Name: _____

GCSE Statistics

Probability (Foundation Only)

Total marks available: 78

Total marks achieved: _____

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.
• Scientific calculators may be used.
• You must show all your working out with your answer clearly identified at the end of your solution.

Information
• The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.

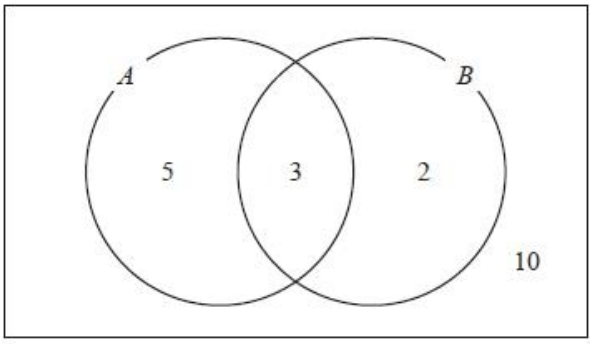
Advice
• Read each question carefully before you start to answer it.
• Try to answer every question.
• Check your answers if you have time at the end.

Q1.

The Venn diagram shows information about 20 films shown in the UK in 2015

A is the event that the film was produced in the UK.
B is the event that the film made more than £40 million.

The numbers in the Venn diagram indicate the number of films.



(Source: *BFI Statistical Yearbook*)

(a) Explain fully what the number 3 represents in the Venn diagram.

.....

.....

(1)

One of the films is chosen at random.

(b) Find P(*B*)

.....

(1)

(c) Find P(*B* | *A*)

.....

(2)

(d) Using your answers to part (b) and part (c), explain whether or not *A* and *B* are independent events.

.....

.....

(2)

(Total for question = 6 marks)

Q2.

The 20 employees in the office work in one of two teams.

Team A	8 employees
Team B	12 employees

One employee from Team A is selected at random and one employee from Team B is selected at random.

Nabir is in Team A and Jenny is in Team B.

(i) Write down the probability that Nabir is selected.

.....

(1)

(ii) Write down the probability that Jenny is selected.

.....

(1)

(iii) Who is more likely to be selected, Nabir or Jenny?
Give a reason for your answer.

.....

.....

(1)

(Total for question = 3 marks)

Q3.

Here is a list of words used to describe the likelihood of an event happening.

impossible **unlikely** **evens** **likely** **certain**

(a) Choose the word from the list that best describes the likelihood of getting five Heads when a fair coin is flipped five times.

.....

(1)

A 10-sided spinner has sides that are coloured Red or Blue or Yellow only.

Rashmi spins the spinner 20 times.

She uses tallies in the following table to show her first 18 results.

Colour	Tally	Frequency
Red	𝍸	
Blue	𝍸 |||	
Yellow	𝍸 ||	

Rashmi's last two results are Blue and then Yellow.

(b) Complete the tallies and the frequency column in the table.

(2)

Rashmi is going to spin the spinner one more time.

(c) Use the results in the table to find an estimate for the probability that Rashmi gets Red.

.....

(1)

The spinner actually has 1 Red side, 6 Blue sides and 3 Yellow sides.

Rashmi is investigating whether the spinner is equally likely to land on each side.

The spinner is spun 20 times.

(d) Complete the table.

Colour	Probability (if spinner is equally likely to land on each side)	Expected frequency
Red	0.1	
Blue	0.6	
Yellow	0.3	

(2)

(e) (i) Use the results from the two tables to discuss whether or not Rashmi's investigation shows that the spinner is equally likely to land on each side.

.....

.....

.....

.....

(2)

(ii) Suggest how Rashmi could improve the reliability of her investigation.

.....

.....

(1)

(Total for question = 9 marks)

Q4.

The table shows the likelihood of each of five outcomes of an experiment.

Outcome	Likelihood
A	impossible
B	likely
C	certain
D	evens
E	very unlikely

(a) Write down the outcome with the greatest probability.

.....

(1)

Two outcomes are less likely to occur than outcome D.

(b) Write down these two outcomes.

