GCSE MATHEMATICS

Probability

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First edition December 2012

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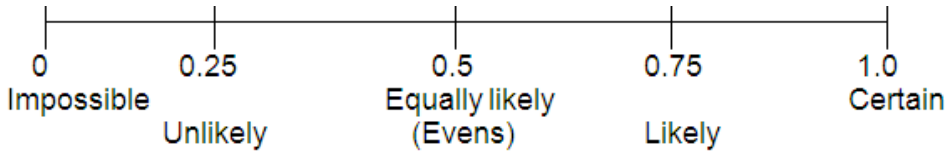
Probability is a measure of how likely an event is to happen.

It is measured on a scale from 1 to 0



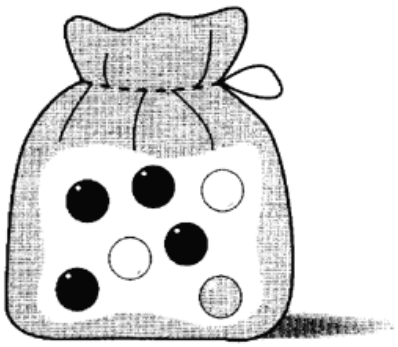
Probabilities can be expressed as decimals, fractions or percentages.

Calculating probabilities

Probability of an event [P(event)] = $\frac{\text{no of ways the event can occur}}{\text{total no of outcomes}}$

Example
Find the probability of picking a blue bead from a bag of 4 blue and 3 other beads.

Solution
The **event** is picking a blue bead. This can occur 4 ways
There are 7 possible **outcomes.**



The probability of a blue, p(blue) = $\frac{3}{7}$

Now try these 1

1. A die is rolled. Find the probability of rolling:

   (i) a 6

   (ii) a 4

   (iii) an odd number

   (iv) the number 4 or less

   (v) the number 1 or more

2. A bag contains 5 red beads, 3 white beads and 2 black beads. Find the probability of drawing :

   (i) a red bead

   (ii) a white bead

   (iii) a green bead

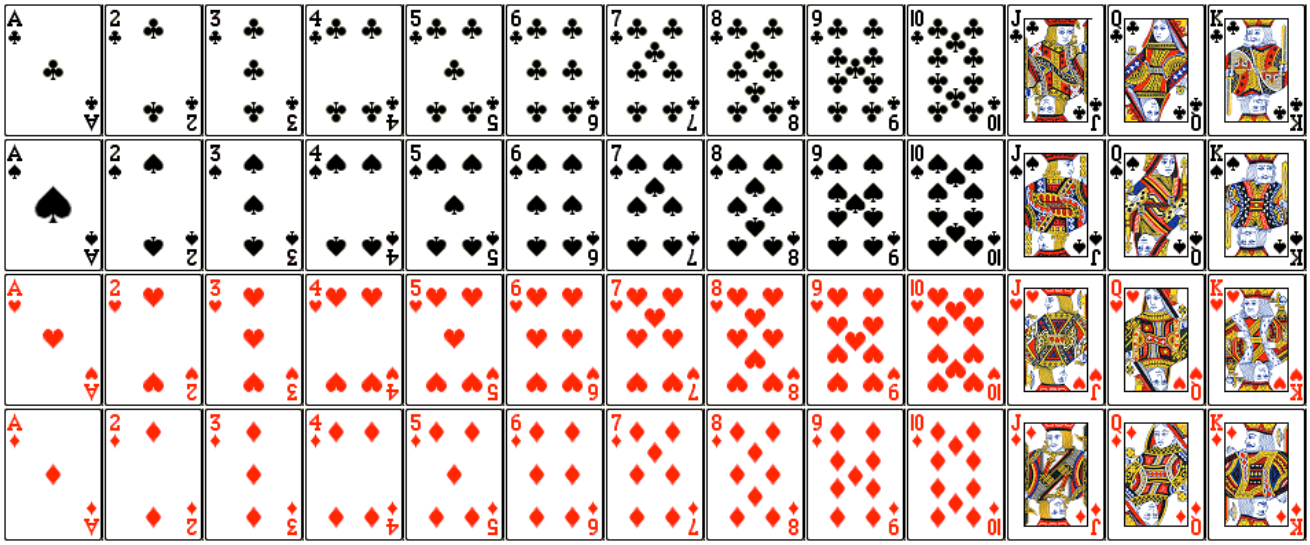
3. Place the following statements in the correct place:

It is Sunday	Stoke City will win on Saturday	You will pass the maths exam
It will snow tomorrow	Throwing a 7 with one dice	
It will rain today		

Add one more statement under the certain and under the impossible column

Impossible	Unlikely	Evens	Likely	Certain

4.



In a pack of playing cards there are 52 cards in four suits:
clubs ♣, spades♠, hearts♥ and diamonds ♦.

Clubs and spades are black. Hearts and diamonds are red.

- There are 13 cards in each suit.
- The numbered cards are 2 to 10.
- There are three face cards: Jack, Queen and King
- And an Ace (1).

What is the probability of picking at random the following:

(a) an ace
(b) a king
(c) a red card
(d) a club
(e) a card less than 6 (including the ace)

Complement

If the probability of an event happening is p the probability of an event **not** happening is $1 - p$.

The complement of an event A' is all the outcomes **not** in A.

$$P(A) + P(A') = 1$$

Example
The probability of it snowing today is 0.2. Find the probability of it **not** snowing.

Solution
$p = 0.2$ not $p = 1 - 0.2 = 0.8$.
The probability of it not snowing is 0.8.

Now try these 2

1. The probability of passing the maths exam is 0.98. What will be the probability of failing the exam?

2. The probability of having a 10-minute break today is 0.4. What is the probability of the break not lasting 10 minutes?

3. A **fair** dice is rolled. What is the probability of it not being a 4?

4. A **biased** dice is thrown. The probability of it being a six is 0.4. What is the probability of not throwing a six with the same dice?

Fair
With a fair dice each number has is equally likely to be thrown.

Biased (or unfair)
If the dice is biased certain numbers will come up more than others.

F & H

Sample space

When two or more events take place (e.g. throwing two dice, or flipping a coin and throwing a dice), the outcomes can be shown on a grid, this is known as a **sample space**.

Example

A coin is flipped three times.
(a) Write down the sample space.
(b) What is the probability of throwing two heads?

