

## P26- Relative Frequency and Experimental Probability

OCR

A bag contains 20 balls.  
Every ball is red or blue or green.

(b) Dan takes a ball at random from the bag.  
He notes its colour and replaces it.

He repeats this process 120 times.

His results are shown in the table.

<b>Colour</b>	Red	Blue	Green
<b>Frequency</b>	66	47	7

Estimate the number of balls of each colour in the bag.

(b) Red .....

Blue .....

Green ..... [3]

A bag contains 20 balls.  
Every ball is red or blue or green.

- (b) Dan takes a ball at random from the bag.  
He notes its colour and replaces it.

He repeats this process 120 times.

His results are shown in the table.

Colour	Red	Blue	Green
Frequency	66	47	7

Estimate the number of balls of each colour in the bag.

$$\frac{66}{120} \text{ of } 20$$

$$= 11$$

11

$$\frac{47}{120} \text{ of } 20$$

$$= 7.83$$

8

$$\frac{7}{120} \text{ of } 20$$

$$= 1.16$$

1

(b) Red .....

Blue .....

Green .....

[3]

20  
R : B : G

11

8

1

15 The probability of each outcome of a computer game is shown in the table below.

<b>Outcome</b>	Win	Lose	Draw
<b>Probability</b>	0.3	0.25	

(a) Complete the table. [2]

(b) Cynthia plays the game 30 times.

(i) Calculate the number of times Cynthia should expect to win.

(b)(i) ..... [2]

(ii) Cynthia wins the game 4 times.

She says

I should have won more times.

Explain why she may be wrong.

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

15 The probability of each outcome of a computer game is shown in the table below.

Outcome	Win	Lose	Draw
Probability	0.3	0.25	0.45 = 1

(a) Complete the table.

[2]

(b) Cynthia plays the game 30 times.

(i) Calculate the number of times Cynthia should expect to win.

$$\begin{array}{r} 0.3 \text{ of } 30 \text{ times} \\ \times \\ \hline \end{array}$$

9

(b)(i) ..... [2]

(ii) Cynthia wins the game 4 times.

She says

I should have won more times.

Explain why she may be wrong.

..... 4 times is a small sample of games  
 ..... to look at. She needed to play more [1]

18 The table shows the relative frequencies of the results for a football team after a number of games.

P26

Result of game	won	lost	drew
Relative frequency	0.2	0.45	

(a) Complete the table.

[2]

(b) The team lost 10 more games than they won.

How many games did the team play altogether?

(b) ..... [3]

The table shows the relative frequencies of the results for a football team after a number of games.

P26

Result of game	won	lost	drew
Relative frequency	0.2	0.45	0.35

$$= \underline{\underline{1}}$$

(a) Complete the table.

$$\begin{array}{r} 0.2 \\ 0.45 \\ \hline 0.65 \end{array}$$

[2]

$$0.25 \times \underline{\underline{4}} = 1$$

(b) The team lost 10 more games than they won.

How many games did the team play altogether?

$$\begin{array}{r} \text{Lost} = 0.45 \\ \text{Won} = 0.2 \\ \hline 0.25 = 10 \text{ games} \\ \quad \times 4 \\ \hline 40 \text{ games} \end{array}$$

(b) ..... [3]



- 7 The probability that any postcard posted in Portugal on Monday is delivered to the UK within a week is 0.62.  
The probability that any postcard posted in Portugal on Friday is delivered to the UK within a week is 0.41.

(a) Anna is on holiday in Portugal.  
She posts 15 postcards to the UK on Monday.

**P26** How many of her postcards can she expect to be delivered within a week?

(a) ..... [2]

- 7 The probability that any postcard posted in Portugal on Monday is delivered to the UK within a week is 0.62.  
The probability that any postcard posted in Portugal on Friday is delivered to the UK within a week is 0.41.

- (a) Anna is on holiday in Portugal.  
She posts 15 postcards to the UK on Monday.

**P26** How many of her postcards can she expect to be delivered within a week?

$$0.62 \text{ of } 15 = 9.3$$

x

(a) ..... [2]

9 ✓

or  
10 ✓

Edexcel

22 There are only red counters, blue counters and green counters in a bag.

number of red counters : number of blue counters : number of green counters = 1 : 3 : 7

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

(a) Complete the table below to show each of the probabilities that the counter will be red or blue or green.

