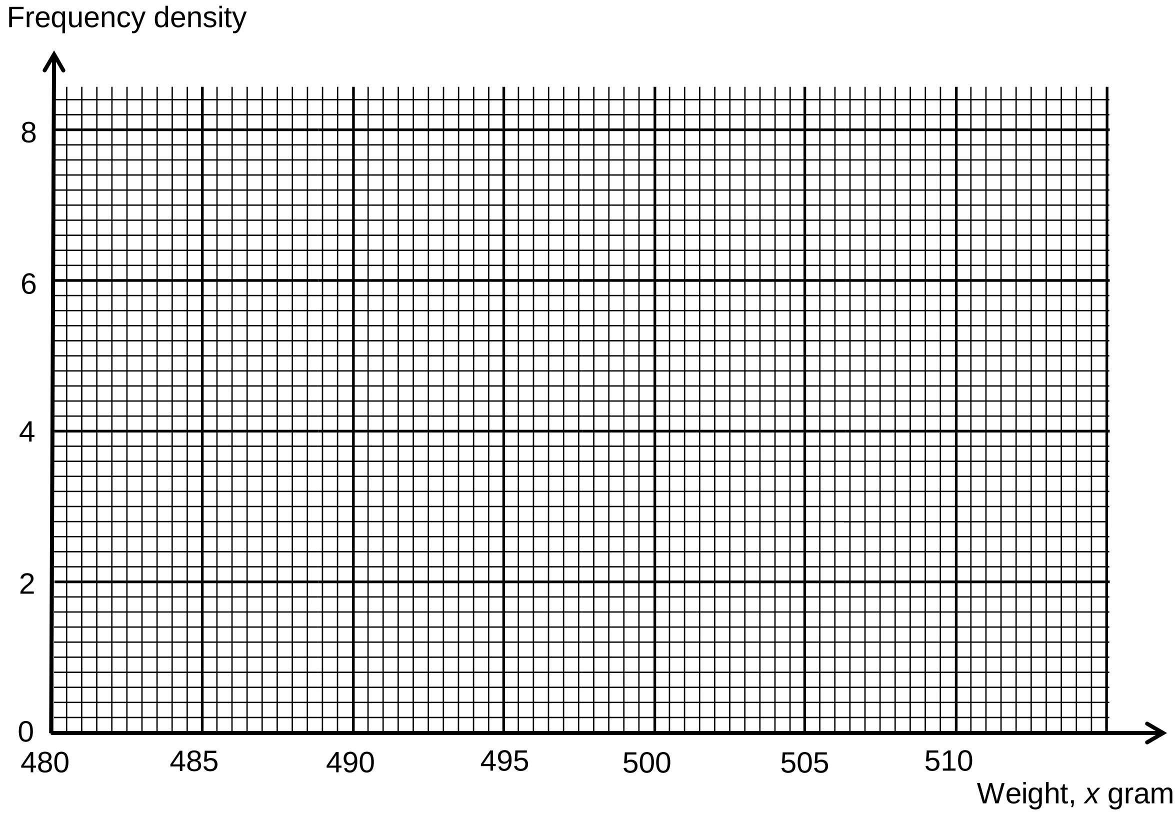
