

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

**Pearson Edexcel**  
**Level 1/Level 2 GCSE (9–1)**

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**Aiming for 9 – Spring 2022 practice paper**

Morning (Time: 1 hour 30 minutes)

Paper Reference **1MA1/3H**

**Mathematics**  
**Paper 3 (Calculator)**  
**Higher Tier**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**



### Information

- The total mark for this paper is 80. There are 22 questions.
- Questions have been arranged in an ascending order of mean difficulty, as found by Grade 7 students in June and November examinations.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

### Advice

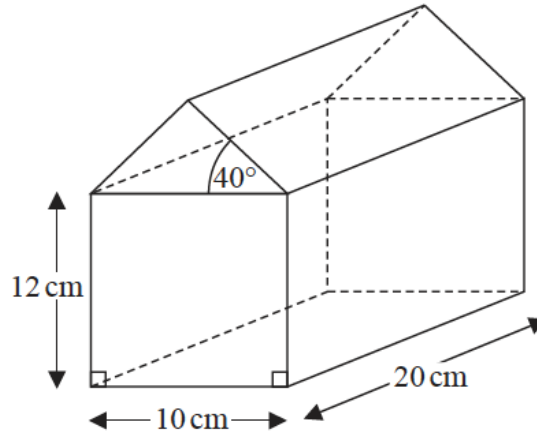
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL TWENTY TWO questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The diagram shows a prism.



The cross section of the prism has exactly one line of symmetry.

Work out the volume of the prism.

Give your answer correct to 3 significant figures.

..... cm<sup>3</sup>

(Total for Question 1 is 5 marks)

2 Olivia and Jessica have in total half as many sweets as Fran and Gary have in total.

Fran and Gary share their sweets in the ratio 2 : 3

Olivia and Jessica share their sweets in the ratio 9 : 1

Fran got  $w$  sweets.

Gary got  $x$  sweets.

Olivia got  $y$  sweets.

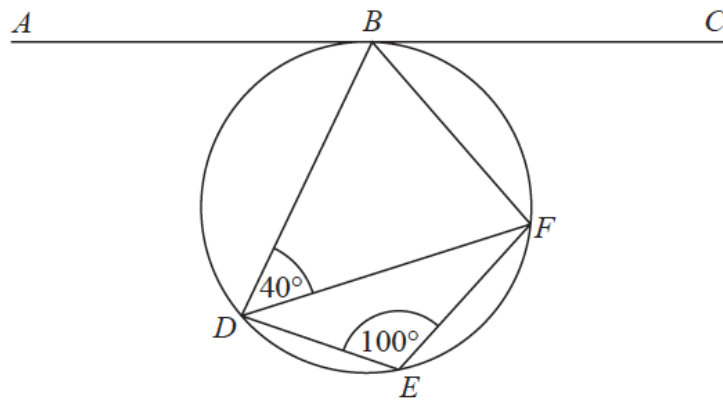
Jessica got  $z$  sweets.

Find, in its simplest form,  $w : x : y : z$

.....  
**(Total for Question 2 is 4 marks)**

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3



Points  $B$ ,  $D$ ,  $E$  and  $F$  lie on a circle.  
 $ABC$  is the tangent to the circle at  $B$ .

Find the size of angle  $ABD$ .

