

Write your name here

Surname

Other names

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

Centre Number

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Candidate Number

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# Mathematics

## Paper 2 (Calculator)

**Higher Tier**

Thursday 8 June 2017 – Morning  
**Time: 1 hour 30 minutes**

Paper Reference

**1MA1/2H**

**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.**
- If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142 unless the question instructs otherwise.



### Information

- The total mark for this paper is 80.
- 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.

Turn over ►

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6/6/6/6/7/1/

# .CG Maths.

Hints



Pearson

Please note that these worked solutions have neither been provided nor approved by Pearson Education and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to [curtis@cgmaths.co.uk](mailto:curtis@cgmaths.co.uk)

**Answer ALL questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

- 1 The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6

<b>Number on dice</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Probability</b>		0.17	0.18	0.09	0.15	0.1

Neymar rolls the biased dice 200 times.

Work out an estimate for the total number of times the dice will land on 1 or on 3

All the probabilities need to add together to get 1 as it is certain that one of the outcomes will happen. Adding together the probabilities of mutually exclusive events gives the probability of either of them happening. The probability is an estimate for the relative frequency of an outcome.

.....  
**(Total for Question 1 is 3 marks)**

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- 2 On Saturday, some adults and some children were in a theatre.  
The ratio of the number of adults to the number of children was 5 : 2

Each person had a seat in the Circle or had a seat in the Stalls.

$\frac{3}{4}$  of the children had seats in the Stalls.

117 children had seats in the Circle.

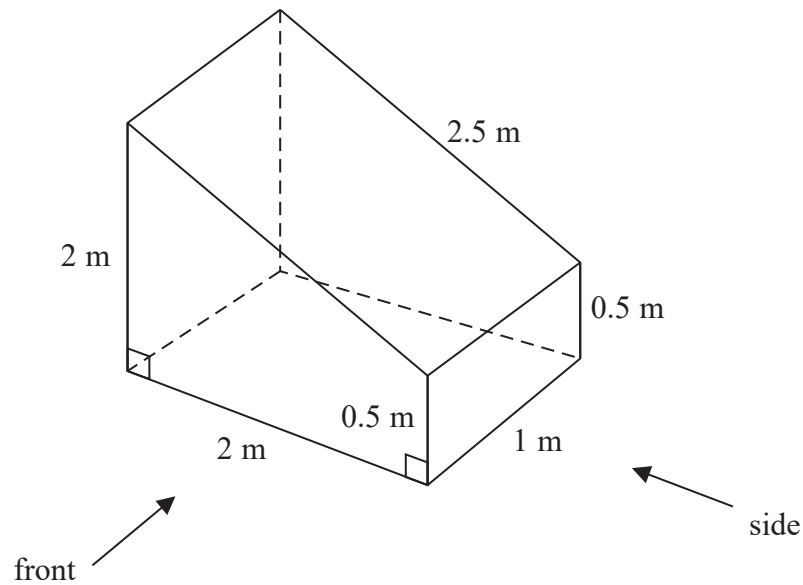
There are exactly 2600 seats in the theatre.

On this Saturday, were there people on more than 60% of the seats?  
You must show how you get your answer.

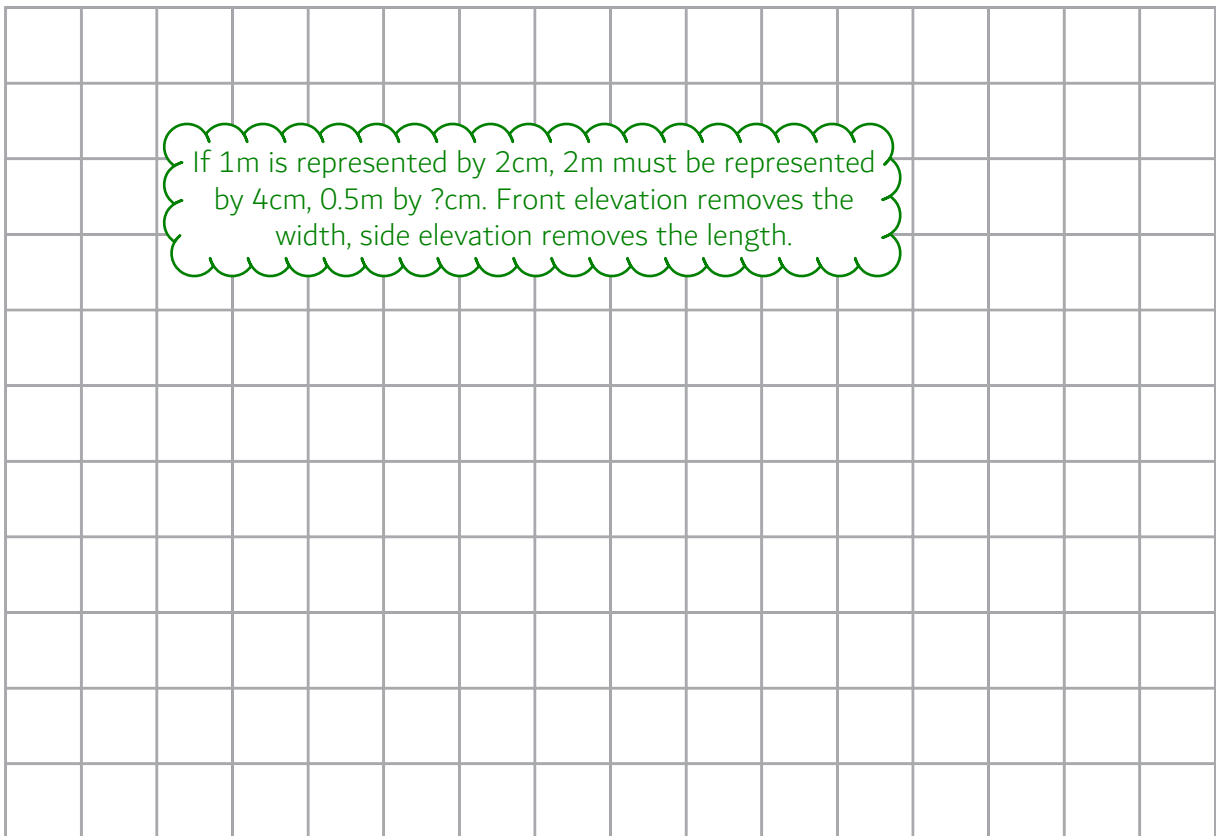
We could find 60% of 2600 as this will tell us the minimum number of people needed to meet the conditions or work out the percentage of seats which are filled. We need to work out how many people there are in total on Saturday. The only number given is 117, which must be a quarter of the children. If we know how many children there are in total, who are represented by two parts in the ratio, we can work out how many people there are in total using the ratio.

