

WA7MPSP2

Probability and statistics

Core + Challenge

Chance Experiments and Relative Frequency

I can conduct chance experiments, calculate relative frequencies and compare them with theoretical probabilities.

Name: _____ Date: _____ Score: _____ / 55

Key idea

Relative frequency (RF) = number of times an outcome happens ÷ number of trials. 28 heads in 50 tosses

$$\rightarrow RF = \frac{28}{50} = 0.56$$

Expected number = probability × number of trials. Expected heads in 50 tosses = $\frac{1}{2} \times 50 = 25$

Results vary from what is expected. With **more trials**, relative frequency usually gets closer to the theoretical probability.

Use RF to **estimate** unknown probabilities, e.g. from repeated draws out of a bag.

A Fluency *practise the skill*

/ 16 marks

Give each answer as a decimal, fraction or whole number.

- | | |
|--|---|
| 1. A coin lands heads 28 times in 50 tosses. RF(heads) _____ | 9. RF = 0.3 over 250 trials. Frequency _____ |
| 2. Same coin. RF(tails) _____ | 10. Expected even numbers in 120 die rolls _____ |
| 3. Expected heads in 50 tosses _____ | 11. 45 reds in 150 draws. RF(red) _____ |
| 4. Difference between actual and expected heads _____ | 12. RF(red) = 0.3. Estimate reds in a bag of 20 _____ |
| 5. A die shows 6 on 14 of 60 rolls. RF(6) _____ | 13. Expected rolls of 1 or 2 in 90 rolls _____ |
| 6. Expected number of 6s in 60 rolls _____ | 14. 13 of 20 as a decimal _____ |
| 7. $P(\text{red}) = \frac{3}{8}$. Expected reds in 80 spins _____ | 15. RF = 0.25 and frequency = 40. Trials _____ |
| 8. 18 successes in 40 trials as a % _____ | 16. Expected tails in 1000 tosses _____ |

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B**Core** *apply the skill to problems*

/ 21 marks

- 1 A die was rolled 60 times: 1 → 8, 2 → 11, 3 → 9, 4 → 12, 5 → 7, 6 → 13. [3 marks]
(a) Find the relative frequency of each outcome (as a fraction).
(b) Compare with the theoretical probability.

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Answer: _____

- 2 A coin is tossed 20 times and lands heads 14 times. Is the coin biased? Explain. [2 marks]

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Answer: _____

- 3 A spinner with red, blue and green sectors was spun 100 times: red 48, blue 27, green 25. [2 marks]
Estimate what fraction of the spinner each colour covers.

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Answer: _____

- 4 Explain how to use random numbers from 1 to 10 to simulate a day with a 30% chance of rain. [2 marks]

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Answer: _____

- 5 Ten groups each toss a coin 20 times. Altogether there are 104 heads. What is the class relative frequency of heads? [2 marks]

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Answer: _____

- 6 In a survey, 36 of 120 students walk to school. Estimate how many of the school's 850 students walk. [2 marks]

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Answer: _____

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- 7 A marble is drawn from a bag of 10 and replaced, 50 times. Red was drawn 32 times. Estimate the number of red marbles in the bag. [2 marks]

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Answer: _____

- 8 A basketballer made 42 of her last 60 free throws. Estimate how many she will make in her next 20. [2 marks]

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Answer: _____

- 9 A fair die is rolled 300 times. How many times would you expect each number? Would you expect exactly this? Explain. [2 marks]

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Answer: _____

- 10 One estimate of $P(\text{heads})$ comes from 10 tosses and another from 1000 tosses. Which is more reliable, and why? [2 marks]

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Answer: _____

C Reasoning *explain, justify and check*

/ 9 marks

- 1 Explain the difference between relative frequency and theoretical probability. [2 marks]

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- 2 Explain why experimental results usually differ from the expected results. [2 marks]

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- 3 Mia got 7 heads in 10 tosses and says $P(\text{heads}) = 0.7$. Evaluate her claim. [2 marks]

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- 4 You want to test whether a spinner is fair. How many trials would you do, and how would you decide? Explain. [3 marks]

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D Challenge *multi-step and problem-solving*

/ 9 marks

- 1 After 400 spins, the relative frequency of red on a spinner with 8 equal sectors is 0.248. How many sectors are probably red? Explain. [2 marks]

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Answer:

- 2 Group A got 30 heads in 50 tosses. Group B got 55 heads in 100 tosses. What is the combined relative frequency of heads? [2 marks]

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Answer:

- 3 A die is rolled 600 times and shows 6 on 150 rolls. Is the die likely to be fair? Explain using expected values. [3 marks]

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Answer:

- 4 Describe how to use two coins to simulate an event with probability $\frac{1}{4}$. [2 marks]

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Answer:

How did I go?

Fluency ___ / 16 Core ___ / 21 Reasoning ___ / 9 Challenge ___ / 9 **Total ___ / 55**

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