5.1 Probability basics and tables

Name: _____ Class: _____ Date: _____ **Total: 23 marks**

KEY WORDS relative frequency • intersection

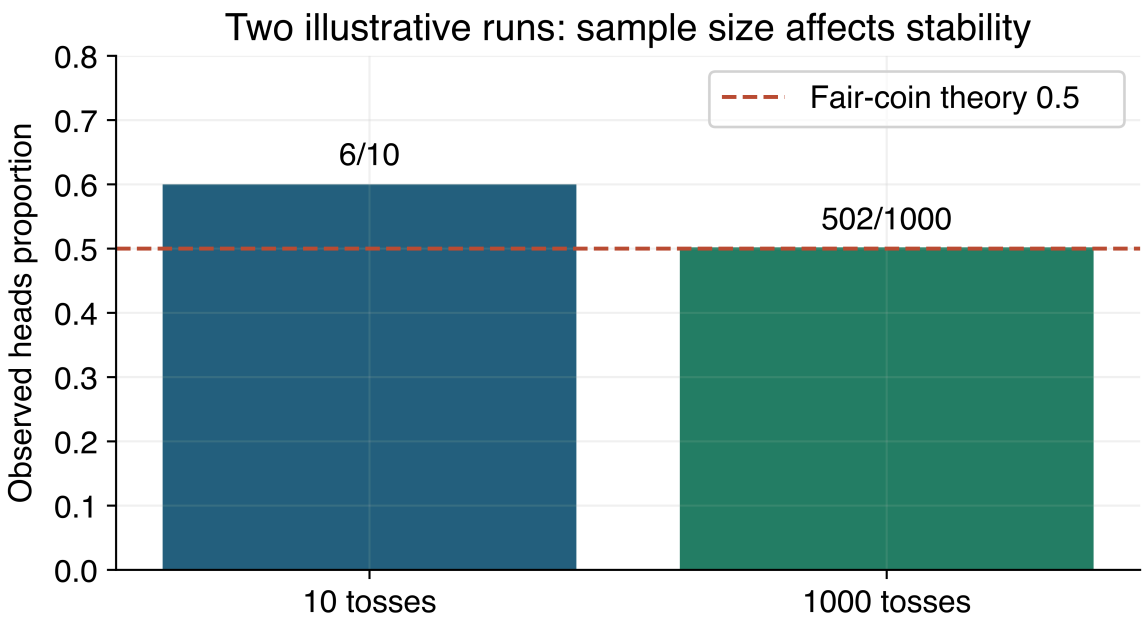
Probability basics and tables

Objective

Record and analyse outcome frequencies with tables and frequency trees, use the probability scale, expected outcomes and exhaustive sums, compare relative frequency with theory, and enumerate sets with grids and Venn diagrams (rows P1–P6).

1 Key knowledge and worked examples

Probability basics. Relative frequency = times occurred ÷ trials; expected count $= n \times p$. Probabilities lie on the 0-to-1 scale; an exhaustive set of mutually exclusive outcomes sums to 1, so a missing probability is $1 -$ (sum of the rest). Equally likely outcomes: probability = favourable ÷ total, listed systematically in tables, grids or Venn diagrams.



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

2 Practice

2.1 Write 0.35 as a fraction in its simplest form. [1]

2.2 Red, blue and green are exhaustive, mutually exclusive outcomes with $P(\text{red}) = 0.3$ and $P(\text{blue}) = 0.45$. Find $P(\text{green})$. [2]

2.3 A spinner lands red 18 times in 60 spins. (a) Estimate $P(\text{red})$. (b) How many reds are expected in 200 future spins? [2]

2.4 A fair coin and a fair die are rolled together. List the sample space and find $P(\text{head and even})$. [3]

2.5 Two fair dice are rolled. Find $P(\text{total is } 7)$. [2]

2.6 In a class of 30, 18 cycle, 12 swim and 7 do both. Find the number who do at least one, and the number who do neither. [3]

3 Exam-style questions

3.1 *(June 2024 2H Q7, adapted.)* Four students each flip a coin a different number of times; one obtains 52 heads in 200 flips. Whose result is the best estimate of $P(\text{head})$, and why? [2]

3.2 *(June 2024 2H Q4(b), adapted.)* A spinner's claimed outcome probabilities are 0.1, 0.5, 0.2 and 0.3. Give one reason why there must be a mistake. [2]

3.3 *(June 2024 3H Q10, adapted.)* The probability that it rains on a day is 0.38. Of 150 days, how many are expected to be dry? [3]

3.4 *(June 2024 3H Q22, adapted.)* A code uses four DIFFERENT digits chosen from five digits. Work out the number of possible codes. [2]

3.5 *(June 2024 2H Q9, adapted.)* Two sets A and B are drawn as a Venn diagram inside a rectangle. Describe, in words, exactly which region must be shaded to show "both A and B". [1]

Solutions

2.1 $0.35 = \frac{35}{100} = \frac{7}{20}$.

2.2 $1 - 0.3 - 0.45 = 0.25$.

2.3 (a) $\frac{18}{60} = 0.3$. (b) $200 \times 0.3 = 60$ reds.

2.4 Twelve ordered outcomes H1–H6 and T1–T6; head-and-even has three (H2, H4, H6): $P = \frac{3}{12} = \frac{1}{4}$.

2.5 Six pairs sum to 7 – (1,6), (2,5), (3,4), (4,3), (5,2), (6,1) – of 36: $P = \frac{6}{36} = \frac{1}{6}$.

2.6 Cycling only $18 - 7 = 11$; swimming only $12 - 7 = 5$; at least one $= 11 + 7 + 5 = 23$; neither $= 30 - 23 = 7$.

3.1 $\frac{52}{200}$ – it uses the largest number of flips, so it is the most stable estimate.

3.2 The probabilities sum to $0.1 + 0.5 + 0.2 + 0.3 = 1.1$, not 1 – an exhaustive set of mutually exclusive outcomes must sum to 1.

3.3 $P(\text{dry}) = 1 - 0.38 = 0.62$; expected $= 0.62 \times 150 = 93$ days.

3.4 $5 \times 4 \times 3 \times 2 = 120$ codes – one fewer choice at each stage because digits cannot repeat.

3.5 The intersection – the overlap lens of the two circles only.

Local review guidance: probability values justified by trials or by the sum-to-1 property; sample spaces listed before dividing counts; expected counts stated as whole numbers with the $n \times p$ route shown. This is authored classroom guidance.