Question 1

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

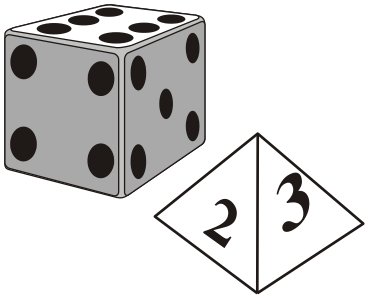
A word is chosen at random from the hundred words.
(a) What is the probability that the word will have 5 letters? **(2 marks)**

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 2

Jack has two fair dice.
One of the dice has 6 faces numbered from 1 to 6.
The other dice has 4 faces numbered from 1 to 4.



Jack is going to throw the two dice.
He will add the scores on the two dice to get the total.

Work out the probability that he will get

(i) a total of 7,
(ii) a total of less than 5. **(4 marks)**

Question 3

Tina has a biased dice.
When she rolls it, the probability that she will get a six is 0.09.
Tina is going to roll the biased dice **twice**.

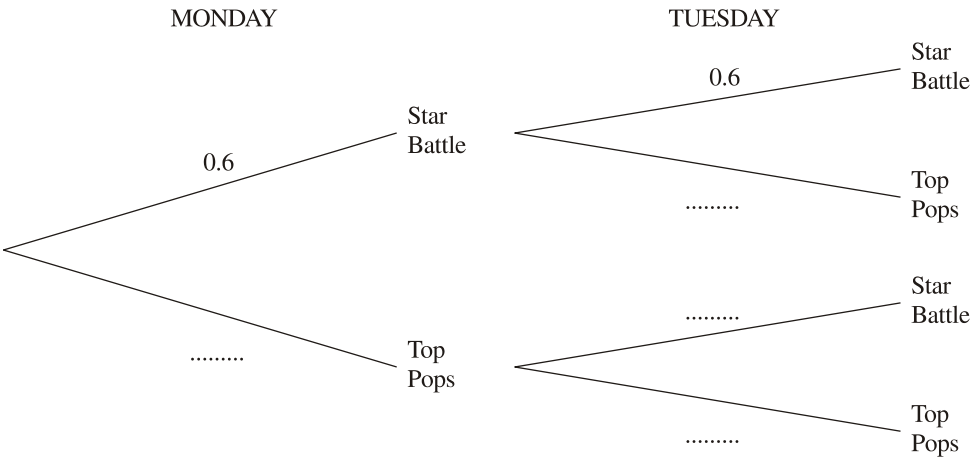
Work out the probability that she will get

(i) **two** sixes,
(ii) **exactly one** six. **(5 marks)**

Question 4

Jason has 10 cups.
6 of the cups are Star Battle cups.
4 of the cups are Top Pops cups.
On Monday Jason picks at random one cup from the 10 cups.
On Tuesday he also picks at random one cup from the same 10 cups.

(a) Complete the probability tree diagram.



(2 marks)

(b) Work out the probability that Jason will pick a Star Battle cup on both Monday and Tuesday. **(2 marks)**

(c) Work out the probability that Jason will pick one of each type of cup. **(3 marks)**

Question 5

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.

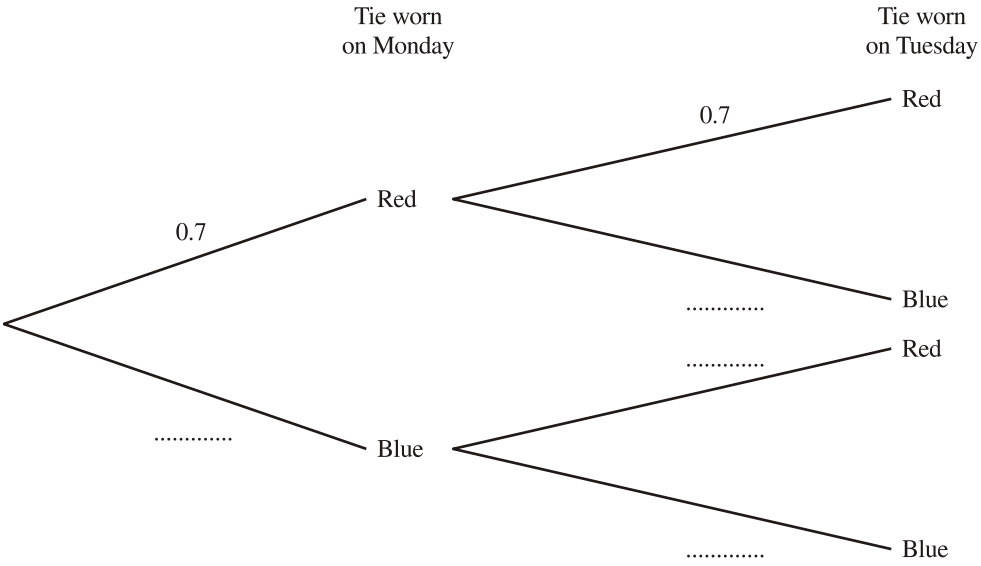
(b) Work out the probability that a box of cereal selected at random from the warehouse will be overweight.
Give your answer as a fraction in its simplest form. **(2 marks)**

Question 6

Every day, Kevin wears either a red tie or a blue tie, chosen at random.