(Total for Question 2 is 5 marks)

- 3 The diagram shows a prism with a cross section in the shape of a trapezium.



On the centimetre grid below, draw the front elevation and the side elevation of the prism. Use a scale of 2 cm to 1 m.



(Total for Question 3 is 4 marks)

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4 Olly drove 56 km from Liverpool to Manchester.  
He then drove 61 km from Manchester to Sheffield.

Olly's average speed from Liverpool to Manchester was 70 km/h.  
Olly took 75 minutes to drive from Manchester to Sheffield.

(a) Work out Olly's average speed for his total drive from Liverpool to Sheffield.

$$s = \frac{d}{t} =$$

km/h : this means divide distance in km by time in hours. The units tell us what to do.

Adding the distances gives the total distance. The 75 minutes needs to be converted into hours (consider that there are 60 minutes in an hour).  
Time for Liverpool to Manchester = distance/speed.  
Adding both of the times for the separate journeys together gives the total amount of time taken for the whole journey.

..... km/h  
(4)

Janie drove from Barnsley to York.

Janie's average speed from Barnsley to Leeds was 80 km/h.  
Her average speed from Leeds to York was 60 km/h.

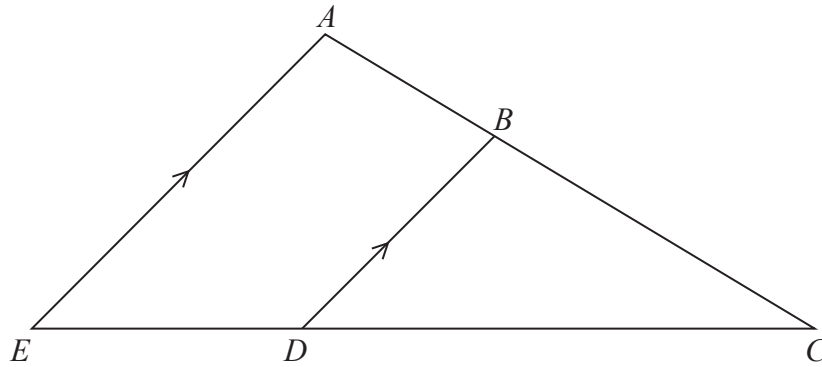
Janie says that the average speed from Barnsley to York can be found by working out the mean of 80 km/h and 60 km/h.

(b) If Janie is correct, what does this tell you about the two parts of Janie's journey?

If she went 80km/h for a longer duration than 60km/h, the average would be closer to 80 than 60.

(1)

(Total for Question 4 is 5 marks)



$ABC$  and  $EDC$  are straight lines.

$EA$  is parallel to  $DB$ .

$EC = 8.1$  cm.

$DC = 5.4$  cm.

$DB = 2.6$  cm.

(a) Work out the length of  $AE$ .

The triangles  $ACE$  and  $BCD$  are similar as all the angles are the same.  $ACE$  is a scaled up version of  $BDC$ . We need to multiply 2.6 by the scale factor as this is the corresponding side to  $AE$ . 5.4 multiplied by the scale factor gives 8.1.

..... cm

(2)

$AC = 6.15$  cm.

(b) Work out the length of  $AB$ .

Dividing the longer side,  $AC$ , by the scale factor gives the shorter corresponding side,  $BC$ .

6.15 -

$$AB = AC - BC$$

..... cm

(2)

(Total for Question 5 is 4 marks)

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6 Anil wants to invest £25 000 for 3 years in a bank.

The interest is added at the end of each year and the percentage is of the amount at the end of the previous year.

**Personal Bank**  
 Compound Interest  
 2% for each year

**Secure Bank**  
**Compound Interest**  
 4.3% for the first year  
 0.9% for each extra year

Which bank will give Anil the most interest at the end of 3 years?  
You must show all your working.

$100\% + 2\% = 102\%$   
 What can we multiply 25000 by to increase by 2%?  
 This needs to be done 3 times as it is compound interest. A similar method needs to be done for Secure bank. We then need to compare the amounts of money (or interest received) at the end of the 3 years in order to conclude which one earned the most.

(Total for Question 6 is 3 marks)

7 A number,  $n$ , is rounded to 2 decimal places.  
The result is 4.76

Using inequalities, write down the error interval for  $n$ .

