6

| 4 | 6 | 3 | 4 | 2 | 3 |
| Red | Yellow | Blue | Blue | Yellow | Blue |

The diagram shows six discs.
Each disc has a colour and a number.

(a) One disc is picked at random.

Write down the probability that

(i) the disc has the number 4,

$\frac{2}{6} = \frac{1}{3}$

................$\frac{1}{3}$................ [1]

(ii) the disc is red and has the number 3,

0

................0................ [1]

(iii) the disc is blue and has the number 4.

$\frac{1}{6}$

................$\frac{1}{6}$................ [1]

5 A spinner is spun.
The possible outcomes are A, B, C or D.
The probability of spinning A, C or D is shown in the table.

Letter on spinner	A	B	C	D
Probability	0.2	0.4	0.05	0.35

Complete the table.

$1 - (0.2 + 0.05 + 0.35)$

$= 1 - 0.6 = 0.4$

5 Eric has four colours of paint.
The table shows the probability that he uses each colour.

Colour	Red	Blue	Green	Yellow
Probability	0.3	0.35	0.13	x

Find the value of x.

$1 - (0.3 + 0.35 + 0.13)$

$= 1 - 0.78$

$= 0.22$

$x = $ ....0.22................ [2]

8 Salma spins a biased spinner with sectors labelled 1, 2, 3, 4 and 5.
The table shows the relative frequencies of each of her scores.

Score	1	2	3	4	5
Relative frequency	0.1	0.05	0.3	0.35	p

(a) Find the value of p.

$$1 - (0.1 + 0.05 + 0.3 + 0.35)$$
$$= 1 - 0.8$$

.... 0.2 .... [2]

(b) Salma spins the spinner 4000 times.

Work out an estimate for the number of times she scores 3.

$$P(3) = 0.3$$

$$0.3 \times 4000 = 1200$$

.... 1200 .... [1]

5 The table shows the relative frequency of the games won by a football team.

Result of game	won	lost	drawn
Relative frequency	0.1	0.6	0.3

The number of games lost is twice the number of games drawn.

Complete the table.

drawn: x
lost: $2x$

$$x + 2x = 0.9$$
$$3x = 0.9$$
$$\div 3 \qquad \div 3$$
$$x = 0.3$$

[3]

7 A spinner has five sides.
Each side is painted red, blue, green, yellow or orange.
The table shows some of the probabilities of the spinner landing on each colour.

Colour	Red	Blue	Green	Yellow	Orange
Probability	0.3	0.16	0.18	0.25	$O\cdot11$

$$1 - 0.89 = 0.11$$

(a) Complete the table. [2]

(b) Dan spins the spinner once.

Find the probability that the spinner lands on red or blue.

$$P(R \text{ or } B) = 0.3 + 0.16$$
$$= 0.46$$

_____0.46_____ [2]

6 Rama asks a group of students how they travel to school.
The table shows the probability of how a student, chosen at random, travels to school.

	Bus	Walk	Car	Other
Probability	0.4	0.32	0.17	$O\cdot11$

(a) Complete the table.

$$1 - 0.89 = 0.11$$

[2]

(b) There are 1800 students at the school.

Find the expected number of students that walk to school.

$$P(\text{walk}) = 0.32$$
$$0.32 \times 1800 = 576$$

_____576_____ [1]

8 Pryanka plays a game in which she can win, lose or draw.
The table shows the probability of her winning or losing a game.

Result of game	win	lose	draw
Probability	0.3	0.25	0·45

(a) Complete the table. $1 - 0.55 = 0.45$ [2]

(b) Pryanka plays this game 120 times.

Work out the expected number of games she wins.

$P(win) = 0.3$

$0.3 \times 120 = 36$

........................36........................ [1]

4 A bag contains blue, red, yellow and green balls only.
A ball is taken from the bag at random.
The table shows some information about the probabilities.

Colour	Blue	Red	Yellow	Green
Probability	0.15	0.2	0·22	0.43

(a) Complete the table. $1 - 0.78 = 0.22$

[2]

(b) Abdul takes a ball at random and replaces it in the bag.
He does this 200 times.