Solution

(a)

	HHH	THH
	HHT	THT
	HTH	TTH
	HTT	TTT

(b) There are 8 possible outcomes; of the 8 there are 3 with two heads.

Hence p(two heads) = $\frac{3}{8}$

F & H

Now try these 3

1. Complete the sample space for throwing two dice:

		Red dice					
	+	**1**	**2**	**3**	**4**	**5**	**6**
	1						
	2						
Blue	**3**						
dice	**4**						
	5						
	6						

Use the above diagram to

(a) calculate the probability of scoring: (i) a total of 2 (ii)a total of 9 or more

(b) work out which is the most likely total score.

H

2. (a) A computer is used to generate numbers.

It always generates one of the numbers '0', '1', '2' or '3'.

A game is played by generating two numbers and the score is calculated by **multiplying** the numbers together.

(i) Complete the table, showing all the possible scores that can be obtained.

Second number

	x	***0***	***1***	***2***	***3***
First number	***0***		0		
	1				3
	2				
	3				

(ii) What is the probability of scoring 0?

(iii) If each number is equally likely to be generated, what is the probability of getting the maximum score?

F & H

Relative frequency

This is an estimate of the probability, it is also known as **experimental probability**.

$$\text{Relative frequency} = \frac{\text{frequency of event}}{\text{total frequency}}$$

As the number of trials of an experiment is increased, then the long-term relative frequency will be a better estimate of the probability.

Expected frequency

The expected frequency is the number of times we expect an event to happen given a certain number of trials.

Expected frequency = probability $\times$ number of trials

Example
The probability it will snow on the first Monday in December is 0.04. How many times would you expect it to snow in the next fifty years on that day?

Expected frequency = probability $\times$ number of trials

p(snow) = 0.04, the number of trials is 50.

$0.04 \times 50 = 2.00$

We would expect it to snow on 2 out of the 50 days.

Now try these 4

F & H

1. The probability that it will rain in London on Christmas day is 0.01. Work out an estimate of the number of days it will rain on Christmas Day in London in the next fifty years.

2. A computer generates numbers at random.
In a test run the computer generated the following numbers:

2	5	7	3	11	12	14	15	3	7
4	6	4	1	10	9	12	5	1	13

(a) Use the test run to estimate the probability of the computer generating an odd number.
(b) Use your answer to calculate how many odd numbers you would expect when the computer generates 300 numbers at random.

H

3. A manufacturer makes switches for electric circuits.
The probability that a switch is faulty is 0.1.

William buys 150 of these switches

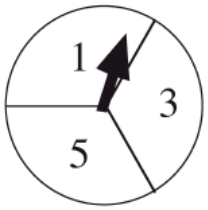
(a) How many of the 150 switches can be expected to be faulty?

(b) Explain why your answer is only an approximation.

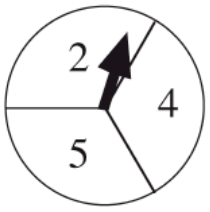
Spinners

Two fair spinners are numbered 1, 3, 5 and 2, 4, 5 respectively.

Spinner A



Spinner B



You spin the spinners and add the numbers together.

- If the total is even, Amy wins a prize.
- If the total is a multiple of 3, Max wins a prize.
- If the total is 5 or 7, Sam wins a prize.

1. Draw a table to show all the equally likely outcomes:

		Spinner A		
		1	**3**	**5**
Spinner B	**2**			
	4			
	5			

2. Complete the table below:

Name	**Probability of winning a prize**
Amy	$\frac{1}{3}$
Max	
Sam	

3. Explain what is wrong with the following statement:

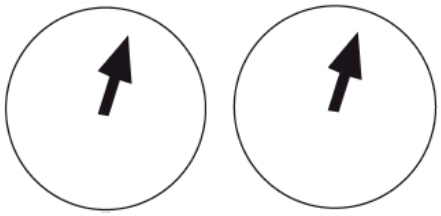
   "The probability that someone will win is 1. This means that the probabilities in question 2 should add up to 1."

4. What further questions can you ask?

Make up your own question and exchange questions with someone else. (Make sure you know the answers for your questions!)

Two fair spinners are numbered ..... and ..... respectively.

Spinner A Spinner B



You spin the spinners and ..... the numbers together.

If the result is ..... then .....

If the result is ..... then .....

If the result is ..... then .....

1. Draw a ..... to show all the equally likely outcomes:

2. .....

3. .....

H

Adding probabilities

Two events are said to be **mutually exclusive** when both cannot happen at the same time. Suppose you flip a coin. The event 'obtain a head' and the event 'obtain a tail' are mutually exclusive, as you cannot obtain both a head and a tail at the same time. If two events are mutually exclusive, then you can calculate the probability of one or the other occurring.

Example

A fair die is thrown. What is the probability of throwing a 2 or a 3?

The event 'throw a 2' and the event 'throw a 3' are mutually exclusive.

Probability (2) = $\frac{1}{6}$ Probability (3) = $\frac{1}{6}$

so probability (2 or 3) = $\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$

Now try these 5

(a) There are 5 red beads, 3 white beads and 2 black beads in a bag. Find the probability of drawing :
- i) a red or white bead
- ii) a white or black bead
- iii) a bead that is not white.

(b) Two fair dice are thrown and the totals added. What is the probability of getting :
- i) a total of 3 or 4
- ii) a total that is an even number.

[A sample space diagram may help you to answer this question]

H

Multiplying probabilities

Two events are said to be independent when the result of one does not affect the result of the other. Suppose you toss a coin and throw a dice. Whether you obtain a head or a tail from the coin clearly does not affect the score on the die. These events are independent of each other. If you want to calculate the probability of throwing a six and obtaining a tail, how can you do this?

You could list all the possible outcomes or show all the outcomes on a table:

	Number on die						
		1	2	3	4	5	6
Face on	H	H1	H2	H3	H4	H5	H6
coin	T	T1	T2	T3	T4	T5	T6

From the table, the probability of throwing a six and obtaining a tail is $\frac{1}{12}$.

A quicker way of working this out without a diagram is:

p (6 on die) = $\frac{1}{6}$ p (tail on coin) = $\frac{1}{2}$

so probability (6 and tail)

= $\frac{1}{6}$ x $\frac{1}{2}$ = $\frac{1}{12}$

Similarly, if you have two dice (a red and a blue), the probability of throwing two 2s (a 2 on one and a 2 on the other) is:

p (2 on red) = $\frac{1}{6}$ p (2 on blue) = $\frac{1}{6}$

so probability (2 on red and 2 on blue)

= $\frac{1}{6}$ x $\frac{1}{6}$ = $\frac{1}{36}$

Sometimes, there are two different ways of achieving a result.