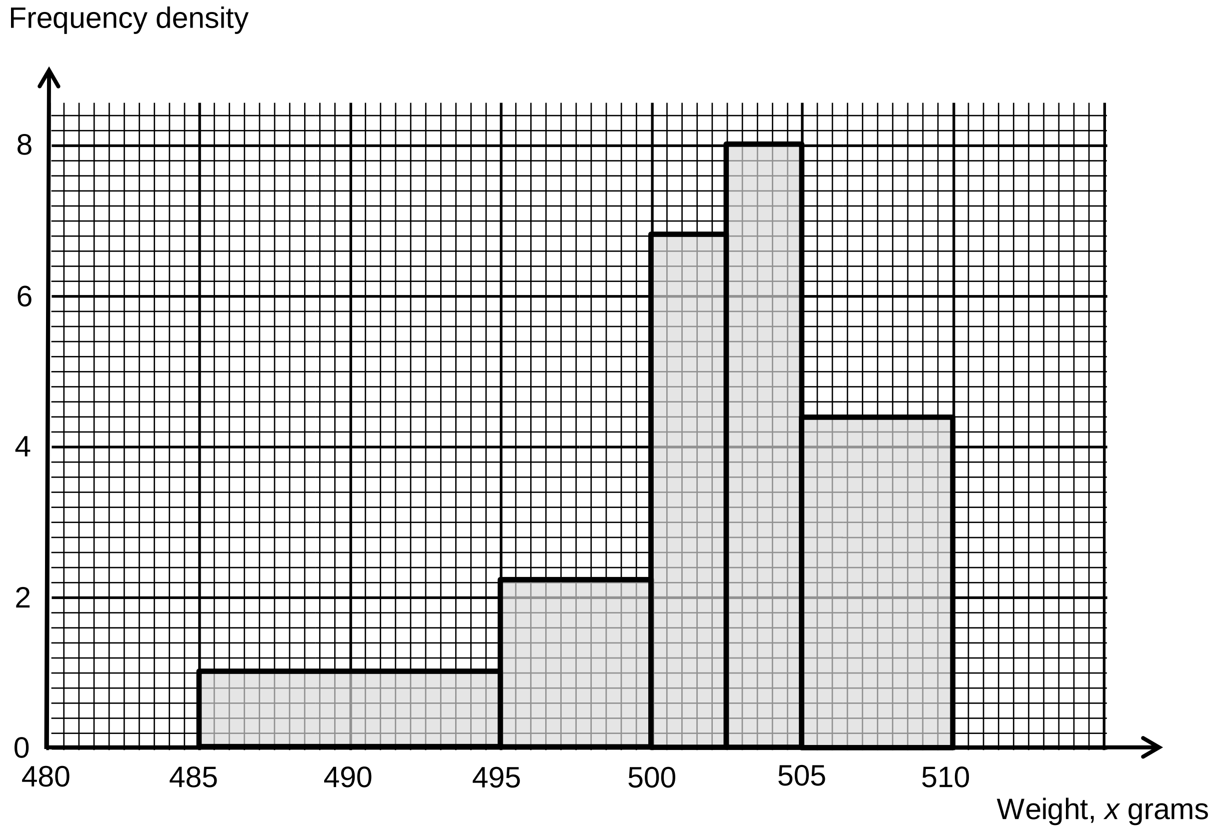


