



KS3.M-P3 Listing Outcomes and Sample Space Diagrams

AQA KS3.M-P3 · Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Write down the possible outcomes for each single event.
- (a) A fair coin is flipped once. Write down the possible outcomes. (1)
- _____
- (b) A 4-sided spinner numbered 1 to 4 is spun once. Write down the possible outcomes. (1)
- _____
- (c) A die with faces 1 to 6 is rolled and the outcome recorded. Write down the possible outcomes for the number shown. (1)
- _____
- (d) A bag contains one red and one blue counter. One counter is drawn at random. Write down the possible outcomes for the colour drawn. (1)
- _____
-
- 2** List the sample space for tossing two fair coins. In your listing treat the first and second coin as distinct (order matters). (2)
- _____
-
- 3** A spinner has three equal sections coloured red, blue and green. The spinner is spun once and then a fair coin is tossed once. List the sample space for these two events (spin, then toss). (2)

- 4** A 6-sided die is rolled and then a coin is tossed. Write down the sample space for the two events (die outcome, coin).

(2)

- 5** Make the sample space for two-digit numbers formed using the digits 1, 3 and 5 if digits cannot be repeated. List the outcomes and state how many outcomes there are.

(2)

- 6** Two fair coins are tossed. Use the sample space to find the probability of getting exactly one head.

(2)

- 7** Two fair six-sided dice are rolled. Use the sample space to find the probability that the sum of the two dice is 7.

(2)

- 8** A spinner with 4 equal sections is spun twice. What is the probability that the two results are exactly the same?

(2)

- 9** A bag contains three counters labelled A, B and C. A counter is picked at random, replaced, then a second counter is picked. (a) List the sample space. (b) Find the probability that both picks are the same letter.

(a) List the sample space. (1)

(b) Find the probability both picks are the same letter. (2)

- 10** A bag has 2 red and 3 blue counters. Two counters are taken without replacement. Find the probability both are red.

(2)

- 11** Complete the sample space for a 4-sided die (1 to 4) rolled after a coin toss (coin then die). List all pairs (coin,die).

(2)

- 12** A spinner has three equal regions: red, green and blue. A six-sided die is rolled. You win if the spinner shows red and the die shows an even number. Find the probability of winning.

(2)

- 13** Three fair coins are flipped. List the sample space and find the probability of getting exactly two heads.

(2)

14 Spinner A lands equally on numbers 1, 2 or 3. Spinner B lands equally on letters X or Y. One spin of each is made. (a) List the sample space. (b) Find the probability that spinner A shows 3 and spinner B shows Y.

(a) List the sample space. (1)

(b) Find the probability spinner A shows 3 and spinner B shows Y. (1)

15 Two fair six-sided dice are rolled. Find the probability that at least one die shows a 6. Give a method using the complement.

(2)

16 A fair coin is tossed and a 3-sided spinner showing 1, 2, 3 (equal chances) is spun. Find the probability that the coin shows tails or the spinner shows 2 (or both).

(3)

17 Stretch. Two fair six-sided dice are rolled. Find the probability that both dice show even numbers.

(3)

18 Stretch. A bag contains 3 red, 2 green and 1 blue counters. A counter is drawn at random, replaced, and then a second counter is drawn. Find the probability both draws are green.

(3)

Mark scheme · KS3.M-P3 Listing Outcomes and Sample Space Diagrams

Question 1

- (a) **B1** H and T listed (order not important) cao
- (a) Answer: **H, T**
- (b) **B1** 1, 2, 3, 4 all listed cao
- (b) Answer: **1, 2, 3, 4**
- (c) **B1** 1, 2, 3, 4, 5, 6 all listed cao
- (c) Answer: **1, 2, 3, 4, 5, 6**
- (d) **B1** red and blue listed cao
- (d) Answer: **red, blue**

Question 2

- **M1** correct method of listing 2x2 outcomes, e.g. start with H then T for second coin
- **A1** correct complete list: HH, HT, TH, TT cao
- Answer: **HH, HT, TH, TT**

Question 3

- **M1** method of pairing each spinner colour with coin outcomes
- **A1** complete list: (red,H), (red,T), (blue,H), (blue,T), (green,H), (green,T) cao
- Answer: **(red,H), (red,T), (blue,H), (blue,T), (green,H), (green,T)**

