

Exercise walk-through

5.1.2

Experimental Probability

AQA · GCSE · Mathematics

14. Experimental probability, fairness and expected outcomes · Foundation

Experimental probability, fairness and expected outcomes · Foundation

Record each trial consistently and total the counts. Relative frequency estimates probability as outcome frequency/trials. For a stated probability p , expected count in n future trials is np ; it is a long-run average, not a guarantee. Unbiased trials with larger samples usually give more stable estimates, but cannot force exact agreement with theory. Probabilities lie from 0 to 1 and a mutually exclusive exhaustive list sums to 1.

16. Experimental probability, fairness and expected outcomes · Foundation

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A spinner lands red 18 times in 60 spins, giving estimated $P(\text{red}) = 18/60 = 0.3 = 30\%$. Using this estimate predicts $0.3 \times 200 = 60$ red results in 200 future spins. If red, blue and green are exhaustive with probabilities 0.3, 0.45 and p , then $p = 1 - 0.75 = 0.25$. A fair coin has theoretical $P(\text{head}) = 0.5$; 100 tosses give expected heads 50, but 48 or 54 is possible. An experiment with 6 heads in 10 tosses estimates 0.6; one with 502 heads in 1000 estimates 0.502. These illustrative runs are not proof that error falls at every stage.

23. Systematic possibilities and equally likely outcomes · Foundation

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A coin and a fair die have 12 equally likely ordered outcomes: H1 to H6 and T1 to T6. Heads with an even die result has three outcomes, so probability is $3/12=1/4$. Two dice have 36 ordered pairs. Total seven arises from (1,6),(2,5),(3,4),(4,3),(5,2),(6,1), so probability is $6/36=1/6$. A double has six outcomes and probability $1/6$. Total at least eleven occurs in (5,6),(6,5),(6,6), giving $1/12$. With a spinner divided into unequal sectors, the named colours are not automatically equally likely; use the sector proportions or a justified experimental estimate.

Exercises 2.1·2.3

2.1 (Foundation) Find red relative frequency for 18 red results in 60 trials.

2.2 (Foundation) Use $p=0.3$ to estimate red count in 200 trials.

2.3 (Foundation) Red,blue,green probabilities are 0.3,0.45, p . Find p .

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Foundation) Find red relative frequency for 18 red results in 60 trials.

2.1 $18/60=0.3$.

2.2 (Foundation) Use $p=0.3$ to estimate red count in 200 trials.

2.2 Expected count= $np=200 \times 0.3=60$.

2.3 (Foundation) Red,blue,green probabilities are 0.3,0.45, p . Find p .

3 Exam-style questions

2.3 Exhaustive separate outcomes sum to 1: $p=1-0.3-0.45$.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Expected count 50 means exactly 50 successes must occur.

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3.1 False. For 100 independent fair-coin tosses, the expected heads count is 50, but 49 heads has positive probability. An expectation is an average over repetitions, not a guaranteed result.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.