Year 7 Probability topic test

15 questions | 39 marks | 45 minutes

A progressive by-hand paper on single-stage chance, expected frequencies, experimental records and simulation interpretation. All required data are supplied.

Equivalent correct methods earn the corresponding marks.

1. List the ordinary two-outcome sample space for one coin toss. [1 mark]

The recorded upper face is heads or tails.

Answer: $\{H, T\}$.

2. An ordinary six-sided die is rolled. Classify “a result greater than 6” as impossible, possible or certain. [1 mark]

No die face number is greater than 6.

Answer: Impossible.

3. A fair die is rolled. Find the probability of an even result. [2 marks]

Even results are 2, 4 and 6.

$\frac{3}{6} = \frac{1}{2}$.

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

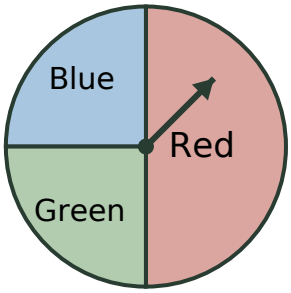
4. One card is chosen at random from cards numbered 1 to 15. Find the chance of a multiple of 5. [2 marks]

Favourable numbers are 5, 10 and 15.

$\frac{3}{15} = \frac{1}{5}$.

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

5. Use the ideal spinner shown. Find the probability of blue and explain why it is not $\frac{1}{3}$. [2 marks]



Red: one half

Blue: one quarter

Green: one quarter

Each direction is equally likely.

The three colour regions have different sizes.

Use the fraction of the circle, not the number of colour labels.

Answer: $\frac{1}{4}$; blue occupies a quarter of the circle.

6. A bag holds 5 red, 2 blue and 5 green equal-size counters. A counter is chosen at random. Find the chance that it is not red. [3 marks]

Not red: $2+5=7$ counters.

Total: $5+2+5=12$.

Use $\frac{7}{12}$.

Answer: $\frac{7}{12}$.

7. An event has chance $\frac{1}{5}$. Find its expected frequency in 60 trials. [2 marks]

$60\times\frac{1}{5}=12$.

Answer: 12.

8. An event has chance $\frac{2}{5}$. Its expected frequency in 8 trials is 3.2. Explain why this is valid even though an actual count cannot include part of a result. [2 marks]

$8 \times \frac{2}{5} = 3.2$.

Each actual count is whole, but an average can lie between whole numbers.

Answer: Expected frequency is an average prediction across comparable runs.

9. Heads occurred 21 times in 35 tosses. Find its relative frequency as a simplified fraction. [2 marks]

Use $\frac{21}{35}$.

Divide both parts by 7.

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

10. Use the supplied results. Find the total trials and the relative frequency of yellow. [3 marks]

Example spinner results

Colour	Frequency
Red	13
Blue	11
Yellow	16

Total trials: $13 + 11 + 16 = 40$.

Yellow frequency is 16.

Calculate $\frac{16}{40}$.

Answer: 40 trials; $\frac{16}{40} = \frac{2}{5} = 0.4$.

11. A coin gave 25 heads in 36 tosses. A student says this proves it is unfair. Explain the problem with that conclusion. [3 marks]

The fair-model expectation is 18 heads, but actual counts vary.

More trials can give better evidence; expectation is not a guarantee.

Answer: A small unbalanced record does not prove unfairness.

12. Comparable experiments record 9 successes in 15 trials and 18 in 35 trials. Find their combined relative frequency. [3 marks]

Successes: $9 + 18 = 27$.

Trials: $15 + 35 = 50$.

Divide pooled counts, not an unweighted average of the two proportions.

Answer: $\frac{27}{50} = 0.54$.

13. Plan 50 random draws from a bag with 4 red and 6 blue equal-size counters. State how you keep the chances unchanged and how you record the results. [3 marks]

Replacement restores the original contents.

Mixing and blind selection maintain the random procedure.

All frequencies should total 50.

Answer: Choose without looking; record each colour; replace and remix after every draw; stop at 50 valid draws.

14. Use the supplied die-simulation records. Answer each part. [5 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

(a) Find the prime-result relative frequency in the 60-trial run. [2 marks]

The prime faces are 2, 3 and 5.

Their count is $12 + 9 + 8 = 29$; divide by 60.

Answer: $\frac{29}{60}$.

(b) For 600 fair-die trials, find the expected prime count and compare it with the observed count. [3 marks]

Three of six faces are prime, so the chance is $\frac{1}{2}$.

$600 \times \frac{1}{2} = 300$.

Observed prime count: $98 + 95 + 103 = 296$.

Answer: 300 expected; 296 observed, four fewer than expected.

15. A fair coin will be tossed 80 times. After 40 tosses, 15 heads were recorded. Answer each part. [5 marks]

(a) How many heads were expected in the first 40 tosses, and how far below that is the observed count? [2 marks]

$40 \times \frac{1}{2} = 20$.

$20 - 15 = 5$.

Answer: 20 expected; 5 below expectation.

(b) How many heads are expected in the next 40 tosses? Explain why the coin does not need to catch up. [3 marks]

The fair chance remains $\frac{1}{2}$ on each later toss.

$40 \times \frac{1}{2} = 20$.

Future random results are not changed to repair a past imbalance.

Answer: 20 heads are expected; the earlier shortfall does not force extra future heads.