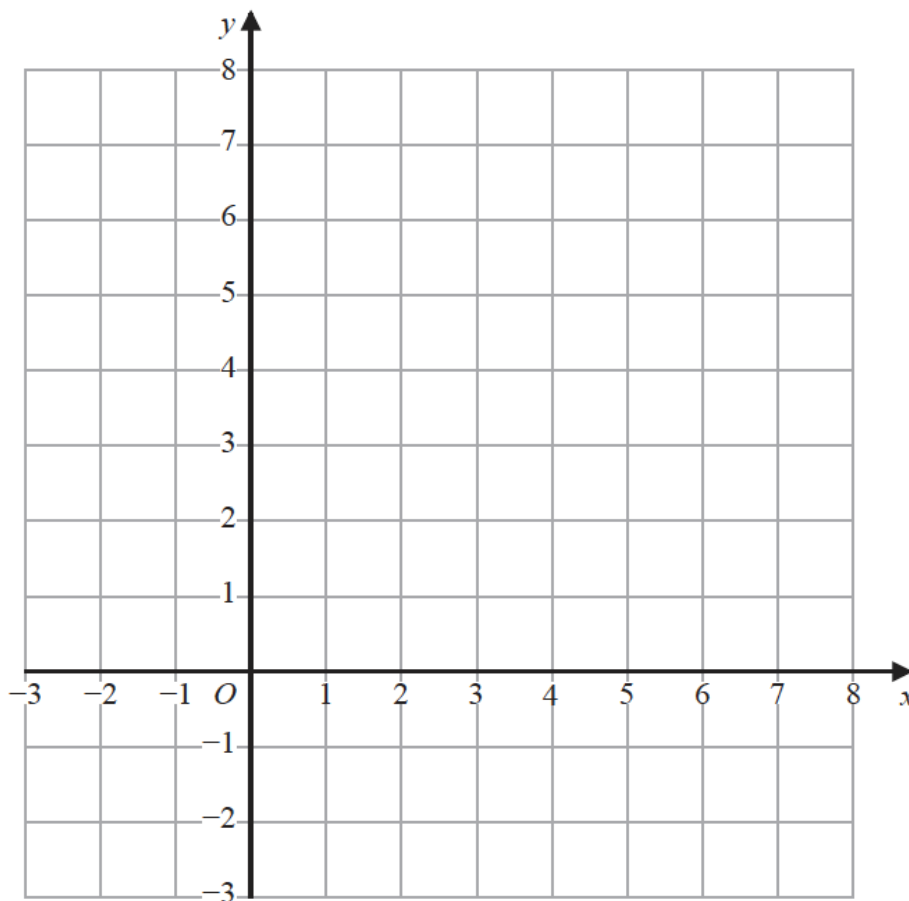
You must give a reason for each stage of your working.

(Total for Question 3 is 4 marks)

4 (a) On the grid show, by shading, the region that satisfies all these inequalities.

$$x \geq 0 \quad x \leq 2 \quad y \leq x + 3 \quad 2x + 3y \geq 6$$

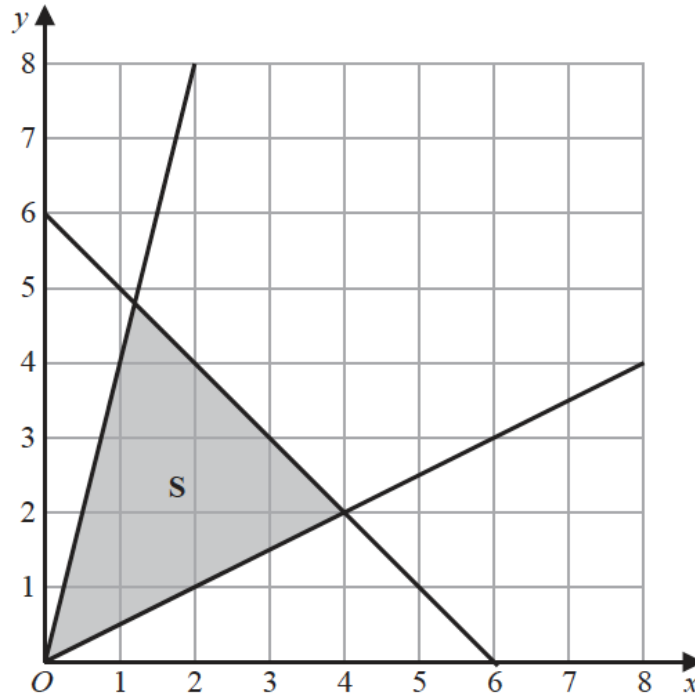
Label the region **R**.



