

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

C300UA0-1



WEDNESDAY, 8 NOVEMBER 2023 – MORNING

MATHEMATICS – Component 1

Non-Calculator Mathematics

HIGHER TIER

2 hours 15 minutes

ADDITIONAL MATERIALS

An additional formulae sheet.
 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

Use black ink or black ball-point pen.
 Do not use gel pen or correction fluid.
 You may use a pencil for graphs and diagrams only.
 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.
 If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

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.
 You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	2	
2.	4	
3.	3	
4.	2	
5.	3	
6.	5	
7.	2	
8.	3	
9.	2	
10.	6	
11.	3	
12.	5	
13.	5	
14.	7	
15.	5	
16.	5	
17.	7	
18.	6	
19.	5	
20.	4	
21.	5	
22.	4	
23.	4	
24.	6	
25.	7	
26.	5	
27.	2	
28.	3	
Total	120	



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Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

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

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

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

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

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$



- 1. Ivy mixes lemon juice, pineapple juice and orange juice in the ratio 1 : 2 : 7 to make a fruit drink.

Ivy has 330ml of her fruit drink in a glass.

How much pineapple juice is in Ivy's glass?

[2]

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- 2. The shape below consists of a square surrounded by four semi-circles. The diameter of each semi-circle is 12 cm.

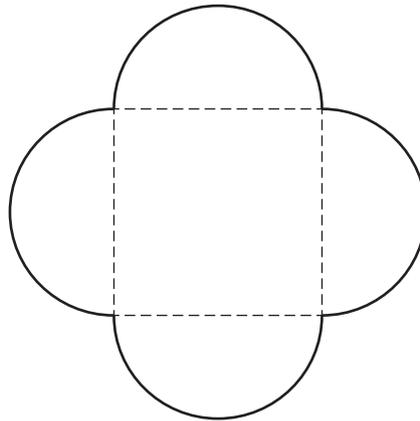


Diagram not drawn to scale

Work out the area of the shape. Give your answer in the form $a + b\pi$.

[4]

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Area = cm^2



4. Oliver and Kian bake cakes.

The mass of Oliver's cake is between 400g and 500g inclusive.
The mass of Kian's cake is between 200g and 300g inclusive.

Complete the inequality to show the least and greatest possible differences between the mass of their cakes. [2]

..... ≤ mass difference ≤

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5. Jen is mixing some paints to make brown paint.

She made orange paint by mixing red paint and yellow paint.
40% of the orange paint was red paint.

She then mixes the orange paint with some blue paint in the ratio 20 : 21 to make brown paint.

What fraction of the brown paint is red paint? [3]

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7. (a) Simplify $7\sqrt{2} \times 3$ [1]

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(b) Complete the calculation below.

$2\sqrt{11} \times \dots\dots\dots = 22$ [1]

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8. Factorise $3xy^2 + 6x^2y$ [3]

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9. Hans thinks of a number.
When his number is multiplied by 2.4×10^5 , the answer is 9.6×10^8 .

What number did Hans think of?
Write your answer in standard form. [2]

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10. Kate is visiting London.

The probability that she will go on a train is 0.4.

The probability of Kate going to the theatre is independent of her going on a train.

The probability that she goes on a train and goes to the theatre is 0.28.

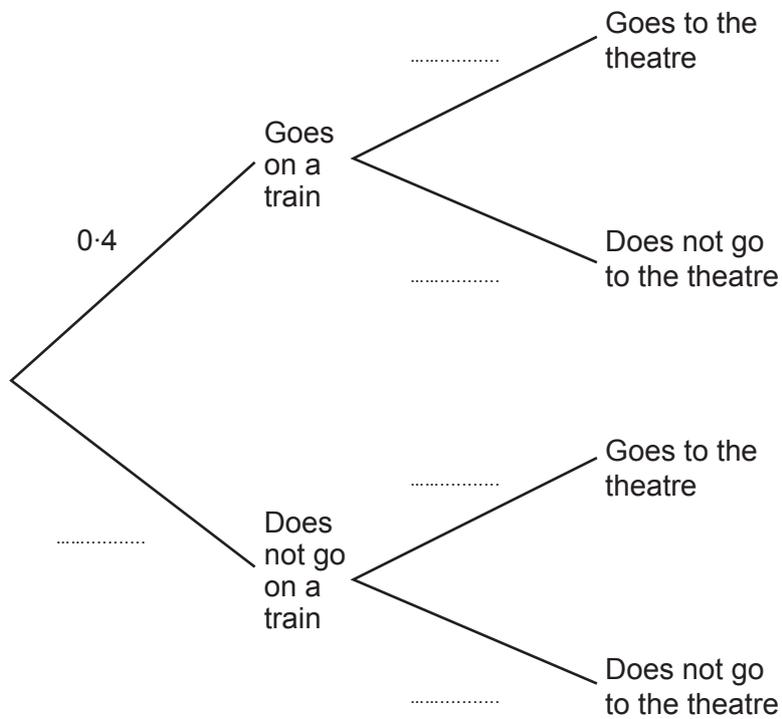
(a) Complete the following tree diagram.