Colour	red	blue	green
Probability			

(2)

Jamie takes at random a counter from the bag and records the colour of the counter.  
He then puts the counter back in the bag.

Jamie does this a number of times.  
He records a total of 68 blue counters.

(b) Work out an estimate for the total number of times Jamie takes a counter from the bag.

.....  
(2)

(Total for Question 4 is 4 marks)

There are only red counters, blue counters and green counters in a bag.

number of red counters : number of blue counters : number of green counters = 1 : 3 : 7

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

- (a) Complete the table below to show each of the probabilities that the counter will be red or blue or green.

Colour	red	blue	green
Probability	$\frac{1}{11}$	$\frac{3}{11}$	$\frac{7}{11}$

(2)

Jamie takes at random a counter from the bag and records the colour of the counter. He then puts the counter back in the bag.

Jamie does this a number of times.

He records a total of 68 blue counters.

- (b) Work out an estimate for the total number of times Jamie takes a counter from the bag.

$$\text{Blue} = \frac{3}{11}$$

$$\frac{3}{11} = 68$$

$$\frac{1}{11} = 22.6$$

$$\frac{11}{11} = 249.3$$

$$249 \text{ or } 250$$

(Total for Question 4 is 4 marks)

22 A biased spinner can land on red, on blue, on green or on yellow.

P26 John is going to spin the spinner.

The table shows each of the probabilities that the spinner will land on red, on blue or on green.

<b>Colour</b>	red	blue	green	yellow
<b>Probability</b>	0.2	0.25	0.15	

(a) Complete the table.

(2)

Hayley is going to spin the spinner 60 times.

(b) Work out an estimate for the number of times the spinner will land on red.

.....  
(2)

22 A biased spinner can land on red, on blue, on green or on yellow.

P26 John is going to spin the spinner.

The table shows each of the probabilities that the spinner will land on red, on blue or on green.

Colour	red	blue	green	yellow
Probability	0.2	0.25	0.15	0.4

= 1

(a) Complete the table.

(2)

$$\begin{array}{r}
 0.2 \\
 0.25 \\
 0.15 \\
 \hline
 0.60 = 0.6
 \end{array}$$

Hayley is going to spin the spinner 60 times.

(b) Work out an estimate for the number of times the spinner will land on red.

$$\begin{array}{l}
 0.2 \text{ of } 60 \\
 \frac{2}{10} \text{ of } 60
 \end{array}
 \quad
 \begin{array}{l}
 20\% \text{ of } 60 \\
 \dots\dots\dots
 \end{array}
 \quad
 \begin{array}{l}
 12 \\
 \dots\dots\dots \\
 (2) \quad \checkmark
 \end{array}$$

Video created by W Neill

17 The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6

Number on dice	1	2	3	4	5	6
Probability		0.17	0.18	0.09	0.15	0.1

Neymar rolls the biased dice 200 times.

Work out an estimate for the total number of times the dice will land on 1 or on 3

.....  
**(Total for Question 17 is 3 marks)**



17 The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6

Number on dice	1	2	3	4	5	6
Probability	0.31	0.17	0.18	0.09	0.15	0.1

= 1

Neymar rolls the biased dice 200 times.

0.69

Work out an estimate for the total number of times the dice will land on 1 or on 3

$$1 \dots 0.31 \times 200 = 62$$

$$3 \dots 0.18 \times 200 = 36$$

---


$$98 \checkmark$$

(Total for Question 17 is 3 marks)

24 There are some counters in a bag.  
The counters are red or white or blue or yellow.

Bob is going to take at random a counter from the bag.

The table shows each of the probabilities that the counter will be blue or will be yellow.

P26

<b>Colour</b>	red	white	blue	yellow
<b>Probability</b>			0.45	0.25

There are 18 blue counters in the bag.

The probability that the counter Bob takes will be red is twice the probability that the counter will be white.

(a) Work out the number of red counters in the bag.

.....  
(4)

A marble is going to be taken at random from a box of marbles.  
The probability that the marble will be silver is 0.5

There must be an even number of marbles in the box.

