BOOTCAMP

EASTER

(The last push)

Higher Tier

'If you're going through hell, Keep going!'

(Winston Churchill)

Name_____

Group_____ Teacher_____

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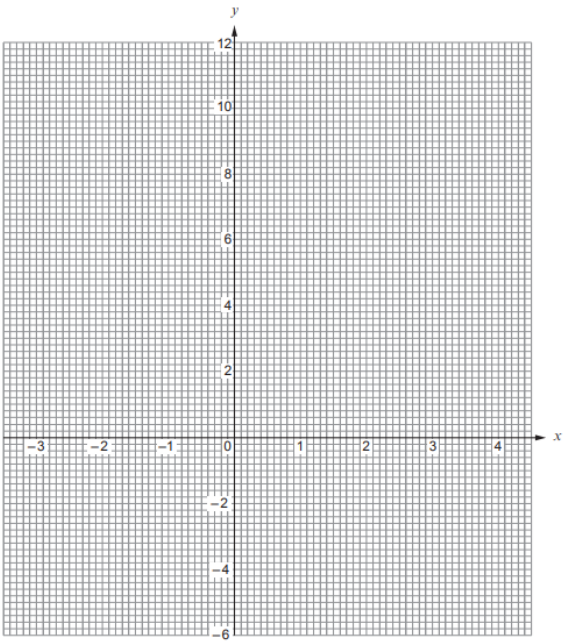
No calculators allowed **Time Taken**

1

The table below shows some of the values of $y = x^2 - 2x - 4$ for values of x from –3 to 4.

x	–3	–2	–1	0	1	2	3	4
$y = x^2 - 2x - 4$	11	4	–1	–4		–4	–1	4

On the graph paper opposite, draw the graph of $y = x^2 - 2x - 4$ for values of x from –3 to 4. [2]



Solve the following simultaneous equations using an algebraic (not graphical) method.

$$5x + 3y = 11$$
$$2x - 7y = 29$$

You must show all your working. [4]

Factorise $x^2 + 4x - 21$. Hence, solve $x^2 + 4x - 21 = 0$. [3]

Express $0\dot{4}7\dot{5}$ as a fraction. [2]

Circle the correct answer for the following statement. [1]

$16^{-\frac{3}{4}}$ is equal to

–12 $\frac{1}{8}$ –8 $\frac{1}{12}$ –16·75

The illuminance of light, I, from a lamp depends on the distance, d, from the lamp.
The unit used to measure the illuminance of light is the lux.

It is known that I is inversely proportional to the square of d.

Carys has a desk lamp in her room.
For her lamp, Carys measures the illuminance, I, to be 5 lux when the distance, d, is 2 m.

What is the illuminance of light from this lamp at a distance of 0·5 m? [4]

Simplify

$$(2+\sqrt{5})^2 - \frac{\sqrt{500}}{(\sqrt{5})^3}$$

and indicate whether your answer is rational or irrational. [5]

Sixteen balls are placed in a bag.
Ten of the balls are green and six are yellow.
Two balls are selected at random and not replaced.

Benjamin states that the probability of selecting two balls of the **same colour** is equal to the probability of selecting two balls of **different colours.**

Is Benjamin correct?
You must show all your working to justify your answer. [4]

Calculate $(3{\cdot}4 \times 10^{-5}) \times 700$.
Give your answer in standard form.

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Calculators allowed **Time Taken**

2

Circle the correct answer for each of the following.

(a) $81 =$ [1]

3^3 9^3 9^4 18^2 3^4

(b) $2{\cdot}1^5 =$ [1]

32·5 10·5 40·84101 30·84101 32·1

(c) $(12{\cdot}96)^{\frac{1}{2}} =$ [1]

6·48 3·6 4·32 3·3 2·16

A solution of the equation

$$x^3 - 3x = 37$$

lies between 3 and 4.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

Calculate the length of the side *MN* in the triangle *LMN* shown below. [3]

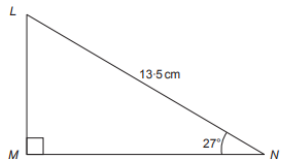


Diagram not drawn to scale

A right-angled triangle *LMN* is shown below.
LN = 16·9 cm and *LM* = 6·5 cm.

