Sparx Maths

Crossover Workbook 5

Probability

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In this series of six workbooks, there are a range of questions from key crossover topics that appear in both the GCSE Foundation and Higher tier papers.

Each workbook will focus on a particular strand of maths.

Workbook 5 will cover **Probability** topics.

The contents of Workbooks 1-6 are shown below.

1 Number

- Fractions
- Factors, multiples and primes
- Percentage change
- Standard form
- Error intervals

2 Algebra

- Solving linear equations
- Linear inequalities
- Index laws
- Linear simultaneous equations
- Linear graphs and coordinates
- Quadratic graphs and equations

3 Ratio & Proportion

- Ratio
- Speed
- Density and pressure
- Proportion

4 Geometry

- Area
- Volume
- Angles
- Pythagoras' theorem
- Trigonometry
- Transformations

5 Probability

- Calculating probabilities
- Expected outcomes
- Tree diagrams
- Set notation

6 Statistics

- Averages
- Averages with grouped data
- Sampling
- Scatter graphs
- Frequency polygons

This booklet is split into two sections:

- **Introduce** questions are fluency questions on each topic to practise the key concepts.
- **Deepen** mixed topic questions are more challenging reasoning and problem solving questions.

Use the list below to keep track of your progress in each topic. If you use Sparx Maths you can find even more questions by searching for the Sparx topic codes in Independent Learning.

	Sparx topic codes	Teacher comment
Calculating probabilities	U408 U510 U683 U580	
Expected outcomes	U166	
Tree diagrams	U558 U729	
Set notation	U748 U296	

Calculators may be used in all questions

Q1 The table below shows the probability that a letter chosen at random from a page of a book is a vowel.

What is the probability that a random letter is **not** a vowel?

Letter	A	E	I	O	U
Probability	12%	21%	18%	5%	3%

Answer: .....

Q2 A bag contains 5 red marbles, some green marbles and some blue marbles.

A marble is going to be taken at random from the bag.

The table shows the probability of taking a green marble and the probability of taking a blue marble.

Colour	Red	Green	Blue
Probability		0.3	0.45

a) Complete the table.

b) Work out the total number of marbles in the bag.

Answer: .....

Q3 A spinner has two coloured sections.

Amara and Harry spin the spinner a number of times.

They record how many times the spinner landed on each colour in the table below.

	Red	Purple
Amara	13	37
Harry	14	6

a) Whose results will give the best estimate for the probability of the spinner landing on red?

Justify your answer.

Answer: .....

.....

b) Use **all** the results in the table to work out an estimated probability for the spinner landing on red.

Answer: .....

Q4 A spinner has four sections labelled A, B, C and D.

The probability of it landing on A and the probability of it landing on B are shown in the table below.

Letter	A	B	C	D
Probability	0.05	0.25		

The probability of it landing on C is the same as the probability of it landing on D.

a) Complete the table.

b) What is the probability of the spinner landing on B or D?

Answer: .....

Q1

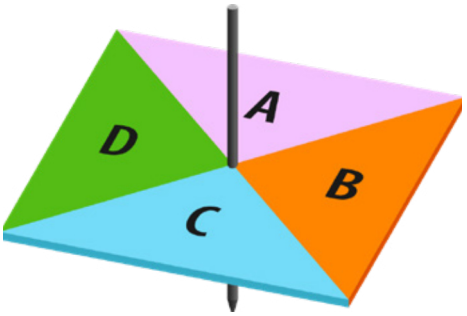
A factory makes dresses.
The probability that a dress has a fault is 11%

If the factory makes 700 dresses in a day, how many do you expect to be faulty?

Answer: .....

Q2

The diagram shows a biased 4-sided spinner.



The table shows the probabilities that the spinner will land on A, B and C.

Letter	A	B	C	D
Probability	0.15	0.3	0.1	

Sumaya is going to spin the spinner 300 times.
Work out an estimate for the number of times the spinner lands on D.

