| Name | Date started | Target end date |
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**WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack**

Foundation relative and experimental frequency: estimating probability from observed data as relative frequency = observed/trials, computing expected

REVISE
.wales

# F2.19 — Relative & experimental frequency

## *Spec 4.3.7, 4.3.8, 4.3.9, 4.3.10 — Unit 2 (no calculator)*

*Foundation relative and experimental frequency: estimating probability from observed data as relative frequency = observed/trials, computing expected numbers as N×P, and recognising that larger trial counts give closer agreement with the theoretical probability. Sourced from legacy WJEC GCSE Mathematics-Numeracy Foundation papers (3300U10/U20) and accessible content from Intermediate papers (3300U30/U40), organised for revision under the 2025 spec.*

2025 SPECIFICATION

### Estimated time for entire question pack: ~28 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (19 marks across 8 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

### ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification.

Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

### INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

*A calculator is **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

# Relative & experimental frequency — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

## Relative frequency 4.3.7

- Compute relative frequency from a frequency table.
- Use relative frequency as an estimate of probability.

## Expected number 4.3.8

- Use expected number = N×P to predict counts.
- Compare predicted and observed counts.

## Reliability of estimates 4.3.9

- Recognise that more trials give a more reliable estimate.
- Identify possible bias from a discrepancy between observed and theoretical probability.

## Exam strategy 4.3.10

- Non-calculator — keep fractions in lowest terms.
- Read carefully: relative frequency vs expected number vs raw count.



Crib sheet »

# Relative & experimental frequency in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

### Relative frequency

**Relative frequency = (number of times it happened) ÷ (number of trials).**
Use as an estimate of probability when the theoretical value is unknown.

### Expected number

Over *N* trials, expected number = ***N*×P**.
Use the best probability you have — theoretical if known, otherwise relative frequency.

### Bigger N, better estimate

Relative frequency tends towards theoretical probability as the number of trials grows.
One or two trials is not enough — expect short-run variation.

### Fairness check

Compare relative frequency with the theoretical value (e.g. 1/6 for a die).
Large gap with many trials ⇒ the die or spinner may be biased.

### Common traps

- Confusing "expected number" with the value that actually occurred.
- Quoting a theoretical probability when only experimental data is available.
- Forgetting to multiply by N when asked "how many would you expect".

### Recording

Always state the answer as a probability between 0 and 1, then convert to a fraction or percentage if asked.

Examiner only

**6.** *(a)* Write down the first three terms of the sequence whose $n$th term is given by $2n - 5$. [2]

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The first three terms are ..... , ..... and .....

*(b)* Write down an expression for the $n$th term of the following sequence. [2]

7, 11, 15, 19, ...

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Examiner only

**18.** A dice is thrown 50 times.
The number shown on the dice is recorded after each throw.
The table below shows the results recorded.

| Number shown on dice | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Frequency | 9 | 7 | 8 | 7 | 6 | 13 |

*(a)* The relative frequency of throwing a 1 was calculated as $\frac{9}{50} = 0{\cdot}18$.

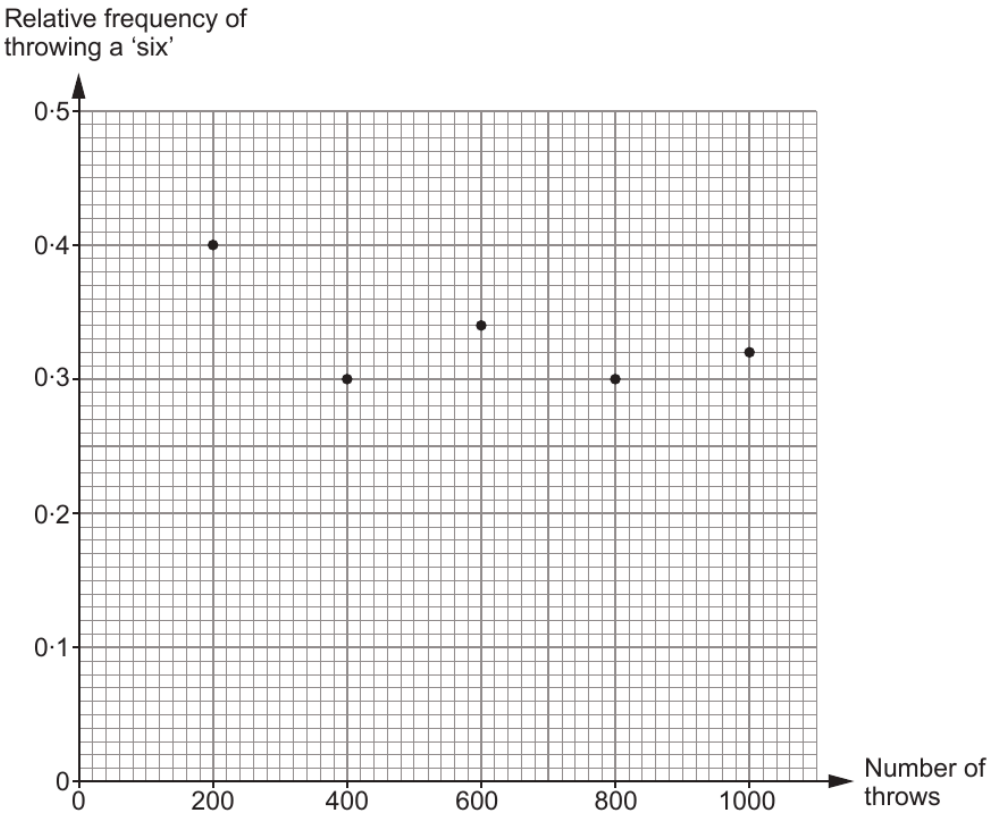
What was the relative frequency of throwing a 6?
Give your answer as a decimal. [1]