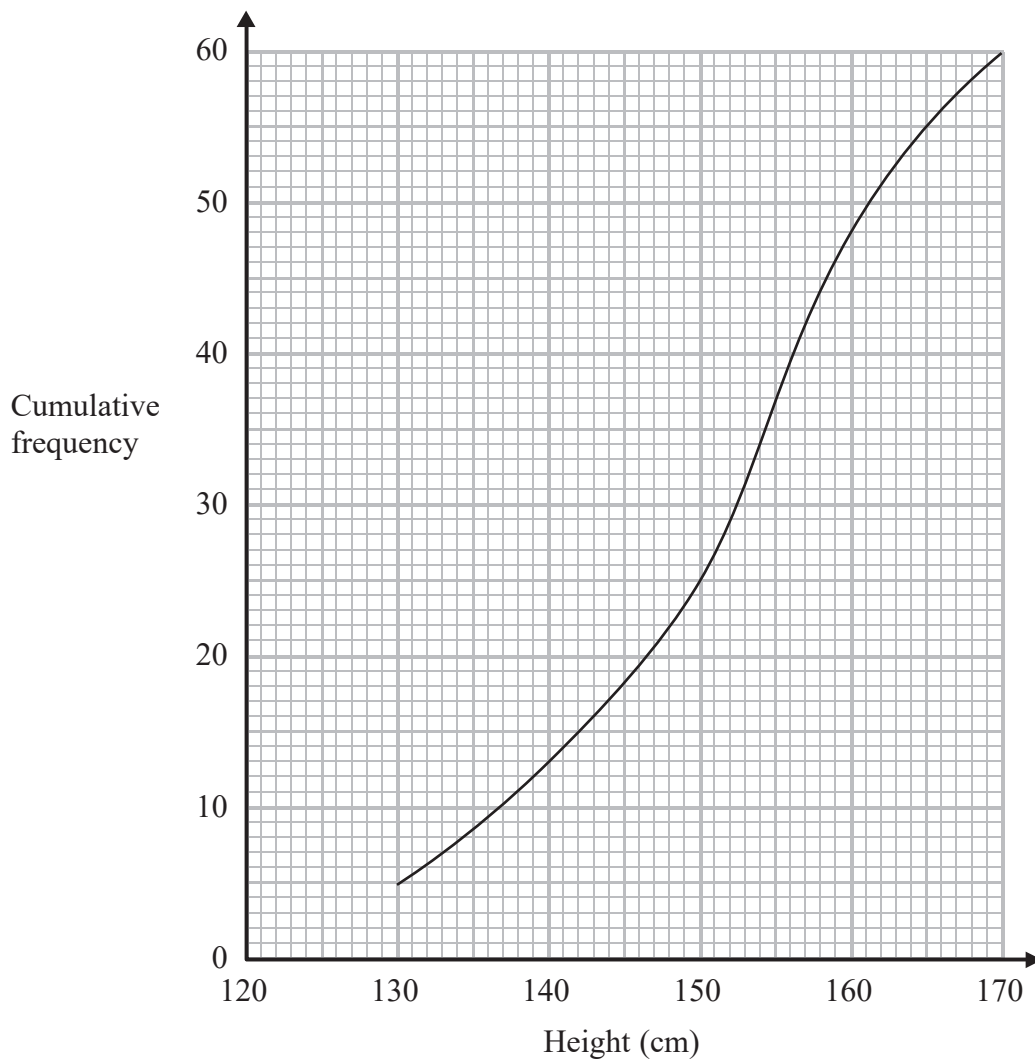
The third decimal place will determine whether the second decimal place rounds up or down. What is the lowest it can go without rounding down to 4.75 and the highest it can go without rounding to 4.77?

$4.75 \leq n < 4.77$

(Total for Question 7 is 2 marks)



- 8 The cumulative frequency graph shows some information about the heights, in cm, of 60 students.

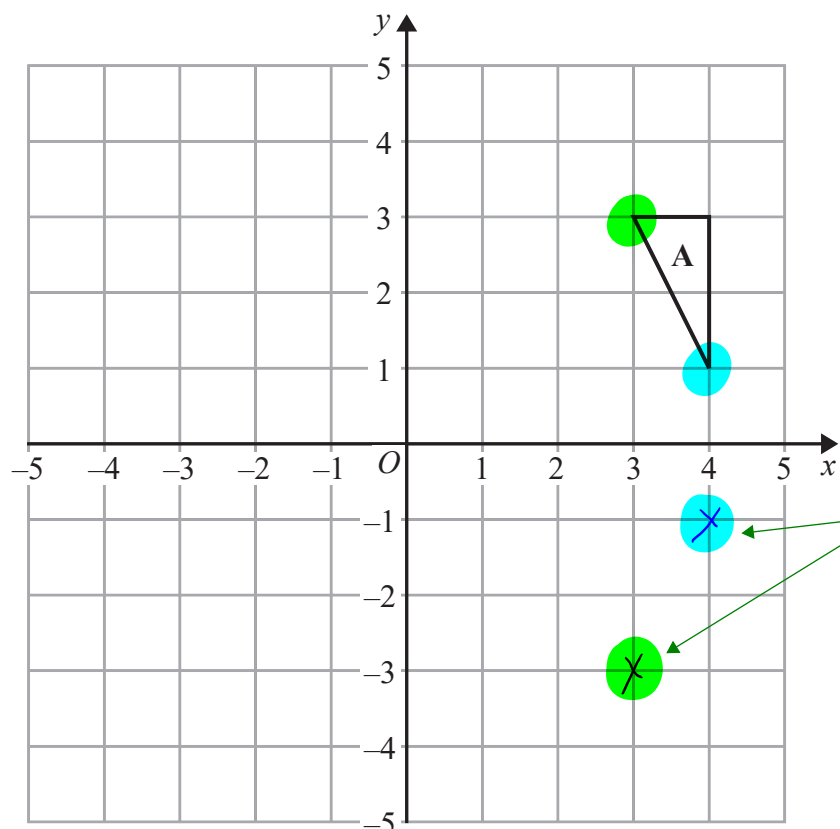


Work out an estimate for the number of these students with a height greater than 160 cm.