Answer: .....

Q3 A local weather forecaster can predict a storm with an accuracy of $\frac{8}{10}$

If they forecast a storm 220 times, how many times would you expect them to get it **wrong**?

Answer: .....

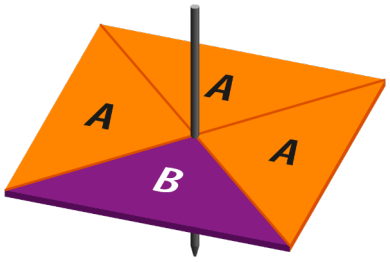
Q4 180 people enter a competition.

The probability of winning the competition is $\frac{1}{6}$ and each winner gets a prize of £9

How much prize money would you expect to be won in total?

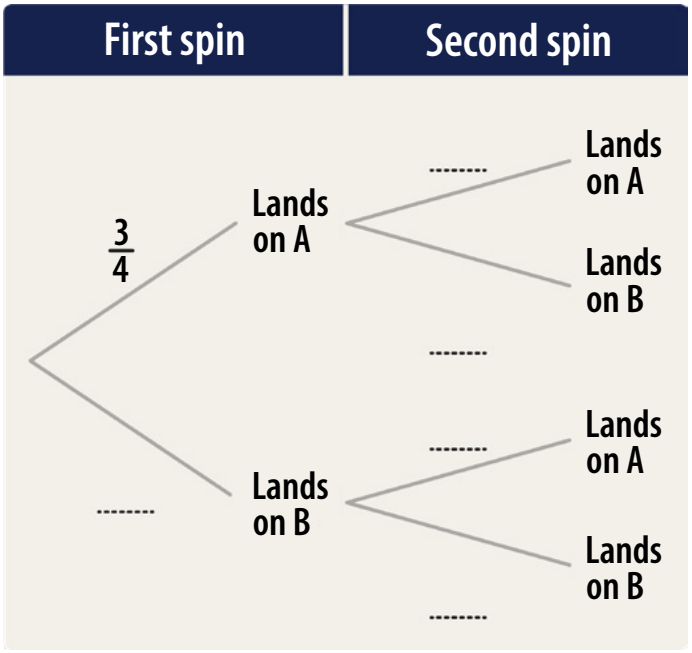
Answer: £ .....

Q1 The diagram shows a fair 4-sided spinner.



Abi spins the spinner twice.

a) Complete the probability tree diagram.

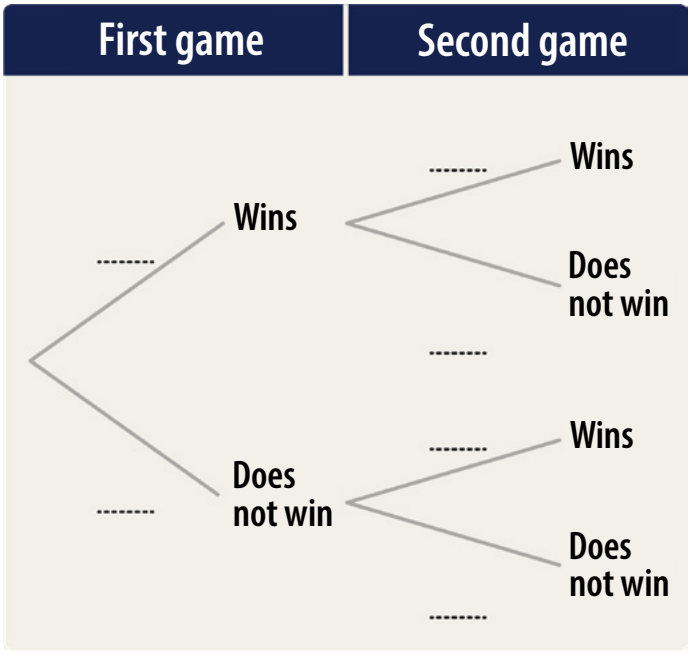


b) Work out the probability that the spinner lands on A on both spins.