(b) Explain why.

.....  
(1)

24 There are some counters in a bag.  
 The counters are red or white or blue or yellow.

Bob is going to take at random a counter from the bag.

The table shows each of the probabilities that the counter will be blue or will be yellow.

$2 : 1$

Colour	red	white	blue	yellow
Probability	0.2	0.1	0.45	0.25

There are 18 blue counters in the bag.

The probability that the counter Bob takes will be red is twice the probability that the counter will be white.

(a) Work out the number of red counters in the bag.

$$0.45 + 0.25 = 0.7$$

Handwritten calculations:

- $0.45 = 18 \text{ counters}$
- $0.05 = 2 \text{ counters}$
- $0.1 = 4 \text{ counters}$
- $0.2 = 8 \text{ counters}$

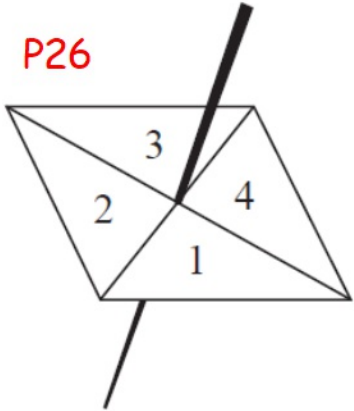
Red

---

8

14 Here is a 4-sided spinner.

P26



The table shows the probabilities that when the spinner is spun it will land on 1, on 3 and on 4

<b>Number</b>	1	2	3	4
<b>Probability</b>	0.2		0.4	0.1

The spinner is spun once.

(a) Work out the probability that the spinner will land on 2

.....  
(1)

(b) Which number is the spinner least likely to land on?

Jake is going to spin the spinner 60 times.

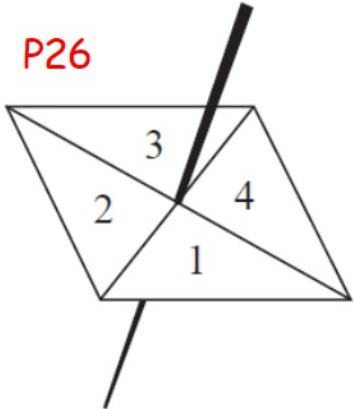
.....  
(1)

(c) Work out an estimate for the number of times the spinner will land on 1

.....  
(2)

14 Here is a 4-sided spinner.

P26



The table shows the probabilities that when the spinner is spun it will land on 1, on 3 and on 4

<b>Number</b>	1	2	3	4
<b>Probability</b>	0.2	0.3	0.4	0.1

= 1

0.7

The spinner is spun once.

(a) Work out the probability that the spinner will land on 2

(b) Which number is the spinner least likely to land on?

(1)

4

(1)

Jake is going to spin the spinner 60 times.

(c) Work out an estimate for the number of times the spinner will land on 1

0.2 of 60 times  
x

12

(2)

**26** When a drawing pin is dropped it can land point down or point up.

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Lucy, Mel and Tom each dropped the drawing pin a number of times.

The table shows the number of times the drawing pin landed point down and the number of times the drawing pin landed point up for each person.

	<b>Lucy</b>	<b>Mel</b>	<b>Tom</b>
<b>point down</b>	31	53	16
<b>point up</b>	14	27	9

Rachael is going to drop the drawing pin once.

- (a) Whose results will give the best estimate for the probability that the drawing pin will land point up?  
Give a reason for your answer.

Stuart is going to drop the drawing pin twice.

- (b) Use all the results in the table to work out an estimate for the probability that the drawing pin will land point up the first time and point down the second time.

8 When a drawing pin is dropped it can land point down or point up.

Created by W Neill

Lucy, Mel and Tom each dropped the drawing pin a number of times.

The table shows the number of times the drawing pin landed point down and the number of times the drawing pin landed point up for each person.

	Lucy	Mel	Tom
point down	31	53	16
point up	14	27	9

Total  
100  
50  

---

150

⊗  
⊗

Rachael is going to drop the drawing pin once.

(a) Whose results will give the best estimate for the probability that the drawing pin will land point up?

Give a reason for your answer.

Mel, because she has had most trials

Stuart is going to drop the drawing pin twice.