For instance, what is the probability of obtaining a 5 and a 4 with two dice?

The probability of getting a 5 with the first and a 4 with the second is

$\frac{1}{6}$ x $\frac{1}{6}$ = $\frac{1}{36}$

and the probability of getting a 4 with the first and a 5 with the second is

$\frac{1}{6}$ x $\frac{1}{6}$ = $\frac{1}{36}$

So the probability of getting a 5 and a 4 is $\frac{1}{36} + \frac{1}{36} = \frac{2}{36} = \frac{1}{18}$

H

Probability trees

Probability trees are useful ways to show the possible outcomes of two or more events.

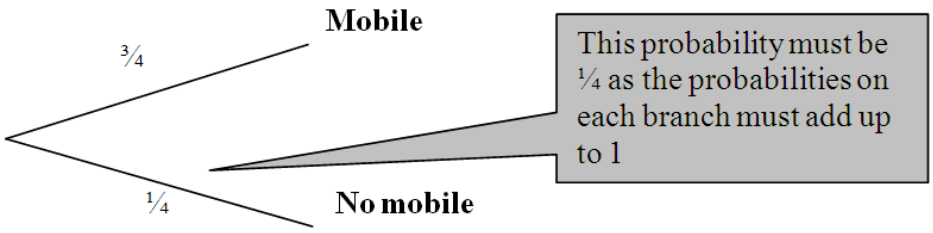
There are two important things to remember:

- Each branch must add up to 1
- Multiply (×) along the branches

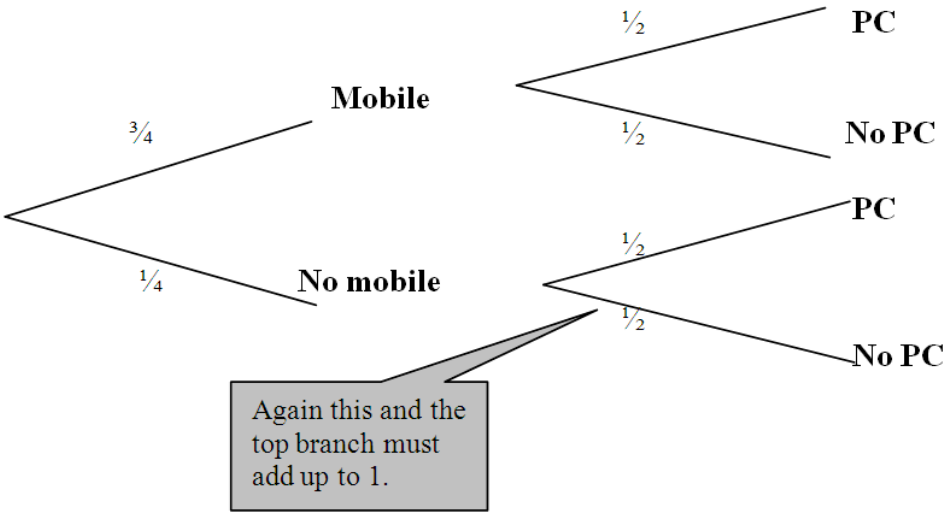
Example
In a class the probability that a student has their own mobile phone is ¾, the probability that the student will have their own PC is ½

Find the probability that a student will have their own mobile and PC
Find the probability that pupil will have only 1 of the items.

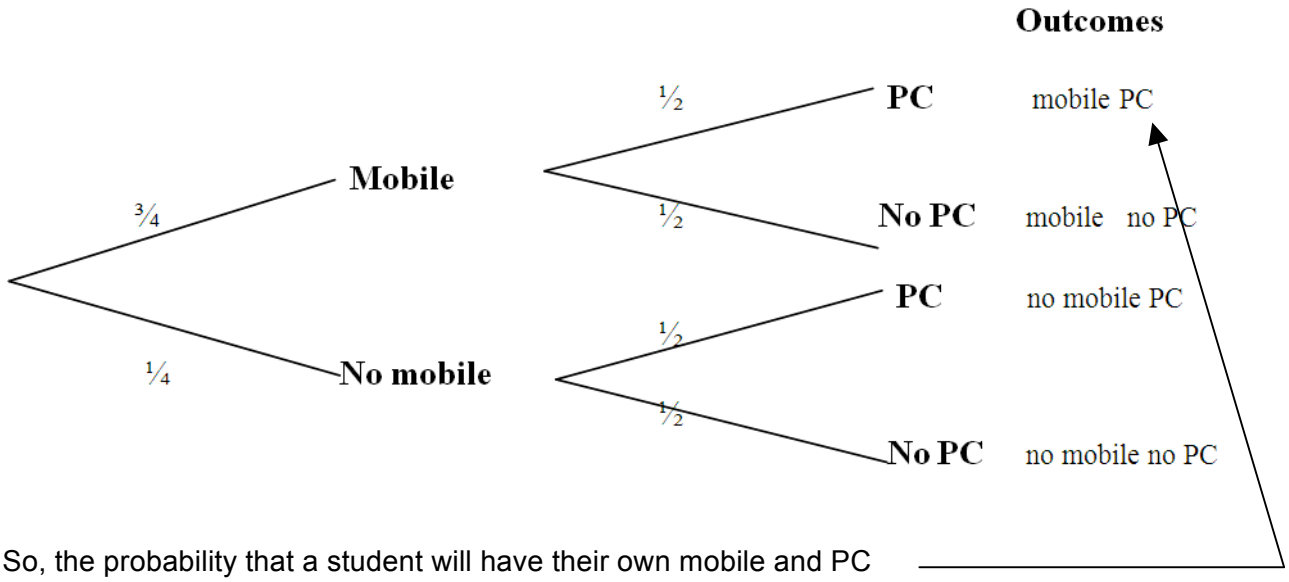
First draw the information on a probability tree diagram.
Draw the first branch which shows the probabilities of having a mobile



Then draw the second branch which shows the probabilities of having a PC



The outcomes can then be shown:



So, the probability that a student will have their own mobile and PC is ¾ × ½ = 3/8 (multiplying along the branches)

The probability that pupil will have only 1 of the items is on two branches:

mobile and no PC OR no mobile and PC.