Answer: .....

Q2 Yasmin plays a game twice.
Each time she plays, the probability that she wins is $\frac{5}{11}$

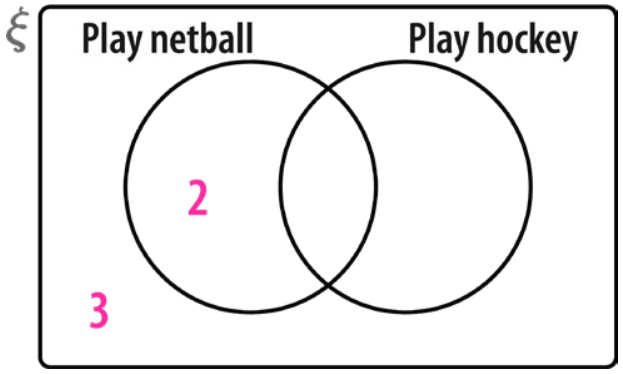
a) Complete the probability tree diagram.



b) Work out the probability that she wins exactly one of the games

Answer: .....

Q1 There are 15 students in a class and 11 of them play netball.
The Venn diagram below is partly completed.



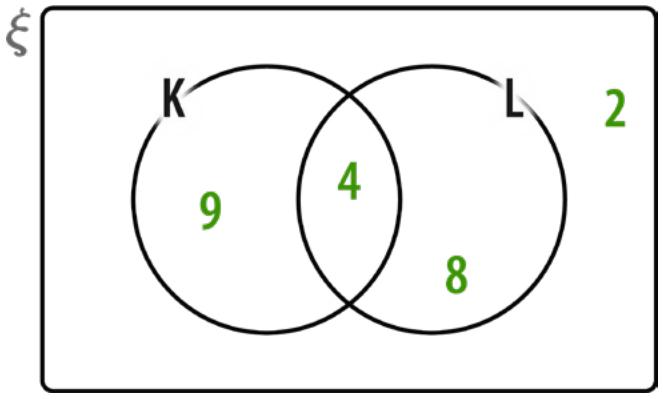
a) How many students play both netball and hockey?

Answer: .....

b) How many students play hockey and not netball?

Answer: .....

Q2 The Venn diagram below shows information about the number of items in sets K and L.



Write down the number of items in

a) K ∪ L

Answer: .....

b) K ∩ L

Answer: .....

c) K′

Answer: .....

d) K′ ∩ L

Answer: .....

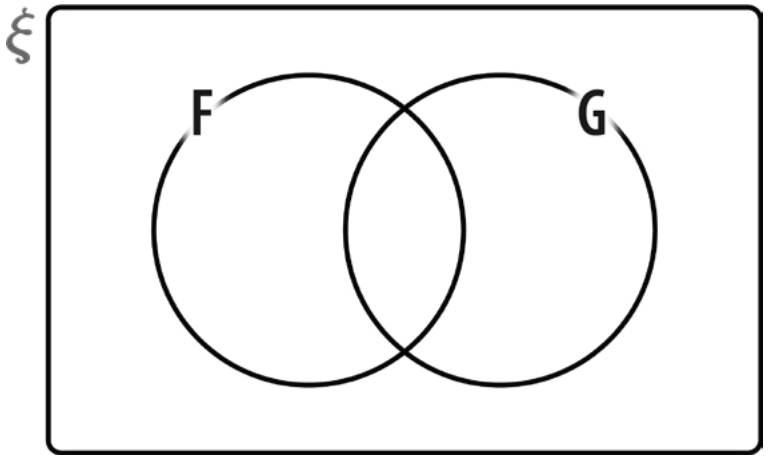
Q3

$\xi = \{4, 5, 8, 10, 12, 15, 16, 20, 21\}$

$F = \{8, 12, 16, 20\}$

$G = \{\text{multiples of } 5\}$

a) Complete the Venn diagram to represent this information.



b) Write down all the elements of $F' \cap G'$

Answer: .....

c) What is the probability that an item chosen at random is in $F' \cap G'$?