(4)

(b) The diagram below shows the region S that satisfies the inequalities

$$y \leq 4x \quad y \geq \frac{1}{2}x \quad x + y \leq 6$$



Geoffrey says that the point with coordinates (2, 4) does not satisfy all the inequalities because it does not lie in the shaded region.

Is Geoffrey correct?

You must give a reason for your answer.

.....

.....

.....

(1)

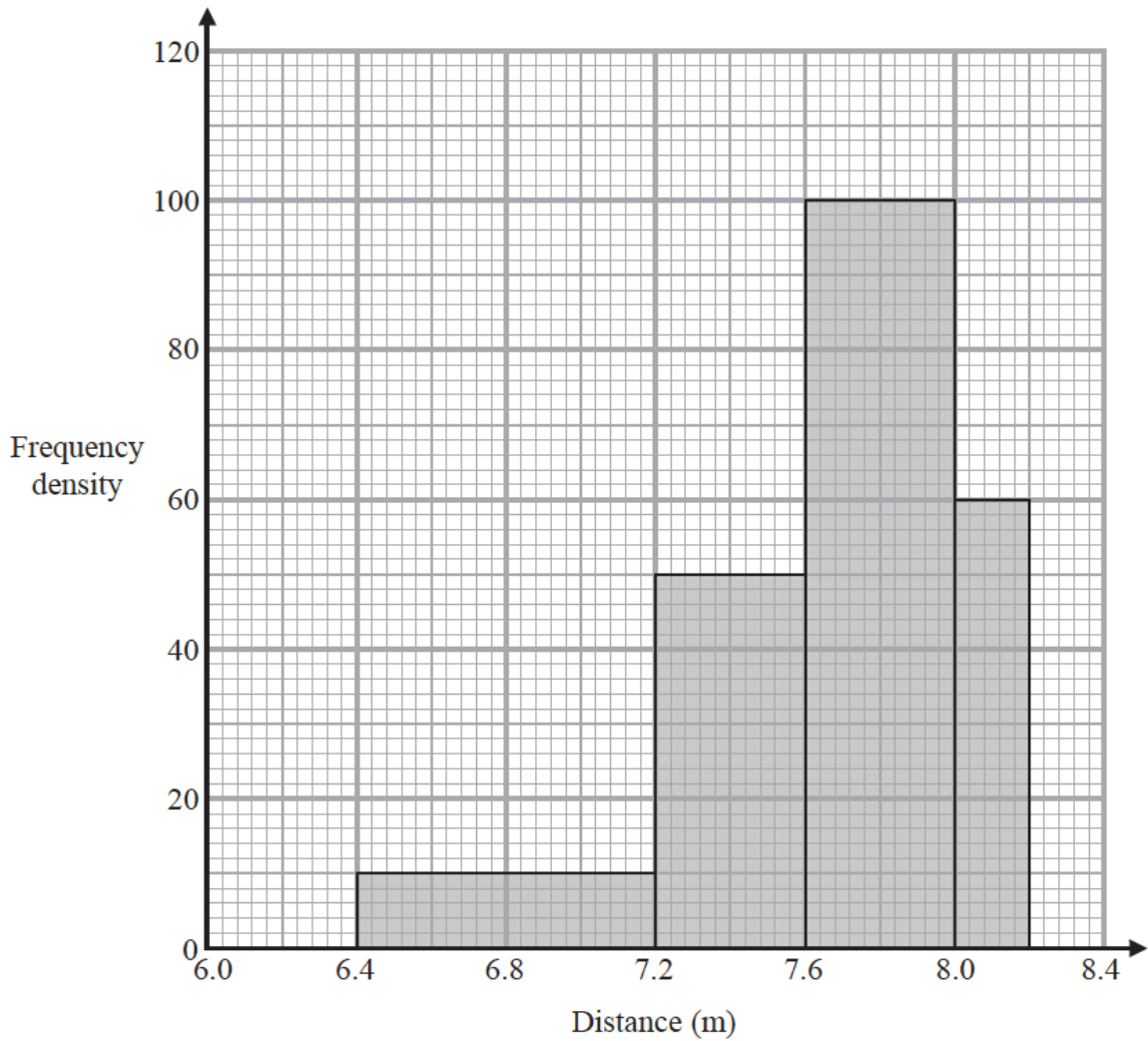
(Total for Question 4 is 5 marks)

