

Two-Way Tables and Probability

Maths

Level 2

Exam-style practice · 7 questions · 28 marks · Calculator allowed

Remember

Two-way table: rows for one category, columns for another. Every row and column has a total; the grand total is in the corner. Fill in what you know, then use the totals to find the gaps.

Probability from a table: the number in the cell $\div$ the total you are choosing from. 'A student chosen at random' $\rightarrow$ grand total. 'A *female* student chosen at random' $\rightarrow$ the female total.

Sample-space grid: for two dice or two spinners, a grid of every combination makes counting outcomes easy.

Relative frequency: number of times it happened $\div$ number of trials – an estimate of probability from experiment.

Section A – Completing and reading two-way tables

1. 120 adults at a leisure centre were asked whether they mainly use the gym or the pool. 68 were female. 45 of the males use the gym. 41 people use the pool altogether. Complete the two-way table.

	Gym	Pool	Total
Female			
Male			
Total			

(4 marks)

2. Using your completed table, find the probability that a person chosen at random (a) is a female who uses the pool (b) uses the gym (c) is male, given that they use the pool. (3 marks)

3. A college surveyed 200 students about how they travel in.

	Bus	Car	Walk	Total
Under 18	54	12		110
18 and over		38	22	
Total	84			200

(a) Complete the table. (b) A student is picked at random. What is the probability they walk? (c) An over-18 is picked at random. What is the probability they come by car? (5 marks)

Section B – Sample spaces and relative frequency

4. Two spinners are spun: one numbered 1–4, one numbered 1–3. The scores are multiplied. Draw a grid of all outcomes. (a) How many outcomes are there? (b) What is the probability the product is 6? (c) What is the probability the product is more than 8? (5 marks)

5. A drawing pin is dropped 200 times and lands point-up 128 times. (a) Estimate the probability it lands point-up. (b) In 1,500 drops, how many point-up landings would you expect? (3 marks)

6. A biased coin is flipped 50 times and shows heads 31 times. Zara says the probability of heads is 0.62. Ahmed says it is 0.5 because a coin has two sides. Who is right, and how could the estimate be improved? (3 marks)

7. The table shows the results of 80 games played by a chess club.

	Win	Draw	Loss
Home	22	9	11
Away	14	8	16

(a) Estimate the probability that the club wins its next home game. (b) Estimate the probability of a draw in any game. (c) Are they more successful at home or away? Use figures. (5 marks)

Two-Way Tables and Probability – Answers

Level 2 · Working shown so you can check your method, not just the final number.

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Section A

- Male total = 52; male pool = $52 - 45 = 7$; female pool = $41 - 7 = 34$; female gym = $68 - 34 = 34$; gym total = 79. Table: Female 34 / 34 / 68; Male 45 / 7 / 52; Total 79 / 41 / 120.
- (a) $\frac{34}{120} = \frac{17}{60}$ (0.28) (b) $\frac{79}{120}$ (0.66) (c) $\frac{7}{41}$ (0.17).
- (a) Under-18 walk = $110 - 66 = 44$; over-18 bus = $84 - 54 = 30$; over-18 total = 90; car total 50; walk total 66. (b) $\frac{66}{200} = \mathbf{0.33}$. (c) $\frac{38}{90} = \mathbf{0.42}$.

Section B

- Grid products: 1,2,3 / 2,4,6 / 3,6,9 / 4,8,12. (a) **12**. (b) 6 appears twice: $\frac{2}{12} = \frac{1}{6}$. (c) More than 8: 9 and 12 $\rightarrow \frac{2}{12} = \frac{1}{6}$.
- (a) $128 \div 200 = \mathbf{0.64}$. (b) $0.64 \times 1,500 = \mathbf{960}$.
- Zara** – the coin is biased, so the experiment is the only guide; $31 \div 50 = 0.62$. Ahmed's 0.5 only applies to a fair coin. Improve it by flipping many more times (e.g. 500).
- (a) $\frac{22}{42} = \mathbf{0.52}$. (b) $\frac{17}{80} = \mathbf{0.21}$. (c) **Home**: 52% of home games won vs $14 \div 38 = 37\%$ away.

Where Level 2 students lose marks on this topic

- Dividing by the grand total when the question says 'a female is chosen' – use the female total.
- Filling in a two-way table without checking that every row and column adds to its total.
- Treating a relative frequency from 50 trials as exact – it is an estimate that improves with more trials.