Answer: .....

d) What is the probability that an item chosen at random is in $F \cup G$?

Answer: .....

Q1 A bag contains 20 coloured marbles.

Complete the table to show the probability of picking each colour and the number of each colour marble in the bag.

Colour	Probability	Number of Marbles
Green	10%	
Purple		4
Red	15%	
Orange		

Q2 The probability of winning a prize in a competition is 18%.

How many people need to enter the competition for the expected number of winners to be 36?

Answer: .....

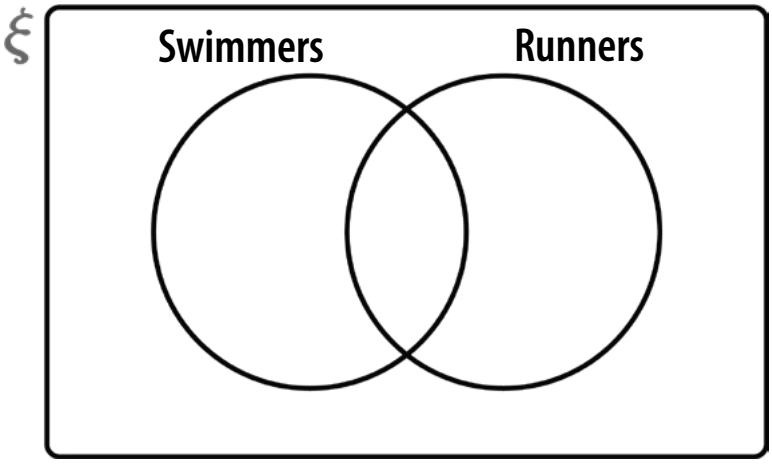
Q3 There are 70 members of a sports club.

12 are swimmers but not runners.

$\frac{1}{5}$ are neither a swimmer nor a runner.

25% of the runners are also swimmers.

Complete the Venn diagram to represent this information.



Q4 Jayden has a bag of 5 cubes.

The probability of choosing a red cube at random from the bag is 0.4

Jayden removes a red cube from the bag.

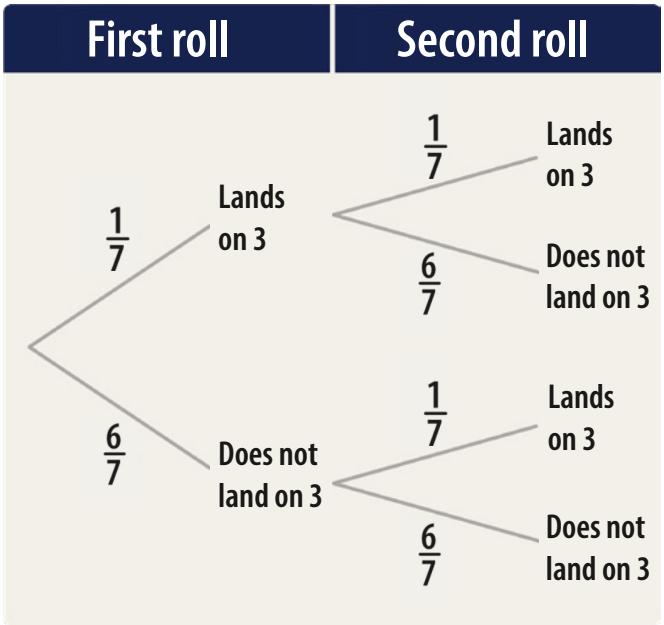
If Jayden now takes another cube from the bag at random, what is the probability that it will be red?

Answer: .....

Q5 Ava rolls a biased 6-sided dice twice.