[4]

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(b) Calculate the probability that Kate does not go on a train and does not go to the theatre.

[2]

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11. It takes 2 hours to empty 8 identical tanks of water using 9 identical pumps.

How long would it take to empty 2 of these tanks using 3 of these pumps?

[3]

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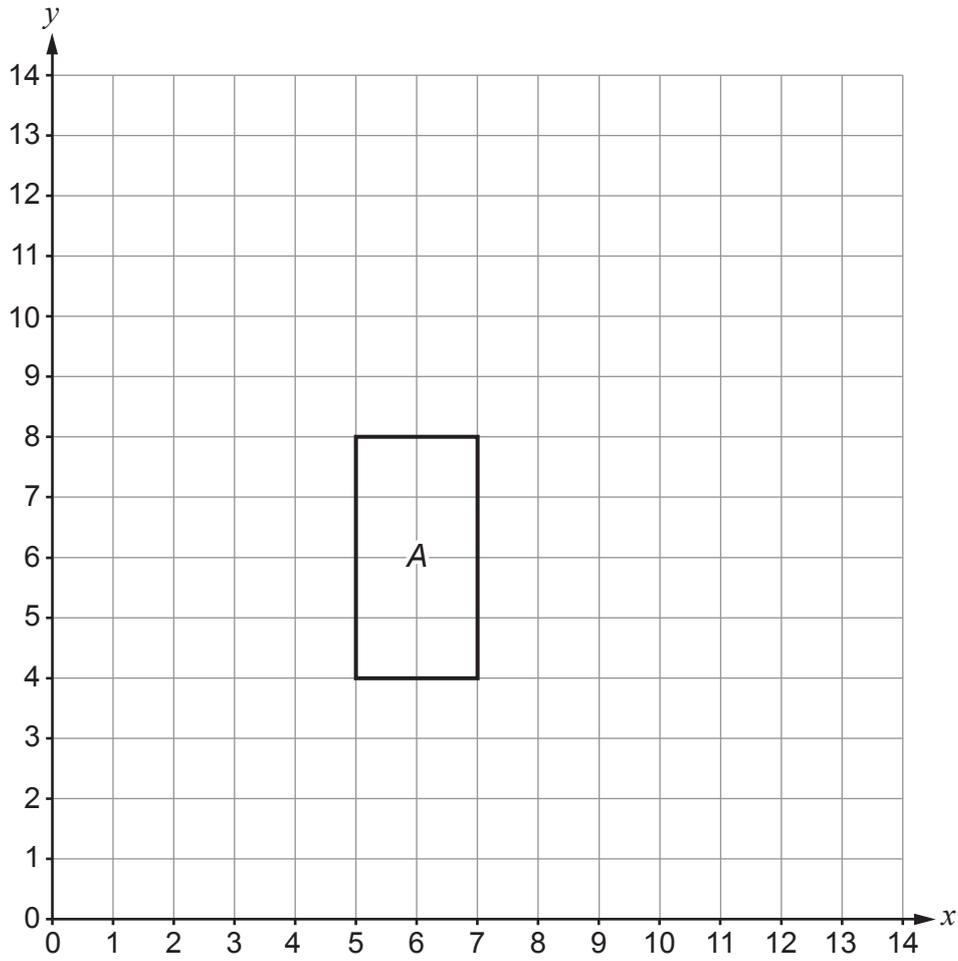
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12. (a)



Draw the enlargement of rectangle A with scale factor $\frac{1}{2}$ and centre of enlargement (1, 2).