5 Prove algebraically that  $0.\overline{73}$  can be written as  $\frac{11}{15}$

**(Total for Question 5 is 2 marks)**

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- 6 The histogram gives information about the distances 80 competitors jumped in a long jump competition.



Calculate an estimate for the mean distance.

..... m

**(Total for Question 6 is 4 marks)**

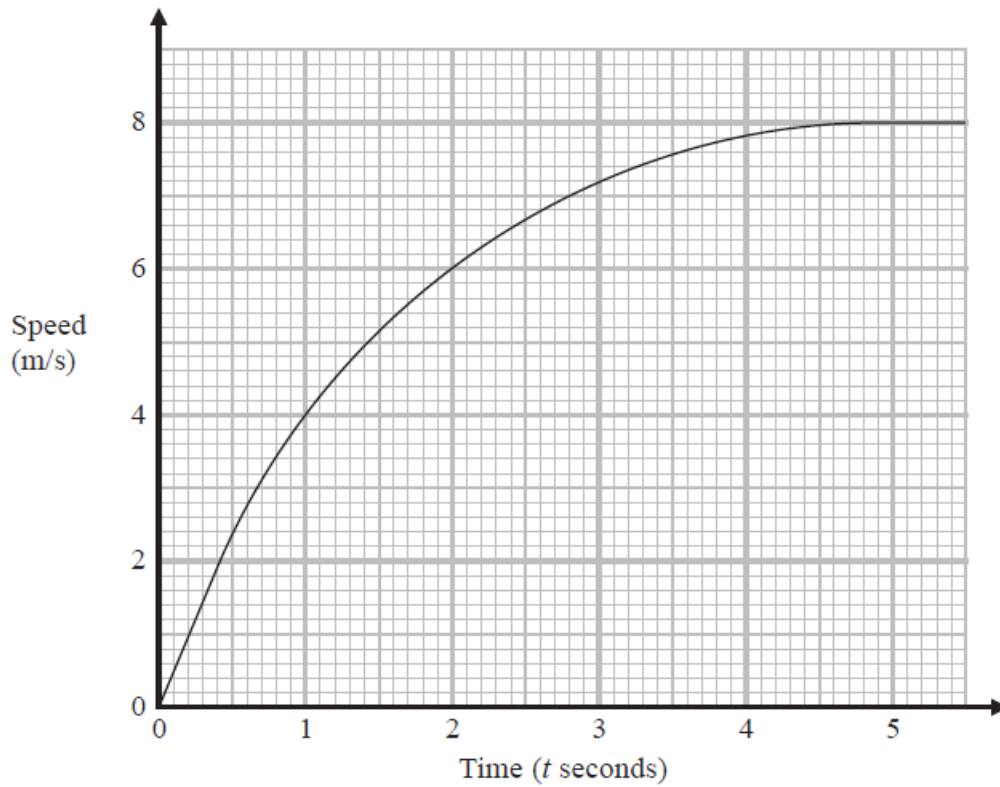


7 Show that  $\frac{6x^3}{(9x^2-144)} \div \frac{2x^4}{3(x-4)}$  can be written in the form  $\frac{1}{x(x+r)}$  where  $r$  is an integer.

**(Total for Question 7 is 3 marks)**

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- 8 Here is a speed-time graph showing the speed, in metres per second, of an object  $t$  seconds after it started to move from rest.



