Digital simulations and explaining differences from predictions

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Which rule models a fair die: =RANDBETWEEN(0,6) or =RANDBETWEEN(1,6)? Explain. [2 marks]

The required outcomes are exactly 1 to 6.

The other rule adds a seventh outcome, 0.

Answer: =RANDBETWEEN(1,6).

2. Describe a random-integer model for a fair coin using integers 1 and 2. [2 marks]

Each integer has chance 1/2.

Each recorded outcome matches one integer.

Answer: Choose 1 or 2 equally; use 1 for heads and 2 for tails.

3. Use the supplied table. Find the relative frequency of 6 in the 60-trial run. [2 marks]

Supplied example die-simulation records; each row is a separate run

Trials	1	2	3	4	5	6
60	7	12	9	13	8	11
600	101	98	95	107	103	96

The six frequency is 11.

Divide by 60; the decimal is rounded to three decimal places.

Answer: $11/60 \approx 0.183$.

4. For the 600-trial run, state observed and expected six counts, and their difference. [3 marks]

Supplied example die-simulation records; each row is a separate run

Trials	1	2	3	4	5	6
60	7	12	9	13	8	11
600	101	98	95	107	103	96

Expected six count: $600 \times 1/6 = 100$.

Read the actual count 96.

$100 - 96 = 4$.

Answer: 96 observed; 100 expected; 4 fewer than expected.

5. A model chooses 1 to 10 equally and labels 1 to 4 as green. Find green chance and expected greens in 50 trials. [3 marks]

Four of ten integers give green.

$50 \times 2/5 = 20$.

Answer: Chance $4/10 = 2/5$; expected greens 20.

6. A simulation estimate is 0.6 for an event with theoretical chance 0.5. Must its coding be wrong? State one check and one alternative explanation. [3 marks]

A correct model can give an unbalanced finite record.

Check that outcomes are assigned in the intended proportions.

Do not adjust recorded data to force an expected fraction.

Answer: Not necessarily. Check the random-outcome mapping; random variation can explain the difference.