

5.1.1 Probability

Name: _____ Class: _____ Date: _____

KEY WORDS conditional probability

<!-- Session 2 native-skill companion -->

Objective

Practise probability within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Probability trees and outcomes · Foundation

A probability lies between 0 and 1. Exhaustive, mutually exclusive outcomes have probabilities summing to 1. Multiply successive branch probabilities and add separate routes to an outcome.

$$P(RR) = P(R_1)P(R_2 \mid R_1)$$

A bag contains 3 red and 2 blue counters. With replacement, $P(\text{two red}) = \frac{3}{5} \times \frac{3}{5} = \frac{9}{25} = 0.36$. Without replacement, the red-red branch is $\frac{3}{5} \times \frac{2}{4} = 0.3$. Label each branch before multiplying.

Mutually exclusive means no overlap; independent means that knowing one event does not change the other's probability. Two disjoint events with positive probability are not independent.

Use a frequency table or a simple tree before calculating. Formal conditional probability formulae are outside this Foundation/Core support lesson.

■ Probability, trees and conditional reasoning · Higher

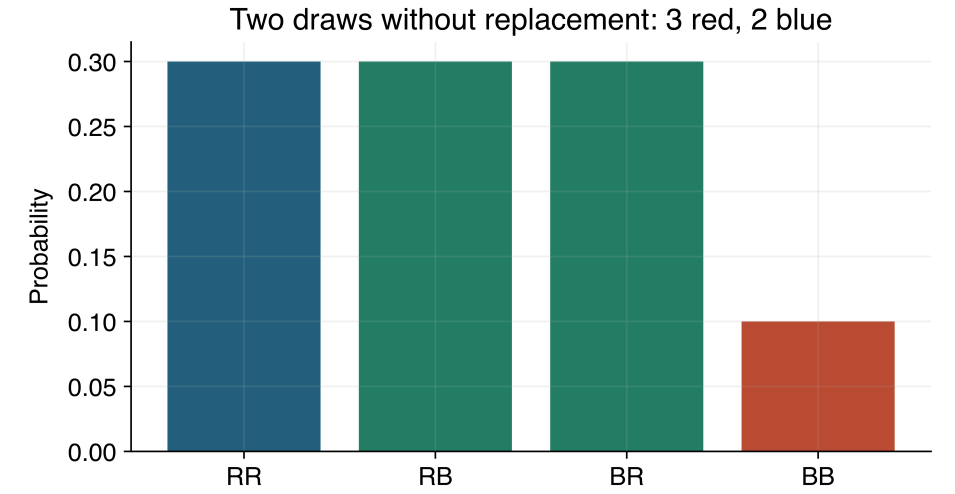
Multiply along a tree branch and add disjoint branches. With replacement, the composition stays fixed. Conditional probability is $P(A \text{ given } B) = \frac{P(A \cap B)}{P(B)}$, for $P(B) > 0$.

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}, \quad P(B) > 0$$

Without replacement, $P(\text{two red}) = \frac{3}{5} \times \frac{2}{4} = \frac{3}{10}$. $P(\text{one of each}) = \frac{3}{5} \times \frac{2}{4} + \frac{2}{5} \times \frac{3}{4} = \frac{3}{5}$. If $P(A \cap B) = 0.12$ and $P(B) = 0.3$, $P(A \text{ given } B) = 0.4$.

Mutually exclusive means no overlap; independent means that knowing one event does not change the other's probability. Two disjoint events with positive probability are not independent.

A two-way table makes the restricted denominator visible. Before using a product $P(A)P(B)$, justify independence from the context or the supplied information.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find the probability of two red from 3 red and 2 blue without replacement.

2.2 (Foundation) Find the probability of blue on a single draw from 3 red and 2 blue.

2.3 (Foundation) Find the probability of one red and one blue in that bag.

2.4 (Higher) Find $P(A \text{ given } B)$ if $P(A \cap B)=0.12$ and $P(B)=0.3$.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Mutually exclusive events with positive probabilities must be independent.

Solutions

2.1 Without replacement, $P(RR)=3/5 \times 2/4=0.3$.

2.2 A single blue draw has probability $2/(3+2)=0.4$.

2.3 Add the two orders: $3/5 \times 2/4 + 2/5 \times 3/4=0.6$.

2.4 $P(A|B)=P(A \cap B)/P(B)=0.12/0.3=0.4$.

3.1 False. A fair die shows 1 with probability $1/6$ and 2 with probability $1/6$. The events cannot occur together, so their joint probability is zero. Independence would require $1/36$.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.