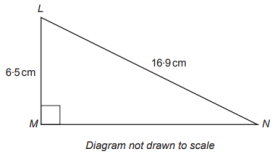


Diagram not drawn to scale

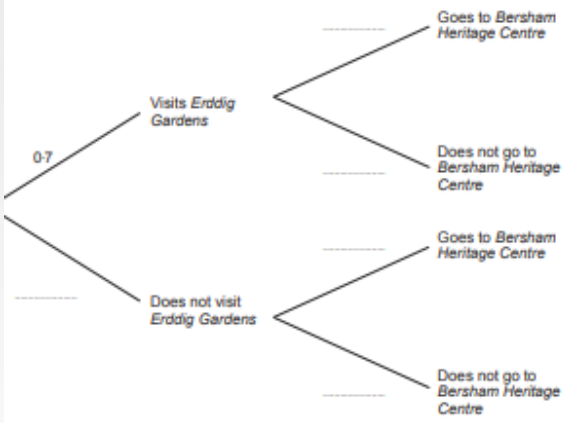
Calculate the length *MN*. [3]

Use the quadratic formula to solve $(3x - 2)^2 = (x + 1)(x + 2)$
Give your answers correct to 2 decimal places.
You must show all your working.

Dylan is having a weekend break in Wrexham.
The probability that he will visit *Erddig Gardens* is 0·7.
The probability of Dylan going to the *Bersham Heritage Centre* is independent of him visiting *Erddig Gardens*.

The probability that he visits *Erddig Gardens* **and** goes to the *Bersham Heritage Centre* is 0·28.

(a) Complete the following tree diagram. [4]



(b) Calculate the probability that Dylan visits *Erddig Gardens* but does not go to the *Bersham Heritage Centre*. [2]

A cuboid has dimensions of 40 mm, 25 mm and 12 mm.
All of these measurements are correct to the nearest mm.

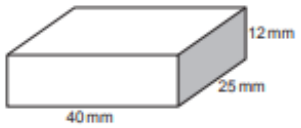


Diagram not drawn to scale

Four of these cuboids are stacked together as shown below.

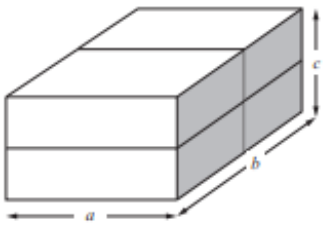


Diagram not drawn to scale

(a) Write down the **greatest** possible value of length a.
Give your answer in mm. [1]

(b) Calculate the **greatest** possible value of length b.
Give your answer in mm. [1]

(c) Calculate the **least** possible value of length c.
Give your answer in mm. [1]

A biased coin is thrown 100 times.
The number of heads thrown is recorded after 20 throws, 40 throws, 60 throws, 80 throws and 100 throws.

Some of the results are recorded in the relative frequency table below.

Complete the table. [2]

Number of throws	20	40	60	80	100
Number of heads	11	18	24	30	
Relative frequency	0·55	0·45		0·375	0·37

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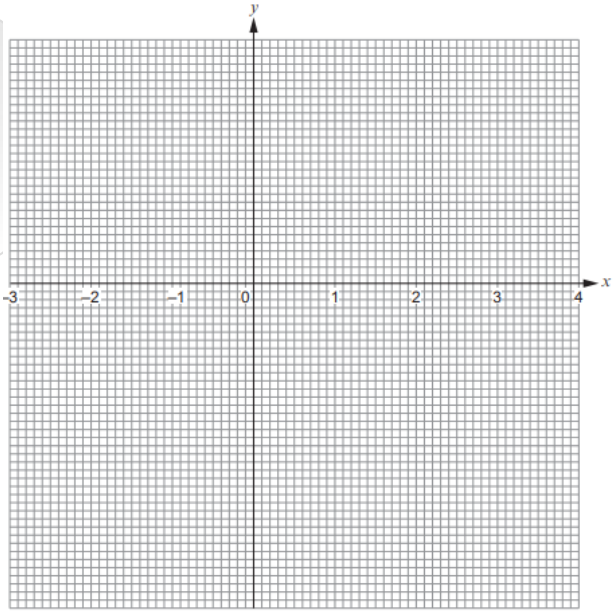
No calculators allowed **Time Taken**

3

Complete the table below.
Draw the graph of $y = 3x^2 - 25$ for values of x between −3 and 4.
Use the graph paper below.
You must choose a suitable scale for the y-axis. [4]

x	−3	−2	−1	0	1	2	3	4
$y = 3x^2 - 25$	2		−22	−25	−22	−13	2	23



Solve the following simultaneous equations using an algebraic (not graphical) method. [4]

$$3x + 4y = 7$$
$$2x - 3y = 16$$

Factorise $x^2 - x - 20$, and hence solve $x^2 - x - 20 = 0$. [3]

Express $0\dot{2}4\dot{8}$ as a fraction.

