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?

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.

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

Version history and licensing

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