*(b)* The number 4 was thrown 7 times in the first 50 throws.
Using **this fact**, calculate how many times you would expect a 4 to be thrown when this dice is thrown 3000 times. [2]

*(c)* How many times would you expect a 4 to be thrown when a **fair** dice is thrown 3000 times? [2]

Examiner only

**17.** A biased six-sided dice is thrown a total of 1000 times.
The graph shows the relative frequency of throwing a 'six' after 200, 400, 600, 800 and 1000 throws.




*(a)* Which of the following is the best estimate for the probability of throwing a 'six' with this dice?
Circle your answer. [1]

0·4 0·3 0·5 0·32 0·34

*(b)* (i) How many 'sixes' were thrown in the first 600 throws of the dice? [2]

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(ii) How many **more** 'sixes' were recorded for these 600 throws than you would expect when a **fair** six-sided dice is thrown 600 times? [2]

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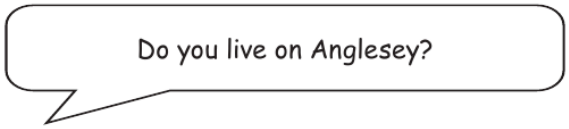
Examiner only

**15.** The Anglesey Show is a two-day event held every August.

*(a)* On the first day, a random sample of 2000 visitors at the show were asked:




640 of them answered 'Yes'.

What was the relative frequency of those who answered 'Yes'?
Give your answer as a decimal. [1]

*(b)* On the second day a random sample of 3000 visitors at the show were asked the same question.
The relative frequency of those who answered 'Yes' on this day was 0·42.

Calculate the relative frequency of those who said they lived on Anglesey when the samples for **both** days were combined.
Give your answer as a decimal. [4]

*(c)* Which of the following is most likely to give the best estimate for the relative frequency of visitors to the show living on Anglesey?
Circle your answer.

| Your answer to part *(a)* | 0·42 | Your answer to part *(b)* |
|---|---|---|

You **must** give an explanation for your choice. [1]

Examiner only

**11.** *(a)* A biased coin is thrown 100 times.
The number of heads thrown is recorded after 20 throws, 40 throws, 60 throws, 80 throws and 100 throws.

Some of the results are recorded in the relative frequency table below.

Complete the table. [2]

| Number of throws | 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|
| Number of heads | 11 | 18 | 24 | 30 | |
| Relative frequency | 0·55 | 0·45 | | 0·375 | 0·37 |

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Examiner only

*(b)*

5 7 8 11 14 17 17 19 26 28

The sum of the ten numbers shown above is 152.
The numbers are displayed in the grouped frequency table shown below.

| Number | 0 - 9 | 10 - 19 | 20 - 29 |
|---|---|---|---|
| Frequency | 3 | 5 | 2 |

Consider the estimated mean calculated from the table and the actual mean of the ten numbers.
Calculate the difference between these two values.
You must show all your working. [5]

Examiner only

**10.** *(a)* Caryl has two fair dice.

Dice A is a cube. It shows the numbers 1 to 6.
Dice B is a tetrahedron. It shows the numbers 1 to 4.

Caryl throws both dice.