This then is (¾ × ½) OR (¼ × ½) = 3/8 + 1/8 = 4/8 = ½.

Now try these 5

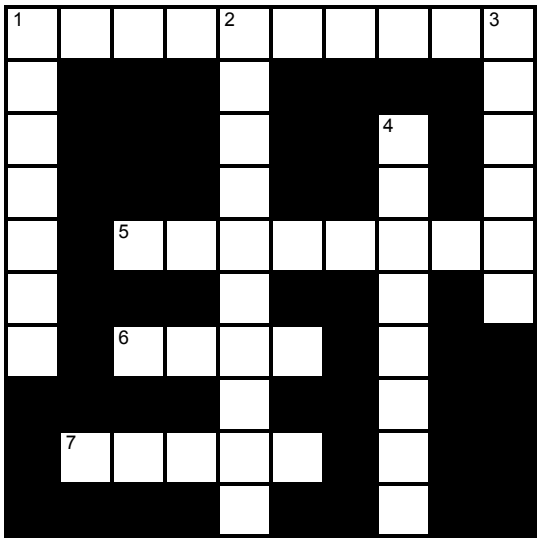
1. In penalty competition the first player has a probability of 0.3 of scoring a goal and a second player has a probability of 0.2 of scoring. What is the probability of scoring
   (a) two goals
   (b) at least one goal
   (c) exactly one goal.

2. A bag contains 5 red and 7 green balls. I draw out two balls one after the other with replacement i,e. the first ball is replaced in the bag before the second is drawn out. What is the probability of drawing out
   (a) a red ball first then a green ball
   (b) two green balls
   (c) a red ball and a green ball.
   (d) Given that I draw out a green ball first, how likely am I to draw out a second green ball?
   (e) Given that I draw out a green ball second, how likely is it my first ball was green?

3. Repeat question 2 above but this time *without replacement*, i.e. the first ball is not placed back in the bag before the second ball is drawn out.

Finished early?

Complete the crossword



Across

1 Data that is measured (10)

5 Data that is counted (8)

6 Unbiased (4)

7 A means of counting in fives (5)

Down

1 A probability of 1 (7)

2 A probability of 0 (10)

3 This is needed to find out people's opinions (6)

4 A frequency diagram that uses angles (3, 5)

True or false?

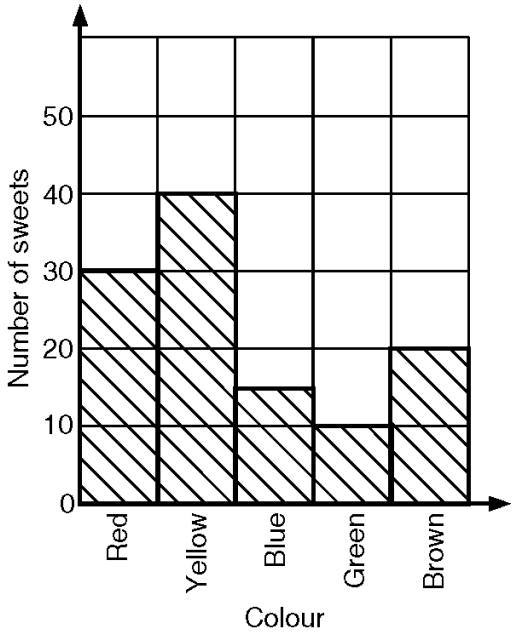
Look at these statements. Discuss them with a partner or in a small group. Which are true, which are false and which ones are you unsure of?

A When you roll a fair six-sided die, it is harder to roll a six than a four. 	**B** Scoring a total of three with two dice is twice as likely as scoring a total of two. 
C In a lottery, the six numbers 3, 12, 26, 37, 44, 45 are more likely to come up than the six numbers 1, 2, 3, 4, 5, 6.	**D** When two coins are tossed there are three possible outcomes: two heads, one head or no heads. The probability of two heads is therefore $\frac{1}{3}$.
E There are three outcomes in a football match: win, lose or draw. The probability of winning is therefore $\frac{1}{3}$. 	**F** In a 'true or false?' quiz with ten questions, you are certain to get five right if you just guess. 
G If you toss a fair coin five times and get five heads in a row, the next time you toss the coin it is more likely to show a tail than a head.	**H** In a group of ten learners, the probability of two learners being born on the same day of the week is 1. 
I If a family has already got four boys, then the next baby is more likely to be a girl than a boy. 	**J** The probability of getting exactly three heads in six coin tosses is $\frac{1}{2}$.

Probability Foundation GCSE Questions

Question 1

A box contains sweets of different colours.
The bar chart shows how many sweets of each colour are in the box.



(a) How many red sweets are in the box?

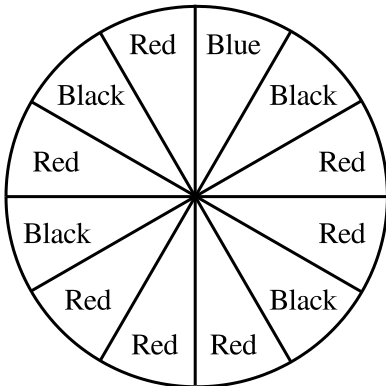
(b) How many blue sweets are in the box?

(c) i) Which colour sweet is most likely to be taken?

ii) Explain you answer to part i).

Question 2

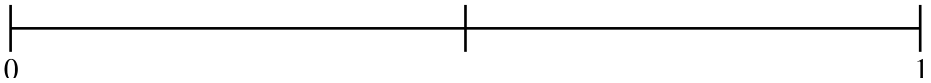
Here is a spinner.
The spinner is spun.



(a) i) Which colour is least likely?

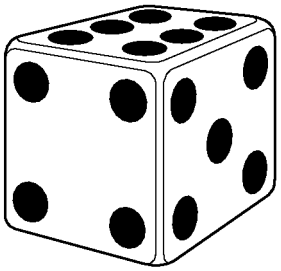
ii) Give a reason for your answer. (2 marks)

(b) On the probability line, mark with an X the probability that the colour will be Red. (1 mark)



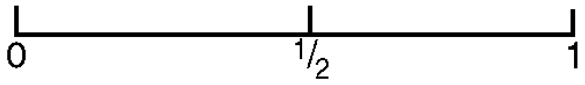
(c) Write down the probability that the colour will be Blue. (1 mark)

Question 3



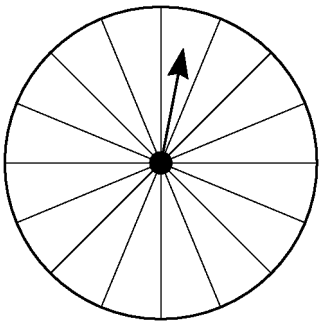
Thelma rolls a normal dice with faces numbered from 1 to 6.

