

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

C300UA0-1



A19-C300UA0-1



**TUESDAY, 5 NOVEMBER 2019 – MORNING**

**MATHEMATICS – Component 1**  
**Non-Calculator Mathematics**  
**HIGHER TIER**

2 hours 15 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**

Use black ink or black ball-point pen.  
 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 continuation pages 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.	3	
2.	4	
3.	3	
4.	7	
5.	6	
6.	4	
7.	3	
8.	6	
9.	2	
10.	6	
11.	3	
12.	7	
13.	11	
14.	5	
15.	6	
16.	6	
17.	5	
18.	5	
19.	4	
20.	7	
21.	4	
22.	8	
23.	5	
<b>Total</b>	<b>120</b>	

**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. The diagram shows a cylinder.

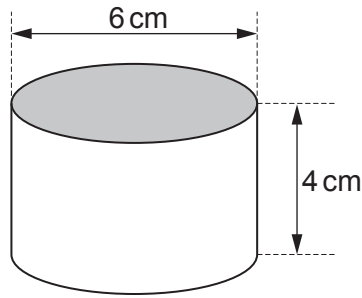


Diagram not drawn to scale

On the 1 centimetre grid below, draw accurately:

- the plan of the cylinder,
- the side elevation of the cylinder.

[3]

Plan



Side elevation



2. Gita is carrying out a survey to find out what people think of a proposed new road for Redville.
- (a) Gita decides to ask the first 20 people she meets at Redville bus station between 8 a.m. and 9 a.m. on a Monday morning.

Give **two** reasons why this plan is unlikely to produce reliable results. [2]

Reason 1:

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Reason 2:

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- (b) Here is a question from Gita's survey:

How often do you use your car?			
1 – 2	<input style="width: 40px; height: 30px;" type="checkbox"/>	3 – 4	<input style="width: 40px; height: 30px;" type="checkbox"/>
4 – 5	<input style="width: 40px; height: 30px;" type="checkbox"/>	6 +	<input style="width: 40px; height: 30px;" type="checkbox"/>

Make **two** criticisms of Gita's question. [2]

Criticism 1:

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Criticism 2:

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Examiner  
only

3. In 2018, the total volume of ice in the Greenland ice sheet was  $2.99 \times 10^6 \text{ km}^3$ .  
The total surface area of the ice sheet was  $1.799 \times 10^6 \text{ km}^2$ .

Assuming that the depth of the ice was constant for the whole ice sheet, **estimate** the depth of the ice in 2018.

You must state the units of your answer.

[3]

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Depth of ice = ..... Units .....

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4. (a) Solve  $5x - 1 = 3x + 4$ .

[2]

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(b) Solve the following simultaneous equations.

[2]

$$\begin{aligned} 2x + y &= 8 \\ x - y &= 1 \end{aligned}$$

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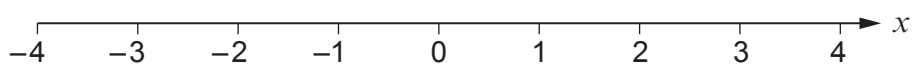
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(c) Represent the inequality  $-2 \leq x \leq 3$  on the number line below.

[1]



(d) Solve  $\frac{2x}{3} < 4$ .

[2]

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6. Shania has two pieces of ribbon.

One piece is  $5\frac{1}{4}$  metres long.

The difference between the lengths of the two pieces is  $2\frac{9}{20}$  metres.

Work out the **two** possible lengths of the other piece of ribbon.

Give each of your answers as a mixed number in its simplest form.

[4]

