



## S22-test Sample Space Diagrams: Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 25 minutes

Total Marks

Name: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Answer ALL questions. Show all your working.**

- 1** Two fair coins are tossed together. The result for each coin is either Heads (H) or Tails (T). The sample space diagram below shows the outcome for each coin, with two of the four outcomes already filled in.

|           | Coin 1: H | Coin 1: T |
|-----------|-----------|-----------|
| Coin 2: H | HH        |           |
| Coin 2: T |           | TT        |

- (a) Complete the sample space diagram to show all four possible outcomes. (2)

- (b) Write down the probability of getting two heads. (1)

- (c) Find the probability of getting at least one head. (2)

(Total for Question 1 is 5 marks)

- 2** Two fair six-sided dice are rolled together and the two scores are added. The sample space diagram below has already been completed, showing the sum of the two scores for every possible outcome.

| Sum   | D1: 1 | D1: 2 | D1: 3 | D1: 4 | D1: 5 | D1: 6 |
|-------|-------|-------|-------|-------|-------|-------|
| D2: 1 | 2     | 3     | 4     | 5     | 6     | 7     |
| D2: 2 | 3     | 4     | 5     | 6     | 7     | 8     |
| D2: 3 | 4     | 5     | 6     | 7     | 8     | 9     |
| D2: 4 | 5     | 6     | 7     | 8     | 9     | 10    |
| D2: 5 | 6     | 7     | 8     | 9     | 10    | 11    |
| D2: 6 | 7     | 8     | 9     | 10    | 11    | 12    |

- (a)** Use the sample space diagram to find the probability that the sum of the two scores is at least 10. (2)
- .....
- (b)** List, as ordered pairs (first score, second score), all the outcomes for which the sum of the two scores is exactly 11. (2)

**(Total for Question 2 is 4 marks)**

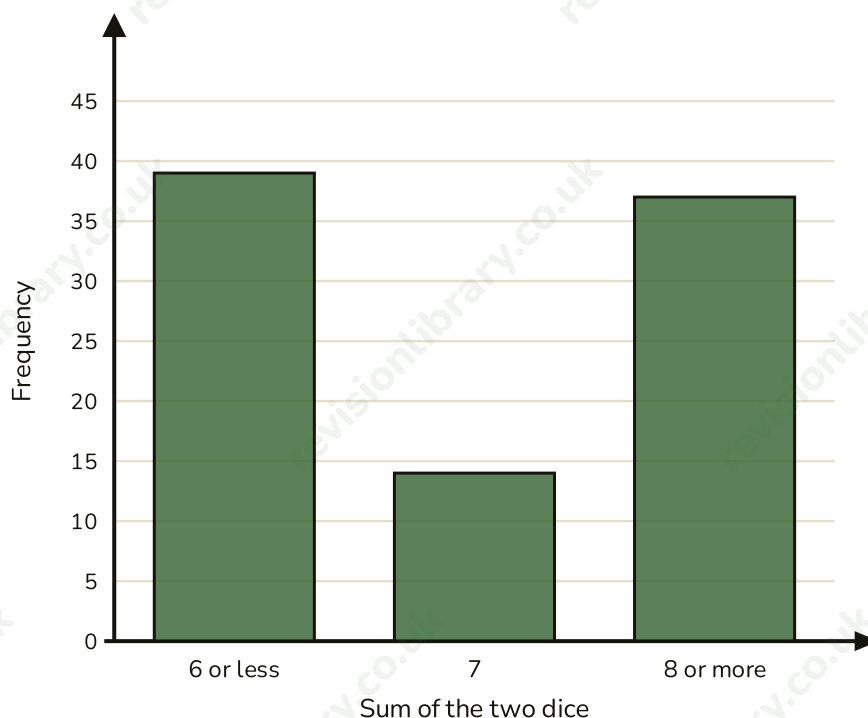
- 3** A fairground stall has a game using two fair spinners. Spinner P has five equal sections numbered 1, 2, 3, 4, 5. Spinner Q has three equal sections numbered 1, 2, 3. Both spinners are spun together and the two scores are added. A player wins if the sum of the two scores is 6 or more. As part of planning the game, the stallholder must first check that the sample space gives 15 equally likely outcomes.