On any day, the probability that he will wear a red tie is 0.7

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



(2 marks)

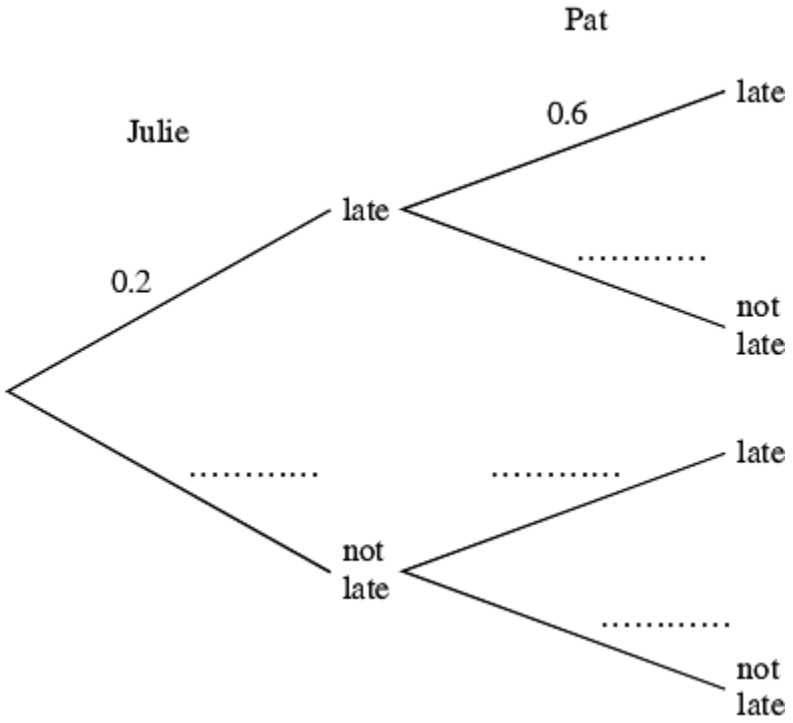
(b) Find the probability that the colours of the ties that Kevin will wear on Monday and Tuesday are different. **(3 marks)**

Question 7

Julie and Pat are going to the cinema.

The probability that Julie will arrive late is 0.2
The probability that Pat will arrive late is 0.6
The two events are independent.

(a) Complete the diagram.



(2 marks)

(b) Work out the probability that Julie and Pat will both arrive late.

.....

(2 marks)

Question 8

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.

.....

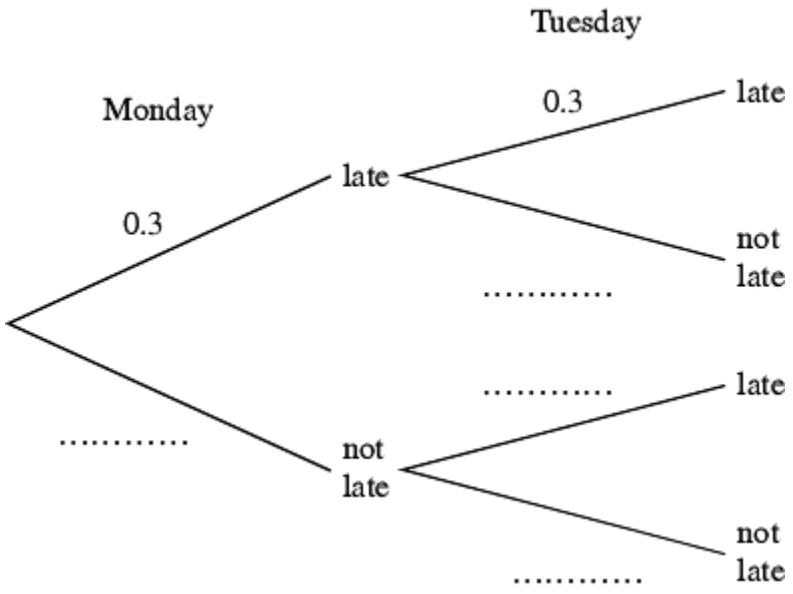
(2 marks)

Question 9

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 10

A bag contains 3 black beads, 5 red beads and 2 green beads.
Gianna takes a bead at random from the bag, records its colour and replaces it.
She does this two more times.