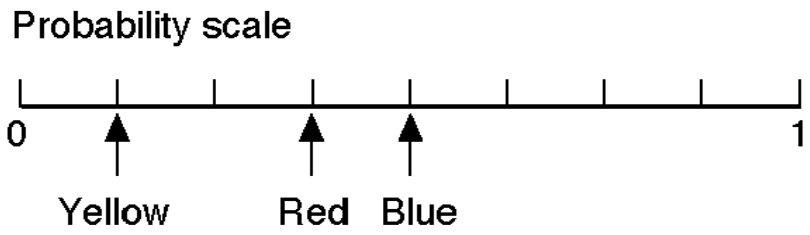
On the probability line below mark with a
i) E the probability of scoring an even number.
ii) T the probability of scoring a ten.
iii) S the probability of scoring a number less than 7.



Question 4

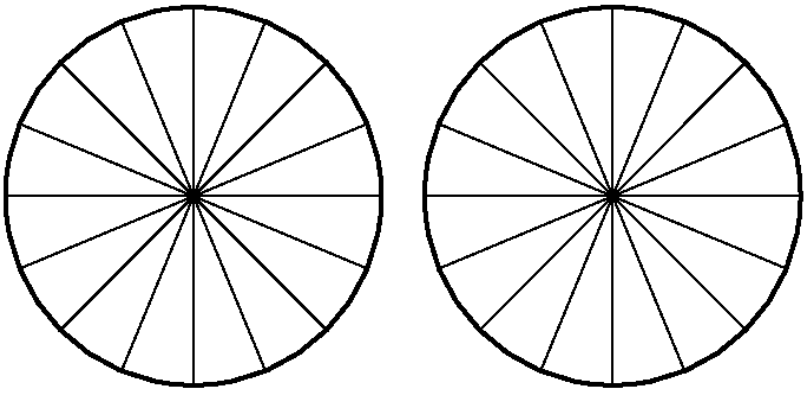
In a game you spin an arrow. The arrow stops on one of sixteen equal sectors of
a circle. Each sector of the circle is coloured. The probability scale shows how
likely it should be for the arrow to stop on any one colour.





Shade these circles to show how many sectors should be

i) coloured red ii) coloured blue



Question 5

Peter and Asif are both taking their driving test for a motor cycle for the first time.
The table below gives the probabilities that they will pass the test at their first attempt.

	Probability of passing at first attempt
Peter	0.6
Asif	0.7

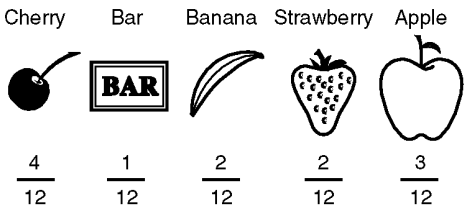
(a) Write down the probability that Asif will pass the test at the first attempt.

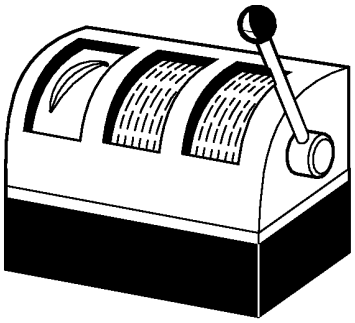
(b) Work out the probability that Peter will fail the test at the first attempt.

(c) Explain clearly why Asif is more likely to pass the test at the first attempt than he is to fail at the first attempt.

Question 6

A game in an amusement arcade can show the following pictures.
The fraction under each picture shows the probability of the picture being shown
at the first window.





Calculate the probability of the game not showing a Bar at the first window.

Question 7

Here are the numbers of people living in the different houses in a short road.

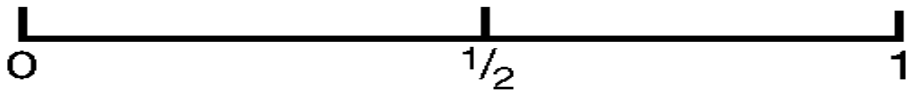
4, 2, 3, 4, 5, 1, 3, 2

(a) Work out the mean number of people per house.

(b) Work out the range of the number of people living in a house.

One of the houses is to be chosen at random.

(c) On the probability line below, mark with a letter X the probability that the house chosen will be the one with 5 people.



Question 8

The table shows the bus fares paid by some pupils to travel to school.

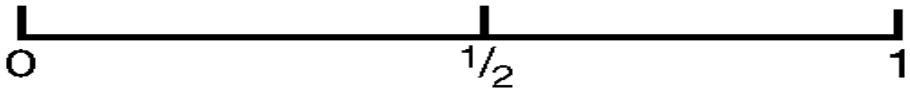
Name	Bus fare to school in pence
Neil	45
Daksha	60
Tarik	35
Sarah	35
Marc	60
Tom	35
Rob	35
Sita	40

(a) Write down the range of these bus fares.

One of these pupils is to be chosen at random.

(b) What is the most likely bus fare of the chosen pupil?

(c) Mark with an X on the number line below the probability that the chosen pupil pays a 40 pence bus fare.



Probability Foundation and Higher GCSE Questions

Question 1

Martin bought a packet of mixed flower seeds.
The seeds produce flowers that are Red or Blue or White or Yellow.
The probability of a flower seed producing a flower of a particular colour is:

Colour	Red	Blue	White	Yellow
Probability	0.6	0.15		0.15

(a) Write down the most common colour of a flower. **(1 mark)**

Martin chooses a flower seed at random from the packet.

(b) **i)** Work out the probability that the flower produced will be White.
ii) Write down the probability that the flower produced will be Orange.

(3 marks)

Question 2

A fair dice is to be thrown.

(a) Write down the probability of the dice landing on
i) a six
ii) an even number

A second dice is to be thrown.
The probability that this dice will land on each of the numbers 1 to 6 is given in the table.

number	1	2	3	4	5	6
probability	*x*	0.2	0.1	0.3	0.1	0.2

The dice is to be thrown once.

