Probability - Practice test 1

16 questions | 38 marks | 55 minutes

Build from sample spaces to replacement models, overlapping events and trial evidence.

Equivalent correct methods earn the corresponding marks.

1. A fair die is rolled. Find $P(\text{number greater than } 4)$. [1 mark]

5 and 6 are favourable among six: $\frac{2}{6} = \frac{1}{3}$.

Answer: $\frac{1}{3}$

2. List all ordered outcomes for two coin tosses. [1 mark]

List both second results for each first result.

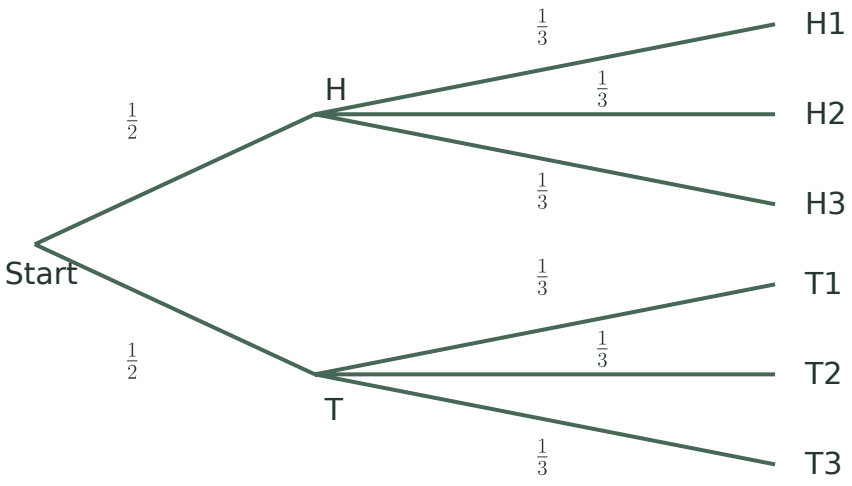
Answer: HH, HT, TH, TT.

3. Two fair independent coins are tossed. Find $P(\text{exactly one head})$. [2 marks]

HT and TH are two of four equally likely outcomes.

Answer: $\frac{1}{2}$

4. A fair coin is followed by an independent equal spinner labelled 1, 2, 3. Find $P(\text{heads and } 2)$. [2 marks]



Follow H then 2: $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$.

Answer: $\frac{1}{6}$

5. Two fair independent dice are rolled. Find $P(\text{sum } 8)$. [3 marks]

Favourable ordered pairs: $(2,6), (3,5), (4,4), (5,3), (6,2)$.

Five of 36 outcomes are favourable.

Answer: $\frac{5}{36}$

6. An equal spinner labelled A, B, C is spun twice independently. Find $P(\text{different letters})$. [2 marks]

There are nine outcomes; AA, BB, CC are the three same-letter results.

Six are different, so $\frac{6}{9} = \frac{2}{3}$.

Answer: $\frac{2}{3}$

7. A bag has 4 red and 1 blue counter. Draw twice at random, replacing and mixing after the first draw. Find $P(\text{two reds})$. [2 marks]

$\frac{4}{5} \times \frac{4}{5} = \frac{16}{25}$.

Answer: $\frac{16}{25}$

8. A bag has 4 red and 1 blue counter. Draw twice at random without replacement. Find $P(\text{red then blue})$. [2 marks]

$\frac{4}{5} \times \frac{1}{4} = \frac{1}{5}$.

Answer: $\frac{1}{5}$

9. A bag has 4 red and 1 blue counter. Draw twice at random without replacement. Find $P(\text{one counter of each colour})$. [3 marks]

RB has chance $\frac{1}{5}$.

BR has chance $\frac{1}{5} \times \frac{4}{4} = \frac{1}{5}$.

Add the two disjoint orders.

Answer: $\frac{2}{5}$

10. Of 24 students, 14 attend art, 10 attend music and 4 attend both. [4 marks]

(a) How many attend at least one of the two activities? [2 marks]

$14 + 10 - 4 = 20$.

Answer: 20

(b) Find the probability that a randomly chosen student attends neither. [2 marks]

$24 - 20 = 4$ attend neither; $\frac{4}{24} = \frac{1}{6}$.

Answer: $\frac{1}{6}$

11. A fair die is rolled. Find $P(\text{even or prime})$. [3 marks]

Even: $\{2, 4, 6\}$; prime: $\{2, 3, 5\}$.

The union is $\{2, 3, 4, 5, 6\}$; count 2 only once.

Answer: $\frac{5}{6}$

12. An event occurs 36 times in 120 trials. [3 marks]

(a) Find its relative frequency. [1 mark]

$\frac{36}{120} = 0.30$.

Answer: 0.30

(b) Use this estimate to predict its count in 180 similar trials. [2 marks]

$180 \times 0.30 = 54$.

Answer: About 54.

13. Give a fair random-digit mapping, using digits 0-9, to simulate a fair coin. [2 marks]

Each outcome receives five of the ten equally likely digits.

Answer: For example, $0\text{–}4 = \text{heads}$ and $5\text{–}9 = \text{tails}$.

14. Use $0\text{–}4 = \text{H}$ and $5\text{–}9 = \text{T}$. Read pairs 03, 57, 28, 64, 91. Find the relative frequency of exactly one head. [3 marks]

The outcomes are HH, TT, HT, TH, TH.

Three of five have exactly one head.

Answer: $\frac{3}{5}$

15. An event has probability $\frac{1}{4}$. Explain whether 80 independent trials must contain exactly 20 successes. [2 marks]

$80 \times \frac{1}{4} = 20$ is an average prediction.

Random variation can give other counts.

Answer: No. Twenty is the expected count, not a guaranteed count.

16. A fair independent coin gives four tails. A student says heads is now more likely. Assess the claim. [3 marks]

Past results do not alter the next independent toss.

There is no balancing rule requiring a head next.

Answer: The claim is false; the next-head probability is still $\frac{1}{2}$.