Question 4

- **M1** method showing 6 die faces each paired with H and T
- **A1** all 12 pairs listed cao
- Answer: **(1,H), (1,T), (2,H), (2,T), (3,H), (3,T), (4,H), (4,T), (5,H), (5,T), (6,H), (6,T)**

Question 5

- **M1** method showing permutations without repetition (3x2)
- **A1** correct list and count: 13, 15, 31, 35, 51, 53 and number = 6 cao
- Answer: **13, 15, 31, 35, 51, 53; 6 outcomes**

Question 6

- **M1** identify favourable outcomes HT and TH (2) and total outcomes 4
- **A1** probability $2/4 = 1/2$ cao
- Answer: **1/2**

Question 7

- **M1** count favourable pairs summing to 7: (1,6),(2,5),(3,4),(4,3),(5,2),(6,1) = 6 and total 36
- **A1** probability $6/36 = 1/6$ cao
- Answer: **1/6**

Question 8

- **M1** recognise 4 outcomes for first spin and only 1 matching outcome on second spin for each = 4 favourable out of 16
- **A1** probability $4/16 = 1/4$ cao
- Answer: **1/4**

Question 9

- (a) **B1** all nine ordered pairs listed cao
- (a) Answer: **(A,A), (A,B), (A,C), (B,A), (B,B), (B,C), (C,A), (C,B), (C,C)**
- (b) **M1** identify 3 favourable outcomes (A,A), (B,B), (C,C) and total 9
- (b) **A1** probability $3/9 = 1/3$ cao
- (b) Answer: **1/3**

Question 10

- **M1** method: first pick $2/5$ then second pick $1/4$ or count combinations $C(2,2)/C(5,2)$
- **A1** probability $2/5 \times 1/4 = 2/20 = 1/10$ cao
- **Answer: 1/10**

Question 11

- **M1** method pairing coin outcomes with die faces
- **A1** complete list: (H,1),(H,2),(H,3),(H,4),(T,1),(T,2),(T,3),(T,4) cao
- **Answer: (H,1), (H,2), (H,3), (H,4), (T,1), (T,2), (T,3), (T,4)**

Question 12

- **M1** recognise spinner favourable $1/3$ and die even outcomes $3/6$ or $1/2$ then multiply
- **A1** probability $1/3 \times 1/2 = 1/6$ cao
- **Answer: 1/6**

Question 13

- **M1** list or recognise sample space has 8 outcomes and count favourable ones (3 outcomes: HHT, HTH, THH)
- **A1** probability $3/8$ cao
- **Answer: Sample space: HHH, HHT, HTH, HTT, THH, THT, TTH, TTT; probability 3/8**

Question 14

- (a) **B1** all six ordered pairs listed cao
- (a) **Answer: (1,X), (1,Y), (2,X), (2,Y), (3,X), (3,Y)**
- (b) **B1** 1 favourable outcome out of 6 so probability $1/6$ cao
- (b) **Answer: 1/6**

Question 15

- **M1** use complement: probability no six on a die is $5/6$ so both not six $(5/6)^2 = 25/36$ or state 25 favourable non-six pairs
- **A1** probability at least one six = $1 - 25/36 = 11/36$ cao
- **Answer: 11/36**

Question 16

- **M1** list total outcomes $2 \times 3 = 6$ and identify favourable: tails with any spinner (T,1)(T,2)(T,3) = 3 and heads with spinner 2 (H,2) = 1, or use addition with intersection
- **M1** count intersection correctly: (T,2) counted in both sets so use inclusion-exclusion or use combined list to get 4 favourable
- **A1** probability $4/6 = 2/3$ cao
- **Answer: 2/3**

Question 17

- **M1** identify even faces on one die are 2,4,6 ($3/6 = 1/2$) and method of multiplying for two independent dice
- **M1** compute $(1/2) \times (1/2) = 1/4$
- **A1** final probability $1/4$ cao
- **Answer: 1/4**

Question 18

- **M1** identify probability of green on one draw $2/6 = 1/3$ and use replacement so probabilities multiply
- **M1** compute $(1/3) \times (1/3) = 1/9$
- **A1** final probability $1/9$ cao
- **Answer: 1/9**