Find how many times he expects to take a red ball.

$P(red) = 0.2$

$0.2 \times 200 = 40$

........................40........................ [1]

12 Farid spins a three-sided spinner with sides labelled A, B and C.
The probability that the spinner lands on C is 0.35 .
Farid spins the spinner 40 times.

Calculate the number of times he expects the spinner to land on C.

$$0.35 \times 40 = 14$$

..............................14.............................. [1]

6 A spinner can land on the colours green, black or red.
The table shows the probabilities of the spinner landing on green or black.

Colour	Green	Black	Red
Probability	$\frac{2}{5}$	$\frac{1}{4}$	$\frac{7}{20}$

$$\frac{2}{5} \times \frac{4}{4} + \frac{1}{4} \times \frac{5}{5}$$

(a) Complete the table. [2]

$$\frac{8}{20} + \frac{5}{20} = \frac{13}{20} \qquad 1 - \frac{13}{20} = \frac{7}{20}$$
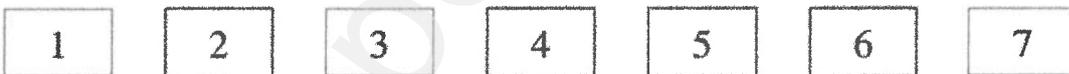
(b) Chang spins the spinner 120 times.

Find the expected number of times it lands on green.

$$P(\text{green}) = \frac{2}{5}$$

$$\frac{2}{5} \times 120 = 48$$

..............................48.............................. [1]

4

1	2	3	4	5	6	7

Samira picks one of these cards at random and replaces it.

(a) Find the probability that she picks an odd number.

..............................$\frac{4}{7}$.............................. [1]

(b) Samira repeats this 35 times.

Calculate the number of times Samira is expected to pick an odd number.

$$\frac{4}{7} \times 35 = 20$$

..............................20.............................. [1]

5 A bag contains 7 black balls, 2 red balls and 4 yellow balls.
One ball is chosen at random from the bag.

Find the probability that the ball chosen is yellow.

$$\frac{4}{13}$$ [1]

4 A bag contains 3 blue balls and 7 green balls.
One ball is chosen at random.

Find the probability the ball chosen is

(a) white

$$0$$ [1]

(b) not blue.

$$\frac{7}{10}$$ [1]

5 An unbiased six-sided die is numbered 1, 2, 3, 4, 5, 6.
The die is rolled.

Find the probability that it shows

(a) 6,

$$\frac{1}{6}$$ [1]

(b) a number greater than 6.

$$0$$ [1]

1   The probability of picking a red sweet from a bag is 0.05 .

Find the probability of not picking a red sweet. $1 - 0.05 = 0.95$

.... 0.95 .... [1]

2   The probability that a train is late is 0.15 .

Write down the probability that the train is not late.

$1 - 0.15 = 0.85$

.... 0.85 .... [1]

1   The probability that Jane wins a game is $\frac{7}{10}$.

(a)   Find the probability that Jane does not win the game.

$1 - \frac{7}{10} = \frac{3}{10}$

.... $\frac{3}{10}$ .... [1]

(b)   Jane plays this game 50 times.

Find the number of times she is expected to win the game.

$\frac{7}{10} \times 50 = 35$

.... 35 .... [1]

5   Sofia has a bag containing 8 blue beads and 7 red beads only.
She takes one bead out of the bag at random and replaces it.
She does this 90 times.

Find the number of times she expects to take a red bead.

$P(red) = \frac{7}{15}$

$\frac{7}{15} \times 90 = 42$

.... 42 .... [2]

13 John goes to a shop that sells newspapers and magazines only.

(a) Complete the table of probabilities of John buying something at the shop.

	Buys a newspaper	Does not buy a newspaper	Total
Buys a magazine	0.30	0.10 ✓	0.40
Does not buy a magazine	0.25	0.35	0.60
Total	0.55	0.45	1.00

[2]

(b) Find the probability that John buys a magazine but not a newspaper.

0.1 [1]

11 Angela picks a number at random from the numbers 1, 2 and 3.
She then picks a number at random from the numbers 4, 5 and 6.
She adds the two numbers to find the total.