..... and .....

(1)

(c) Write down the probability that outcome D will occur.

.....

(1)

(d) Write down the probability that outcome A will occur.

.....

(1)

(e) Write down the probability that outcome A will **not** occur.

.....

(1)

(Total for question = 5 marks)

Q5.

Katy is carrying out quality checks on bags of lollies produced in a factory.

Katy took a random sample of 18 bags and counted the number of lollies in each bag.

Here are her results.

15	14	12	11	13	12	13	12	14
13	12	14	15	12	12	13	12	15

(a) Fill in the tally chart for this information **and** complete the frequency column.

Number of lollies in bag	Tally	Frequency
11		
12		
13		
14		
15		

(2)

Katy thinks that 10 of the bags in her sample contain more lollies than the mode of the sample.

(b) Is Katy correct?

Give a reason for your answer.

.....

.....

.....

(2)

One of these 18 bags is chosen at random.

(c) Find the probability that this bag contains more than 11 lollies.

.....

(1)

(Total for question = 5 marks)

Q6.

In a factory there are two machines, Machine A and Machine B, that produce parts.

The table shows the number of faulty parts and the number of non-faulty parts that are produced by each machine one morning.

	Faulty	Non-faulty	Total
Machine A	1	19	20
Machine B	2	48	50

(a) Find the relative risk of getting a faulty part from Machine A compared with getting a faulty part from Machine B.

.....

(3)

Carla says,

"The relative risk shows that the risk of Machine A producing a faulty part is greater than the risk of Machine B producing a faulty part".

(b) Using your answer to part (a), explain whether or not Carla's conclusion is correct.

.....

.....

(1)

(Total for question = 4 marks)

Q7.

The table gives information about the numbers of students from different types of schools who applied to Cambridge University in 2016

Type of school	Applications in 2016		
	Gender		Total
	Male	Female	
Maintained	3674	2899	6573
Independent	1510	1268	2778
Other and Overseas	300	312	612
Total	5484	4479	9963

(Source: *www.cam.ac.uk*)

A student is to be chosen at random from the 9963 students.

F is the event that the student chosen is female.

I is the event that the student chosen is from an independent school.

M is the event that the student chosen is from a maintained school.

(d) Explain why the event *F* and the event *I* are **not** mutually exclusive.

.....

.....

(1)

(e) Find P(*I* or *M*).

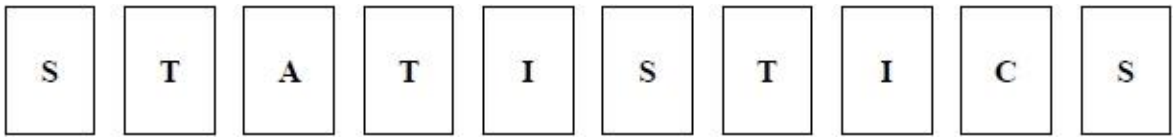
.....

(2)

(Total for question = 3 marks)

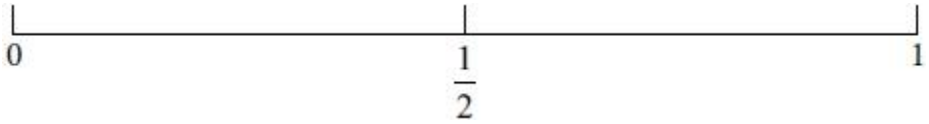
Q8.

Ramon uses 10 letter cards to spell the word **STATISTICS**.



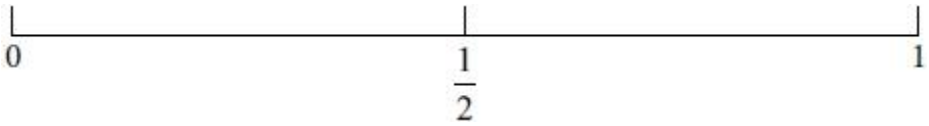
Ramon takes one of these cards at random.

(a) On the probability scale, mark with a cross (×) the probability that the letter on the card is **S**.