Evaluate $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$.

Given that y is inversely proportional to x^2, and that $y = 5$ when $x = 2$,

(a) find an expression for y in terms of x. [3]

Simplify $\sqrt{45}$.
Circle your answer. [1]

$3\sqrt{5}$ $3\sqrt{15}$ $5\sqrt{3}$ $9\sqrt{5}$ 22·5

(b) Use the expression you found in *(a)* to complete the following table. [2]

x	2	0·5	
y	5		0·2

Evaluate $\left(2\sqrt{7} - \sqrt{3}\right)^2$.
Simplify your answer.

A box contains 4 yellow cards and 6 red cards.
Three cards are chosen at random, one at a time, without replacement.

(a) Calculate the probability that the first two cards are yellow and the third card is red.
You must show all your working. [2]

(b) Calculate the probability that at least one yellow card is chosen. [3]

Calculate the value of $(5{\cdot}41 \times 10^5) + (2{\cdot}3 \times 10^4)$.
Give your answer in standard form.

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Calculators allowed **Time Taken**

4 Circle the correct answer for each of the following.

(a) $81 =$

3^3 9^3 9^4 18^2 3^4

(b) $2{\cdot}1^5 =$

32·5 10·5 40·84101 30·84101 32·1

(c) $(12{\cdot}96)^{\frac{1}{2}} =$

6·48 3·6 4·32 3·3 2·16

A solution of the equation

$$2x^3 + x - 10 = 0$$

lies between 1 and 2.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

PQR is a right-angled triangle.
PR = 16·7 cm, *QR* = 9·6 cm.

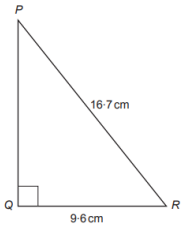


Diagram not drawn to scale

Calculate the size of $\hat{QPR}$. [3]

The right-angled triangle *ABC* has an area of 84 cm².
AB = 24 cm.

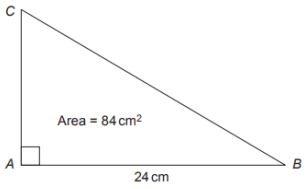


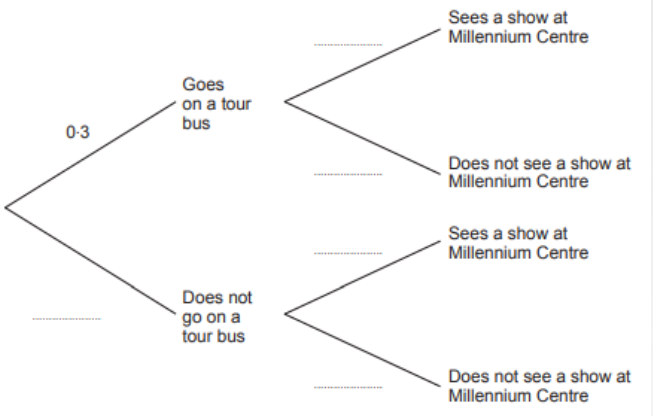
Diagram not drawn to scale

Calculate the perimeter of the triangle *ABC*.
You must show all your working.

Leah is visiting Cardiff.
The probability that she will go on a tour bus is 0·3.
The probability of Leah seeing a show at the Millennium Centre is independent of her going on a tour bus.

The probability that she goes on a tour bus and sees a show at the Millennium Centre is 0·24.

(a) Complete the following tree diagram. [4]



(b) Calculate the probability that Leah does not go on a tour bus and does not see a show at the Millennium Centre. [2]

Solve $3x^2 + 4x - 18 = 0$, giving your answers correct to two decimal places.
You must show all your working. [3]

A car travels 300 km, measured correct to the nearest 5 km.
It travels this distance in 6 hours, measured correct to the nearest hour.