(b) Use all the results in the table to work out an estimate for the probability that the drawing pin will land point up the first time and point down the second time.

$$\frac{50}{150} \times \frac{100}{150} = \frac{2}{9} \checkmark$$

- 10 There are only blue counters, yellow counters, green counters and red counters in a bag. Created by W Neill  
A counter is taken at random from the bag.

The table shows the probabilities of getting a blue counter or a yellow counter or a green counter.

<b>Colour</b>	blue	yellow	green	red
<b>Probability</b>	0.2	0.35	0.4	

- (a) Work out the probability of getting a red counter.

.....  
(1)

- (b) What is the least possible number of counters in the bag?  
You must give a reason for your answer.

.....  
.....  
(2)



- 10 There are only blue counters, yellow counters, green counters and red counters in a bag. Created by W Neill  
A counter is taken at random from the bag.

The table shows the probabilities of getting a blue counter or a yellow counter or a green counter.

Colour	blue	yellow	green	red
Probability	0.2	0.35	0.4	0.05 = 1

- (a) Work out the probability of getting a red counter.

$$\frac{1}{20}$$

- (b) What is the least possible number of counters in the bag?  
You must give a reason for your answer.

Red =  $\frac{1}{20}$  so there must be at least 20  
counters in the bag.

(1)

(2)

**16** There are only red counters, blue counters and purple counters in a bag.

p26 The ratio of the number of red counters to the number of blue counters is 3 : 17

Sam takes at random a counter from the bag.

The probability that the counter is purple is 0.2

Work out the probability that Sam takes a red counter.

(Total for Question 16 is 3 marks)

16 There are only red counters, blue counters and purple counters in a bag.

p26 The ratio of the number of red counters to the number of blue counters is 3 : 17

Sam takes at random a counter from the bag.

The probability that the counter is purple is 0.2

Work out the probability that Sam takes a red counter.

$$\text{Red and Blue} = 0.8$$

$$\text{Red } \frac{3}{20} \text{ of } 0.8$$

$$\frac{3}{20} = \frac{15}{100}$$

$$= 15\%$$

$$15\% \text{ of } 0.8$$

$$10\% = 0.08$$

$$5\% = 0.04$$

$$\begin{array}{r} R : B : P \\ 3 : 17 : 0.2 \\ \hline 0.8 \end{array}$$

$$\text{ans} = 0.12 \checkmark$$

(Total for Question 16 is 3 marks)

AQA

25

The table shows information about some CDs.

P26  
A16

Type	Rock	Pop	Jazz
Number of CDs	2	$x$	$2x + 5$

A CD is chosen at random.

The probability it is rock is  $\frac{1}{20}$ 

Work out the probability it is jazz.

**[4 marks]**

Answer \_\_\_\_\_

The table shows information about some CDs.

P26  
A16

Type	Rock	Pop	Jazz
Number of CDs	2	$x$	$2x + 5$

38

11  
 $2x + 5$   
 $22 + 5$

A CD is chosen at random.

The probability it is rock is  $\frac{1}{20}$

Work out the probability it is jazz.

$$3x + 5 = 38$$

$$x \rightarrow (x \times 3) \rightarrow (+5) \rightarrow 38 \quad [4 \text{ marks}]$$

$$11 \leftarrow (3) \leftarrow (-5) \leftarrow 38$$

$$x = 11$$

$x \times 20$   $\left\{ \begin{array}{l} \frac{1}{20} = 2 \text{ cd's} \\ \frac{20}{20} = 40 \text{ cd's} \end{array} \right.$

Answer

$\frac{27}{40}$  ✓

- 21** An experiment is carried out 200 times.  
The possible outcomes are K, L and M.

**P26**

<b>Outcome</b>	K	L	M
<b>Frequency</b>	84	54	
<b>Relative frequency</b>	0.42		

**21 (a)** Complete the table. **[2 marks]**

**21 (b)** Altogether, the experiment is carried out 500 times.

How many times would you expect the outcome to be K? **[2 marks]**

Answer \_\_\_\_\_

- 21 An experiment is carried out 200 times.  
The possible outcomes are K, L and M.