(a) Complete the table to show the possible outcomes.

First number

+	1	2	3
4	5 ✓	6	⑦ ✓
5	6	7 ✓	8
6	7 ✓	8	⑨ ✓

Second number

✓ = odd

◯ = one of the numbers is a 3

[2]

(b) Given that the total is odd, find the probability that one of the numbers Angela picks is 3.

5 odd totals, 2 of which use a three:

$\frac{2}{5}$ [2]

www.pastpaperpenguin.com

7 Shami asked 200 people from a town about their favourite type of TV programme.
These are the results.

Type of programme	Sport	Comedy	Drama	Quiz	Reality	Documentary
Frequency	46	38	23	21	56	16

(a) Find the relative frequency of Reality.

$$\frac{56}{200} = \frac{7}{25}$$

........................$\frac{7}{25}$........................ [1]

(b) The town has 40 000 inhabitants.

Work out the expected number of people in the town whose favourite type of programme is Documentary.

$$P(Documentary) = \frac{16}{200} = \frac{2}{25}$$

$$\frac{2}{25} \times 40\,000 = 3\,200$$

........................3200........................ [2]

10 The table shows the favourite colour of each of 80 people.

Colour	Red	Blue	White	Green	Silver	Black	Yellow
Frequency	23	17	11	9	12	3	x

(a) Find the value of x.

$$23 + 17 + 11 + 9 + 12 + 3 = 75$$

$$80 - 75 = 5$$

........................5........................ [1]

(b) Find the relative frequency of silver, giving your answer as a fraction in its lowest terms.

$$\frac{12}{80} = \frac{3}{20}$$

........................$\frac{3}{20}$........................ [2]

7 Eggs are graded into four sizes: extra large, large, medium and small.
A farmer records the sizes of a sample of 100 eggs that she collects.
The results are shown in the table.

Size	Extra large	Large	Medium	Small
Number of eggs	28	36	24	12

(a) Find the relative frequency for large eggs.

$$\frac{36}{100} = \frac{9}{25}$$

.................$\frac{9}{25}$................. [1]

(b) In one month, the farmer collects 2500 eggs.

Calculate an estimate for the number of these eggs that are small.

$$\frac{9}{25} \times 2500 = 900$$

.................900................. [2]

5 A biased 5-sided spinner is spun 200 times.
The results are shown in the table.

Number	1	2	3	4	5
Frequency	24	48	63	38	27

(a) Find the relative frequency of the spinner landing on 2.

$$\frac{48}{200} = \frac{6}{25}$$

.................$\frac{6}{25}$................. [1]

(b) The spinner is spun 1000 times.

Find the expected number of times that the spinner lands on 2.

$$\frac{6}{25} \times 1000 = 240$$

.................240................. [1]

7 Regan is playing a game with these six number cards.

| -3 | -2 | 2 | 3 | 5 | 7 |

(a) She takes two cards at random, without replacement, and **multiplies** the two numbers to give a score.

Find the probability that

(i) the score is 35

Second Card

First Card

	-3	-2	2	3	5	7
-3	X	6	-6	-9	-15	-21
-2	6	X	-4	-6	-10	-14
2	-6	-4	X	6	10	14
3	-9	-6	6	X	15	21
5	-15	-10	10	15	X	35
7	-21	-14	14	21	35	X

two 35s out of thirty possibilities:

$$\frac{2}{30} = \frac{1}{15}$$

.................$\frac{1}{15}$................. [3]

X because not replacing the cards so can't get the same twice.

(ii) the score is a positive number.

$$\frac{14}{30} = \frac{7}{15}$$

.................$\frac{7}{15}$................. [3]

16 Sachin picks a number at random from the first three multiples of 3.
He then picks a number at random from the first three prime numbers.
He adds the two numbers to find a score.

(a) Complete the table.

Multiples of 3

	3	6	9
2	5	8 ✓	11
3	6 ✓	9	(12) ✓
5	8 ✓	11	(14) ✓

Prime numbers

✓ = even

○ = one of the numbers is a 9.