(b) The histogram for the samples of “Oat Crunch” is shown below.



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

[4]

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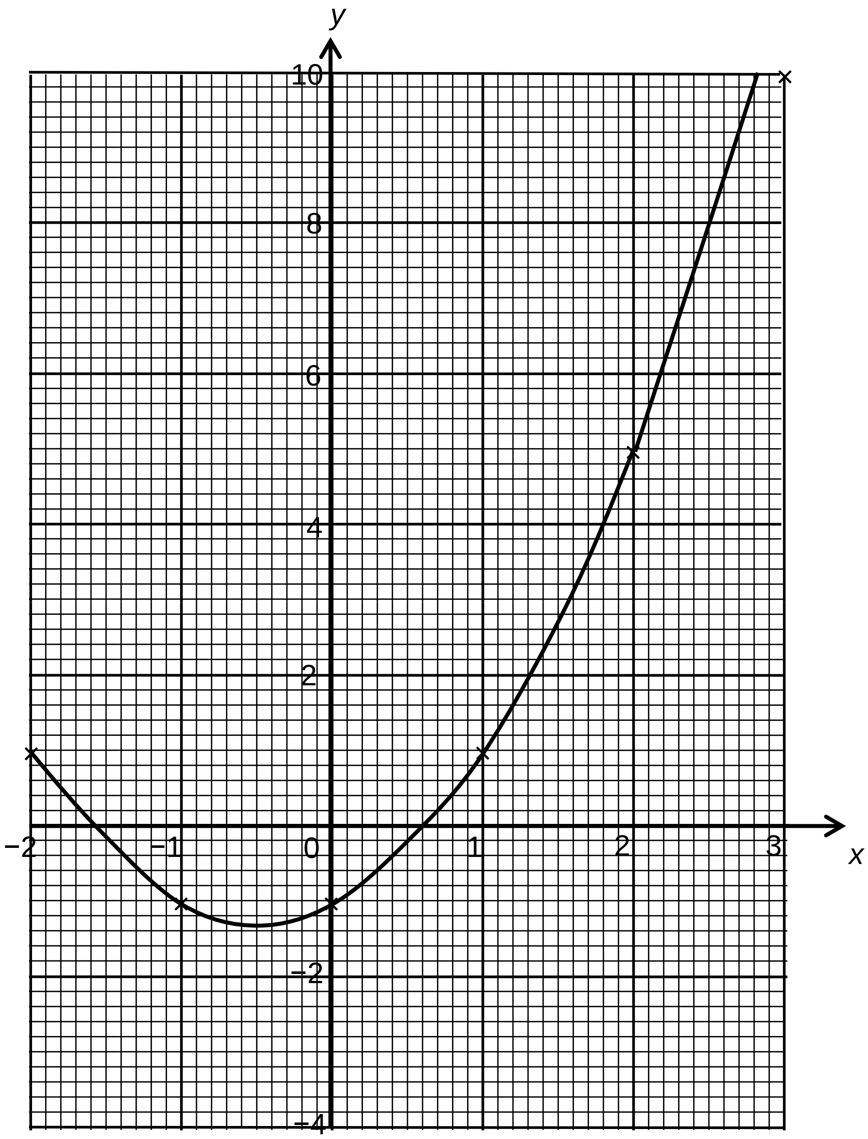
14. The graph of $y = x^2 + x - 1$ is shown below for values of x from −2 to 3.



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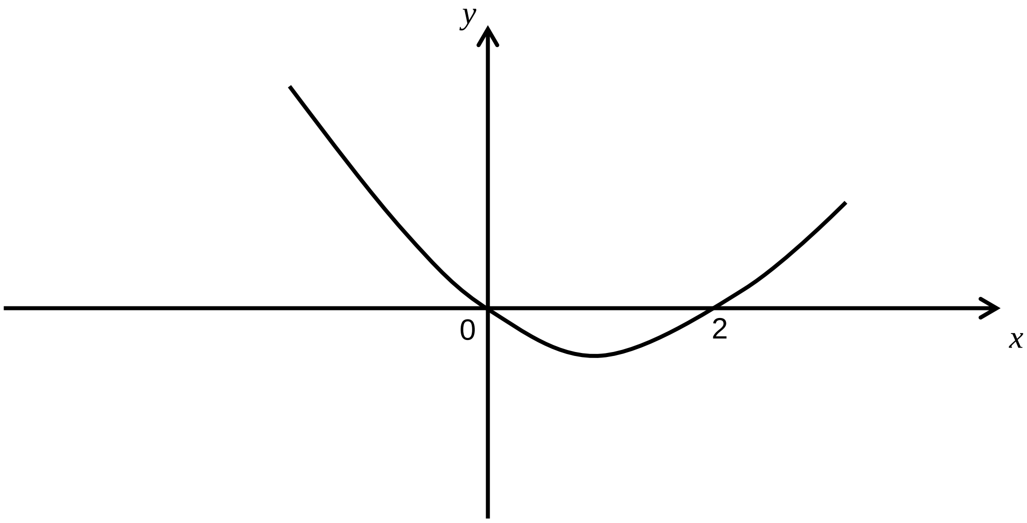
17. The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curves $y = f(x + 3)$ and $y = -f(x + 3)$.
Clearly label each curve with its function, and indicate the coordinate of any point where a curve crosses an axis.

[3]



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