Questions: Conditional probability

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Summary

A selection of questions to test your understanding of conditional probability, the multiplication rule, and independence.

*Before attempting these questions it is highly recommended that you read* [*Guide: Conditional probability*](../studyguides/conditionalprobability.qmd)*.*

## Q1

Answer the following using the definition of conditional probability.

**1.1.** In a deck of cards, one card is drawn at random. Let be the event that the card is a heart, and the event that the card is red. What is the probability that the card is a heart, given that it is red?

**1.2.** In a university class, of students are left-handed and of left-handed students play the piano. What is the probability that a randomly chosen student plays the piano, given that they are left-handed?

**1.3.** In the workforce of Cantor’s Confectionery, of employees speak French and of employees take both French and Spanish. Let be the event that an employee takes Spanish, and the event that the employee takes French. What is the probability that an employee takes Spanish, given that they take French?

**1.4.** The table below shows survey results from a school about whether students bring a packed lunch and whether they are sixteen:

|  | Sixteen | Not sixteen | Total |
| --- | --- | --- | --- |
| **Packed lunch** | 0.25 | 0.15 | 0.40 |
| **No packed lunch** | 0.35 | 0.25 | 0.60 |
| **Total** | 0.60 | 0.40 | 1.00 |

Let be the event that a student is sixteen, and the event that they bring a packed lunch. What is the probability that the student is sixteen, given they bring a packed lunch?

## Q2

Use the multiplication rule to solve the following problems.

**2.1.** A Cantor’s Confectionery Lagrange Lucky Dip bag contains green sweets and yellow sweets. Two sweets are picked one after the other without replacement. What is the probability that both sweets are green?

**2.2.** In the Cantor’s Confectionery factory, the probability that a box of Bayes Biscuits passes inspection is , and the probability it passes a second inspection given it passed the first is . What is the probability that a box of Bayes Biscuits passes both inspections?

**2.3.** A coin is flipped, and then a die is rolled. The probability of getting heads on the coin is , and the probability of rolling a on the die is . What is the probability of getting heads and rolling a ?

**2.4.** In a survey of the general populace, of people like tea and of tea-drinkers also like coffee. What is the probability that a randomly chosen person likes both tea and coffee?

## Q3

Decide whether the following events are independent.

**3.1.** In a study, , , and . Are and independent? Justify your answer.

**3.2.** Suppose and . Are and independent? Justify your answer.

**3.3.** Suppose , , and . Are and independent? Justify your answer.

**3.4.** Suppose and . Are and independent? Justify your answer.

[After attempting the questions above, please click this link to find the answers.](../answers/as-conditionalprobability.qmd)

## Version history and licensing

v1.0: initial version created 05/25 by Sophie Chowgule as part of a University of St Andrews VIP project.

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