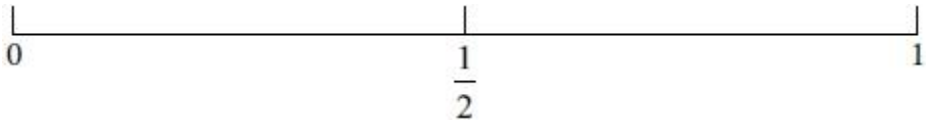
(1)

(b) On the probability scale, mark with a cross (×) the probability that the letter on the card is **Z**.



(1)

(c) On the probability scale, mark with a cross (×) the probability that the letter on the card is **not C**.



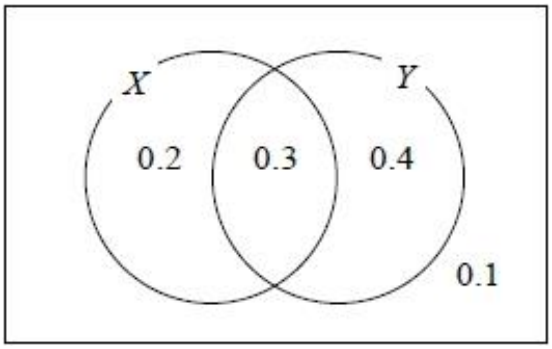
(1)

(Total for question = 3 marks)

Q9.

X and *Y* are two events.

The Venn diagram shows information about the probabilities of events related to *X* and *Y* happening.



(a) Find

(i) the probability of event *Y* happening

.....

(1)

(ii) P(*X* and *Y*)

.....

(1)

(iii) P(*Y* | *X*)

.....

(2)

Two different events *A* and *B* are independent

P(*A*) = 0.8 and P(*B*) = 0.5

(b) Find P(*A* and *B*)

.....

(2)

(Total for question = 6 marks)

Q10.

A bag contains 8 coloured beads.

There are

4 blue beads,
2 red beads,
1 green bead,
1 yellow bead.

A bead is picked at random from the bag.

(a) Underline the word from the list below that best describes the likelihood that the bead is green.

impossible certain evens unlikely likely

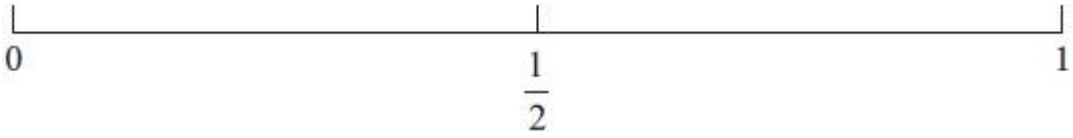
(1)

(b) Beads of which two colours are equally likely to be picked?

..... and .....

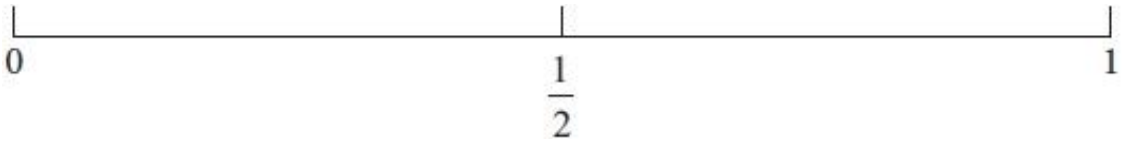
(1)

(c) On the probability scale below, mark with a cross (X) the probability that the bead is blue.



(1)

(d) On the probability scale below, mark with a cross (X) the probability that the bead is black.



(1)

(Total for question = 4 marks)

Q11.

A supermarket manager recorded the total number of each type of bank note in the tills when the supermarket closed one Saturday. Here are his results.

Bank note	£5	£10	£20	£50	Total
Number in tills	75	111	96	18	300

One of the bank notes is selected at random.

(a) Find the probability that the value of the bank note is less than £20

.....

(2)

The manager uses his data to predict the proportion of each type of bank note in use in the UK.

Bank note	£5	£10	£20	£50
Predicted proportion	25%	37%	32%	6%

(b) Explain how the manager could improve his predictions.