(b) Calculate the value of *x*.

(c) Calculate the probability that the dice will land on a number higher than 3.

Question 3

Alison, Brenda, Claire and Donna are the only runners in a race.
The probabilities of Alison, Brenda and Claire winning the race are shown below.

Alison	Brenda	Claire	Donna
0.31	0.28	0.24	

Work out the probability that Donna will win the race.

Question 4

A packet contains only yellow counters and green counters.
There are 8 yellow counters and 5 green counters.
A counter is to be taken from the packet at random.

(a) Write down the probability that
- **i)** a yellow counter will be taken,
- **ii)** a yellow counter will **not** be taken.

A second counter is to be taken from the packet.

(b) Write down all the possible outcomes of taking two counters from the packet.

Question 5

A fair dice is to be thrown.

(a) Write down the probability of the dice landing on
- **i)** a six
- **ii)** an even number

A second dice is to be thrown.
The probability that this dice will land on each of the numbers 1 to 6 is given in the table.

number	1	2	3	4	5	6
probability	x	0.2	0.1	0.3	0.1	0.2

The dice is to be thrown once.

(b) Calculate the value of x.

(c) Calculate the probability that the dice will land on a number higher than 3.

The dice is thrown 1000 times.

(d) Estimate the number of times the dice is likely to land on a six.

Question 6

A dice has six faces numbered 1, 2, 3, 4, 5 and 6.
The dice, which is biased, is thrown 200 times and the number on the upper face is recorded.

The frequencies of the numbers obtained are shown in the table.

Number shown on dice	1	2	3	4	5	6
Frequency	38	22	46	25	53	16

Estimate the probability that the next time the dice is thrown it will show the number 3.

Question 7

A factory makes boxes of cereal.
A box of cereal can be either underweight or the correct weight or overweight.

The probability that a box of cereal selected at random is underweight is 1%.
The probability that a box of cereal selected at random is overweight is 3%.

(a) Work out the probability that a box selected at random will be the correct weight.

…… %

(2 marks)

All the underweight boxes of cereal are removed.
All boxes that are the correct weight or overweight are put in an empty warehouse.
A box of cereal is then selected at random from the warehouse.

(b) Work out the probability that a box of cereal selected at random from the warehouse will be overweight.
Give your answer as a fraction in its simplest form. **(2 marks)**

Question 8

A factory makes boxes of cereal.
A box of cereal can be either underweight or the correct weight or overweight.

The probability that a box of cereal selected at random is underweight is 1%.
The probability that a box of cereal selected at random is overweight is 3%.

(a) Work out the probability that a box selected at random will be the correct weight.

……..%

(2 marks)

All the underweight boxes of cereal are removed.
All boxes that are the correct weight or overweight are put in an empty warehouse.
A box of cereal is then selected at random from the warehouse.

(b) Work out the probability that a box of cereal selected at random from the warehouse will be overweight.
Give your answer as a fraction in its simplest form. **(2 marks)**

Question 9

The probability that a biased dice will land on a six is 0.4
Marie is going to throw the dice 400 times.

Work out an estimate for the number of times the dice will land on a six.

.....

(2 marks)

Question 10

Here is a 4-sided spinner.

The sides are labelled 1, 2, 3, 4.

The spinner is biased.

The probability that the spinner will land on each of the numbers 1 to 3 is given in the table.

Number	1	2	3	4
Probability	0.3	0.4	0.1	

Sabia spins the spinner once.

(a) Work out the probability that the spinner will land on an odd number.

.....

(2 marks)

Ben spins the spinner twice.

(b) Work out the probability that the spinner will land on the number 1 both times.

.....

(2 marks)

Probability Higher Tier GCSE Questions

Question 1
Peter and Asif are both taking their driving test for a motor cycle for the first time.
The table below gives the probabilities that they will pass the test at the first attempt or, if they fail the first time, the probability that they will pass at the next attempt.

	Probability of passing at first attempt	Probability of passing at next attempt if they fail the first attempt
Peter	0.6	0.8
Asif	0.7	0.7

On a particular day 1000 people will take the test for the first time.
For each person the probability that they will pass the test at the first attempt is the same as the probability that Asif will pass the test at the first attempt.

(a) Work out an estimate for how many of these 1000 people are likely to pass the test at the first attempt.

(b) Calculate the probability that both Peter and Asif will pass the test at the first attempt.

(c) Calculate the probability that Peter will pass the test at the first attempt and Asif will fail the test at the first attempt.

(d) Calculate the probability that Asif will pass the test within the first two attempts.

Question 2
Tony carries out a survey about the words in a book.
He chooses a page at random.
He then counts the number of letters in each of the first hundred words on the page.
The table shows Tony's results.

Number of letters in a word	1	2	3	4	5	6	7	8
Frequency	6	9	31	24	16	9	4	1

A word is chosen at random from the hundred words.

(a) What is the probability that the word will have 5 letters? **(2 marks)**

The book has 25 000 words.

(b) Estimate the number of 5 letter words in the book. **(2 marks)**

The book has 125 pages with a total of 25 000 words.
The words on each of the first 75 pages are counted.
The mean is 192.

(c) Calculate the mean number of words per page for the remaining 50 pages.

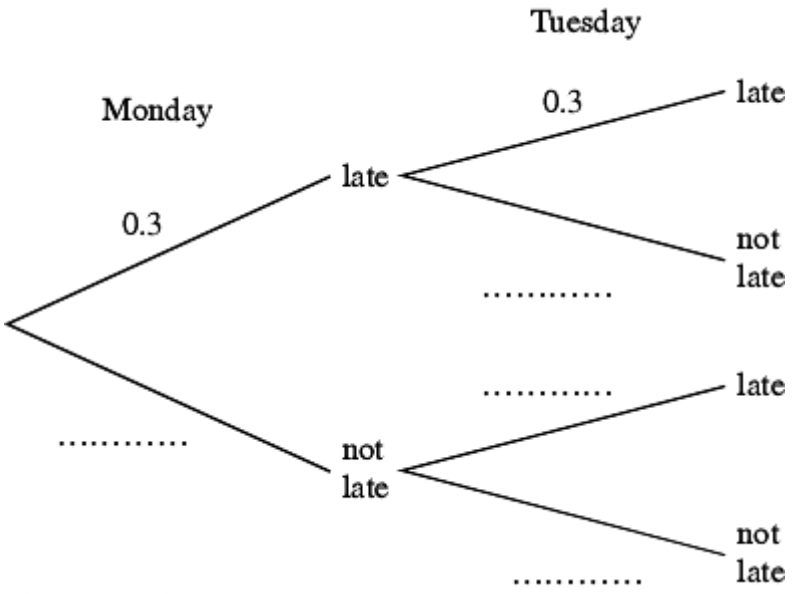
(2 marks)

Question 3

Salika travels to school by train every day.