We can use the graph to determine which student is apparently 160cm tall. All of the students after that student would be taller than 160cm.

(Total for Question 8 is 2 marks)

9 The diagram shows triangle A drawn on a grid.



When performing transformations, it is best to start with the corners then join them up with lines.

Kyle reflects triangle A in the  $x$ -axis to get triangle B.  
He then reflects triangle B in the line  $y = x$  to get triangle C.

If  $x$  is 1,  $y$  would be 1. If  $x$  is 2,  $y$  would be 2 etc. We need to sketch this line as we are reflecting on it.

Amy reflects triangle A in the line  $y = x$  to get triangle D.  
She is then going to reflect triangle D in the  $x$ -axis to get triangle E.

Amy says that triangle E should be in the same position as triangle C.

Is Amy correct?

You must show how you get your answer.

To sketch triangle E, we need to sketch triangle D, which is the reflection of A in the line  $y = x$ . We then need to do a similar method to sketch triangle C and determine if they are in the same place.

To reflect, count the number of jumps to the line reflected on then do the same number of jumps on the other side.

(Total for Question 9 is 3 marks)

10 The table shows some information about eight planets.

Planet	Distance from Earth (km)	Mass (kg)
Earth	0	$5.97 \times 10^{24}$
Jupiter	$6.29 \times 10^8$	$1.898 \times 10^{27}$
Mars	$7.83 \times 10^7$	$6.42 \times 10^{23}$
Mercury	$9.17 \times 10^7$	$3.302 \times 10^{23}$
Neptune	$4.35 \times 10^9$	$1.024 \times 10^{26}$
Saturn	$1.28 \times 10^9$	$5.68 \times 10^{26}$
Uranus	$2.72 \times 10^9$	$8.683 \times 10^{25}$
Venus	$4.14 \times 10^7$	$4.869 \times 10^{24}$

They are all in standard form. Increasing the power of 10 by 1 would increase a number by a factor of 10.

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(a) Write down the name of the planet with the greatest mass.

.....  
(1)

(b) Find the difference between the mass of Venus and the mass of Mercury.

Largest - smallest = difference  
Standard form can be put into the calculator and the answer can be given in standard form.

..... kg  
(1)

Nishat says that Neptune is over a hundred times further away from Earth than Venus is.

(c) Is Nishat right?

You must show how you get your answer.

We can find the factor between the distances and see if it is greater than 100. Or we could multiply the smallest distance by 100 and compare this to the longer distance.

(2)

(Total for Question 10 is 4 marks)

11 Solve  $\frac{3x - 2}{4} - \frac{2x + 5}{3} = \frac{1 - x}{6}$

Algebraic fractions work in a similar way to normal fractions. To add/subtract them we need to make a common denominator. We have to multiply or divide the numerator and denominator at the same time by the same number if we are converting them into an equivalent fraction. The denominators need to be eliminated to get a linear equation which can be solved by simplifying and rearranging.

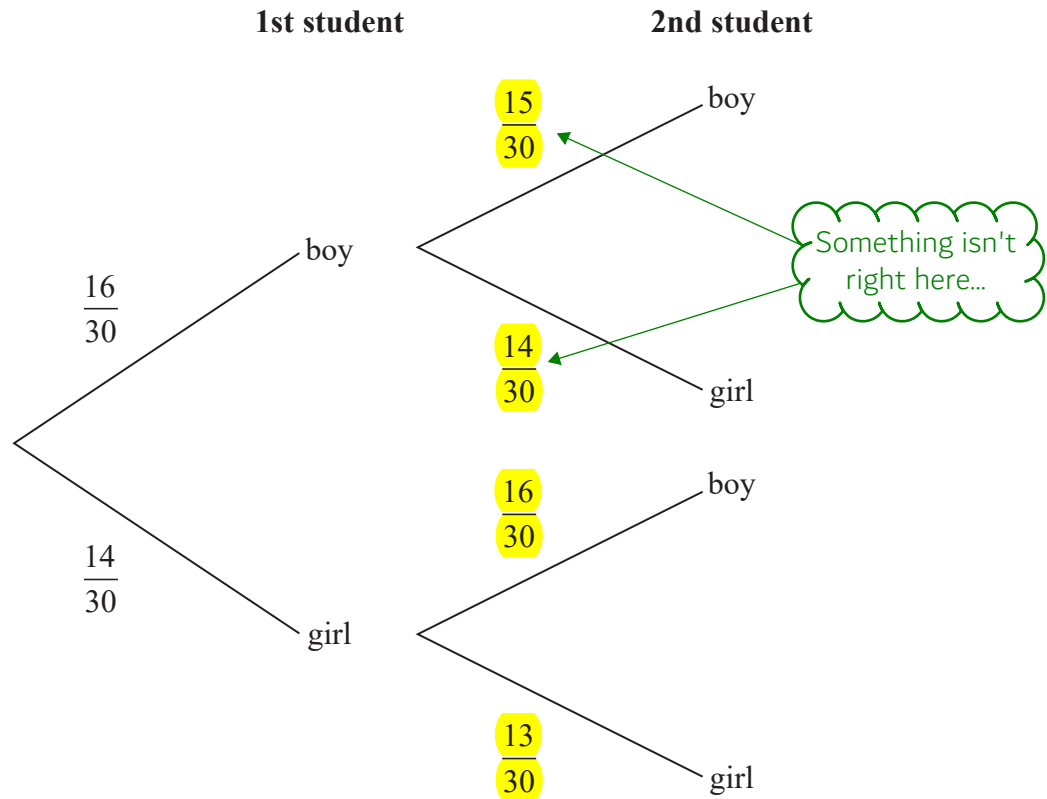
$x = \dots\dots\dots$

(Total for Question 11 is 4 marks)

