

Combined Probability

KS3 Maths · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

A spinner (1/3 red, 2/3 blue) is spun twice. Find P(red, then blue).

Step 1 · Identify the two probabilities

$$P(\text{red}) = 1/3, P(\text{blue}) = 2/3$$

Step 2 · Multiply (independent events, AND)

$$1/3 \times 2/3 = 2/9$$

Answer: 2/9

Check: This matches following ONE specific path through a tree diagram ✓

2. Now try one with the steps

A coin is flipped and a fair dice is rolled. Find P(head and an even number).

Step 1 · The events are independent (one cannot affect the other)

Step 2 · AND → multiply

Step 3 · Check with a sample space

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. A coin is flipped twice. Find the probability of getting two heads. [2]

2. A bag has 3 red and 2 blue balls. One ball is picked, replaced, then a second is picked. Find P(both red). [3]

3. A die is rolled and a coin is flipped. Find P(rolling a 6 AND flipping heads). [2]

4. A bag has 4 red and 6 blue balls. A ball is picked and NOT replaced, then a second is picked. Find $P(\text{both red})$. [3]

5. Using a tree diagram approach for the bag of 4 red, 6 blue (without replacement), find $P(\text{exactly one red})$. [4]

6. Explain why probabilities change in a 'without replacement' scenario but not in 'with replacement'. [3]

7. Two fair coins are flipped. Find the probability of getting two tails. [1]

8. A coin is flipped and a dice is rolled. How many different outcomes are possible altogether? [1]

9. Two fair dice are rolled. Find the probability that both show a 6. [1]

10. Independent events A and B have $P(A) = 0.3$ and $P(B) = 0.5$. Find $P(A \text{ and } B)$. [1]

11. A spinner has $P(\text{red}) = 0.4$. It is spun twice. Find $P(\text{red both times})$. [1]

12. The probability Nadia's bus is late on any day is 0.2. Find the probability it is NOT late on both Monday and Tuesday. [2]

13. The spinner with $P(\text{red}) = 0.4$ is spun twice. Find $P(\text{exactly one red})$. [3]

14. Two fair coins are flipped. Find the probability of getting at least one head. [2]

15. A bag has 5 green and 3 yellow sweets. Two are taken without replacement. Find $P(\text{both yellow})$. [3]

16. For the same bag (5 green, 3 yellow, two taken without replacement), find $P(\text{at least one green})$. [3]

4. Before you hand it in

Adding probabilities along a single path of a tree diagram instead of multiplying

Multiply ALONG a single branch/path (AND — both things happen in sequence). Add ACROSS different branches/paths (OR — either one path or another happens).

Using the same probability for both picks in a 'without replacement' problem

In 'without replacement' problems, the SECOND probability must be adjusted: both the total and the relevant count have decreased by one (since the first item was removed and not put back).

Finding $P(\text{at least one head in two flips})$ as $1/2 + 1/2 = 1$

Getting a head on flip 1 and a head on flip 2 are not mutually exclusive. Use $1 - P(\text{no heads}) = 1 - 1/4 = 3/4$, or list the outcomes HH, HT, TH, TT.