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 class:

- 60% of students are left-handed
- 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 a class:

- 30% of students take French,

- 15% of students take both French and Spanish.

Let A be the event that a student takes Spanish, and B the event that the student takes French. What is the probability that a student takes Spanish, given that they take French?

1.4.

The table below shows survey results about whether students bring a packed lunch and whether they are in Year 12:

	Year 12	Not Year 12	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 in Year 12, and B the event that they bring a packed lunch. What is the probability that the student is Year 12, given they bring a packed lunch?

Q2

Use the multiplication rule to solve the following problems.

2.1.

A 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 a factory:

- The probability a toy passes inspection is 0.9
- The probability it passes a second inspection given it passed the first is 0.95

What is the probability that a toy passes both inspections?

2.3.

A coin is flipped, and then a die is rolled.

- The probability of getting heads on the coin is 0.5
- 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:

- 70% of people like tea
- 60% 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:

- $P(A) = 0.4$
- $P(B) = 0.5$
- $P(A \cap B) = 0.2$

Are A and B independent? Justify your answer.

3.2.

Suppose $P(A) = 0.3$ and $P(A \mid B) = 0.3$. Are A and B independent? Justify your answer.

3.3.

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

3.4.

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

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

Version history and licensing

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