- 12 There are 30 students in Mr Lear's class.  
16 of the students are boys.

Two students from the class are chosen at random.

Mr Lear draws this probability tree diagram for this information.



- (a) Write down **one** thing that is wrong with the probabilities in the probability tree diagram.

(1)

Owen and Wasim play for the school football team.

The probability that Owen will score a goal in the next match is 0.4

The probability that Wasim will score a goal in the next match is 0.25

Mr Slater says,

“The probability that both boys will score a goal in the next match is  $0.4 + 0.25$ ”

- (b) Is Mr Slater right?

Give a reason for your answer.

The boys each have less than half chance of scoring and yet the probability of both of them scoring is more than half?

(1)

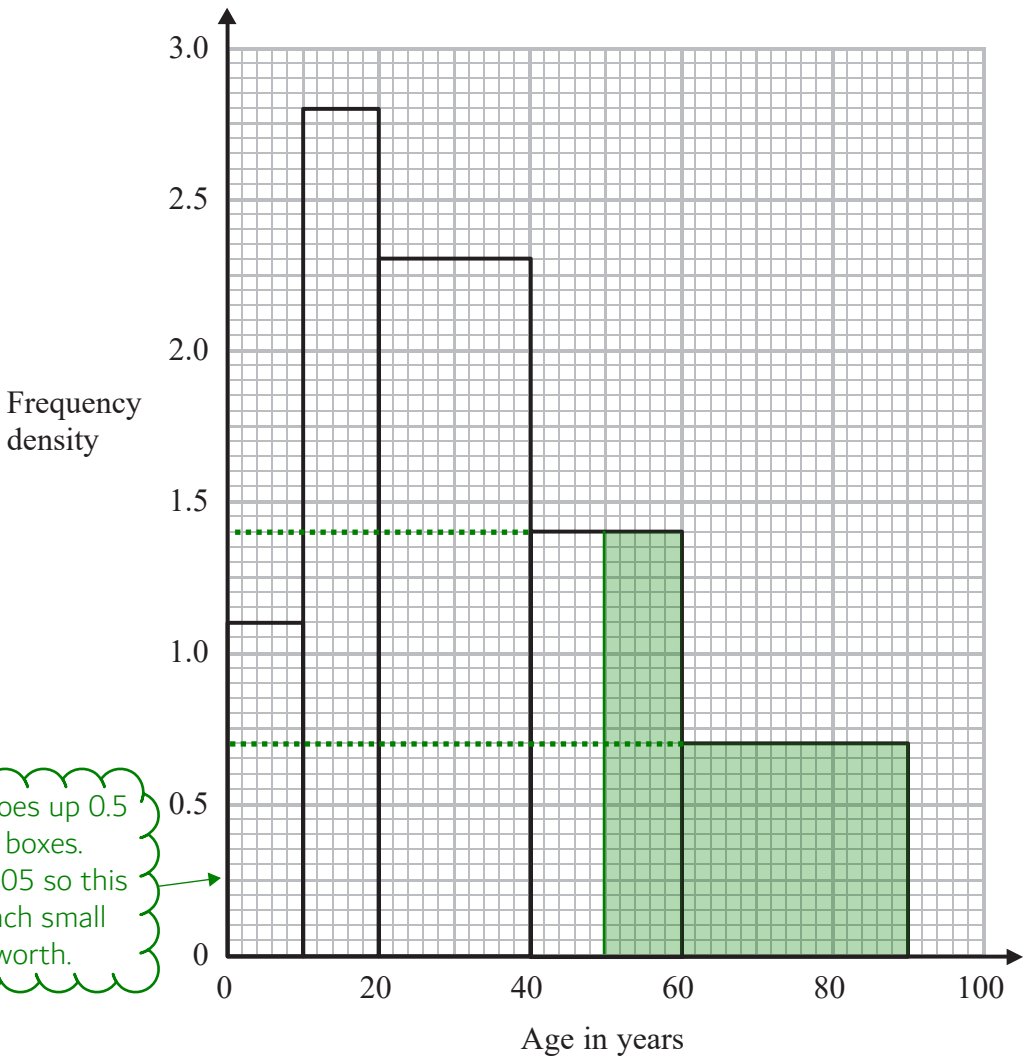
(Total for Question 12 is 2 marks)

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13 The histogram shows some information about the ages of the 134 members of a sports club.



The scale goes up 0.5 over 10 boxes.  
 $0.5/10 = 0.05$  so this is what each small box is worth.