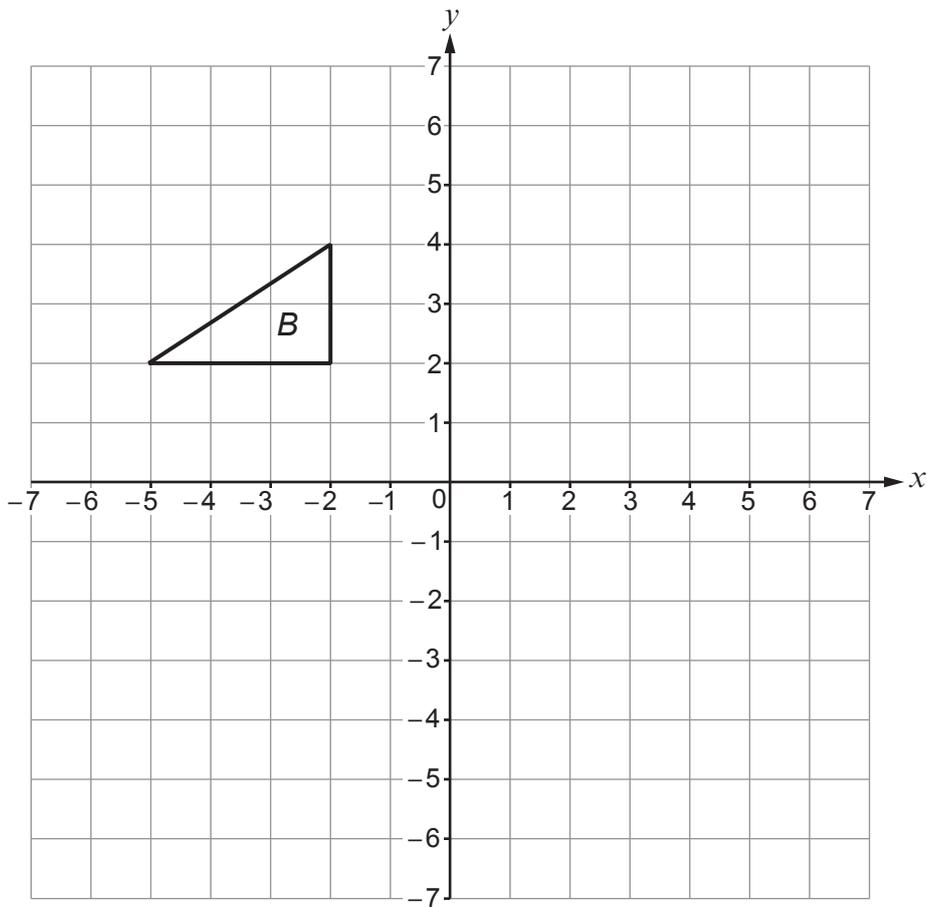
[2]

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(b)



Triangle *B* is reflected in the line $x = 0$ to give triangle *C*.

Triangle *C* is rotated 90° clockwise about $(0, 0)$ to give triangle *D*.

- (i) Draw triangle *C* and triangle *D*. [2]
- (ii) Describe the **single** transformation that maps triangle *B* to triangle *D*. [1]

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13. (a) Show that the lines

$$3y - 12x = 9 \text{ and } 2y = 8x - 13$$

are parallel to each other.

[3]

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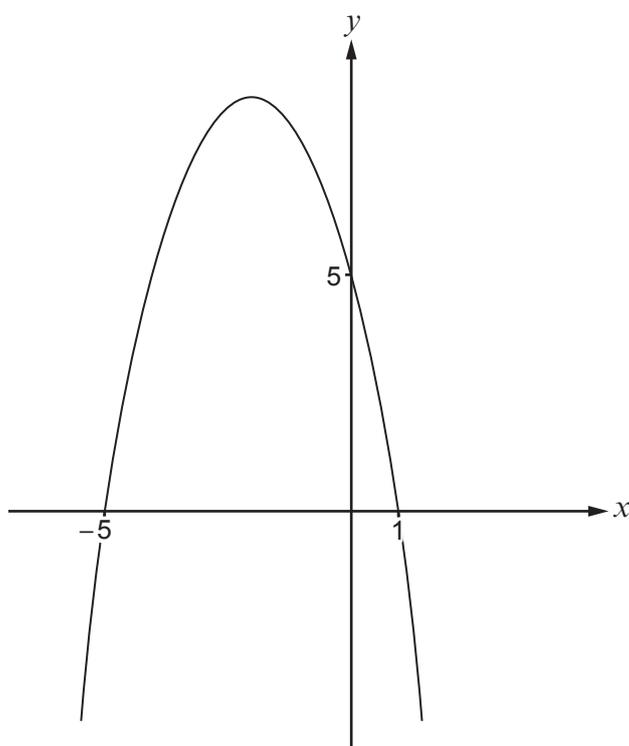
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(b) The diagram shows the curve $y = 5 - 4x - x^2$.



