

Probability

Exam questions

Foundation and Higher tiers

Please write clearly in block capitals.

Name

Class **Teacher**

Time allowed: 110 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 12): you must not use a calculator.
- **Section B** (questions 13 to 28): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 97.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

Q	Mark	Q	Mark
1		15	
2		16	
3		17	
4		18	
5		19	
6		20	
7		21	
8		22	
9		23	
10		24	
11		25	
12		26	
13		27	
14		28	
TOTAL			

Section A



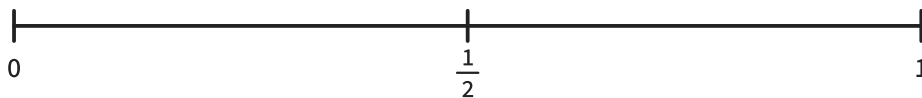
You must not use a calculator

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write
outside
the box

- 1** Here are four events.

A	A fair six-sided dice lands on a number greater than 3
B	A fair six-sided dice lands on a number less than 7
C	A number chosen at random from 1, 2, 3, 4 and 5 is greater than 1
D	A fair six-sided dice lands on 8

Draw an arrow on the probability scale to show the probability of each event.
Label each arrow with its letter.

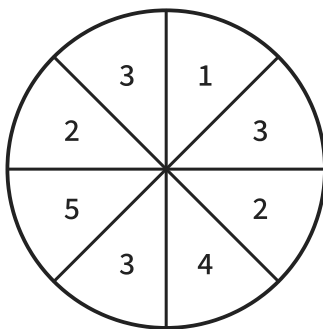


[2 marks]

2

Here is a fair spinner.
It has 8 equal sections.

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- (a) Write down the probability that the spinner lands on 3

Answer _____

[1 mark]

- (b) Work out the probability that the spinner lands on an odd number.

Answer _____

[1 mark]

- (c) Jo says,
“The spinner is twice as likely to land on 2 as it is to land on 4”
Is Jo correct?
Give a reason for your answer.

[1 mark]

3

A juice bar makes smoothies.
Each smoothie has one fruit and one base.
The fruit is mango, kiwi or banana.
The base is milk or yoghurt.

- (a) List all the different smoothies the juice bar can make.

[2 marks]

- (b) Leon chooses a fruit at random and a base at random.
Work out the probability that his smoothie does **not** contain kiwi.

Answer _____

[1 mark]

4

Spinner A has four equal sections numbered 1, 2, 3 and 4
Spinner B has three equal sections numbered 1, 3 and 5
Both spinners are spun and the two numbers are multiplied to give a score.

- (a) Complete the table of scores.

		Spinner A				
		×	1	2	3	4
Spinner B	1	1	2			
	3	3				12
	5				15	

[2 marks]

- (b) Work out the probability that the score is greater than 8

Answer _____

[1 mark]

- 5** 120 students each chose one trip: the museum, the theatre or the zoo.

(a) Complete the two-way table.

	Museum	Theatre	Zoo	Total
Year 10	18		12	55
Year 11		14		
Total	40		41	120

[2 marks]

- (b) One of the students is chosen at random.
Write down the probability that the student is in Year 11 and chose the zoo.

Answer _____

[1 mark]

- 6** A packet contains 200 seeds.
The seeds are sunflower, poppy, cornflower or daisy.
A seed is taken from the packet at random.
The table shows some of the probabilities.

Seed	sunflower	poppy	cornflower	daisy
Probability	0.35		0.15	

46 of the seeds in the packet are daisy seeds.

- (a) Complete the table.

[3 marks]

- (b) How many sunflower seeds are in the packet?

Answer _____

[1 mark]

- 7** Ava, Ben, Cal and Dee are in a quiz team.
Two of them are chosen at random to answer the final question.

(a) List all the possible pairs that could be chosen.

[2 marks]

(b) Work out the probability that Ava is chosen.

Answer _____

[1 mark]

- 8** At a school fair, it costs 60p to spin a wheel.
The wheel has 10 equal sections.
1 section wins £3
2 sections win £1
The other sections win nothing.
- The wheel is spun 120 times.
- Work out how much profit the school can expect to make.