The probability that the dice lands on 3 is $\frac{1}{7}$

What is the probability that the dice lands on 3 at least once?



Answer: .....

Q6 Jess has a bag containing 2 yellow counters and 1 blue counter.

She then puts **more blue counters** in the bag.

She is going to take one counter without looking.

The probability that the counter will be blue is $\frac{4}{5}$

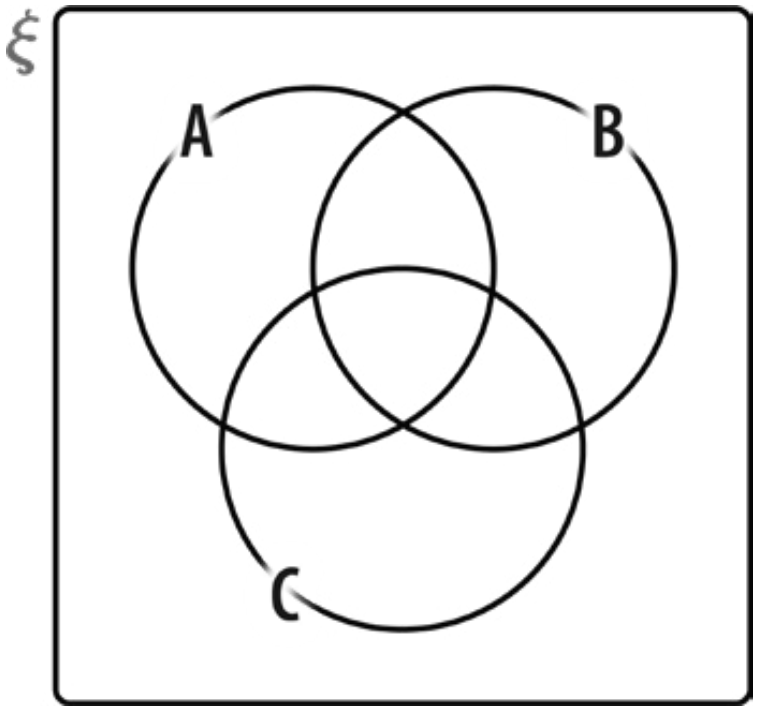
How many **more** blue counters did Jess put in the bag?

Answer: .....

Q7 The universal set, ξ, and sets A, B and C are defined below.

$\xi = \{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{2, 4, 6, 8, 10\}$
$B = \{2, 3, 4, 5\}$
$C = \{6, 7, 8, 9\}$

a) Complete the Venn diagram to represent this information.



b) An item is chosen at random from the Venn diagram.
Find the the probability that this item is in the set $A' \cap B'$

Answer: .....

Q8 Lily is playing a game.

Each play of the game costs 80p and the probability of winning the game each time is $\frac{1}{20}$

Each time Lily wins she gets a prize of £10

How much money is Lily expected to lose if she plays the game 100 times?

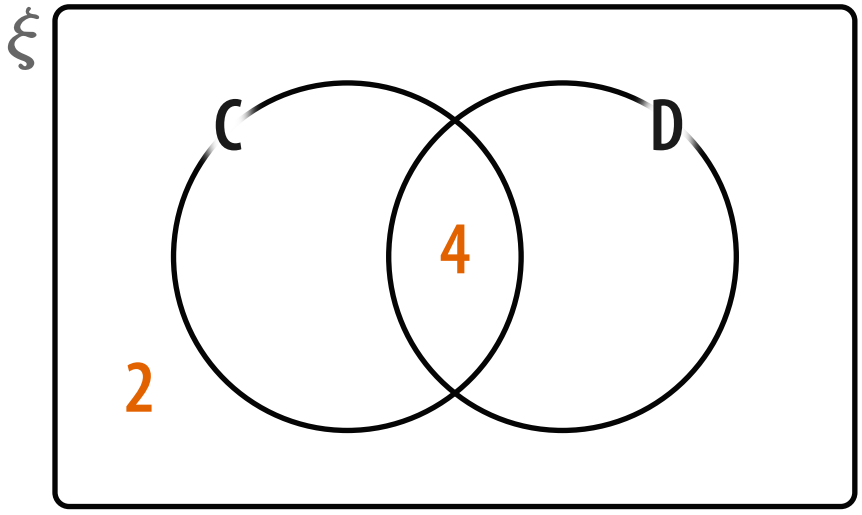
Answer: £ .....