Calculate the coordinates of the turning point of the curve.

[2]

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(..... ,)



14. (a) (i) Find the next term in this sequence. [2]

$$\frac{5}{2} \quad - \frac{25}{4} \quad \frac{125}{8} \quad - \frac{625}{16} \quad \dots\dots\dots$$

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- (ii) Find the next term in this Fibonacci-style sequence. [1]

$$10 \quad 15 \quad 25 \quad 40 \quad 65 \quad \dots\dots\dots$$

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- (b) The n th term of a sequence is $(10\sqrt{5})^n$.

Calculate the 4th term of this sequence.
You must simplify your answer.

[2]

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4th term =



(c) Find the n th term of the sequence below.

[2]

3 15 35 63 99

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n th term =



15. (a) Factorise $5x^2 + 13x + 6$.

[2]

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(b) Adrian is trying to solve $3 - 4x > 11$.
He writes the following:

$3 - 4x > 11$
$-4x > 8$
$x > \frac{8}{-4}$
$x > -2$

Adrian's method is incorrect. Explain why.

[1]

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(c) Simplify $\frac{(x^4)^3}{x^2}$.

[2]

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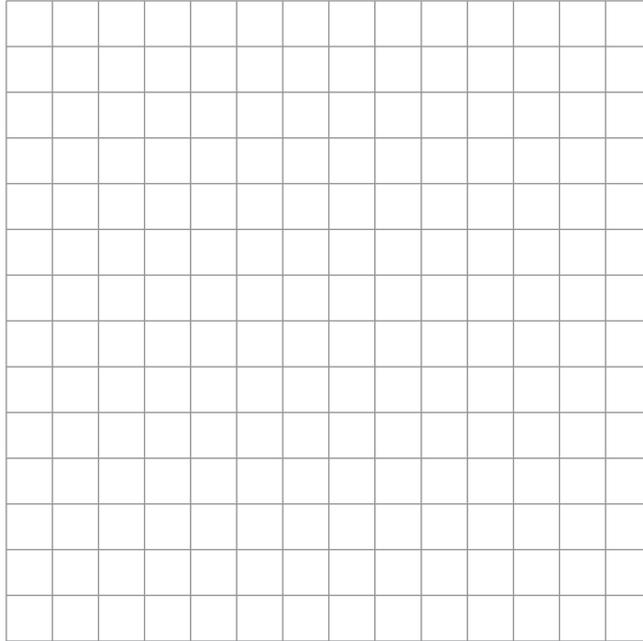
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16. (a) The vector $t = \begin{pmatrix} 7 \\ -2 \end{pmatrix}$ and the vector $w = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$.

On the grid below, draw the vector $t + w$.

[2]



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17. (a) Evaluate $8^{\frac{5}{3}}$.

[2]

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(b) Write $\frac{6}{\sqrt{2}}$ in the form $a\sqrt{2}$ where a is an integer.

[2]

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(c) **Estimate** the value of $\frac{(1.96 \times 10^8) + (6.89 \times 10^8)}{298}$.

Write your answer in standard form.

[3]