| Sum  | P: 1 | P: 2 | P: 3 | P: 4 | P: 5 |
|------|------|------|------|------|------|
| Q: 1 | 2    | 3    |      | 5    | 6    |
| Q: 2 |      | 4    | 5    | 6    | 7    |
| Q: 3 | 4    | 5    | 6    | 7    |      |

- (a) Write down one assumption needed for the 15 outcomes in the sample space to be equally likely. (1)
- .....
- (b) Complete the sample space diagram to show the sum of the two scores for every outcome. (3)
- (c) Find the probability that a player wins on one go (the sum of the two scores is 6 or more). (2)
- .....
- (d) The stallholder says: "About 2 in 5 games are won, so if 60 people play, I expect about 24 winners." Comment on whether this is a reasonable use of the probability from part (c). (2)

(Total for Question 3 is 8 marks)

- 4 A student wants to test whether the sums of two fair dice behave as the theoretical sample space predicts. As part of this statistical enquiry, the student rolls two fair six-sided dice together 90 times and records the sum each time. The bar chart shows the results, grouped into three categories.



- (a) Using a sample space diagram for two fair dice, show that the theoretical probability that the sum of the two scores is 7 is  $\frac{1}{6}$ . (2)
- (b) Use the bar chart to write down the number of times a sum of 7 was recorded in the 90 rolls. (1)
- (c) Work out the expected number of times a sum of 7 would occur in 90 rolls, using the theoretical probability from part (a). (2)
- (d) Comment on how the experimental frequency in part (b) compares with the expected frequency in part (c). (2)

(Total for Question 4 is 7 marks)

## Mark scheme · S22-test Sample Space Diagrams: Test Pack

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### Question 1

- (a) **B1** HT written in the Coin 2: H row, Coin 1: T column
- (a) **B1** TH written in the Coin 2: T row, Coin 1: H column
- (a) **Answer: HT, TH**
- (b) **B1**  $\frac{1}{4}$  oe cao
- (b) **Answer:  $\frac{1}{4}$**
- (c) **M1** identifies the 3 outcomes with at least one head (HH, HT, TH), oe
- (c) **A1**  $\frac{3}{4}$  cao
- (c) **Answer:  $\frac{3}{4}$**

### Question 2

- (a) **M1** identifies the 6 outcomes with sum 10, 11 or 12, oe
- (a) **A1**  $\frac{1}{6}$  oe cao
- (a) **Answer:  $\frac{1}{6}$**
- (b) **B1** one correct ordered pair with sum 11, no incorrect pairs given
- (b) **B1** both correct ordered pairs listed: (5,6) and (6,5)
- (b) **Answer: (5,6), (6,5)**

### Question 3

- (a) **B1** states that both spinners are fair/unbiased, so each section is equally likely to be landed on, oe
- (a) **Answer: Both spinners are fair, so each section is equally likely.**
- (b) **B1** at least 1 of the 3 missing sums correct
- (b) **B1** at least 2 of the 3 missing sums correct
- (b) **B1** all 3 missing sums correct: 4 (Q:1,P:3), 3 (Q:2,P:1), 8 (Q:3,P:5)
- (b) **Answer: 4, 3, 8**
- (c) **M1** identifies the 6 outcomes with sum 6 or more, oe
- (c) **A1**  $\frac{2}{5}$  oe cao
- (c) **Answer:  $\frac{2}{5}$**
- (d) **B1** shows  $60 \times \frac{2}{5} = 24$ , matching the stallholder's claim
- (d) **B1** explains this is a reasonable estimate (expected value) but not a guaranteed exact outcome, since each go is random/independent, oe
- (d) **Answer: Reasonable estimate of 24 winners, but the actual number could differ by chance.**

### Question 4

- (a) **M1** identifies 6 outcomes with sum 7 out of 36 total outcomes, oe
- (a) **A1**  $\frac{6}{36} = \frac{1}{6}$  shown
- (a) **Answer:  $\frac{1}{6}$**
- (b) **B1** 14 cao
- (b) **Answer: 14**
- (c) **M1**  $90 \times \frac{1}{6}$ , oe
- (c) **A1** 15 cao
- (c) **Answer: 15**
- (d) **B1** notes that 14 is close to (but not exactly) the expected 15
- (d) **B1** explains the small difference is due to chance in a finite number of trials; the relative frequency would be expected to get closer to  $\frac{1}{6}$  with many more rolls, oe
- (d) **Answer: 14 is close to the expected 15; the small gap is due to chance.**