Q9 The Venn diagram below is partly complete and shows information about the frequency of items in sets C and D.

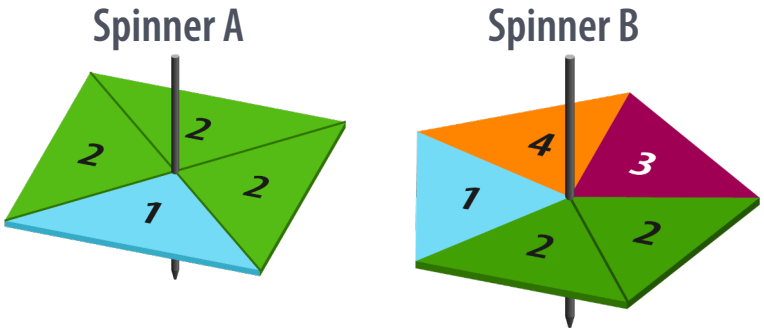
There are 17 items in total.

The probability that an item chosen at random is in C ∪ D' is $\frac{8}{17}$

Complete the Venn diagram.

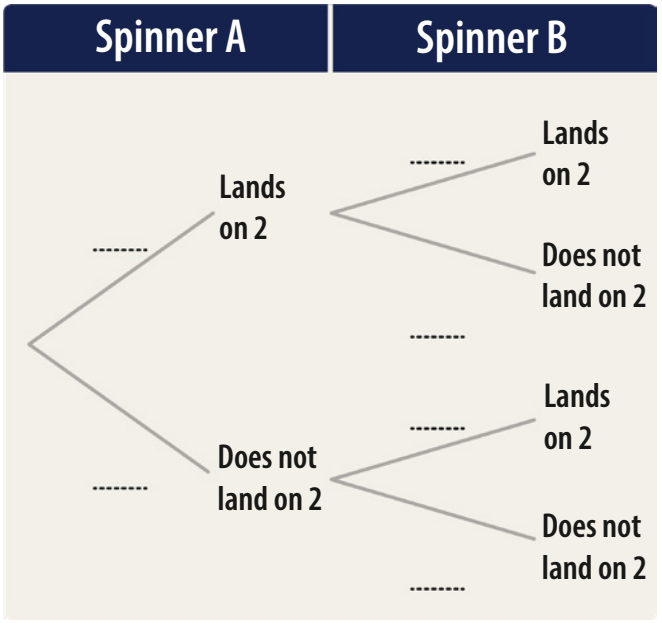


Q10 Emma has a fair 4-sided spinner and a fair 5-sided spinner.



Emma spins each spinner once.

a) Complete the probability tree diagram.



b) Work out the probability of getting 2 on **both** spinners.

Answer: .....

Q11 Charlie rolls a biased six-sided dice.
The probabilities of the dice landing on 1, 2, 4 and 5 are shown in the table below.

The probability of rolling a 3 is 0.04 more than the probability of rolling a 6.

a) Complete the table.

Outcome	1	2	3	4	5	6
Probability	0.1	0.38		0.15	0.09	

b) Work out an estimate for the number of times the dice will land on a prime number if it is rolled 500 times.

Answer: .....

Q12 Kasha has 9 scarves, of which 4 are silk and the rest are wool.

One day, she chooses a scarf at random to wear and replaces it at the end of the day.

The next day, she chooses a scarf at random.

Work out the probability that she chooses a different type of scarf each day.

Answer: .....

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