IM-101 · Combined events: sample spaces, AND and OR

IGCSE Mathematics (0580) · HomiLabs: Maths · Ep 101

Every combined event on this sheet is with replacement (or independent). Give probabilities as fractions in their simplest form, decimals or percentages.

Set A · Fluency

1. Two fair coins are thrown. List all the outcomes and find the probability of two tails.

2. A fair spinner shows 1, 2 or 3, and a fair coin is thrown. List the 6 outcomes. Find (a) P(3 and heads) (b) P(an even number).

3. Two fair dice are rolled. Find the probability that the total is 5.

4. Two fair dice are rolled. Find the probability of (a) a double (both dice the same) (b) a total less than 5.

5. A and B are independent events with P(A) = 0.6 and P(B) = 0.3. Find P(A and B).

6. A fair coin is thrown three times. Find the probability of at least one head.

7. A spinner lands on red with probability 0.45 and on blue with probability 0.3. Find the probability that it lands on red or blue.

8. A bag has 2 red and 3 white counters. A counter is taken and replaced, then a second counter is taken. Find (a) P(both white) (b) P(at least one red).

Set B · Exam style

1. (Paper 1/2 · no calculator) (C) Spinner A shows 2, 4 or 6. Spinner B shows 1, 2, 3 or 4. Both are fair. The score is the sum of the two numbers.
   (a) Draw a sample space diagram showing all the scores. [2]
   (b) Find the probability that the score is odd. [1]
   (c) Find the probability that the score is greater than 7. [1]

2. (Paper 3/4 · calculator) (C) In a game of chess, the probability that Lina wins is 0.35 and the probability of a draw is 0.15. Otherwise she loses. She plays two games; the results are independent.
   (a) Find the probability that she does not lose a game. [1]
   (b) Find the probability that she wins both games. [2]
   (c) Find the probability that she loses both games. [2]

3. (Paper 1/2 · no calculator) (C) A fair coin is thrown and a fair dice is rolled.
   (a) Find the probability of a head and a number less than 3. [2]
   (b) Find the probability of a tail or a 6 (or both). [2]

4. (Paper 3/4 · calculator) (C) Two machines work independently. In a week, the probability that machine A breaks down is 0.08 and the probability that machine B breaks down is 0.05.
   (a) Find the probability that both break down. [2]
   (b) Find the probability that at least one machine breaks down. [3]

Challenge

(E) A bag has n counters, and 3 of them are red. A counter is taken and replaced, then a second counter is taken. The probability that both are red is 1/16.
(a) Find n. (b) Find the probability that exactly one of the two counters is red. (Links Ep 6, square roots.)

Spaced review

1. (Ep 13) Share 84 in the ratio 3 : 4.

2. (Ep 16) Increase 60 by 15%.

Answers

Set A

1. HH, HT, TH, TT; P(TT) = 1/4

2. 1H, 1T, 2H, 2T, 3H, 3T; (a) 1/6 (b) 2/6 = 1/3

3. (1, 4), (2, 3), (3, 2), (4, 1): 4/36 = 1/9

4. (a) 6/36 = 1/6 (b) totals 2, 3, 4: 1 + 2 + 3 = 6 cells, 6/36 = 1/6

5. 0.6 × 0.3 = 0.18

6. 1 − 1/8 = 7/8

7. 0.45 + 0.3 = 0.75

8. (a) 3/5 × 3/5 = 9/25 (b) 1 − 9/25 = 16/25

Set B

1. (a) rows 2: 3, 4, 5, 6; 4: 5, 6, 7, 8; 6: 7, 8, 9, 10 B2 (b) odd scores 3, 5, 5, 7, 7, 9: 6/12 = 1/2 B1 (c) 8, 8, 9, 10: 4/12 = 1/3 B1

2. (a) 0.35 + 0.15 = 0.5 B1 (b) 0.35 × 0.35 M1 = 0.1225 A1 (c) P(lose) = 1 − 0.5 = 0.5 M1; 0.5 × 0.5 = 0.25 A1

3. (a) 1/2 × 2/6 M1 = 1/6 A1 (b) six tail cells + H6 M1: 7/12 A1

4. (a) 0.08 × 0.05 M1 = 0.004 A1 (b) P(neither) = 0.92 × 0.95 M1 = 0.874 A1; 1 − 0.874 = 0.126 A1

Challenge

(a) $(3/n)^2 = 1/16$, so $3/n = 1/4$ and $n = 12$ (b) 1/4 × 3/4 + 3/4 × 1/4 = 6/16 = 3/8

Spaced review

1. 84 ÷ 7 = 12: 36 and 48

2. 60 × 1.15 = 69