- (a) Using 3 trapeziums of equal width, work out an estimate for the area under the graph between  $t = 1$  and  $t = 4$

.....  
(3)

- (b) What does this area represent?

.....  
(1)

**(Total for Question 8 is 4 marks)**

9  $(ax^6)^{\frac{1}{n}} = 7x^3$

Work out the value of  $a$  and the value of  $n$ .

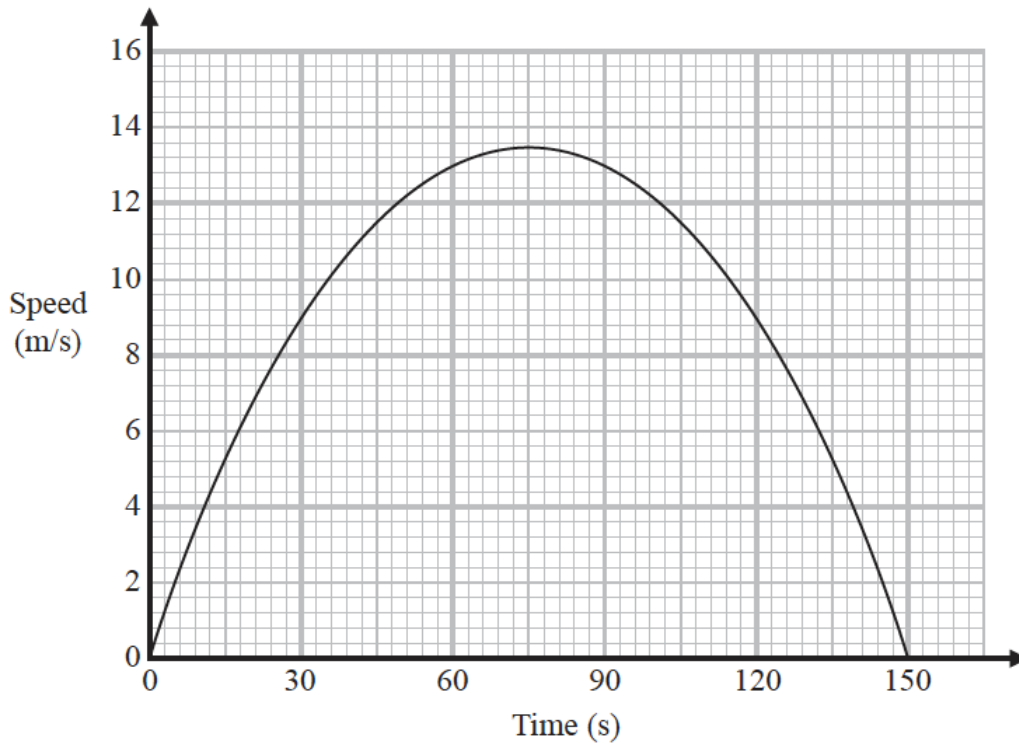
$a = \dots\dots\dots$

$n = \dots\dots\dots$

**(Total for Question 9 is 2 marks)**

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10 Here is a speed-time graph for a car.



(a) Work out an estimate for the distance the car travelled in the first 30 seconds.

..... m  
(2)

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 30 seconds?  
Give a reason for your answer.

.....  
.....  
.....  
(1)

Julian used the graph to answer this question.

Work out an estimate for the acceleration of the car at time 60 seconds.

Here is Julian's working.

$$\begin{aligned} \text{acceleration} &= \text{speed} \div \text{time} \\ &= 13 \div 60 \\ &= 0.21\dot{6} \text{ m/s}^2 \end{aligned}$$

Julian's method does not give a good estimate of the acceleration at time 60 seconds.

(c) Explain why.

.....

.....

.....

**(1)**

**(Total for Question 10 is 4 marks)**

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- 11**  $x$  is directly proportional to the square of  $y$ .  
 $y$  is directly proportional to the cube of  $z$ .

$z = 2$  when  $x = 32$

Find a formula for  $x$  in terms of  $z$ .