Calculate the least possible average speed of the car.
Give your answer in km/h, correct to 2 decimal places.

A raffle is held at a school fair and a total of 100 tickets are sold.
Angharad buys three of the tickets and Meirion buys one ticket.
Tickets are selected at random and not replaced.
The first prize to be awarded is a calculator.
The second prize to be awarded is a voucher.
No other prizes are awarded.

(a) Calculate the probability that Angharad wins the calculator and Meirion wins the voucher. [2]

(b) Calculate the probability that no one wins a prize apart from Angharad or Meirion. [3]

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No calculators allowed **Time Taken**

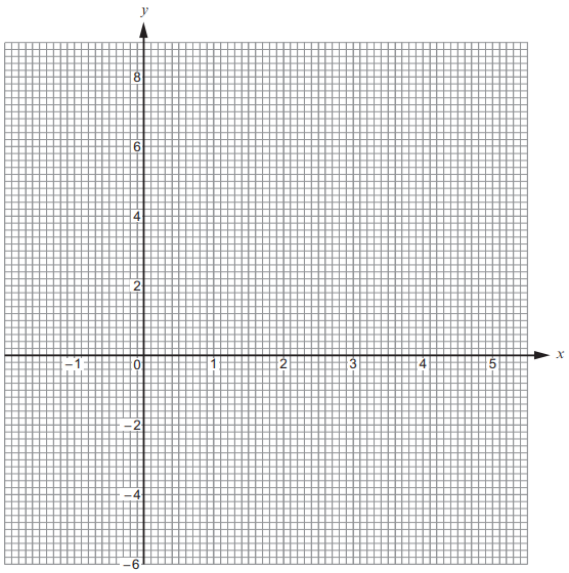
5

The table below shows some of the values of $y = x^2 - 5x + 2$, for values of x from –1 to 5.

x	–1	0	1	2	3	4	5
$y = x^2 - 5x + 2$	8	2	–2	–4		–2	2

(a) Complete the table above. [1]

(b) On the graph paper below, draw the graph of $y = x^2 - 5x + 2$ for values of x from –1 to 5. [2]



Solve the following simultaneous equations by an algebraic (not graphical) method.

$$3x - 2y = 16$$
$$x + 3y = -2$$

Factorise $x^2 + 7x - 18$.

Hence solve the equation

$$x^2 + 7x - 18 = 0.$$

Evaluate $49^{-\frac{1}{2}}$

Express $0\dot{3}\dot{7}\dot{2}$ as a fraction

Find the value of $\left(\sqrt{63} - \sqrt{7}\right)^2$

The time taken, t, for passengers to be checked-in for a flight is inversely proportional to the square of the number of staff, s, working.

It takes 30 minutes passengers to be checked-in when 10 staff are working.

(a) Find an equation connecting t and s.

(b) What is the minimum number of staff that must be working so that the time taken is under 60 minutes?

Given that $f = \sqrt{2}$, $g = \sqrt{5}$ and $h = \sqrt{10}$, find, in its simplest form,

(i) $\frac{fg}{h}$,

(ii) $fg + h$,

A bag contains 6 red blocks, 4 green blocks and 2 yellow blocks.
Three blocks are taken from the bag, at random, **without replacement**.

(a) What is the probability that the first block removed is red, the second is green and the third is yellow? [2]

(b) Calculate the probability that all three blocks will be the same colour. [3]

(c) Write down the probability that the three blocks will **not** be the same colour. [1]

Find, in standard form, the value of:

(i) $(4 \times 10^{-4}) \times (1{\cdot}2 \times 10^{-5})$

(ii) $\frac{3 \times 10^3}{4 \times 10^{-6}}$

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Calculators allowed **Time Taken**

6

Simplify **each** of the following.

(i) $8^{\frac{2}{3}}$ (ii) $25^{-\frac{1}{2}}$

Simplify $64^{\frac{2}{3}} \times 3^{-4}$ leaving your answer in fractional form.

Simplify $(5ab^4)^3$.

Simplify $1000^{-\frac{2}{3}}$

A solution to the equation

$$x^3 - 2x - 45 = 0$$

lies between 3 and 4.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

Calculate the length of the side *QR* in the triangle *PQR* shown below.