P26

Outcome	K	L	M
Frequency	84	54	62
Relative frequency	0.42	0.27	0.31

200  
1 ↙ ÷ 200

- 21 (a) Complete the table. [2 marks]

- 21 (b) Altogether, the experiment is carried out 500 times.

How many times would you expect the outcome to be K? [2 marks]

$$200 \text{ times} = 84$$

$$\times 5 \begin{cases} 100 \text{ times} = 42 \\ 500 \text{ times} = 210 \end{cases}$$

$$500 \text{ times} = 210$$

$$\text{or } 0.42 \times 500 =$$

Answer 210



11 A fair spinner has 12 equal sections.

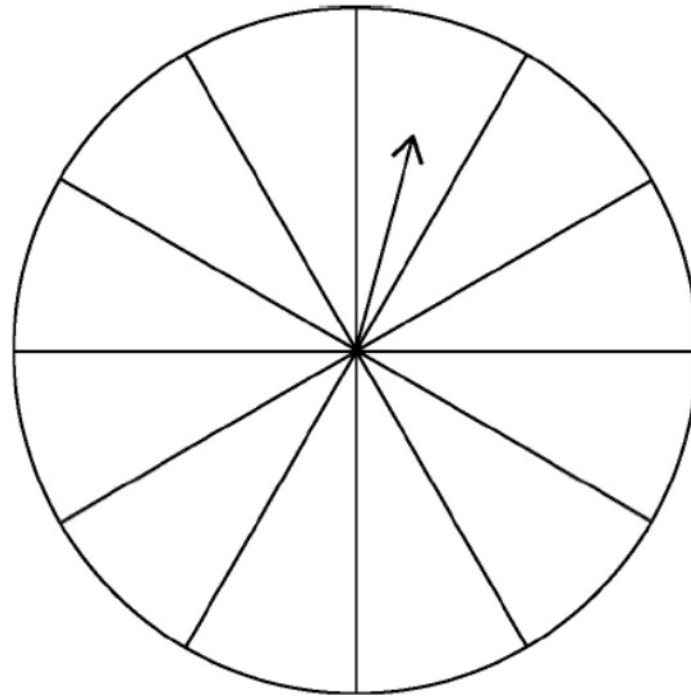
Video created by W Neill

Label each section A, B, C or D so that when the arrow is spun,

P21 the probability it lands on A is  $\frac{1}{6}$

P26 the probability it lands on B is **equal** to the probability it lands on C

R4a the probability it lands on D is **double** the probability it lands on A. [3 marks]



11 A fair spinner has 12 equal sections.

Video created by W Neill

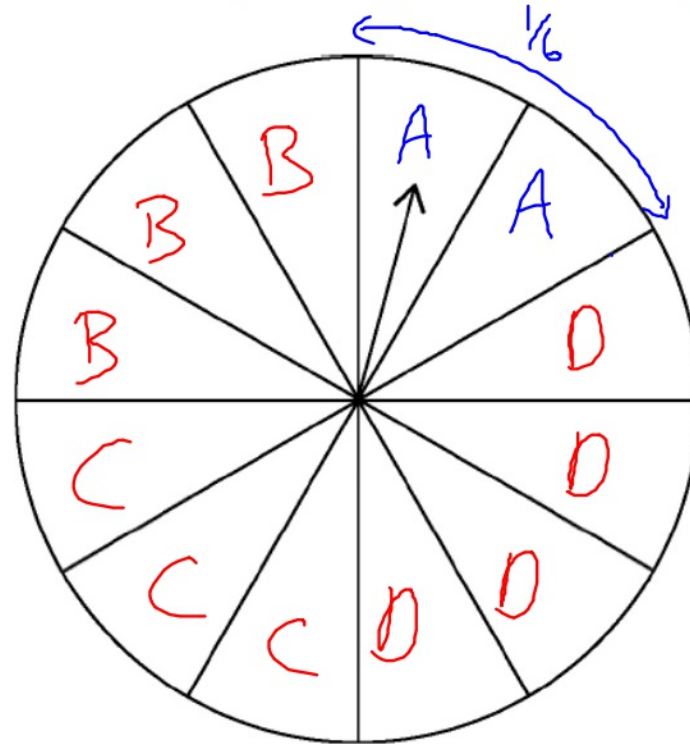
Label each section A, B, C or D so that when the arrow is spun,

P21 the probability it lands on A is  $\frac{1}{6}$

P26 the probability it lands on B is **equal** to the probability it lands on C

R4a the probability it lands on D is **double** the probability it lands on A.