The probability that her train will be late on any day is 0.3.

(a) Complete the probability tree diagram for Monday and Tuesday.



(2 marks)

(b) Work out the probability that her train will be late on **at least one** of these two days.

.....

(3 marks)

Question 4

Daniel took a sample of 100 pebbles from Tawny Beach.
He weighed each pebble and recorded its weight.
He used the information to draw the cumulative frequency graph shown on the grid.

(a) Use the cumulative frequency graph to find an estimate for

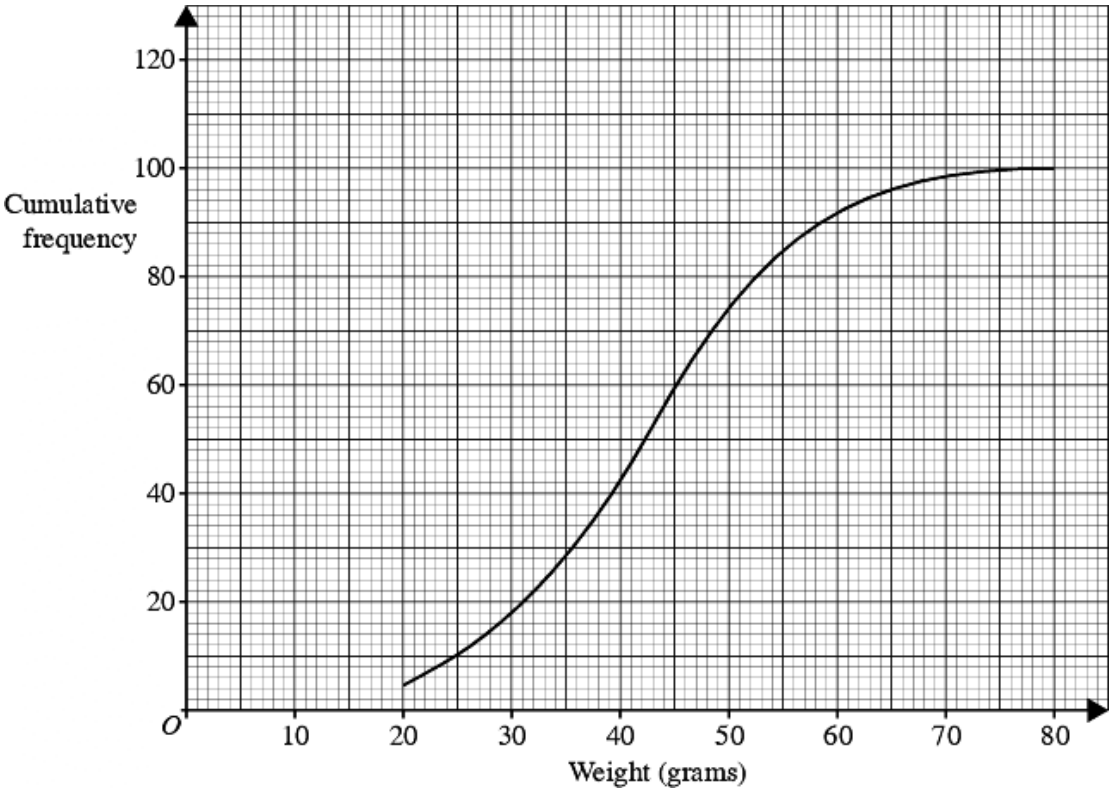
(i) the median weight of these pebbles,

..... grams

(ii) the number of pebbles with a weight more than 60 grams.

.....

(3 marks)



Daniel also took a sample of 100 pebbles from Golden Beach.
The table shows the distribution of the weights of the pebbles in the sample from Golden Beach.

Weight (w grams)	Cumulative frequency
$0 < w \leq 20$	1
$0 < w \leq 30$	15
$0 < w \leq 40$	36
$0 < w \leq 50$	65
$0 < w \leq 60$	84
$0 < w \leq 70$	94
$0 < w \leq 80$	100

(b) On the same grid, draw the cumulative frequency graph for the information shown in the table.

(2 marks)

Daniel takes one pebble, at random, from his sample from Tawny Beach and one pebble, at random, from his sample from Golden Beach.

(c) Work out the probability that the weight of the pebble from Tawny Beach is more than 60 grams **and** the weight of the pebble from Golden Beach is more than 60 grams.

.....

(4 marks)

Question 5

Julie does a statistical experiment. She throws a dice 600 times.
She scores six 200 times.

(a) Is the dice fair? Explain your answer.

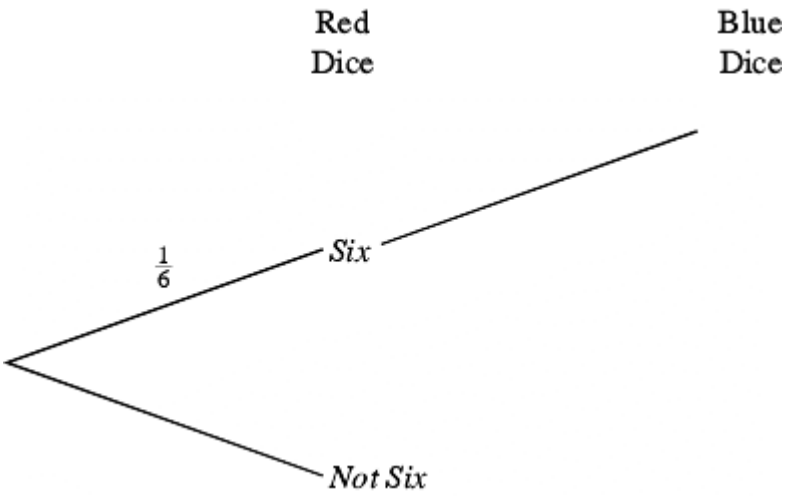
.....

.....

(1 mark)

Julie then throws a fair red dice once and a fair blue dice once.