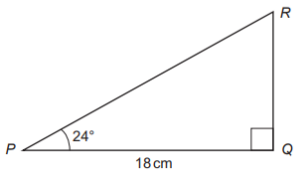


Diagram not drawn to scale

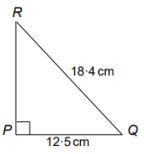


Diagram not drawn to scale

Calculate the length of *PR*, giving your answer correct to 1 decimal place.

100 boxes each contain 10 balls.

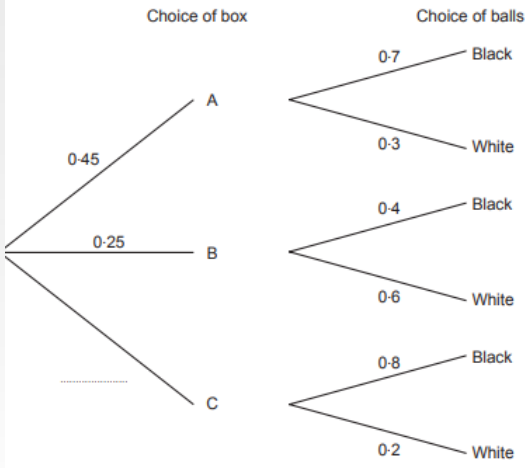
45 of the boxes are labelled A.
They each contain 7 black balls and 3 white balls.

25 of the boxes are labelled B.
They each contain 4 black balls and 6 white balls.

The rest of the boxes are labelled C.
They each contain 8 black balls and 2 white balls.

In a game, a player chooses a box at random, and then chooses a ball at random from that box.

(a) Complete the tree diagram shown below. [1]



(b) What is the probability that a player will select a black ball? [3]

Use the quadratic formula to solve $(3x - 1)^2 = x(2x + 3) + 7$
Give your answers correct to 2 decimal places.

A rectangle measures 38 cm by 26 cm.
Each measurement is correct to the nearest cm.
Calculate the least possible area of the rectangle.

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.

(b) Calculate the probability that the chocolates chosen are of different types.

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No calculators allowed **Time Taken**

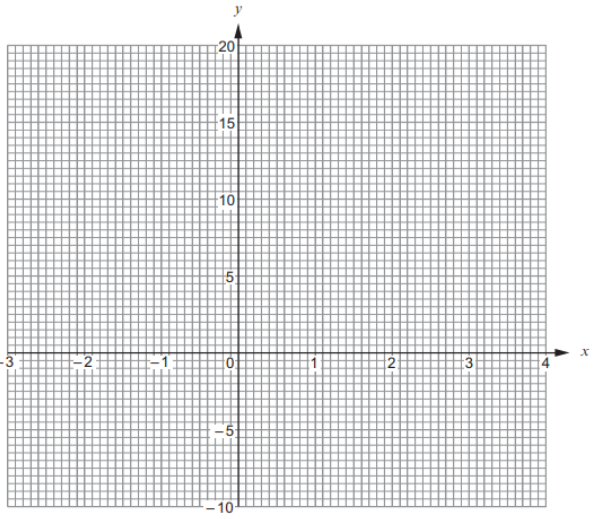
7

(a) The table below shows some of the values of $y = 2x^2 - 5x - 1$ for values of x from −2 to 4.

Complete the table by finding the value of y for $x = -1$ and for $x = 2$. [2

x	−2	−1	0	1	2	3	4
$y = 2x^2 - 5x - 1$	17		−1	−4		2	11

(b) On the graph paper below, draw the graph of $y = 2x^2 - 5x - 1$ for values of x from −2 to 4. [2]



Solve the following simultaneous equations.

$$5x + 2y = 5$$
$$7x + 3y = 9$$

Factorise $x^2 - 2x - 24$, and hence solve $x^2 - 2x - 24 = 0$.

Express $0{\cdot}4\dot{3}\dot{5}$ as a fraction.

Given that y is inversely proportional to x, and that $y = 4$ when $x = 3$,

(a) find an expression for y in terms of x,

(b) use the expression you found in *(a)* to complete the following table.

x	3	0·25	
y	4		$\frac{1}{5}$

Circle the correct answer for each of the following statements.