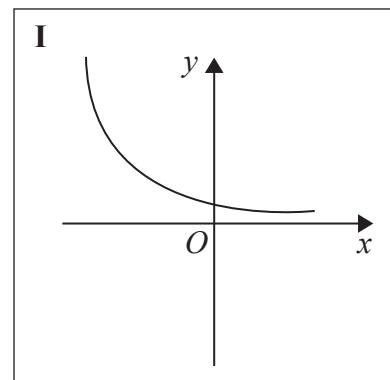
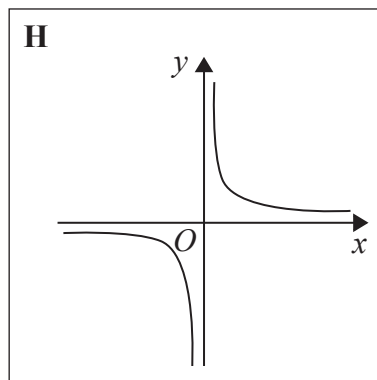
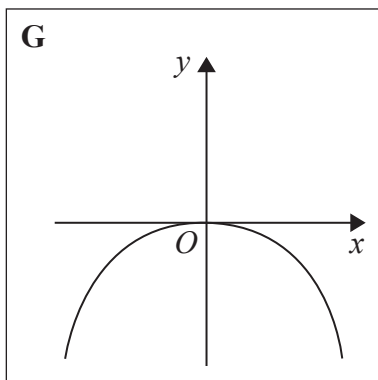
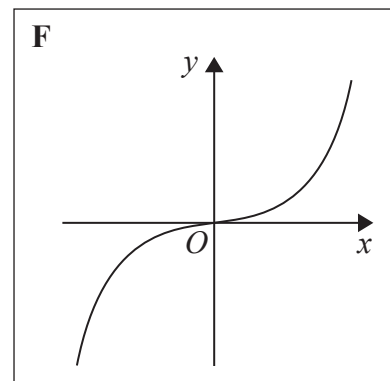
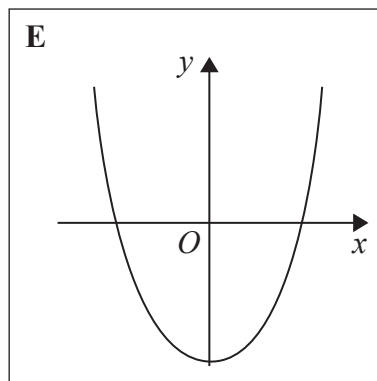
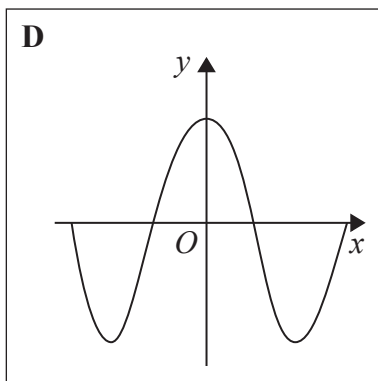
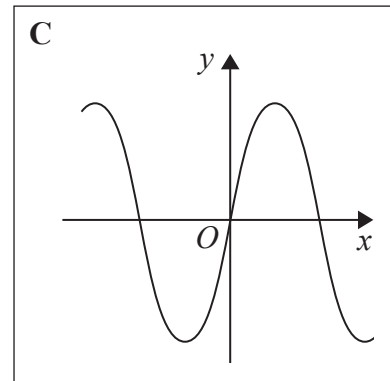
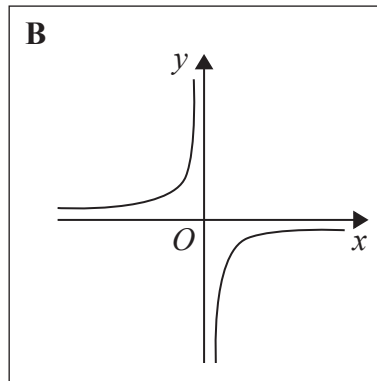
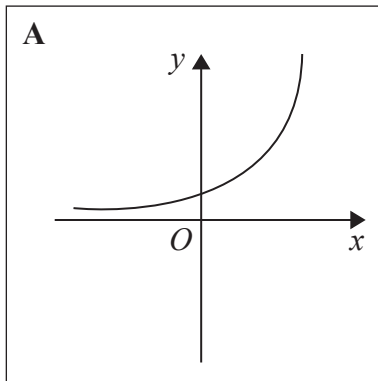
20% of the members of the sports club who are over 50 years of age are female.

Work out an estimate for the number of female members who are over 50 years of age.

Class width  $\times$  frequency density = frequency  
 We then need to find 20% of the estimated frequency.

(Total for Question 13 is 3 marks)

14 Here are some graphs.



In the table below, match each equation with the letter of its graph.

Equation	Graph
$y = \sin x$	
$y = x^3 + 4x$	
$y = 2^x$	
$y = \frac{4}{x}$	

These are common graphs and the curves are typical of the type of equation. Otherwise using table mode on the calculator gives tables of values and we can get an idea of what the curves look like.