(b) Complete the probability tree diagram to show the outcomes.
Label clearly the branches of the probability tree diagram.
The probability tree diagram has been started in the space below.



(3 marks)

(c) **(i)** Julie throws a fair red dice once and a fair blue dice once.
Calculate the probability that Julie gets a six on both the red dice and the blue dice.

.....

(ii) Calculate the probability that Julie gets at least one six.

.....

(5 marks)

Question 6

The probability that it will snow in London on Christmas Day in any year is 0.08

(a) Work out the probability that it will snow in London on **both** Christmas Day 2002 **and** Christmas Day 2003.

.....

(2 marks)

(b) Work out the probability that it will snow in London on **either** Christmas Day 2002 **or** Christmas Day 2003, but **not** on both.

.....

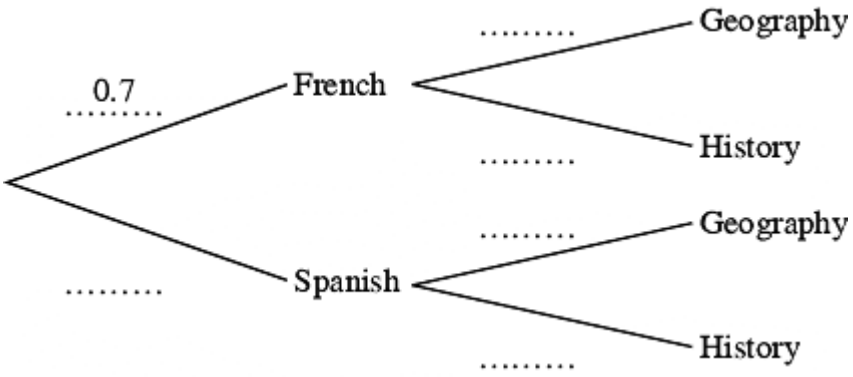
(3 marks)

Question 7

Year 9 students can choose some subjects to take in Year 10.
They must choose **either** French **or** Spanish.
They must also choose **either** Geography **or** History.

In 2002 70% of the students chose French
and 60% of the students chose Geography.

(a) Complete the tree diagram.



(2 marks)

(b) Work out the probability that a student picked at random chose

(i) French and Geography;

.....

(ii) French and Geography **or** Spanish and History.

.....

(5 marks)

In 2003 there will be 200 Year 9 students.

(c) Use the information for 2002 to work out an estimate for the number of Year 9 students who will **not** choose French and Geography in 2003.

.....

(3 marks)

Answers

Foundation questions

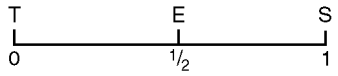
Question 1

(a) 30
(b 15
(c) i) yellow
ii) there are more yellow than any other colour

Question 2

(a) i) blue
ii)less of them
(b) mark at 7 cm
(c) $\frac{1}{12}$

Question 3



Question 4

i) six sectors shaded
ii) 8 sectors shaded

Question 5

(a) 0.7 (F)
(b) 1 - 0.6 = 0.4 (E)
(c) P(pass) + P(fail) = 1
since P(pass) > 0.5 then P(pass) > P(fail) (E)

Question 6

$1-\frac{1}{12}=$

accept $\frac{4}{12}+\frac{2}{12}+\frac{3}{12}+\frac{2}{12}=\frac{11}{12}$

Question 7

(a) $\frac{4+2+3+4+5+1+1+3+2}{8} = 3$
(b) 5 - 1 = 4

Question 8

(a) 60 - 35 (= 25)
(b) 35
(c) Mark X $\frac{1}{8}$ along line from 0

Question 9

(a) i) 10.083
ii) 9
iii) 9
iv) 9.5
(b) i) $\frac{1}{6}$
ii) $\frac{1}{2}$

Foundation and Higher questions

Question 1

(a) Red
(b) i) 1 - (0.6 + 0.15 + 0.15) = 0.1
ii) 0

Question 2

(a) i) $\frac{1}{6}$
ii) $\frac{3}{6}$ (E)
(b) 1 - (0.2 + 0.1 + 0.3 + 0.1 + 0.2) = 0.1 (E)
(c) 0.3 + 0.1 + 0.2 = 0.6 (D)

Question 3

1 - (0.31 + 0.28 + 0.24) = 0.17

Question 4

(a) i) $\frac{8}{13}$ or 0.62...
ii) $1-\frac{\text{"8"}}{13}=\frac{5}{13}$ (or 0.38..)
(b) (y, y) (y, g) (g, y) (g, g)

Question 5

(a) i) $\frac{1}{6}$
ii) $\frac{3}{6}$ (E)
(b) 1 - (0.2 + 0.1 + 0.3 + 0.1 + 0.2) = 0.1 (E)
(c) 0.3 + 0.1 + 0.2 = 0.6 (D)

Question 6

$\frac{46}{200}$ or $\frac{23}{100}$ or 0.23 or 23%

Question 7

(a) 96%

(b) $\frac{1}{33}$

Question 8

(a) 96%

(b) $\frac{1}{33}$

Question 9

160

Question 10

(a) 0.4
(b) 0.09

Higher questions

Question 1

(a) 1000 × 0.7 = 700 (C)
(b) 0.6 × 0.7 = 0.42 (B)
(c) 0.6 ×0.3 = 0.18 (B)
(d) P(pass) + P(fail) × P(pass)
0.7 + 0.3 × 0.7 = 0.91 (A*)

Question 2

(a) (a fraction less than 1, with denominator 100); 16/100 (oe)
(b) "16/100" × 25 000; = 4000
(c) 75 × 192 {= 14 400}
[25 000 - 75 × 192] ÷ 50; = 212

Question 3

(a) 0.7,
0.7, 0.3, 0.7

(b) 0.51 oe

Question 4

(a) 42g
8

(b) cf

(c) 0.0128

Question 5

(a) No, as you would expect about 100. Yes, as it is possible to get 200 sixes with a fair dice

(b) $\frac{1}{6}, \frac{5}{6}$ $\frac{1}{6}, \frac{5}{6}, \frac{1}{6}, \frac{5}{6}$

(c) (i) $\frac{1}{36}$

(ii) $\frac{11}{36}$

Question 6

(a) 0.0064

(b) 0.1472

Question 7

(a) LHS 0.3 RHS 0.6, 0.4, 0.6, 0.4

(b) (i) 0.42 oe
(ii) 0.54 oe

(c) 116