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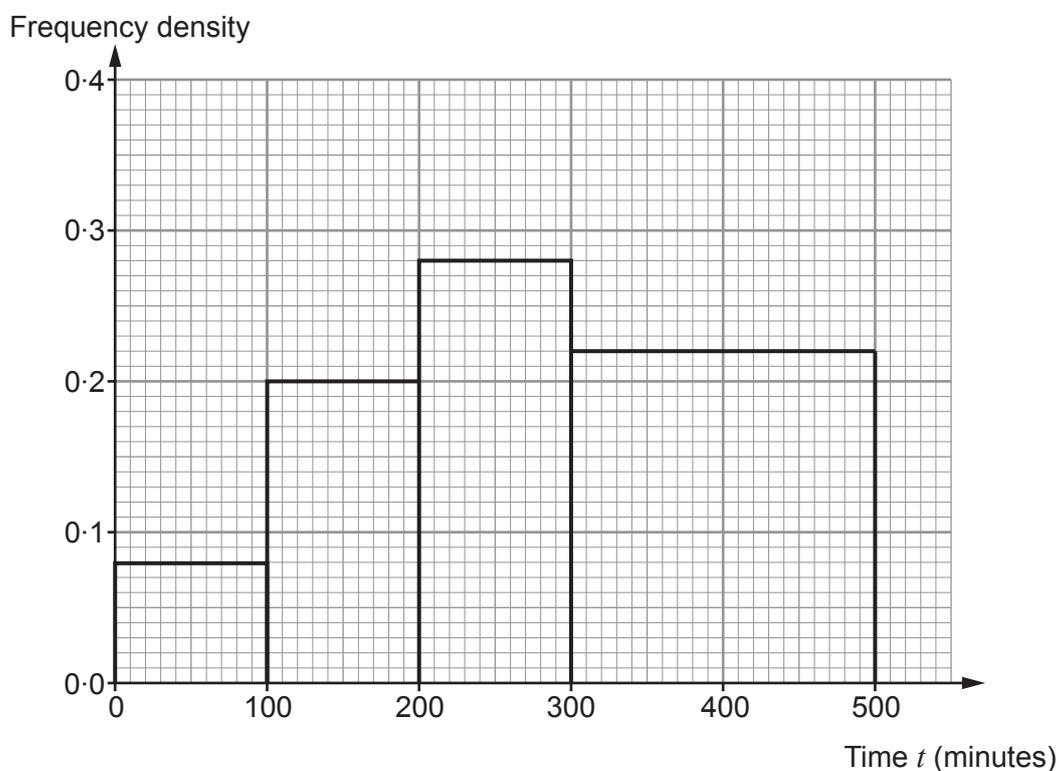
21. Alice is investigating how much time, in minutes, pupils at her school spend on their mobile phones. She asks 100 students in Year 11 and 100 students in Year 7 to record how much time they each spend on their mobile phones on a Monday.

(a) The results for Year 11 are shown in the table below.

Time t (minutes)	$0 \leq t < 50$	$50 \leq t < 100$	$100 \leq t < 200$	$200 \leq t < 300$	$300 \leq t < 400$	$400 \leq t < 500$
Number of students	3	5	20	28	30	14

Alice displays her results in the histogram shown below.

Year 11 results



Give **one** criticism of Alice's histogram.

[1]

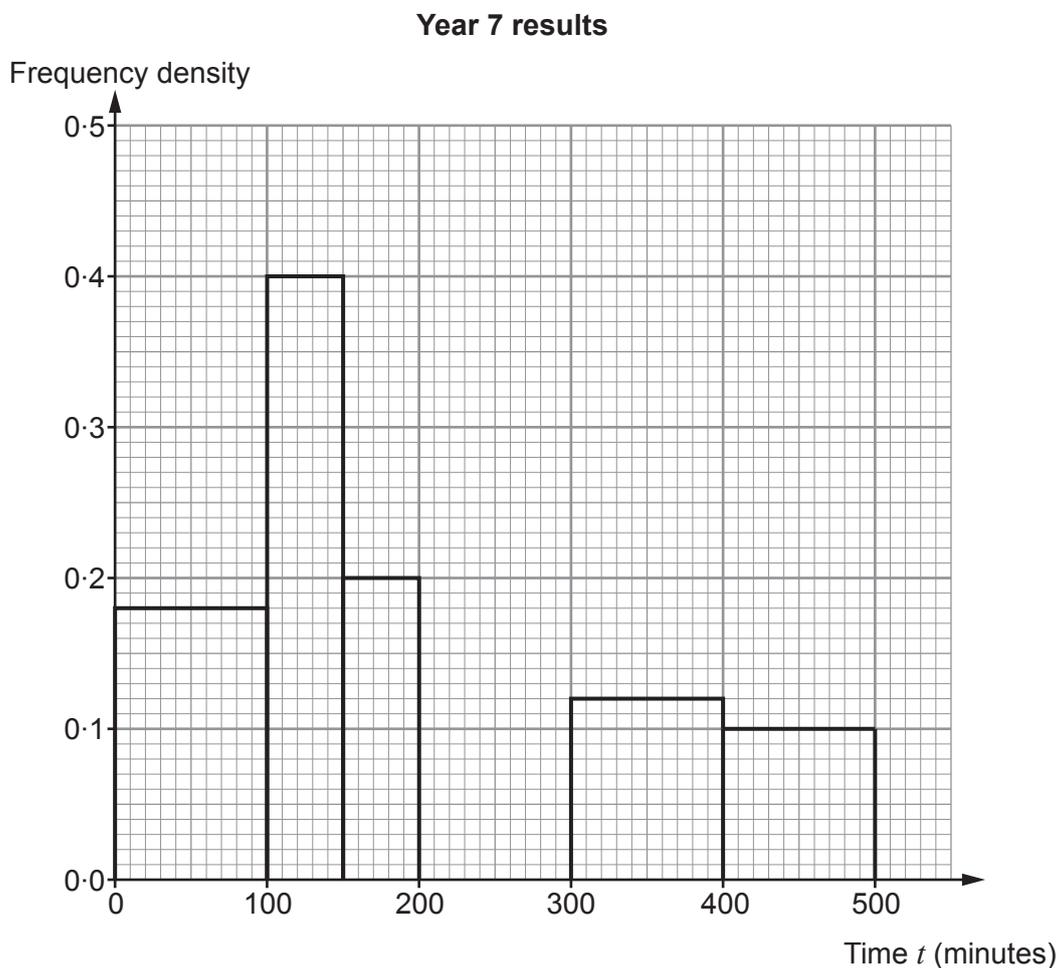
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- (b) Alice's histogram showing the results for the 100 Year 7 students is shown below. The group with time $200 \leq t < 300$ is missing.