What is the probability that she throws a 5 on dice A and a 3 on dice B? [2]

*(b)* Asif has a biased four-sided dice.
The dice shows the numbers 10, 20, 30 and 40.

Asif throws the dice once.

The table below gives the probability of obtaining each number.

| Number | 10 | 20 | 30 | 40 |
|---|---|---|---|---|
| Probability | $\frac{1}{2}$ | $\frac{1}{5}$ | $\frac{1}{5}$ | $\frac{1}{10}$ |

What is the probability that Asif throws a 30 or a 40? [2]

Examiner only

**12.** Samira has a dice. Its faces are numbered 1 to 6.
She wants to know whether her dice is biased or not.
Samira rolled this dice 300 times.
Her results are shown in the table below.

| Number shown on dice | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Frequency | 65 | 40 | 52 | 10 | 23 | 110 |

(a) The relative frequency of throwing a 5 is $\frac{23}{300}$.

What is the relative frequency of throwing a 2?
Give your answer as a fraction in its simplest form. [2]

(b) Do the results in the table suggest that Samira's dice is biased?

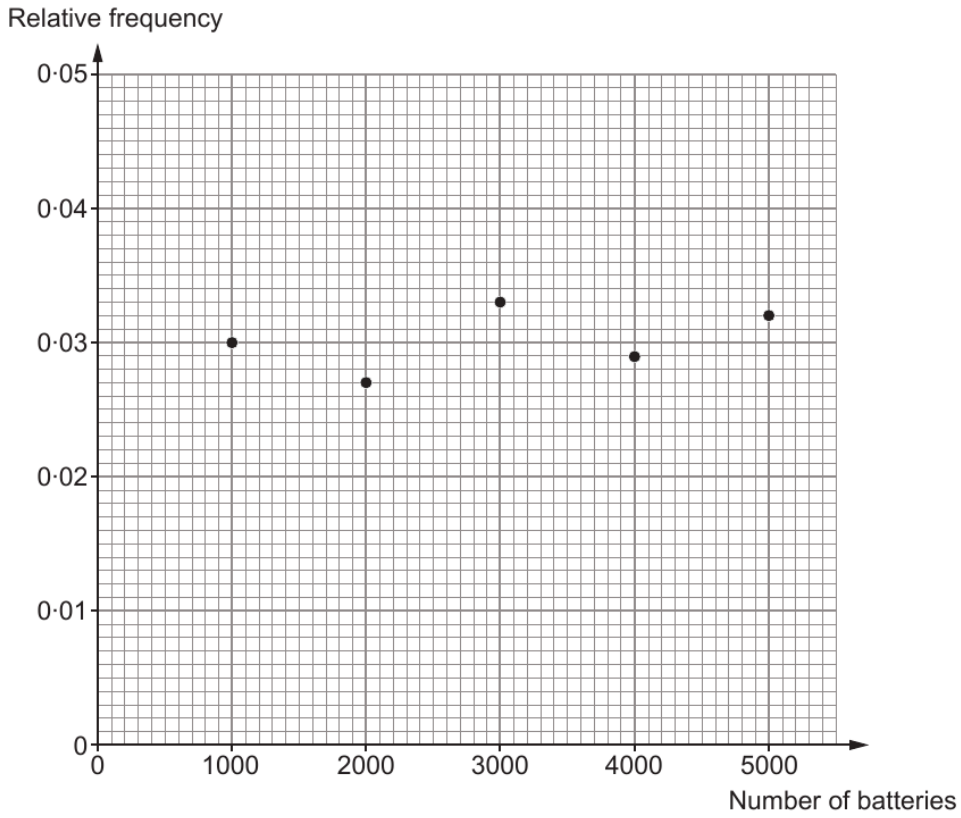
Yes ☐ No ☐

Explain your decision. [1]

(c) This dice is thrown 2400 times.
**Use Samira's results** to calculate the number of times you would expect a 6 to be thrown. [2]

Examiner only

**16.** PowrUp is a company that makes batteries.
The quality of the batteries is tested regularly.
PowrUp calculates the relative frequency of faulty batteries after checking a total of 1000, 2000, 3000, 4000 and 5000 batteries.
The results are plotted on the graph below.




(a) One battery is selected at random.
Write down the best estimate for the probability that this battery will be faulty.
You must give a reason for your choice. [2]

Probability = .....

Reason:

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Examiner only

(b) It costs the company 2·6p to dispose of each of the faulty batteries.
How much will it cost the company to dispose of all the faulty batteries after testing the first 3000 batteries?
You must show all your working. [3]