Statistics

Lecture 20

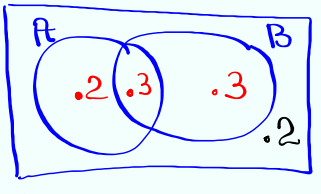
Feb 19-8:47 AM

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

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

2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .5 + .6 - .3 = \boxed{.8}$

3) Construct Venn Diagram



4) $P(\overline{A} \text{ and } \overline{B}) = P(\overline{A \text{ or } B})$ Total = 1

De Morgan's Law $= 1 - P(A \text{ or } B)$
$= 1 - .8 = \boxed{.2}$

5) $P(\overline{A} \text{ or } \overline{B}) = P(\overline{A \text{ and } B})$
$= 1 - P(A \text{ and } B) = 1 - .3 = \boxed{.7}$

Oct 2-8:48 AM

$P(A) = .15$

$P(B) = .65$

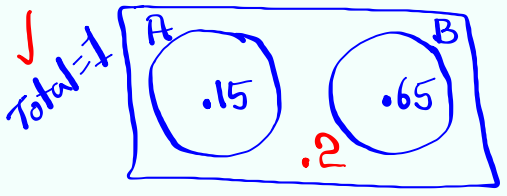
A & B are M.E.E.

1) $P(\bar{A}) = 1 - .15 = .85$

2) $P(A \text{ and } B) = 0$

3) $P(A \text{ or } B)$
$= P(A) + P(B) - P(A \text{ and } B)$
$= .15 + .65 - 0 = .8$

4) Construct Venn Diagram



Oct 2-8:58 AM

Suppose odds in favor of event E are 3:22.

1) odds against Event E. 22 : 3

2) $P(E) = \frac{3}{3+22} = \frac{3}{25}$

3) $P(\bar{E}) = \frac{22}{3+22} = \frac{22}{25}$

Suppose $P(E) = .125$

1) write P(E) in reduced fraction
.125 MATH 1:▶Frac Enter $\frac{1}{8}$

2) Find $P(\bar{E})$ in decimal.
$= 1 - .125 = .875$

3) Find odds in favor of event E.
$P(E) : P(\bar{E})$
$.125 : .875 \rightarrow 1:7$
.125 ÷ .875 Math 1:▶Frac Enter $\frac{1}{7}$

4) Find odds against event E.
7 : 1

Oct 2-9:03 AM

Multiplication Rule

Keyword AND

Multiple Action Event

1) Independent Events

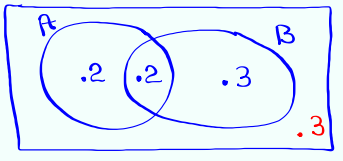
$$P(A \text{ and } B) = P(A) \cdot P(B)$$

A happens then B happens

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

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

$= (.4)(.5) = \boxed{.2}$



Total = 1

Oct 2-9:13 AM

A box has 20 balls, 3 Red, 7 white, and 10 blue color balls.

Take 2 balls with replacement.

RR	RW	RB
WR	WW	WB
BR	BW	BB

Sample Space

$$P(\text{Two Reds}) = P(R) \cdot P(R) = \frac{3}{20} \cdot \frac{3}{20} = \boxed{\frac{9}{400}}$$

$$P(\text{Two Blue}) = P(B) \cdot P(B) = \frac{10}{20} \cdot \frac{10}{20} = \boxed{\frac{1}{4}}$$

$$P(\text{Two white}) = P(W) \cdot P(W) = \frac{7}{20} \cdot \frac{7}{20} = \boxed{\frac{49}{400}}$$

$$P(\text{both balls are Same Color}) = \frac{9}{400} + \frac{100}{400} + \frac{49}{400} = \boxed{\frac{158}{400}}$$

$$= \boxed{\frac{79}{200}}$$

Oct 2-9:18 AM

A full-deck of playing cards has 52 cards, 4 Aces.

Draw 2 Cards with replacement

$A \rightarrow$ Ace

$\bar{A} \rightarrow$ Not Ace

$A\bar{A}$ $\quad \bar{A}A$ $\quad \bar{A}\bar{A}$ $\quad$ Sample Space

$P(\text{Neither one is Ace}) = P(\bar{A}) \cdot P(\bar{A})$

$= \frac{48}{52} \cdot \frac{48}{52} = \frac{12}{13} \cdot \frac{12}{13} = \boxed{\frac{144}{169}}$

$P(\text{at least one Ace}) = 1 - P(\text{No Aces})$

$= 1 - \frac{144}{169} = \boxed{\frac{25}{169}}$

Oct 2-9:28 AM

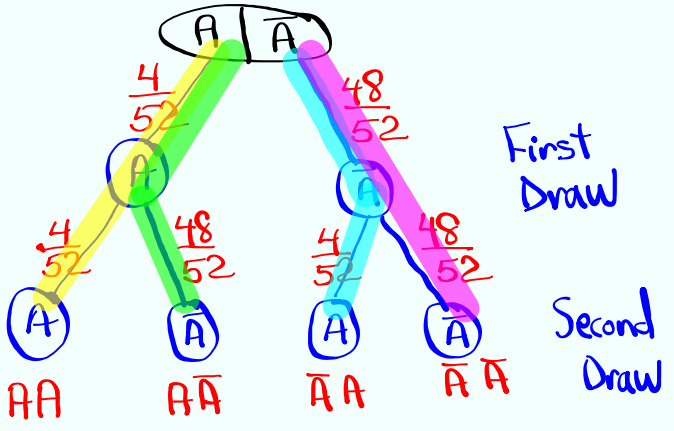
Multiplication with Tree Diagram

52 Cards

4 Aces

Draw 2 Cards

With replacement



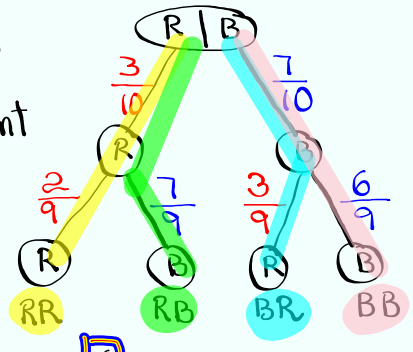
$P(\bar{A}\bar{A}) = \frac{48}{52} \cdot \frac{48}{52} = \boxed{\frac{144}{169}}$

Oct 2-9:35 AM

A box has 3 Red & 7 Blue balls.

Draw 2 balls

No replacement



$P(RR) = \frac{3}{10} \cdot \frac{2}{9} = \frac{6}{90}$

$P(RB) = \frac{3}{10} \cdot \frac{7}{9} = \frac{21}{90}$

$P(BR) = \frac{7}{10} \cdot \frac{3}{9} = \frac{21}{90}$

$P(BB) = \frac{7}{10} \cdot \frac{6}{9} = \frac{42}{90}$

Total $= \frac{90}{90} = 1$

Oct 2-9:41 AM

52 Cards 4 Aces Draw 3 Cards

No replacement

$P(\text{All Aces}) = \frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} = \frac{1}{5525}$

4 ÷ 52 × 3 ÷ 51 × 2 ÷ 50 Math 1:▶Frac Enter

Math 2:▶Dec Enter

$\approx 1.8 \times 10^{-4}$

.00018 - - - -

$\approx .0002$

Oct 2-9:50 AM