Complete the histogram.
You must show all your working.

[3]

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- (c) Make **one** comparison between the amount of time spent on their mobile phones by **all** the students in Year 11 and **all** the students in Year 7. [1]

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22. The following iterative formula can be used to find the number of cells of bacteria after n days.

$$B_0 = 1000$$

$$B_{n+1} = 1.2B_n \text{ where } n \geq 0$$

(a) Show that the number of cells of bacteria after 1 day is 1200. [1]

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(b) Use this formula to find the number of cells of bacteria after 3 days. [3]

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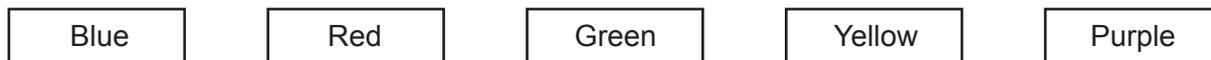
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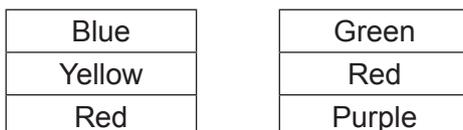
Number of cells of bacteria after 3 days =



23. Adina has 5 wooden blocks. Each block is a different colour.



Adina selects 3 of these wooden blocks at random.
Each time she does this, she places them on top of each other.
Two ways of arranging the blocks are shown below.



(a) Calculate the number of different ways of arranging the blocks. [2]

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(b) How many arrangements are there where the middle block is **either** blue **or** red? [2]

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(b) Use 5 vertical strips of equal width to calculate an estimate of the distance travelled by the car during the first 20 seconds of motion. [3]

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Distance travelled = m



26. Make e the subject of the following formula.

[5]

$$3e = \sqrt{7 - de^2}$$

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27. Express $0.3\dot{4}5$ as a fraction.

[2]

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28.



Sofia's dog is running through a field.
Its speed at t seconds is w metres per second.

The diagram below shows the speed of the dog for part of its run.

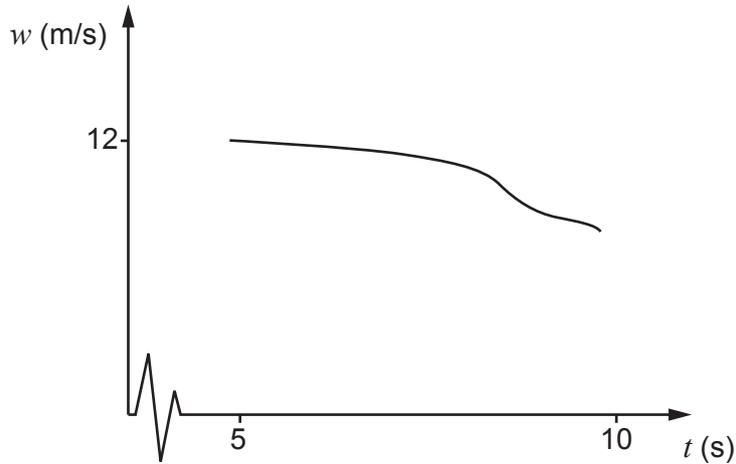


Diagram not drawn to scale

When $t = 5$, $w = 12$.

The average deceleration of the dog between 5 and 10 seconds is 1.5 m/s^2 .

Calculate the speed of Sofia's dog when $t = 10$.

You must show all your working.

[3]

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Speed when $t = 10$ is m/s

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