(a) $9^{-\frac{1}{2}}$ is equal to

-3 $-\frac{1}{3}$ $\frac{1}{4\frac{1}{2}}$ $-4\frac{1}{2}$ $\frac{1}{3}$ [1]

(b) $8^{\frac{2}{3}}$ is equal to

$5\frac{1}{3}$ 4 6 $8\frac{2}{3}$ $\frac{16}{24}$ [1]

Simplify

$$\frac{\left(5\sqrt{3}\right)^2 - \frac{2\sqrt{18}}{\sqrt{2}}}{\sqrt{32} \times \sqrt{2}}$$

and state whether your answer is rational or irrational.

Mair either walks, cycles, travels by car or travels by bus to work each day.
Her method of travel each day is independent of her method of travel on any other day.

The table below shows the probability for three of her methods of travel on any randomly chosen day.

Method of travel	Walk	Bike	Car	Bus
Probability		0·45	0·1	0·25

(a) Calculate the probability that, on any randomly chosen day, she walks to work. [2]

(b) What is the probability that, on any randomly chosen day, she either travelled to work by car or by bus? [2]

Find, in standard form, the value of each of the following

(a) $\frac{7{\cdot}5 \times 10^6}{5000}$

(b) $(2{\cdot}3 \times 10^3) + (6{\cdot}4 \times 10^4)$

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Calculators allowed **Time Taken**

8

Circle the expression that is equivalent to $w^{-\frac{3}{5}}$. [1]

$-\left(\sqrt[3]{w}\right)^5$ $-\frac{3}{5}w$ $-\left(\sqrt[5]{w}\right)^3$ $\frac{1}{\left(\sqrt[5]{w}\right)^3}$ $\frac{1}{\left(\sqrt[3]{w}\right)^5}$

Circle the correct answer

$x^3 \times x^6 =$

x^{36} $x^{0.5}$ x^2 x^9 x^{18}

A solution to the equation

$$2x^3 - 3x - 17 = 0$$

lies between 2 and 3.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

The area of triangle *ABD*, shown in the diagram below, is 35 cm^2.
AD = 5 cm and *BC* = 32 cm.
D is on the line *AC*, and *BD* is perpendicular to *AC*.

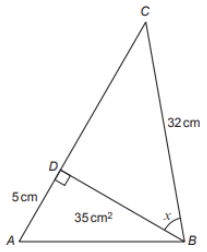


Diagram not drawn to scale

Calculate the size of angle x.
You must show all your working. [5 + 2 OCW]

Solve the equation $x = \frac{7}{5x-3}$.

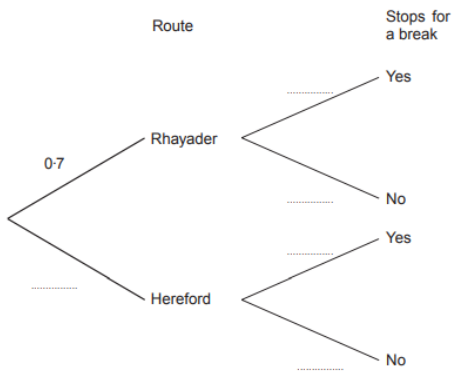
Give your answers correct to 2 decimal places.

Alwyn often drives from Bangor to Cardiff.
He always chooses one of two routes for these journeys.
He either travels through Rhayader or through Hereford.
The probability that he travels through Rhayader is 0·7.

Sometimes he decides to stop for a break during his journey.
His decision is independent of the route he takes.

The probability that he travels through Rhayader **and** stops for a break is 0·42.

(a) Complete the following tree diagram. [4]



(b) Calculate the probability that Alwyn travels through Hereford but **does not** stop for a break. [2]

The region between two rectangles is shaded, as shown in the diagram below.
All of the measurements shown are given **correct to the nearest cm**.

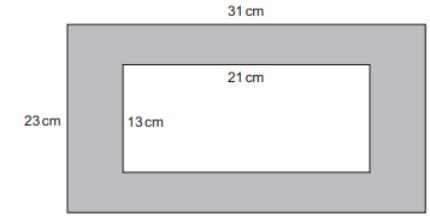


Diagram not drawn to scale

Calculate the greatest possible area of the shaded region. [3]

Megan has a fair 6-sided dice.

She throws the dice twice.
Calculate the probability that she throws a 4 both times.