Work out the probability that, of the three beads Gianna takes, exactly two are the same colour.

.....

(5 marks)

Question 11

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

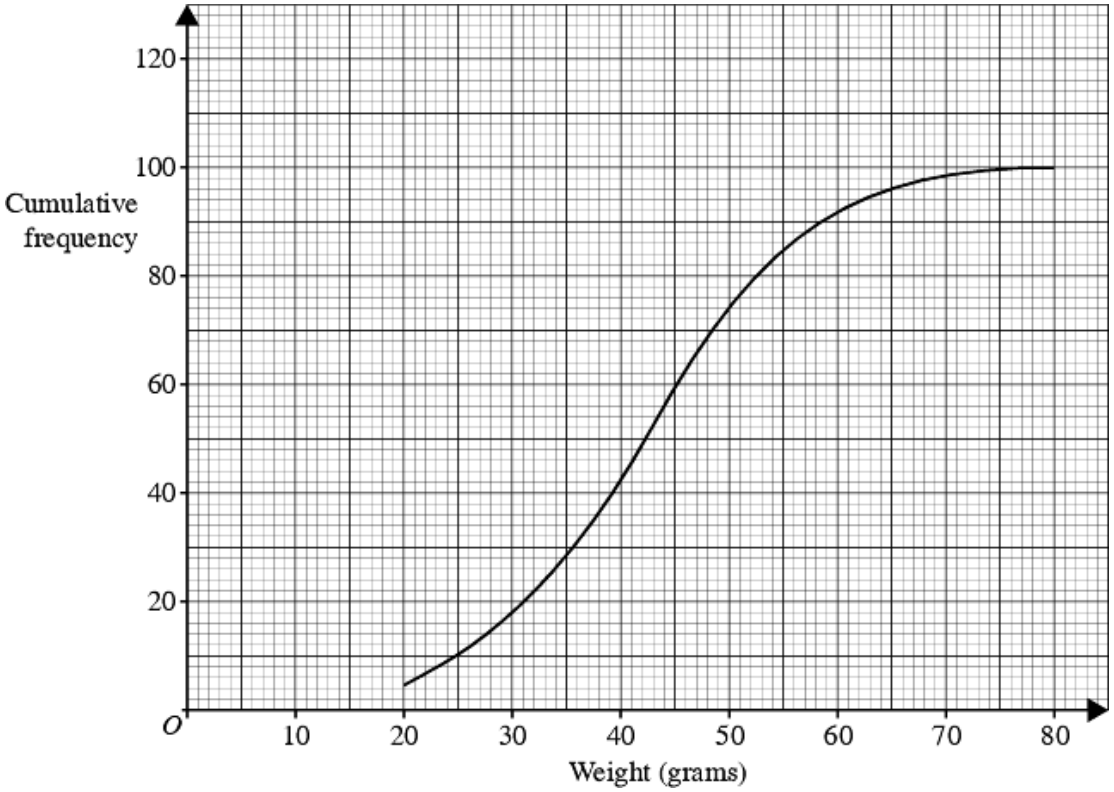
(i) the median weight of these pebbles,

..... 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 12

A bag contains 3 black beads, 5 red beads and 2 green beads.
Gianna takes a bead at random from the bag, records its colour and replaces it.
She does this two more times.

Work out the probability that, of the three beads Gianna takes, exactly two are the same colour.

.....

(5 marks)

Question 13

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

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

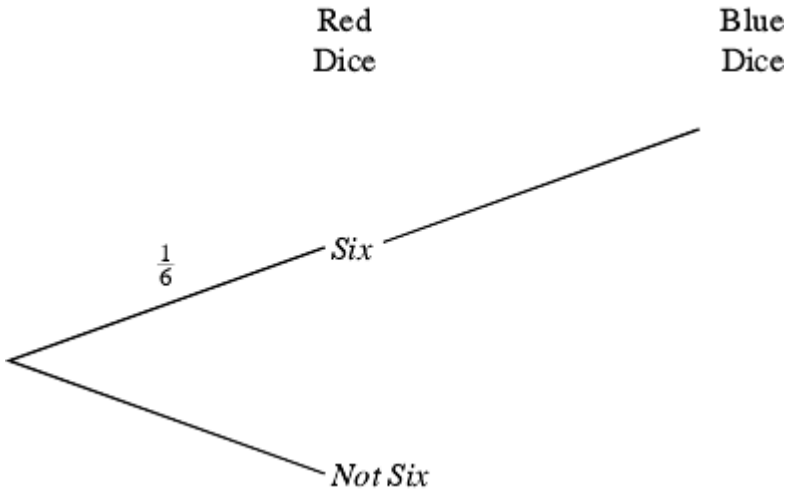
.....