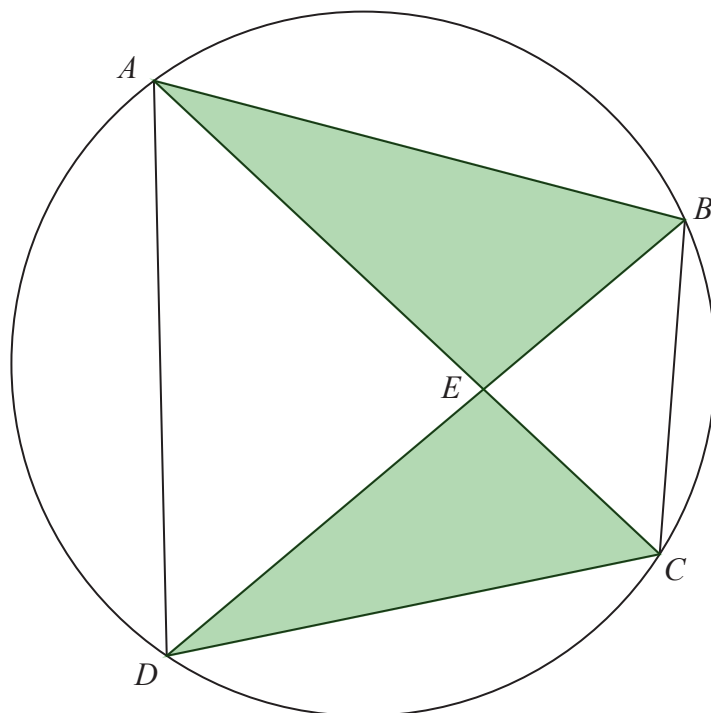
(Total for Question 14 is 3 marks)

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15  $A, B, C$  and  $D$  are four points on the circumference of a circle.



$AEC$  and  $BED$  are straight lines.

Prove that triangle  $ABE$  and triangle  $DCE$  are similar.  
You must give reasons for each stage of your working.

The triangles are similar if the sides have the same proportions or if all the angles are the same. We have no information about the sides but can prove that the angles are equal.

(Total for Question 15 is 3 marks)



16 Using algebra, prove that  $0.1\dot{3}\dot{6} \times 0.\dot{2}$  is equal in value to  $\frac{1}{33}$

$$x = 0.1\dot{3}\dot{6}$$

$$y = 0.\dot{2}$$

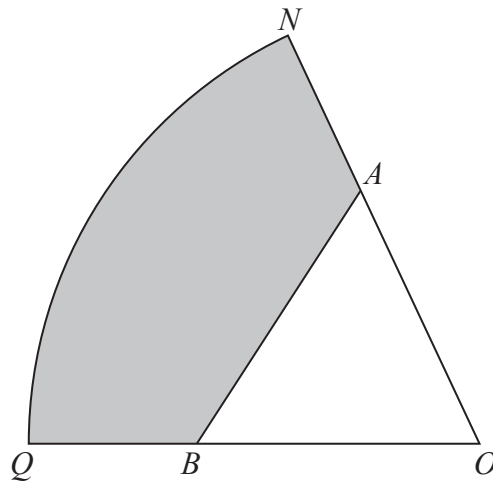
Multiplying each of these by a power of 10 will line up the recurring digits in the same decimal places so that it is possible to subtract the original decimal to eliminate the recurring digits. These can then be converted into fractions.

(Total for Question 16 is 3 marks)

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$ONQ$  is a sector of a circle with centre  $O$  and radius 11 cm.

$A$  is the point on  $ON$  and  $B$  is the point on  $OQ$  such that  $AOB$  is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector  $ONQ$ .  
Give your answer correct to 1 decimal place.

(1 - the proportion of the shape which is unshaded)  $\times$  100 = percentage shaded.  
Proportion of the shape unshaded = area of triangle/area of sector.  
Area of triangle =  $\frac{1}{2} \times ab \sin C$   
Area of sector =  $\frac{x}{360} \times \pi r^2$  where  $x$  is the number of degrees and  $r$  is the radius.  
There are  $60^\circ$  in each angle of an equilateral triangle.

.....%

(Total for Question 17 is 5 marks)

18  $16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$

Work out the exact value of  $x$ .

$$a^x \times a^y = a^{x+y}$$

Converting 16 and 8 into powers of 2 allow us to use this law to form a linear equation which can be solved.

$$(a^x)^y = a^{xy}$$

(Total for Question 18 is 3 marks)

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19  $2 - \frac{x+2}{x-3} - \frac{x-6}{x+3}$  can be written as a single fraction in the form  $\frac{ax+b}{x^2-9}$

where  $a$  and  $b$  are integers.

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

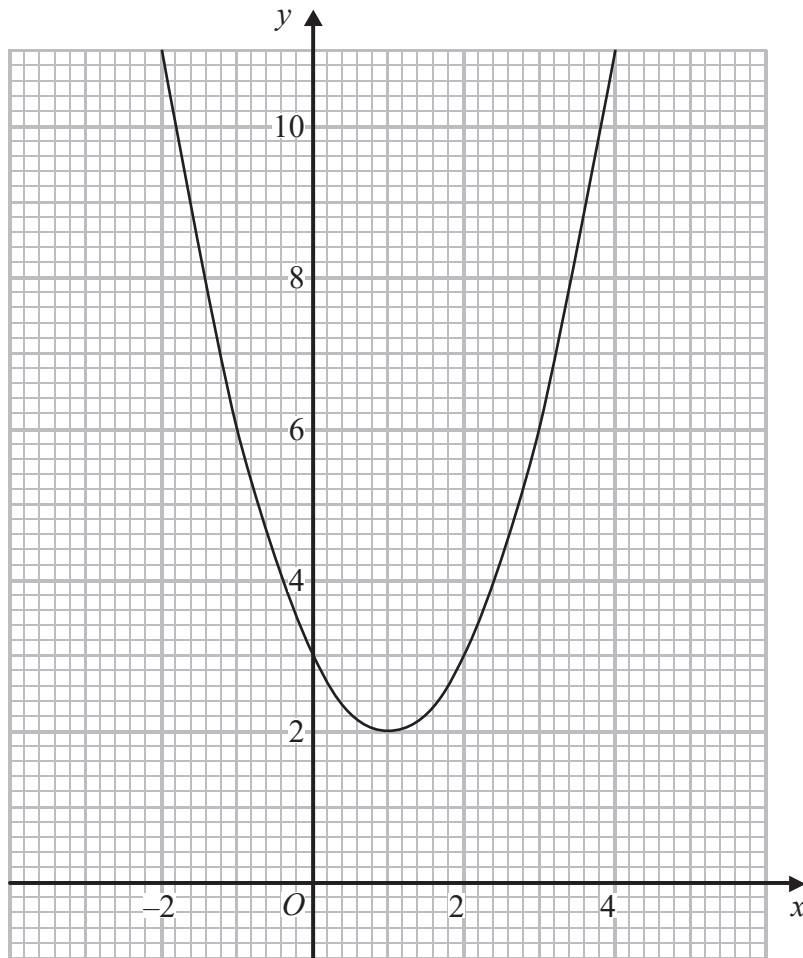
Multiplying all the denominators together finds a common denominator. The numerators have to be multiplied by the same as the denominators. The fractions can then be combined into a single fraction and any brackets can be expanded and simplified.