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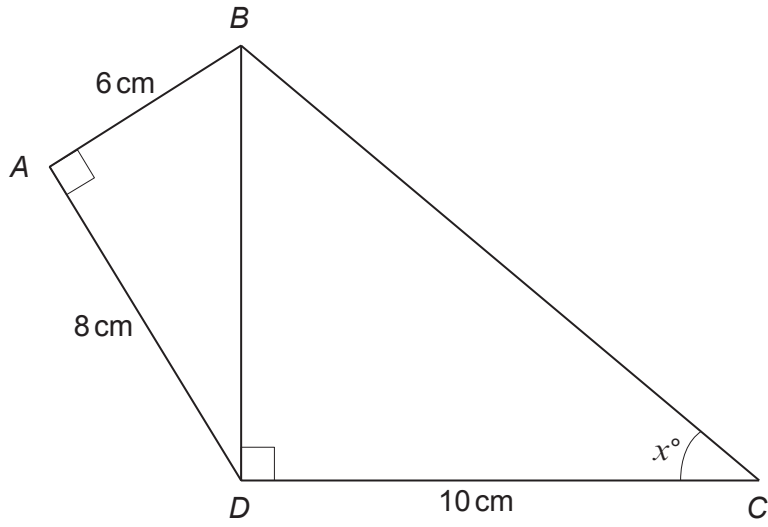


Diagram not drawn to scale

Find the value of  $x$ .  
You must show all your working.

[3]

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$x =$  .....

8. Huw has a maths test.

- (a) For the first question, Huw divides 752 by a whole number. His answer, which is correct, is 25 remainder 27.

What whole number did Huw divide by?

[3]

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- (b) The second question is:

The only food provided for guests at Seaview Hotel is breakfast. The hotel has enough food to make breakfast for 20 guests for 6 days.  
 How long would the food last 30 guests?  
 You may assume each guest eats the same amount of food for breakfast.

Here is Huw's working.

20 guests	for	6 days
10 guests	for	3 days
30 guests	for	9 days

- (i) Without working out the correct answer, explain why Huw's answer of 9 days is incorrect. [1]

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- (ii) Work out the correct answer. [2]

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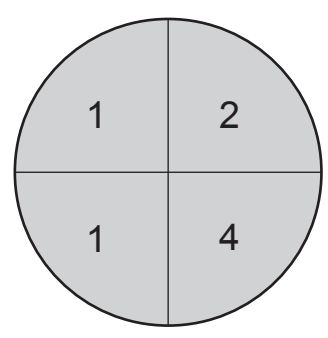
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9. The diagram shows a dartboard with 4 sectors of equal size.



Sanjeev throws 3 darts which all hit this dart board.  
Each dart is equally likely to hit any sector of the dart board.

He **multiplies** his three numbers to find his score.

Work out the probability that his score is an odd number. [2]

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Area with horizontal dotted lines for writing.

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11. A scientist wants to find out how many coots there are on a lake.

One Monday morning, she captures a random sample of 48 coots and tags them.  
She then releases them back onto the lake.

The following Monday morning, she captures a second random sample of 30 coots and counts the number that are tagged.

The scientist finds that 20 of the coots in the second sample are tagged.

Assume that the number of coots on the lake remains constant.

How many coots are there likely to be on the lake?  
Show calculations to justify your answer.



[3]