[3 marks]



$\frac{1}{6}$  of 12 sections

= 2 = A

sections 4 = D



- 5** A coin lands on Tails 200 times.  
The relative frequency of Tails is 0.4  
Work out the number of times the coin was thrown.

**[2 marks]**

Answer \_\_\_\_\_

5

A coin lands on Tails 200 times.

P26

The relative frequency of Tails is 0.4

R4b

Work out the number of times the coin was thrown.

what is 1?

Total times

[2 marks]

$$0.4 = 200 \text{ times}$$

$$\begin{aligned} \div 4 \left( \frac{4}{10} = 200 \text{ times} \right) \div 4 \\ \rightarrow \frac{1}{10} = 50 \text{ times} \end{aligned}$$

$$\frac{10}{10} = 500 \text{ times}$$

Answer

500 ✓

**15** A biased dice is thrown.  
Here are the probabilities of each score.

**P26**

<b>Score</b>	1	2	3	4	5	6
<b>Probability</b>	0.25	0.05	0.15	0.05	0.3	0.2

The dice is thrown 200 times.

Work out the expected number of times the score will be odd.

**[3 marks]**

Answer \_\_\_\_\_

- 15 A biased dice is thrown.  
Here are the probabilities of each score.

P26

Score	1	2	3	4	5	6
Probability	0.25	0.05	0.15	0.05	0.3	0.2

The dice is thrown 200 times.

Work out the expected number of times the score will be odd.

[3 marks]

$$\begin{array}{r}
 0.25 \\
 0.15 \\
 0.30 \\
 \hline
 0.70
 \end{array}$$

$$\begin{array}{l}
 0.7 \times 200 \\
 \frac{7}{10} \text{ of } 200
 \end{array}$$

$$\begin{array}{l}
 70\% \text{ of } 200 \\
 10\% = 20 \\
 70\% = 140
 \end{array}$$

Answer

140 ✓

8 A coin is thrown 50 times.  
It lands on heads 31 times.

P26

(a) Write down the relative frequency it lands on heads.

[1 mark]

Answer \_\_\_\_\_

(b) Raj says,  
"The coin is biased towards heads."

Use the data to give a reason why he might be correct.

[1 mark]

---

---

8

A coin is thrown 50 times.

P26

It lands on heads 31 times.

→ probability

(a) Write down the relative frequency it lands on heads.

[1 mark]

Answer  $\frac{31}{50}$

(b) Raj says,

“The coin is biased towards heads.”

Use the data to give a reason why he might be correct.

[1 mark]

It has landed on head more often  
eg heads = 31    Tails = 19

✓



7

On three days, Ali throws darts at a target.  
Here are his results.

Video created by W Neill

	Number of throws	Number of hits	Number of misses
Monday	20	15	5
Tuesday	30	22	8
Wednesday	40	17	23
Total	90	54	36

7 (a) Work out **two** different estimates for the probability of Ali hitting the target. [2 marks]

P26

Answer \_\_\_\_\_ and \_\_\_\_\_

- 7 On three days, Ali throws darts at a target.  
Here are his results.

	Number of throws	Number of hits	Number of misses
Monday	20	15	5
Tuesday	30	22	8
Wednesday	40	17	23
<b>Total</b>	90	54	36

- (a) Work out **two** different estimates for the probability of Ali hitting the target. [2 marks]

P26

Answer  $\frac{\text{Monday}}{20} = \frac{15}{20}$  and  $\frac{\text{Total}}{90} = \frac{54}{90}$

**13** The probability of Heads when a biased coin is thrown is 0.6  
The coin is thrown 500 times.

**P26** Circle the expected number of Tails.

**[1 mark]**

20

200

250

300

**13** The probability of Heads when a biased coin is thrown is 0.6  
The coin is thrown 500 times.

**P26**

Circle the expected number of Tails.

— 0.4

**[1 mark]**

20

200

250

300

$$0.4 \text{ of } 500 = 200$$

X