$$a = \dots\dots\dots$$

$$b = \dots\dots\dots$$

(Total for Question 19 is 4 marks)

20 The diagram shows part of the graph of  $y = x^2 - 2x + 3$



- (a) By drawing a suitable straight line, use your graph to find estimates for the solutions of  $x^2 - 3x - 1 = 0$

Subtracting  $x + 4$  from the equation in the graph would give 0. Sketching the line  $y = x + 4$  and reading the  $x$ -coordinates of where they cross gives the estimates for the solutions.

.....  
(2)

$P$  is the point on the graph of  $y = x^2 - 2x + 3$  where  $x = 2$

- (b) Calculate an estimate for the gradient of the graph at the point  $P$ .

Draw a tangent to the curve at  $x = 2$  to estimate the gradient.  
Up/across or (change in  $y$ )/(change in  $x$ ) calculates the gradient.

.....  
(3)

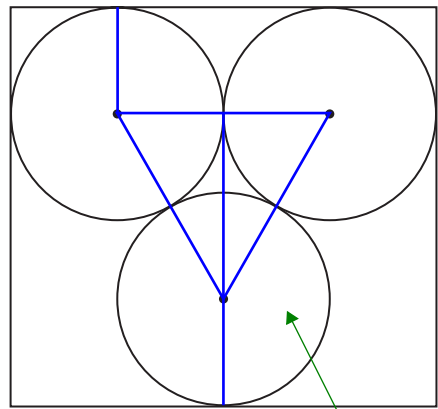
(Total for Question 20 is 5 marks)

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21 The diagram shows 3 identical circles inside a rectangle.  
 Each circle touches the other two circles and the sides of the rectangle, as shown in the diagram.



The radius of each circle is 24 mm.  
 Work out the area of the rectangle.  
 Give your answer correct to 3 significant figures.

Area of rectangle = length x width  
 Length is ? lots of the radius.  
 Width is 2 radii + height of the triangle.  
 Height of the triangle can be found using Pythagoras by splitting it into a right-angled triangle.

..... mm<sup>2</sup>

(Total for Question 21 is 4 marks)

22 Here are the first five terms of a sequence.

4      11      22      37      56

Find an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

List the first difference and then the second difference. The second difference is constant: it must be a quadratic sequence. Half of the second difference is the coefficient of  $n^2$ . List the sequence of  $an^2$  then work out the linear sequence which needs to be added to it to give the original sequence.

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(Total for Question 22 is 3 marks)

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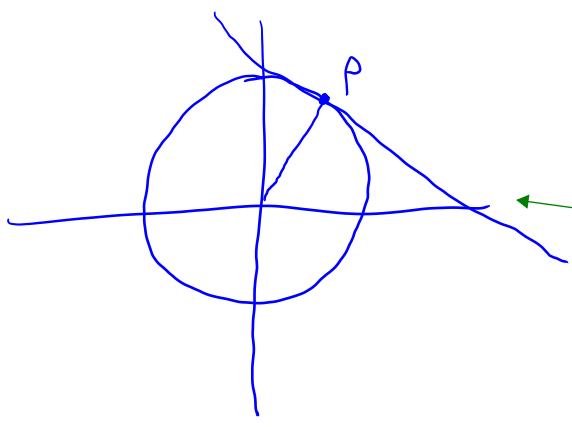
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23 L is the circle with equation  $x^2 + y^2 = 4$

$P\left(\frac{3}{2}, \frac{\sqrt{7}}{2}\right)$  is a point on L.

Find an equation of the tangent to L at the point P.

$(x - h)^2 + (y - k)^2 = r^2$ , centre is  $(h, k)$  and  $r$  is radius  
This is the form of the equation of a circle. The centre must be at the origin as there is no  $h$  or  $k$  value (they are 0)



A very quick and rough sketch of what is going on.

The tangent is a straight line so must be in the form of the general equation for a straight line.

$$y = mx + c$$

The tangent and the radius are perpendicular (circle theorem) so the gradient of the tangent must be the negative reciprocal of the gradient of the radius. Up/across finds the gradient of the radius.

$$c = y - mx$$

Rearranging to make  $c$  the subject then substituting in  $m$ , the gradient, and then  $x$  and  $y$ -coordinates from point  $P$  as they must satisfy the equation.

(Total for Question 23 is 3 marks)

TOTAL FOR PAPER IS 80 MARKS