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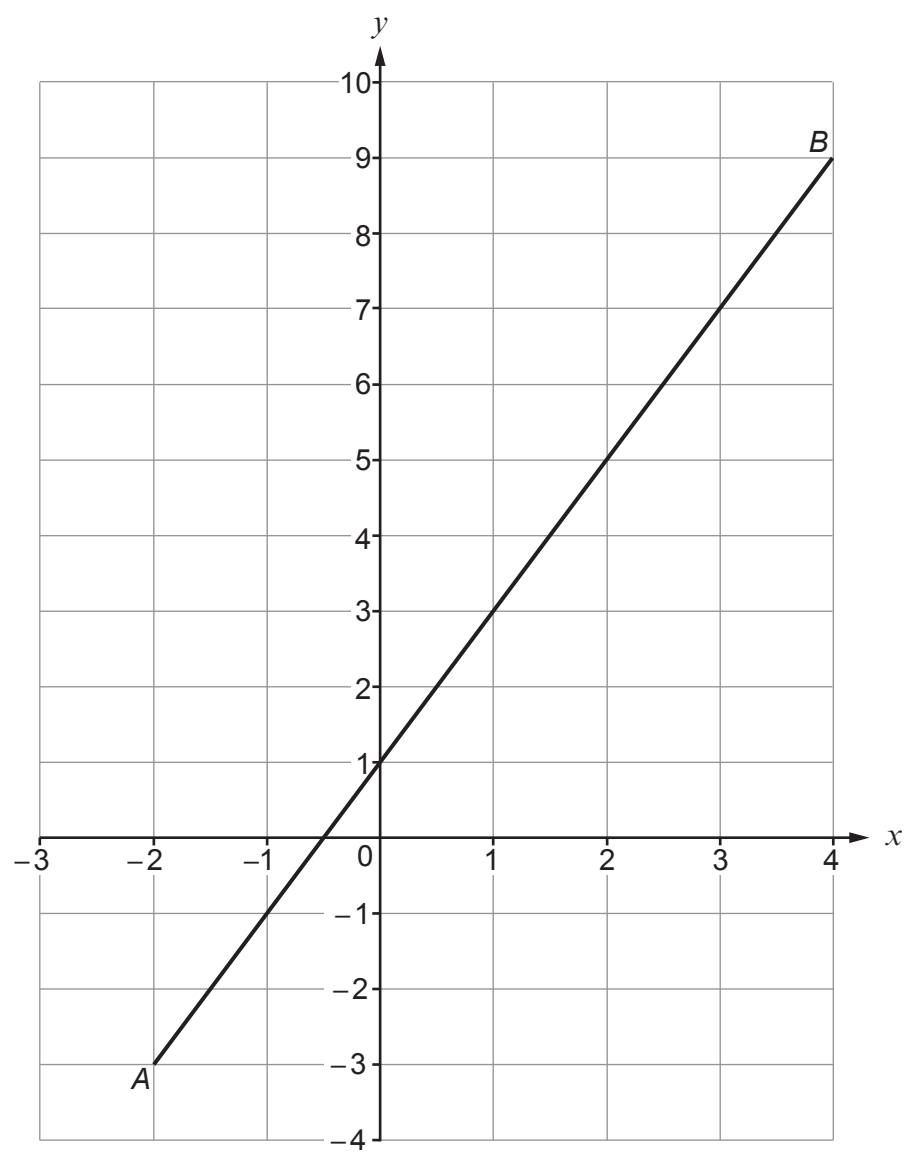
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12.



The diagram shows the graph of a straight line, *AB*.

- (a) Find the equation of this line.  
Give your answer in the form  $y = mx + c$ .

[3]

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$y = \dots\dots\dots$





(b) Find the equation of the perpendicular bisector of the line  $AB$ .

[4]

