Simulations of simple versus related compound events

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. Why is 0-5 = H and 6-9 = T not a fair-coin model? [2 marks]

The groups have unequal sizes.

Answer: H has chance 6/10 and T 4/10.

2. Map 0-4 to H and 5-9 to T. Convert 82, 16, 73, 40 into outcomes. [2 marks]

Classify each digit, keeping its order.

Answer: TH, HT, TH, HH.

3. The simulated outcomes are TH, HT, TH, HH. Estimate P(exactly one head). [2 marks]

TH, HT and TH are successes.

Answer: 3/4

4. Give a random-digit model for success probability 0.3. [2 marks]

Three of ten equally likely digits mean success.

Answer: For example, 0-2 = success and 3-9 = failure.

5. A without-replacement simulation selects the same labelled counter twice in a trial. What needs fixing? [2 marks]

A physical counter cannot be selected while it is kept out.

Answer: Remove the first selected label before selecting the second.

6. An event occurs 198 times in 500 correctly modelled trials. Give an estimate and one limitation. [3 marks]

198/500 = 0.396.

More trials help stability, but the model must also fit the real rules.

Answer: 0.396; a finite simulation still varies randomly.