Answer £ _____

[4 marks]

9

Ben and Asha each spin the same spinner and record how many times it lands on red.

	Number of spins	Number of reds
Ben	20	8
Asha	300	69

- (a) Whose results give the better estimate of the probability that the spinner lands on red?

Give a reason for your answer.

[1 mark]

- (b) Use all the results to work out the best estimate of the probability that the spinner lands on red.

Answer _____

[2 marks]

- (c) The spinner has 4 equal sections and one of them is red.

Do the results suggest that the spinner is biased?

Give a reason for your answer.

[1 mark]

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- 10** A box contains only red, blue and green pencils.
A pencil is taken from the box at random.

Colour	red	blue	green
Probability	$2x$	$x + 0.1$	0.3

- (a) Work out the value of x .

Answer _____

[2 marks]

- (b) There are 60 pencils in the box.
How many blue pencils are there?

Answer _____

[2 marks]

- 11** A fair six-sided dice is rolled once.
Jay works out the probability that it lands on an even number **or** a number greater than 4
Here is his working.

$$P(\text{even}) = \frac{3}{6} = \frac{1}{2} \quad P(\text{greater than 4}) = \frac{2}{6} = \frac{1}{3}$$

$$P(\text{even or greater than 4}) = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$$

- (a) Explain the mistake Jay has made.

[1 mark]

- (b) Work out the correct probability.

Answer _____

[1 mark]

12

A jar contains only black buttons and white buttons.

The ratio of black buttons to white buttons is 3 : 7

Mira takes 15 white buttons out of the jar.

A button is now taken from the jar at random.

The probability that it is black is $\frac{2}{5}$

How many buttons were in the jar before Mira took any out?

Answer _____

[3 marks]

Section B



You may use a calculator

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- 13** A vet sees cats, dogs, rabbits and other animals.

The table shows the probability that the next animal the vet sees is each type.

Animal	cat	dog	rabbit	other
Probability	0.38	0.415		0.07

- (a) Work out the probability that the next animal is a rabbit.

Answer _____

[2 marks]

- (b) Work out the probability that the next animal is **not** a dog.

Answer _____

[1 mark]

14

Each box of a breakfast cereal contains one toy.

The toy is a dinosaur, a robot, a car or a boat.

The table shows the probability that a box chosen at random contains each toy.

Toy	dinosaur	robot	car	boat
Probability	0.235	0.17	0.348	

(a) Work out the probability that a box contains a boat.

Answer _____

[2 marks]

(b) Which toy is a box most likely to contain?

Answer _____

[1 mark]

(c) Work out the probability that a box contains a dinosaur or a robot.

Answer _____

[1 mark]

- 15** A garden centre has 248 plant pots for sale.
97 of the pots are terracotta, 64 are plastic and the rest are ceramic.
One of the pots is chosen at random.

(a) Work out the probability that the pot is ceramic.

Answer _____
[1 mark]

(b) Work out the probability that the pot is terracotta.
Give your answer as a percentage correct to 1 decimal place.

Answer _____ %
[2 marks]

- 16** A ferry company says that the probability a crossing is cancelled is 0.035
The company plans 412 crossings in March.
Work out an estimate for the number of crossings in March that will **not** be cancelled.

Answer _____
[3 marks]

- 17** In training, Ellie faced 160 penalty kicks.
She saved 37 of them.

(a) Work out the relative frequency of Ellie saving a penalty kick.

Answer _____

[1 mark]

- (b) Ellie will face 90 penalty kicks next month.
Use your answer to (a) to estimate the number of these penalty kicks she will save.

Answer _____

[2 marks]

- 18** 616 commuters were asked how they usually travel to work.
Each commuter chose one of car, train or bike.

(a) Complete the two-way table.

	Car	Train	Bike	Total
Under 30	84	118		
30 and over			51	353
Total		247		616

[2 marks]

- (b) One of the commuters is chosen at random.
Work out the probability that the commuter is aged 30 and over **and** travels by car.
Give your answer as a percentage correct to 1 decimal place.

