

# 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](#).*

## Q1

Answer the following using the definition of conditional probability.

**1.1.** In a deck of 52 cards, one card is drawn at random. Let  $A$  be the event that the card is a heart, and  $B$  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, 60% of students are left-handed and 25% 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, 30% of employees speak French and 15% of employees take both French and Spanish. Let  $A$  be the event that an employee takes Spanish, and  $B$  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  $A$  be the event that a student is sixteen, and  $B$  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 3 green sweets and 2 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 0.9, and the probability it passes a second inspection given it passed the first is 0.95. 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  $1/2$ , and the probability of rolling a 6 on the die is  $1/6$ . What is the probability of getting heads and rolling a 6?

**2.4.** In a survey of the general populace, 70% of people like tea and 60% of tea-drinkers also like coffee. What is the probability that a randomly chosen person likes both tea and coffee?

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## Q3

Decide whether the following events are independent.

**3.1.** In a study,  $\mathbb{P}(A) = 0.4$ ,  $\mathbb{P}(B) = 0.3$ , and  $\mathbb{P}(A \cap B) = 0.12$ . Are  $A$  and  $B$  independent? Justify your answer.

**3.2.** Suppose  $\mathbb{P}(A) = 0.3$  and  $\mathbb{P}(A \mid B) = 0.3$ . Are  $A$  and  $B$  independent? Justify your answer.

**3.3.** Suppose  $\mathbb{P}(A) = 0.5$ ,  $\mathbb{P}(B) = 0.4$ , and  $\mathbb{P}(A \cap B) = 0.1$ . Are  $A$  and  $B$  independent? Justify your answer.

**3.4.** Suppose  $\mathbb{P}(A) = 0.6$  and  $\mathbb{P}(A \mid B) = 0.2$ . Are  $A$  and  $B$  independent? Justify your answer.

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After attempting the questions above, please click [this link](#) to find the answers.

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## **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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