[2]

(b) Given that the score is even, find the probability that one of the numbers he picks is 9.

$\dfrac{2}{5}$ [2]

7 Katy has 5 white flowers, x red flowers and $(2x+1)$ yellow flowers.
She picks a flower at random.

The probability that it is white is $\dfrac{1}{12}$.

Find the probability that it is yellow.

Probability of red or yellow:

$1 - \dfrac{1}{12} = \dfrac{11}{12}$

Total of all flowers:

$5 + x + 2x + 1 = 3x + 6$

Total of red and yellow:

$x + 2x + 1 = 3x + 1$

Probability of red or yellow $= \dfrac{11}{12}$:

$\dfrac{3x+1}{3x+6} = \dfrac{11}{12}$

$12(3x+1) = 11(3x+6)$

$36x + 12 = 33x + 66$

$-33x \qquad\qquad -33x$

$3x + 12 = 66$

$-12 \qquad -12$

$3x = 54$

$\div 3 \qquad \div 3$

$x = 18$

yellow:

$2(18)+1 = 37$

all flowers:

$3(18)+6 = 60$

$\dfrac{37}{60}$

11   A bag contains 7 red discs, 5 green discs and 2 pink discs.

(a)   Helen takes one disc at random, records the colour and replaces it in the bag.
She does this 140 times.

Find how many times she expects to take a green disc.

$P(green) = \dfrac{5}{14}$

$\dfrac{5}{14} \times 140 = 50$

.... 50 .... [2]

(b)   Helen adds 9 green discs and some pink discs to the discs already in the bag.
The probability of taking a green disc is now $\dfrac{2}{7}$.

Find the number of pink discs that Helen added to the bag.

Pink discs: x

$P(green):$

$\dfrac{5 + 9}{14 + 9 + x} = \dfrac{2}{7}$ ← green   ↑ green   ↑ pink

$\dfrac{14}{23 + x} \cancel{\times} \dfrac{2}{7}$
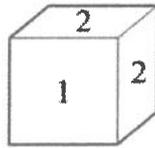
$98 = 2(23 + x)$
$98 = 46 + 2x$
$-46 \qquad -46$
$52 = 2x$
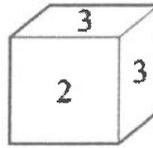$\div 2 \qquad \div 2$
$26 = x$

.... 26 .... [2]

8

Dice A   Dice B

The diagram shows two fair dice.
Dice A is numbered   1, 2, 2, 2, 3, 6.
Dice B is numbered   2, 3, 3, 4, 4, 4.

(a) (i) Dice A is rolled once.

Write down the probability that it lands on the number 6.

$\dfrac{1}{6}$

.... [1]

(ii) Dice A is rolled 150 times.

Find the number of times it is expected to land on the number 6.

$\dfrac{1}{6} \times 150 = 25$

.... 25 .... [1]

(b) Dice A and Dice B are each rolled once.

(i) Find the probability that the two numbers they land on have a total of 6.

		B				
	2	3	3	4	4	4
1	3	4	4	5	5	5
2	4	5	5	6.	6.	6.
2	4	5	5	6.	6.	6.
2	4	5	5	6.	6.	6.
3	5	6.	6.	7	7	7
6	8	9	9	10	10	10

A

$\dfrac{11}{36}$

.... [3]

(ii) Find the probability that when the two numbers they land on have a total of 6, both numbers are 3.

$\dfrac{2}{11}$ ← total of 6 and both numbers are 3

← total of 6

$\dfrac{2}{11}$

.... [2]

(c) Dice B is rolled n times.

The probability that on the nth roll it first lands on a number 3 is $\frac{32}{729}$.

Find the value of n.

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

If it was on 1st roll:

$$\frac{1}{3}$$

2nd roll:

$$\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$$

P(not three)   P(three)

3rd roll:

$$\frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{4}{27}$$

4th roll:

$$\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{8}{81}$$

5th roll:

$$\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{16}{243}$$

6th roll:

$$\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{32}{729}$$

$n =$ ......6...... [2]

Can also just look at powers of 3 on denominator: $3^6 = 729$ so $n=6$