Answer _____ %

[2 marks]

- 19** A seed company says that the probability that one of its lettuce seeds grows is 0.93
Ezra plants 4 trays of these lettuce seeds.
Each tray has 36 seeds.

(a) Work out an estimate for the number of seeds that grow.

Answer _____

[2 marks]

- (b)** Ezra says,
“Exactly 134 of my seeds will grow.”
Is Ezra correct?
Give a reason for your answer.

[1 mark]

- 20** Chidi rolls an ordinary dice 30 times.
He gets a six 9 times.
Chidi says,
“The probability of getting a six with this dice is 0.3”

(a) Give a reason why Chidi’s estimate may not be reliable.

[1 mark]

- (b)** Chidi rolls the dice 600 more times.
He gets a six 104 times.
Use all of Chidi’s results to work out an estimate of the probability of getting a six with this dice.
Give your answer to 2 decimal places.

Answer _____

[2 marks]

- 21** A machine makes 2400 phone cases each day.
One day, a sample of 150 phone cases is checked.
9 of the cases in the sample are faulty.

(a) Estimate the number of faulty phone cases the machine makes that day.

Answer _____

[2 marks]

- (b) The manager says,
“Fewer than 5% of our phone cases are faulty.”
Do the results of the sample support what the manager says?
You must show your working.

[2 marks]

- 22** A quiz app chooses the topic of each question at random.
The table shows some of the probabilities.

Topic	history	science	sport	music
Probability	0.226	0.302		

A question is three times as likely to be about music as about sport.

Work out the probability that a question is about music.

Answer _____

[3 marks]

- 23** A bike hire company finds that the probability that a bike needs a repair after it has been hired is 0.042
Each repair costs the company £13.75
The company expects 1850 hires this summer.
It puts aside £1000 to pay for repairs.

Is £1000 likely to be enough to pay for the repairs this summer?
You must show your working.

[3 marks]

- 24** Ola flips a plastic bottle 80 times.
It lands upright 23 times.

(a) Work out the relative frequency of the bottle landing upright.

Answer _____

[1 mark]

- (b) Ola is going to flip the bottle again.
Using her relative frequency, she estimates that it will land upright 115 times.
How many times is she going to flip the bottle?

Answer _____

[2 marks]

25

A company insures 3500 mobile phones for one year.
For each phone, the probability that a claim is made during the year is 0.084
The mean cost of a claim is £186.40
Every customer pays the company the same amount.
The company wants to expect a profit of at least £25 000 from these phones.

Work out the least amount each customer must pay.
Give your answer in pounds and pence.

Answer £ _____

[4 marks]

26

A camera records the birds that visit a garden feeder.

The table shows the probability that the next bird to visit is each type.

Bird	robin	sparrow	blue tit	finch
Probability	0.17	0.29		

The probability that the next bird is a blue tit is 0.13 more than the probability that it is a finch.

- (a) Work out the probability that the next bird is a finch.

Answer _____

[2 marks]

- (b) The type of each bird does not depend on the bird before it.
Work out the probability that the next two birds are the same type.
Give your answer to 3 decimal places.

Answer _____

[3 marks]

- 27** A courier delivers parcels early, on time or late.
For a parcel chosen at random
the probability that it is late is x
the probability that it is early is x^2
the probability that it is on time is 0.71

- (a)** Work out the value of x .
Give your answer to 3 decimal places.

Answer _____

[3 marks]

- (b)** The courier delivers 3200 parcels in a week.
Work out an estimate for the number of these parcels delivered early.

Answer _____

[2 marks]

28

A music festival has backup generators.

When they are needed, the probability that a generator fails to start is 0.085

The generators work independently of each other.

- (a) The festival has 4 generators.
It needs at least three of them to start.
Work out the probability that at least three of the generators start.
Give your answer to 3 decimal places.

Answer _____

[3 marks]

- (b) The organisers of another festival want the probability that at least one of their generators starts to be greater than 0.99999
Their generators are the same type.
Work out the least number of generators they need.
You must show your working.

Answer _____

[3 marks]

END OF QUESTIONS