.....

(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 14

The probability that Betty will be late for school tomorrow is 0.05
The probability that Colin will be late for school tomorrow is 0.06

The probability that both Betty and Colin will be late for school tomorrow is 0.011

Fred says that the events 'Betty will be late tomorrow' and 'Colin will be late tomorrow' are independent.

Justify whether Fred is correct or not.

.....

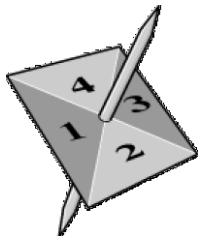
.....

.....

(2 marks)

Question 15

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)

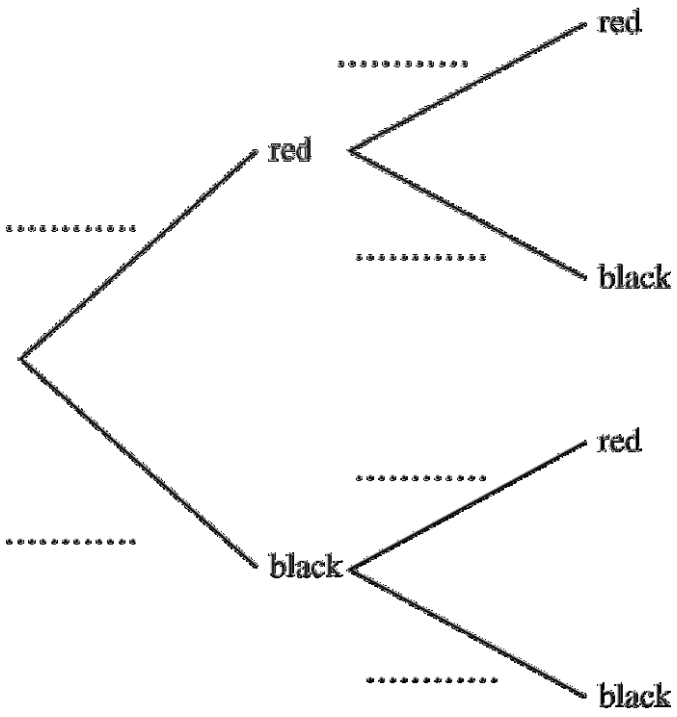
Question 16

A bag contains 10 coloured discs.

4 of the discs are red and 6 of the discs are black.

Asif is going to take two discs at random from the bag, **without** replacement.

(a) Complete the tree diagram. **(2 marks)**



(b) Work out the probability that Asif will take two black discs.

.....

(2 marks)

(c) Work out the probability that Asif takes two discs of the same colour.

.....

(3 marks)

Question 17

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 18

There are n beads in a bag.
6 of the beads are black and all the rest are white.
Heather picks one bead at random from the bag and does not replace it.
She picks a second bead at random from the bag.
The probability that she will pick 2 white beads is $\frac{1}{2}$

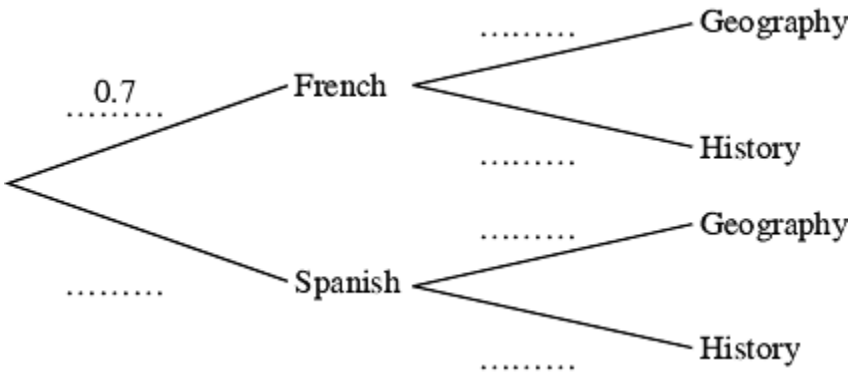
Show that $n^2 - 25n + 84 = 0$ **(6 marks)**

Question 19

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)

Question 20

A box contains 6 beads.
4 are black and 2 are white.

Azida and Paul play a game in which they have to pick two beads of the same colour to win.
Azida will pick two beads at random, without replacement from the box.
If the beads are **not** the same colour then it is Paul's turn.

Azida will keep her two beads.

Paul will pick two more beads at random, without replacement from the box.
The game is a draw if these two beads are **not** the same colour as each other.

Show that the probability that the game will be a draw is $\frac{4}{15}$ **(4 marks)**