

5.1.2 Experimental Probability

Name: _____ Class: _____ Date: _____

KEY WORDS relative frequency

<!-- Session 2 native-skill companion -->

Objective

Practise experimental probability within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Experimental probability, fairness and expected outcomes · Foundation

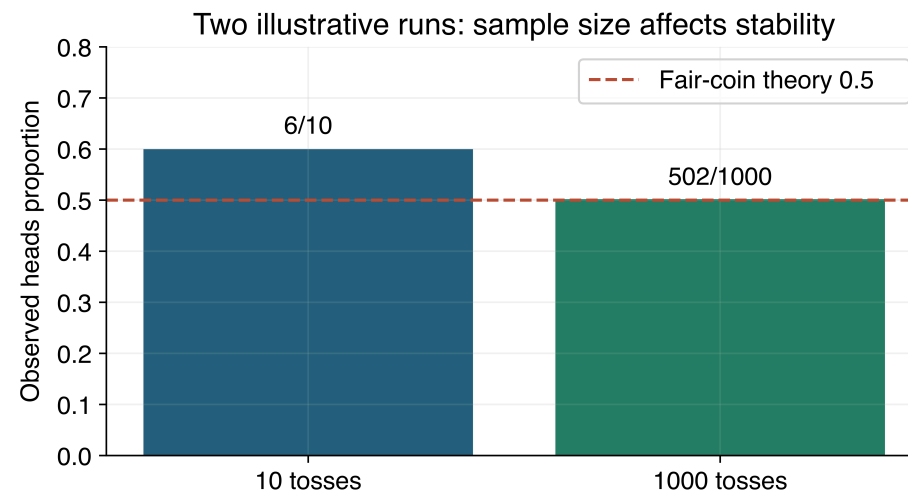
Record each trial consistently and total the counts. Relative frequency estimates probability as outcome frequency/trials. For a stated probability p , expected count in n future trials is np ; it is a long-run average, not a guarantee. Unbiased trials with larger samples usually give more stable estimates, but cannot force exact agreement with theory. Probabilities lie from 0 to 1 and a mutually exclusive exhaustive list sums to 1.

$$\hat{p} = \frac{f}{n}, \quad E = np$$

A spinner lands red 18 times in 60 spins, giving estimated $P(\text{red}) = 18/60 = 0.3 = 30\%$. Using this estimate predicts $0.3 \times 200 = 60$ red results in 200 future spins. If red, blue and green are exhaustive with probabilities 0.3, 0.45 and p , then $p = 1 - 0.75 = 0.25$. A fair coin has theoretical $P(\text{head}) = 0.5$; 100 tosses give expected heads 50, but 48 or 54 is possible. An experiment with 6 heads in 10 tosses estimates 0.6; one with 502 heads in 1000 estimates 0.502. These illustrative runs are not proof that error falls at every stage. Spin using the same method and record all results rather than stopping when a favourite outcome appears.

A larger biased sample can still be misleading. Expected does not mean certain. Mutually exclusive events cannot happen together; if categories overlap, do not simply add their probabilities as separate outcomes.

AQA P1–P5 uses frequency tables/trees, randomness/fairness, expected counts, the probability scale and empirical/theoretical comparison. State whether a value is observed, estimated or theoretical.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find red relative frequency for 18 red results in 60 trials.

2.2 (Foundation) Use $p = 0.3$ to estimate red count in 200 trials.

2.3 (Foundation) Red, blue, green probabilities are 0.3, 0.45, p . Find p .

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Expected count 50 means exactly 50 successes must occur.