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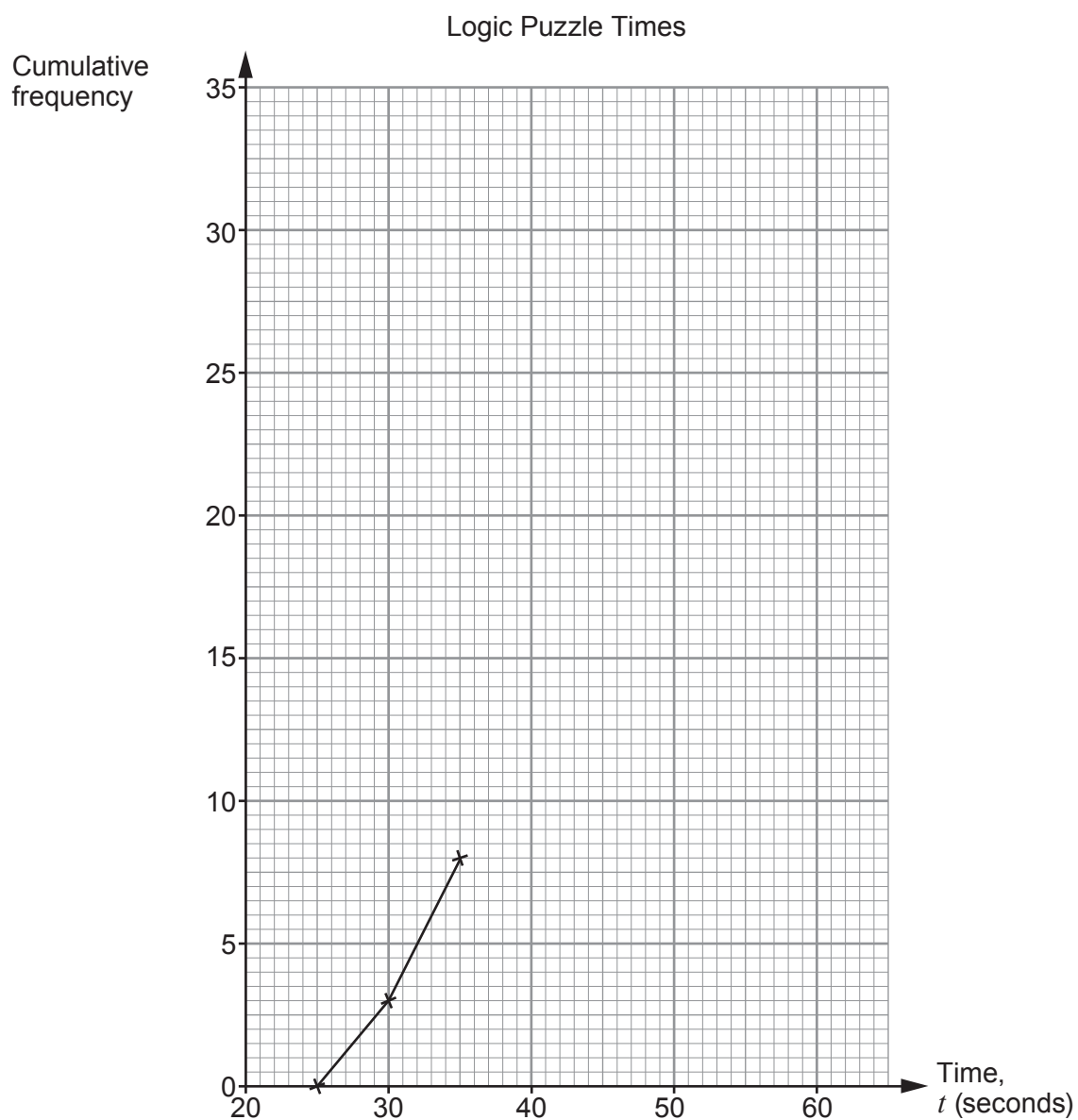
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13. The table shows a summary of the time, in seconds, it takes each of 32 people to complete a logic puzzle.

Time, $t$ (seconds)	$t \leq 25$	$t \leq 30$	$t \leq 35$	$t \leq 40$	$t \leq 45$	$t \leq 50$	$t \leq 55$	$t \leq 60$
Cumulative frequency	0	3	8	16	21	24	29	32

- (a) Complete the cumulative frequency diagram below to show these results.

[2]



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(b) (i) How many people took more than 40 but not more than 50 seconds to complete the puzzle? [1]

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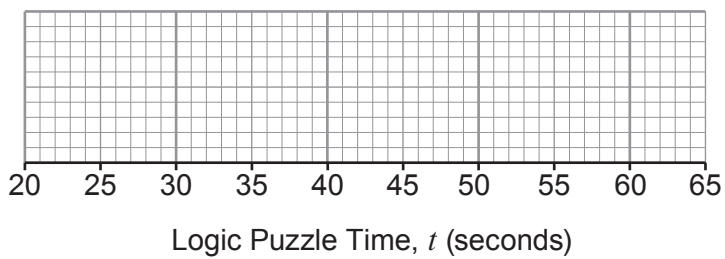
(ii) Complete the inequality to show the modal class. [1]

..... < t ≤ .....

(c) Eddie uses the data from part (a) to obtain estimates and draw a box plot.

He also knows that the fastest time is 26 seconds.  
Eddie also **assumes** that the slowest time is 60 seconds.

(i) Draw Eddie's box plot. [4]



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(ii) Explain why Eddie's assumption may not be correct. [1]

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(iii) Eddie's assumption is not actually correct.  
What effect does this have on each of the range and the interquartile range? [2]

Effect on the range: .....

Effect on the interquartile range: .....

14. (a) Find the value of  $\left(\frac{1}{5}\right)^{-3}$ .

[2]

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(b) Find the value of  $256^{\frac{3}{4}}$ .

[2]

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(c) **Estimate** the value of  $50^{\frac{1}{2}}$ .