.....  
**(Total for Question 11 is 4 marks)**

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**12**  $5c + d = c + 4d$

(a) Find the ratio  $c : d$

.....  
**(2)**

$6x^2 = 7xy + 20y^2$  where  $x > 0$  and  $y > 0$

(b) Find the ratio  $x : y$

.....  
**(3)**

**(Total for Question 12 is 5 marks)**

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**13** The curve **C** has equation  $y = x^2 + 3x - 3$

The line **L** has equation  $y - 5x + 4 = 0$

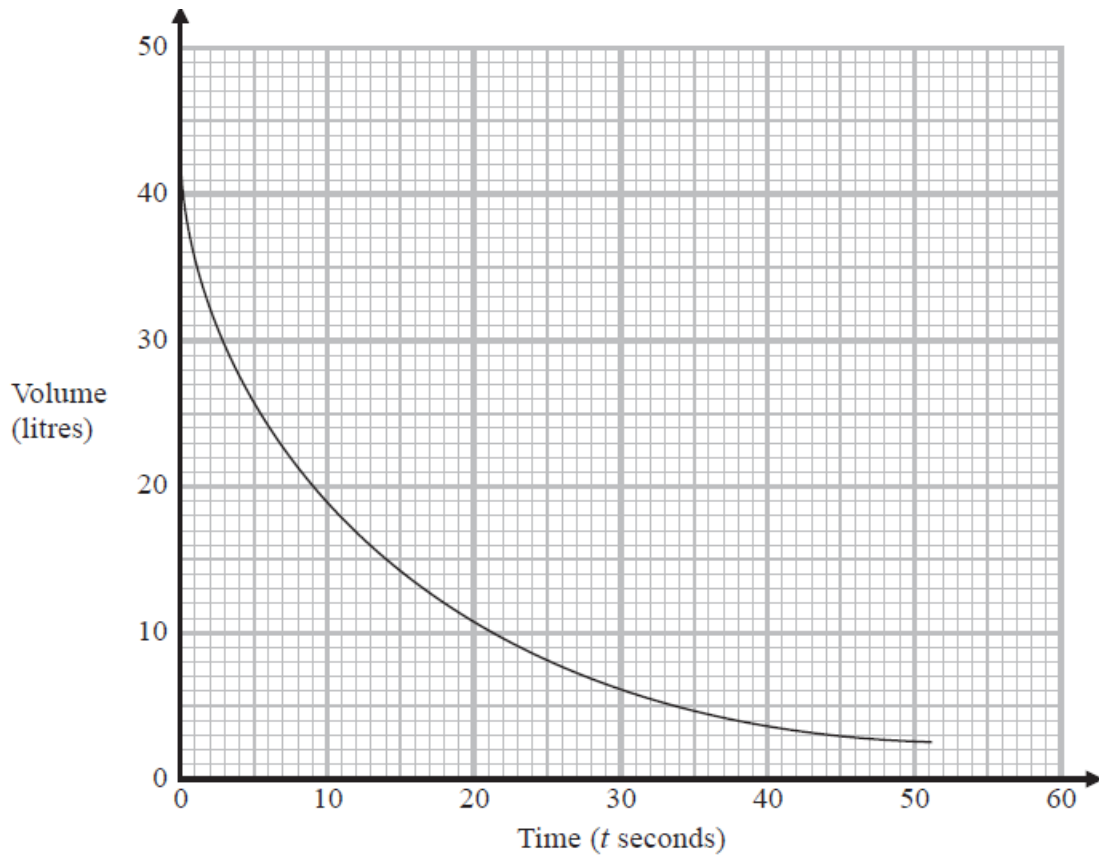
Show, algebraically, that **C** and **L** have exactly one point in common.

**(Total for Question 13 is 4 marks)**

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- 14 The graph gives the volume of water, in litres, in a container at time  $t$  seconds after the water started to flow out of the container.

