Larger simulations and variation

6 questions | 11 marks

Equivalent correct methods earn the corresponding marks.

1. For the supplied 100-trial simulation, check that heads and tails add to the trial count. [1 mark]

Supplied simulated fair-coin results

Trials	Heads	Tails
20	14	6
100	54	46
500	260	240

The two outcomes account for every trial.

Answer: They do: $54 + 46 = 100$.

2. Find the heads percentage in the 500-trial simulation. [2 marks]

Supplied simulated fair-coin results

Trials	Heads	Tails
20	14	6
100	54	46
500	260	240

$\frac{260}{500} = \frac{52}{100} = 52\%$.

Answer: 52%.

3. Which supplied simulation has a heads relative frequency closest to 50%? [2 marks]

Supplied simulated fair-coin results

Trials	Heads	Tails
20	14	6
100	54	46
500	260	240

Their heads percentages are 70%, 54% and 52%.

Their distances from 50% are 20, 4 and 2 percentage points.

Answer: The 500-trial simulation.

4. A simulation cycles heads, tails, heads, tails without any random choice. Why is that unsuitable for demonstrating random variation? [2 marks]

The rule forces balance rather than modelling independent random choices.

It cannot show the variation of a genuine chance experiment.

Answer: The outcomes are fixed in advance.

5. Suggest a fair-die rule to simulate an event with probability $\frac{1}{3}$. [2 marks]

Two of six equally likely outcomes give $\frac{2}{6} = \frac{1}{3}$.

Answer: For example, success on faces 1 or 2; no success on 3, 4, 5 or 6.

6. A larger experiment records 51% successes after a smaller experiment recorded 50%. Does this contradict the idea that larger experiments tend to be more stable? [2 marks]

Tend to is not a guarantee for each pair of experiments.

Random variation can move a result slightly away from the prediction.

Answer: No.