[1]

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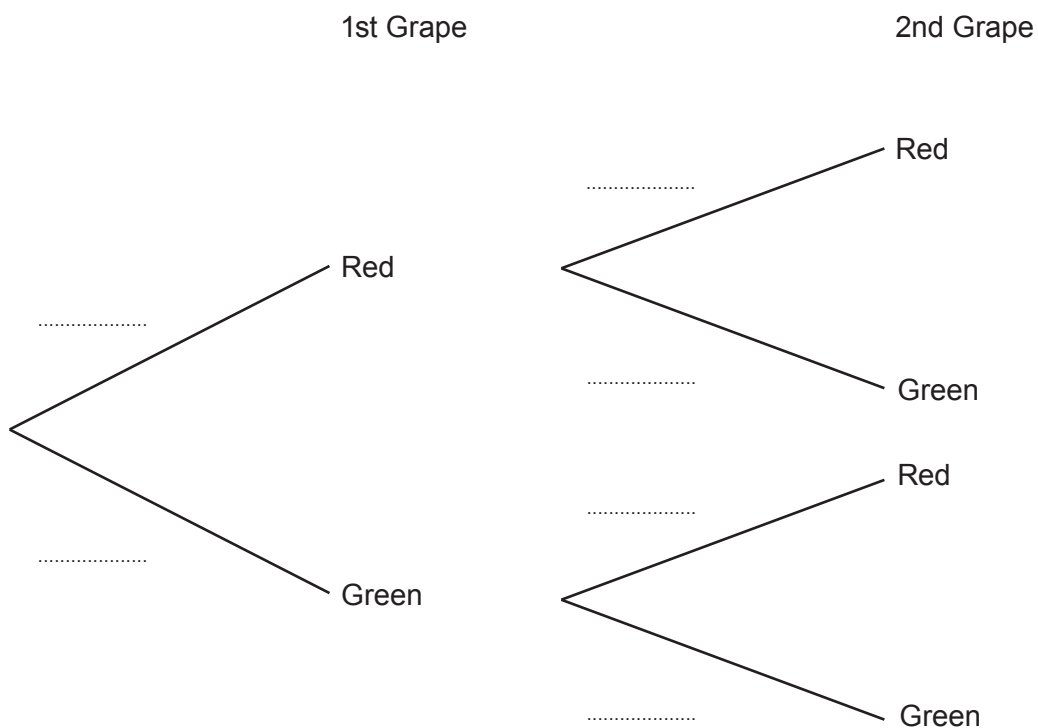
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15. Vera has a pot containing 4 red grapes and 6 green grapes.  
She takes a grape at random and eats it.  
She then takes another grape at random and eats it.

(a) Complete the probability tree to show this information.

[3]



(b) Work out the probability that the second grape Vera eats is green.

[3]

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16. It is known that  $y$  varies inversely as the cube root of  $x$  and that  $y = 2$  when  $x = 27$ .

(a) Find a formula for  $y$  in terms of  $x$ .

[3]

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(b) Using your answer to part (a), find

(i)  $y$  when  $x = 1000$ ,

[1]

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(ii)  $x$  when  $y = 3$ .

[2]

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17. (a)

$$V_0 = 10\,000$$

$$V_{n+1} = 0.8 V_n \text{ where } n \geq 0$$

This iterative formula can be used to work out the value  $V_n$  of a particular type of car when it is  $n$  years old.

(i) Show that a car of this type that is 1 year old is worth £8000. [1]

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(ii) Use this formula to find the value of a car of this type that is 3 years old. [3]

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Value is £ .....

(b)