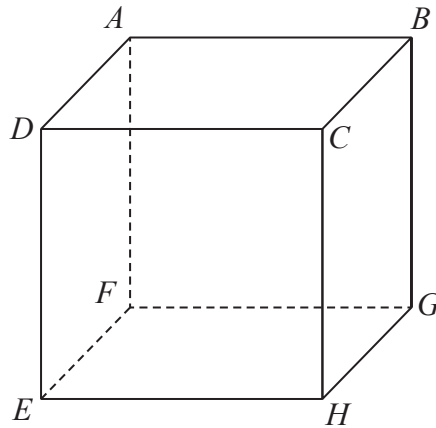


Using the graph, work out an estimate for the rate at which the water is flowing out of the container when  $t = 12$   
 You must show your working.

..... litres per second

**(Total for Question 14 is 3 marks)**

15 The diagram shows a cube.



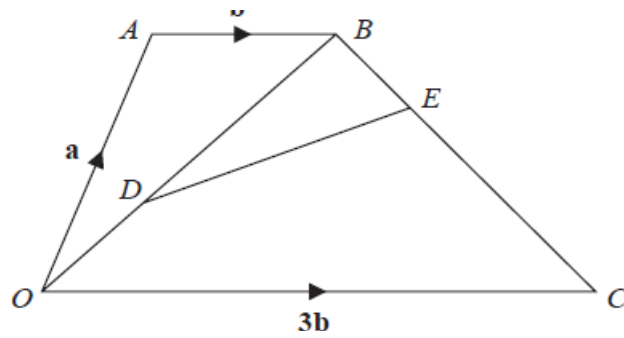
$AH = 11.3$  cm correct to the nearest mm.

Calculate the lower bound for the length of an edge of the cube.  
You must show all your working.

..... cm

**(Total for Question 15 is 4 marks)**

16  $OABC$  is a trapezium.



$$\vec{OA} = \mathbf{a}$$

$$\vec{AB} = \mathbf{b}$$

$$\vec{OC} = 3\mathbf{b}$$

$D$  is the point on  $OB$  such that  $OD : DB = 2 : 3$

$E$  is the point on  $BC$  such that  $BE : EC = 1 : 4$

Work out the vector  $\vec{DE}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .  
Give your answer in its simplest form.

.....  
(Total for Question 16 is 4 marks)

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17 At the start of year  $n$ , the number of animals in a population is  $P_n$

At the start of the following year, the number of animals in the population is  $P_{n+1}$  where

$$P_{n+1} = kP_n$$

At the start of 2017 the number of animals in the population was 4000

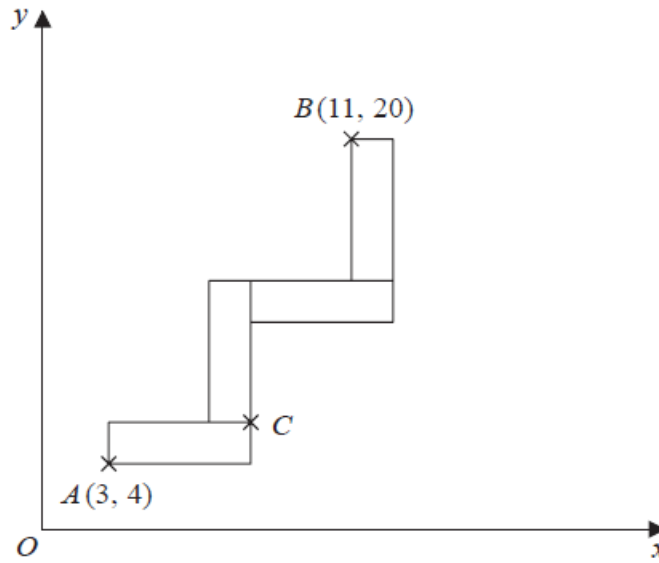
At the start of 2019 the number of animals in the population was 3610

Find the value of the constant  $k$ .