.....

.....

(1)

The table below shows the true proportion of each type of bank note in use in the UK in 2017

Bank note	£5	£10	£20	£50
True proportion	10%	22%	59%	9%

(Source: *Bank of England*)

(c) For £5 bank notes, compare the true proportion in use in the UK in 2017 with the manager's predicted proportion.
You must suggest a possible reason for any difference.

.....

.....

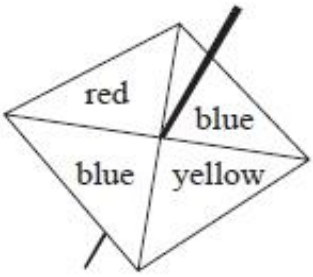
.....

(2)

(Total for question = 5 marks)

Q12.

Here is a fair 4-sided spinner.



The spinner is spun once.

(a) Underline the word from the list below that best describes the likelihood that the spinner will land on green.

impossible certain evens unlikely likely

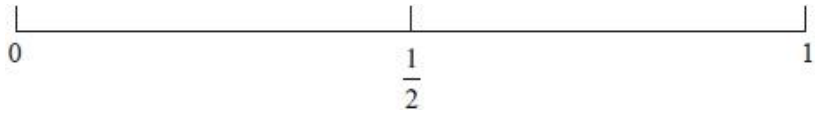
(1)

(b) Underline the word from the list below that best describes the likelihood that the spinner will land on red or yellow.

impossible certain evens unlikely likely

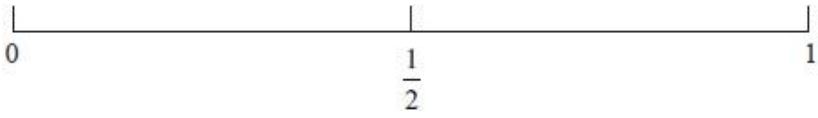
(1)

(c) On the probability scale below, mark with a cross (×) the probability that the spinner will land on yellow.



(1)

(d) On the probability scale below, mark with a cross (×) the probability that the spinner will land on red or blue.



(1)

(Total for question = 4 marks)

Q13. Claire buys packs of sports cards.

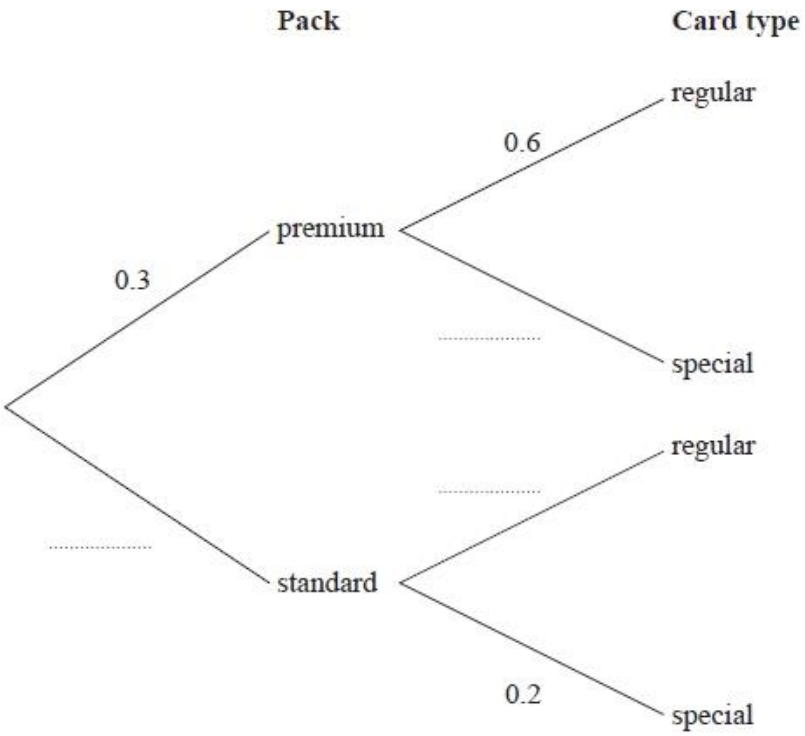
The cards can be bought in premium packs and in standard packs.