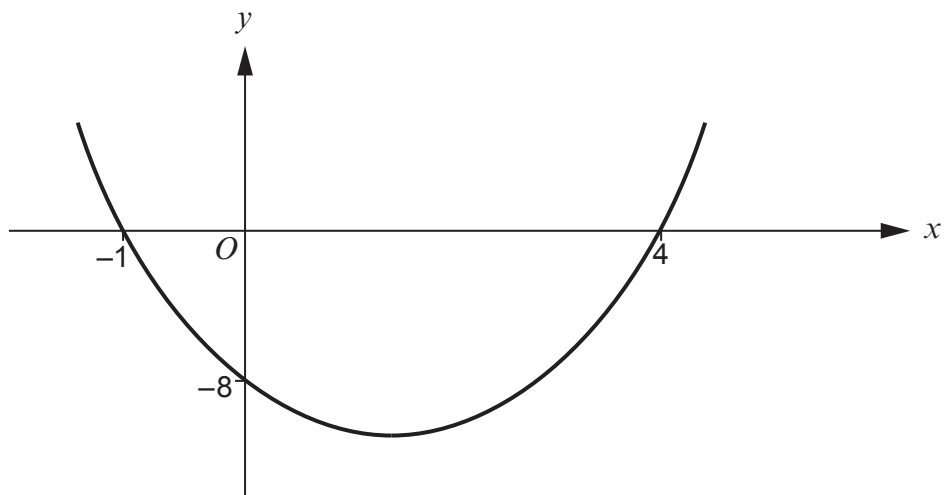
A newly built house is worth £240 000 and is expected to increase in value by 2% each year.

Complete the following iterative formula to show this information. [1]

$$V_0 = \dots\dots\dots$$

$$V_{n+1} = \dots\dots\dots V_n \text{ where } n \geq 0$$

18. (a)



The diagram shows a sketch graph of a quadratic function.

Find the equation of this curve.

[3]

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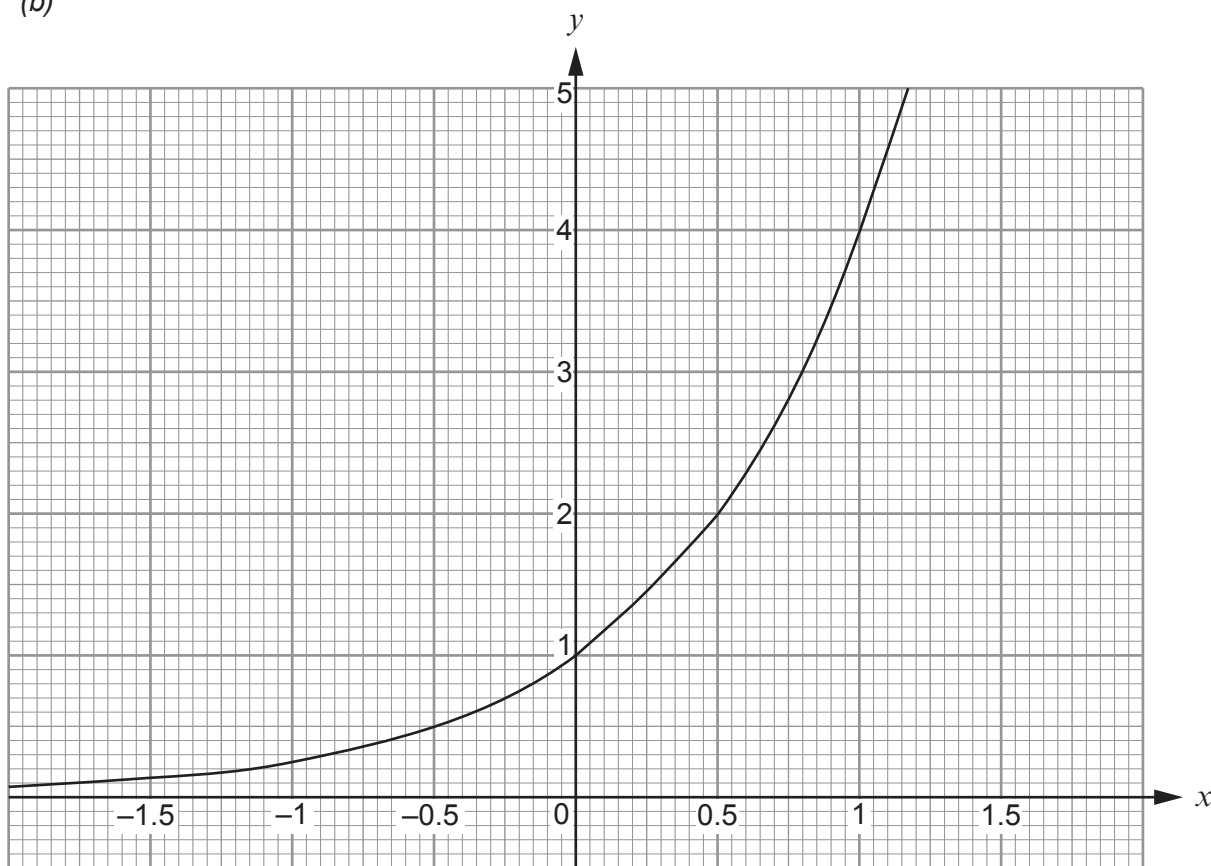
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$y =$  .....