.....  
**(Total for Question 17 is 3 marks)**

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- 18 A pattern is made from four identical rectangles.  
The sides of the rectangles are parallel to the axes.



Point  $A$  has coordinates  $(3, 4)$   
 Point  $B$  has coordinates  $(11, 20)$   
 Point  $C$  is marked on the diagram.

Work out the coordinates of  $C$ .  
 You must show all your working.

(..... , .....)

**(Total for Question 18 is 5 marks)**

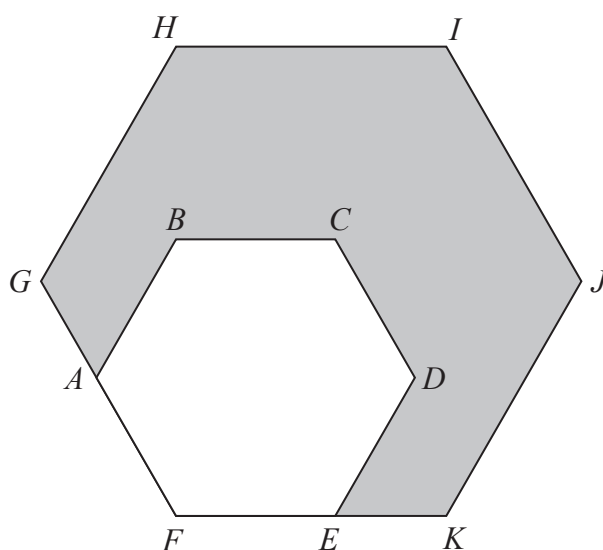
**19** Here is a list of five numbers.

$$98^{53} \quad 98^{64} \quad 98^{73} \quad 98^{88} \quad 98^{91}$$

Find the lowest common multiple of these five numbers.

.....  
**(Total for Question 19 is 1 mark)**

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$ABCDEF$  is a regular hexagon with sides of length  $x$ .

This hexagon is enlarged, centre  $F$ , by scale factor  $p$  to give hexagon  $FGHIJK$ .

Show that the area of the shaded region in the diagram is given by  $\frac{3\sqrt{3}}{2}(p^2 - 1)x^2$

(Total for Question 20 is 4 marks)

21 Pat throws a fair coin  $n$  times.

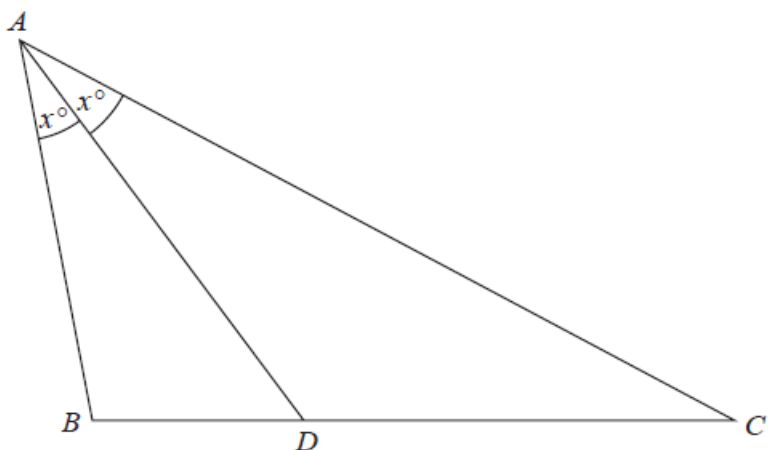
Find an expression, in terms of  $n$ , for the probability that Pat gets at least 1 head and at least 1 tail.

.....  
**(Total for Question 21 is 2 marks)**

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22  $ABC$  is a triangle.



$D$  is the point on  $BC$  such that angle  $BAD = \text{angle } DAC = x^\circ$

Prove that  $\frac{AB}{BD} = \frac{AC}{DC}$

(Total for Question 22 is 4 marks)

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**TOTAL FOR PAPER IS 80 MARKS**

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