Of the packs that Claire buys, 30% are premium packs and 70% are standard packs.

In each premium pack there are 6 regular cards and 4 special cards.

In each standard pack there are 4 regular cards and 1 special card.

(a) Complete the probability tree diagram for this information.



(1)

Claire picks at random one of the packs she has bought, opens the pack and takes at random one card from the pack.

(b) Work out the probability that the card is a regular card.

.....

(3)

Given that the card is a regular card,

(c) work out the probability that it came from a premium pack.

.....

(2)

(Total for question = 6 marks)

Q14.

A driving school has 40 cars.

The cars are either petrol cars or diesel cars.
The cars have either a manual gearbox or an automatic gearbox.

16 of the cars have an automatic gearbox.
10 of the petrol cars have an automatic gearbox.
There are 30 petrol cars.

One of the petrol cars is to be picked at random.
One of the diesel cars is to be picked at random.

Derek says,

> " The probability that the petrol car has a manual gearbox is greater than the probability that the diesel car has a manual gearbox".

Is he correct?
You must show working and justify your answer.

(Total for question = 5 marks)

Q15.

Katrina travels to work by train or by bus or by car.

The table gives some information about her 200 journeys to work last year.

Travel by	Number of journeys	Number of times late for work
Train	120	27
Bus	30	x
Car	50	15

One of the days that Katrina travelled to work last year is picked at random.

(a) Find the probability that she travelled by train and was late for work on that day.

.....

(1)

The absolute risk of Katrina arriving late for work last year when travelling by bus was 0.6

(b) Show why the value of x in the table is 18

(1)

(c) (i) Show that the relative risk of Katrina being late for work last year when she travelled by car compared with when she travelled by bus is 0.5

(2)

(ii) Interpret this relative risk.

.....

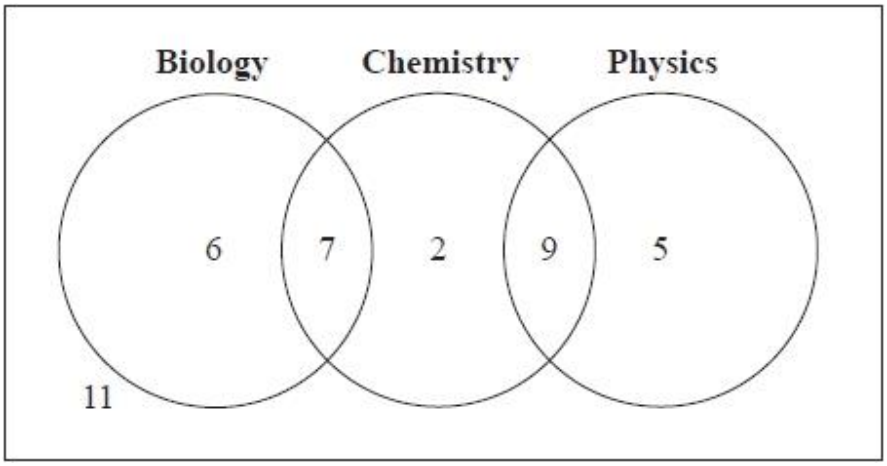
.....

(1)

(Total for question = 5 marks)

Q16.

There are 40 students in Year 12 at a sixth form college. The Venn diagram gives information about the numbers of students studying Biology, Chemistry and Physics.



One of the 40 students is selected at random.

(a) Write down the probability that this student

(i) studies Biology,

.....

(1)

(ii) studies Chemistry and Biology.

.....

(1)

X is the event that the student selected studies Chemistry.
Y is the event that the student selected studies Physics.

(b) Find

(i) P(*X*)

.....

(1)

(ii) P(*X* and *Y*)

.....

(1)

(iii) $\mathrm{P}(Y \mid X)$

.....

(1)

(Total for question = 5 marks)