(b)

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The diagram shows the graph of the curve  $y = k^x$ .

Find the value of the positive integer  $k$ .

[2]

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$k =$  .....

19. (a) A 5-course banquet has 3 options for each course.  
The number of possible 5-course meals is  $m$ .

Find the value of  $m$ .

[2]

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$$m = \text{.....}$$

- (b) The caterer for the banquet decides to change the menu so that there are only 2 options for the first course. The options for the other courses remain the same.

The number of possible 5-course meals is now  $pm$ .

Find the value of  $p$ .

[2]

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$$p = \text{.....}$$

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(c)  $2\sqrt{x} - \sqrt{y} = 0$

Find a value for  $x$  and a value for  $y$  so that  $\sqrt{x}$  and  $\sqrt{y}$  are surds.

[2]

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$x =$  .....  $y =$  .....

21. In this question, all lengths are in centimetres.

A circle has equation  $x^2 + y^2 = 49$ .

Points  $A$ ,  $B$  and  $C$  all lie on this circle.

Their co-ordinates are  $A(a, 0)$ ,  $B(b, 0)$  and  $C(0, c)$ , where  $a < 0$ ,  $b > 0$  and  $c > 0$ .

(a) Find the length of the line  $AB$ .

[2]

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$AB = \dots\dots\dots$  cm

(b) The tangent to the circle at  $A$  and the tangent to the circle at  $C$  meet at the point  $T$ .

Find the coordinates of  $T$ .

[2]

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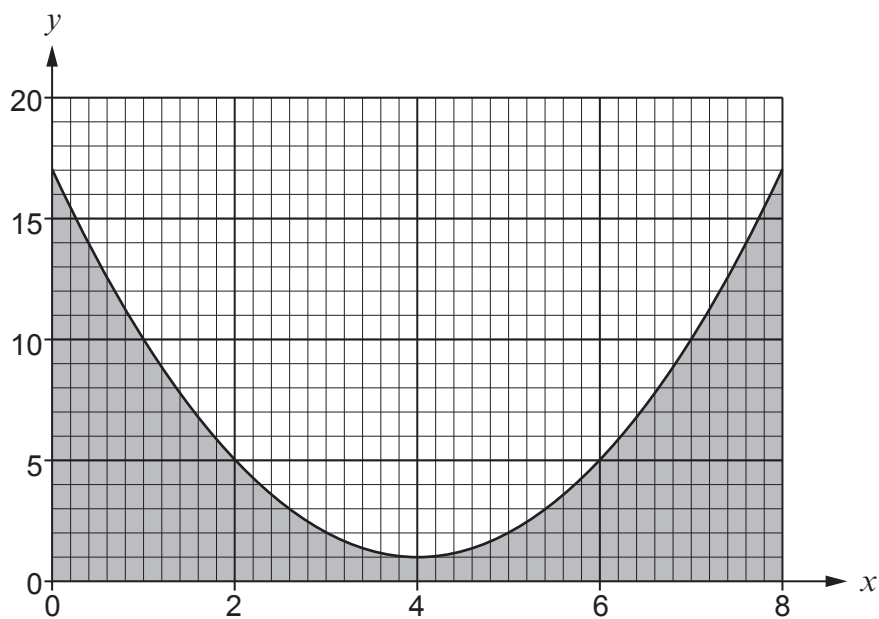
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$T( \dots\dots\dots , \dots\dots\dots )$



23.



The diagram shows the graph of  $y = (x - 4)^2 + 1$  for  $0 \leq x \leq 8$ .

(a) Using four vertical strips of equal width, estimate the area of the shaded region. [4]

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(b) Is your answer to part (a) an underestimate or an overestimate?

Underestimate  Overestimate

Explain how you decide. [1]

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