UNIT 12: More About Probability

Specific Objectives:

1. To learn and apply the law $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
2. To define conditional probability and independent events.
3. To learn and apply the law $P(A \cap B) = P(A)P(B \mid A)$.
4. To learn and apply the Bayes' theorem for simple cases.

Detailed Content	Time Ratio	Notes on Teaching
12.1 The addition rule	4	Teachers should guide the students to discover the following rule through examples $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ Furthermore if *A* and *B* are mutually exclusive, then $P(A \cup B) = P(A) + P(B)$ Students should be able to apply the above to solve problems.
12.2 Conditional probabilities	6	Various examples should be used to illustrate the meaning of conditional probabilities before introducing the definition that $P(B \mid A) = \frac{P(A \cap B)}{P(A)}$ where *A* can be referred as the reduced sample space. From the above definition, we can easily derive the rule: $P(A \cap B) = P(A)P(B \mid A)$ Teachers should emphasize that this rule has been applied to solve problems in the Certificate level. Furthermore, *A* and *B* are said to be independent when $P(B \mid A) = P(B)$ Hence, when *A* and *B* are independent, $P(A \cap B) = P(A)P(B)$

Detailed Content	Time Ratio	Notes on Teaching
12.3 Bayes' Theorem	6	Bayes' theorem states that If $B_1, B_2, \ldots$ are mutually exclusive and exhaustive events, then $P(B_r \mid A) = \frac{P(A \cap B_r)}{\sum_i P(A \cap B_i)} = \frac{P(A \mid B_r)P(B_r)}{\sum_i P(A \mid B_i)P(B_i)}$ Students are advised not to memorize the above formula but to calculate the conditional probability from definition with the aid of a tree diagram. Teachers should guide the students to do that before deriving the Bayes' theorem.
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