Statistics

Lecture 7

Feb 19-8:47 AM

Class Quiz 3 (Closed Notes)

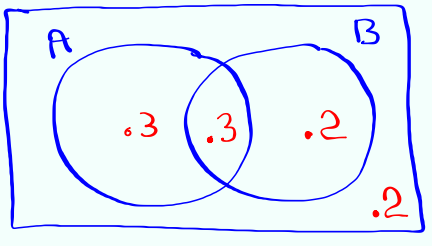
Given $P(A) = .6$ $P(B) = .5$ $P(A \text{ and } B) = .3$

1) $P(\overline{A}) = 1 - P(A) = 1 - .6 = \boxed{.4}$

2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

↑ Addition Rule $= .6 + .5 - .3 = \boxed{.8}$

$P(A \text{ only}) = .6 - .3 = .3$



$P(B \text{ only}) = .5 - .3 = .2$

Total = 1

Jul 8-3:46 PM

Multiplication Rule

Keyword : AND

Multiple Action event

$P(A \text{ and } B)$

A happens then B happens

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

Given

Independent events:

Are those events that one outcome does not change the Prob. of next outcome

Flip a coin twice

TT TH HT HH

Complete list of all possible outcomes

Sample Space

Jul 8-4:40 PM

Multiplication Rules

Case I: Independent Events

IF A and B are independent events, then

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

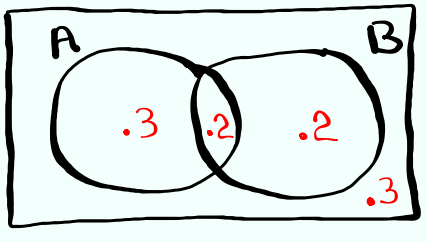
ex: $P(A) = .5$, $P(B) = .4$ A & B are independent events

$$P(A \text{ and } B) = P(A) \cdot P(B) = (.5)(.4) = \boxed{.2}$$

$P(A \text{ or } B) =$

$P(A) + P(B) - P(A \text{ and } B)$

$.5 + .4 - .2 = \boxed{.7}$



Jul 8-4:46 PM

A loaded coin was tossed twice.

$P(T) = .7$ $P(H) = .3$

TT TH HT HH

$P(\text{Both tails}) = P(T) \cdot P(T) = (.7)(.7) = .49$

$P(\text{one T and one H}) = 2 \cdot (.7)(.3) = .42$

$P(\text{Both heads}) = (.3)(.3) = .09$

Total Prob. = 1

Jul 8-4:52 PM

Draw 2 Cards with replacement from a full standard deck of playing cards.

A → Ace

$\bar{A}$ → Not Ace

AA $A\bar{A}$ $\bar{A}A$ $\bar{A}\bar{A}$

Sample Space

$P(\text{Both Aces}) = \frac{4}{52} \cdot \frac{4}{52} = \frac{1}{13} \cdot \frac{1}{13} = \frac{1}{169}$

$P(\text{No Aces}) = \frac{48}{52} \cdot \frac{48}{52} = \frac{144}{169}$

48 ÷ 52 × 48 ÷ 52 Math 1: ▶Frac Enter

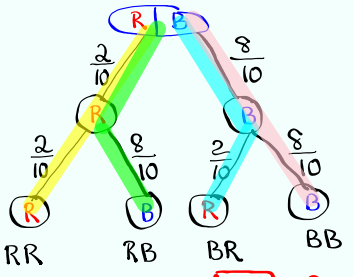
Jul 8-4:57 PM

A box has 2 Red & 8 Blue Color balls.

Take 2 balls with replacement

Sample Space

RR RB BR BB



Tree Diagram

$P(RR) = \frac{2}{10} \cdot \frac{2}{10} = \frac{4}{100} = .04$

$P(RB) = \frac{2}{10} \cdot \frac{8}{10} = \frac{16}{100} = .16$

$P(BR) = \frac{8}{10} \cdot \frac{2}{10} = \frac{16}{100} = .16$

$P(BB) = \frac{8}{10} \cdot \frac{8}{10} = \frac{64}{100} = .64$

Total = 1

Jul 8-5:04 PM

$P(\text{At least one}) = 1 - P(\text{None})$

From last example

$P(\text{At least one Red}) = 1 - P(\text{No red})$

$= 1 - P(BB) = 1 - .64$

$= .36$

$P(\text{at least one Blue ball}) = 1 - P(\text{No Blue})$

$= 1 - P(RR)$

$= 1 - .04 = .96$

Jul 8-5:13 PM

Consider a full deck of playing cards.

Draw 2 cards with replacement,

$P(\text{Both are face cards}) = \frac{12}{52} \cdot \frac{12}{52} = \boxed{\frac{9}{169}}$

$P(\text{no face cards}) = \frac{40}{52} \cdot \frac{40}{52} = \boxed{\frac{100}{169}}$

$P(\text{At least one face card}) = 1 - P(\text{No face cards})$

$= 1 - \frac{100}{169} = \boxed{\frac{69}{169}}$

Sample Space

FF $\quad$ $F\bar{F}$ $\quad$ $\bar{F}F$ $\quad$ $\bar{F}\bar{F}$

Jul 8-5:17 PM

Write the Sample Space for family with 3 kids.

BBB

BBG

BGB

BGG

GBB

GBG

GGB

GGG

SG 12 ✓

$P(1B \& 2G) = 3 \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{3}{8}} = \boxed{.375}$

Jul 8-5:25 PM