Marking guide | Probability

Probability - Practice test 2

16 questions | 39 marks | 55 minutes

A fresh mix of counting, complementary events, compound draws, tables and simulation design.

Equivalent correct methods earn the corresponding marks.

1. A fair die is rolled. Find $P(\text{not a } 4)$. [1 mark]

Five of the six outcomes are not 4.

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

2. An equal three-section spinner is labelled R1, R2, B. It is spun twice independently. Find $P(\text{red both times})$. [2 marks]

Each spin has red probability $\frac{2}{3}$.

$\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$.

Answer: $\frac{4}{9}$

3. A random code uses A, B or C followed by 1, 2, 3 or 4, with all 12 codes equally likely. Find $P(\text{letter C and digit greater than } 2)$. [2 marks]

C3 and C4 are two of twelve outcomes.

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

4. Three fair independent coins are tossed. Find $P(\text{exactly two heads})$. [3 marks]

The eight outcomes are HHH,HHT,HTH,HTT,THH,THT,TTH,TTT.

HHT, HTH and THH are favourable.

Answer: $\frac{3}{8}$

5. Two fair independent dice are rolled. Find $P(\text{an odd product})$. [2 marks]

Both dice must be odd.

Each die has odd probability $\frac{3}{6}$, so $\frac{3}{6} \times \frac{3}{6} = \frac{1}{4}$.

Answer: $\frac{1}{4}$

6. Two fair independent dice are rolled. Find $P(\text{sum no greater than } 4)$. [3 marks]

Sum 2 has one ordered outcome, sum 3 has two and sum 4 has three.

$\frac{6}{36} = \frac{1}{6}$.

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

7. A bag has 2 green and 3 yellow counters. Draw twice at random, replacing and mixing after the first draw. Find $P(\text{different colours})$. [3 marks]

GY: $\frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$.

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Add to obtain $\frac{12}{25}$.

Answer: $\frac{12}{25}$

8. A bag has 2 green and 3 yellow counters. Draw twice at random without replacement. Find $P(\text{two yellows})$. [2 marks]

$\frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$.

Answer: $\frac{3}{10}$

9. Select two different cards at random in order from cards 1,2,3,4, with each remaining card equally likely at each draw. Find $P(\text{sum } 5)$. [3 marks]

There are $4 \times 3 = 12$ equally likely ordered pairs.

14,41,23,32 are favourable: $\frac{4}{12} = \frac{1}{3}$.

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

10. One student is chosen at random from the 30 students in the supplied table. [3 marks]

Thirty students' weekly activities

Bike use / dog ownership	Keeps a dog	Does not keep a dog
Rides a bike	6	9
Does not ride a bike	10	5

(a) Find $P(\text{rides a bike or keeps a dog})$, including students who do both. [2 marks]

There are $6 + 9 + 10 = 25$ in at least one category.

$\frac{25}{30} = \frac{5}{6}$.

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

(b) Find $P(\text{neither rides a bike nor keeps a dog})$. [1 mark]

The bottom-right cell has 5; $\frac{5}{30} = \frac{1}{6}$.

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

11. In a group of 25, 10 play chess, 11 play soccer and 4 play both. One student is chosen at random. Find $P(\text{exactly one of these activities})$. [2 marks]

Chess only: $10 - 4 = 6$; soccer only: $11 - 4 = 7$.

$6 + 7 = 13$ meet exactly one condition.

Answer: $\frac{13}{25}$

12. The same event occurs 30 times in 100 trials and 42 times in another 200 trials. Find the combined relative frequency. [3 marks]

$30 + 42 = 72$ successes in $100 + 200 = 300$ trials.

$\frac{72}{300} = 0.24$.

Answer: 0.24

13. Describe a fair die simulation using equally likely random digits 0-9. [3 marks]

Each die face receives one equally likely accepted digit.

Rejecting the other digits keeps the six faces equally likely.

Answer: For digits 0-5, use $\text{face} = \text{digit} + 1$. Reject 6-9 and draw again.

14. A without-replacement simulation selects two independent colours using fixed first-draw probabilities. Explain the problem. [2 marks]

Fixed independent probabilities model replacement.

Remove the first selected label within each trial.

Answer: The second draw should use the remaining collection, so its probabilities can change.

15. A coin gives 10 heads in 20 tosses. Does this prove the coin fair? Explain. [2 marks]

A biased coin could also produce ten heads in a short run.

Use more controlled observations and consider variation.

Answer: No. A short sample matching the fair expectation is not proof.

16. Two fair independent dice are rolled. Find $P(\text{at least one } 6)$. [3 marks]

$P(\text{no } 6)$ is $\frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$.

Subtract from 1: $1 - \frac{25}{36} = \frac{11}{36}$.

Answer: $\frac{11}{36}$