

MATH III WK III:INDEPENDENT EVENT AND BAYES THEOREM

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Main Objectives

- Understand The definition of Independent Event
- Understand the relationship between independent events
- Apply definition of Bayes Theorem
- Apply problems

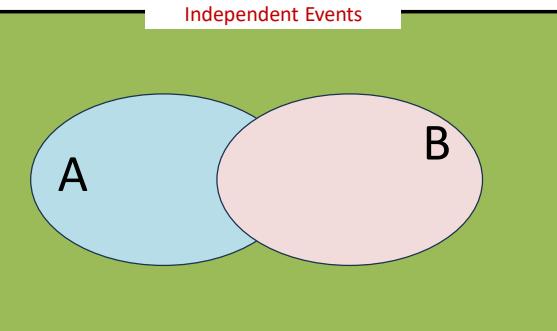
Independent Events

Event that does not change each other's probability

Bayes Theorem

How likely is Event A happening based on the Event B that happened(Reverse Conditional Probability)

Independent Events



$$\text{if } P(A) \times P(B) = P(A \cap B)$$

Event is Independent

$$P(B|A) = P(B)$$

Bayes Theorem

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)}$$

Derivation of Bayes Theorem

Given Event A and B,

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$P(A|B) = \frac{P(B \cap A)}{P(B)}$$

$$P(A|B)P(B) = P(B \cap A)$$

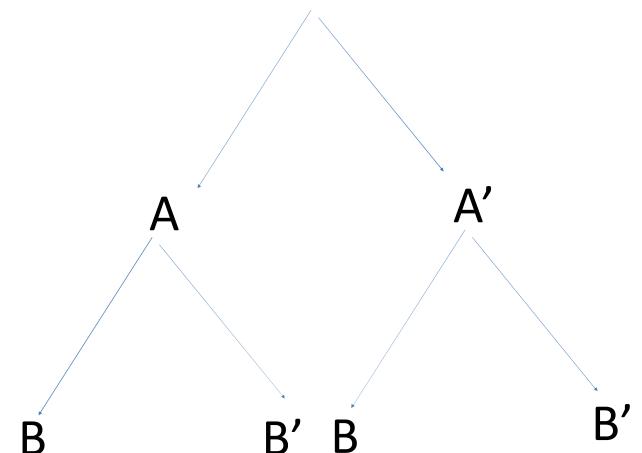
$$P(A \cap B) = P(B \cap A)$$

Thus,

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)}$$

Tree Diagram

For 2 Events, A and B



$$P(A \cap B) = P(B|A)P(A)$$

$$P(A \cap B') = P(B'|A)P(A)$$

$$P(A' \cap B) = P(B|A')P(A')$$

$$P(A' \cap B') = P(B'|A')P(A')$$