Statistics

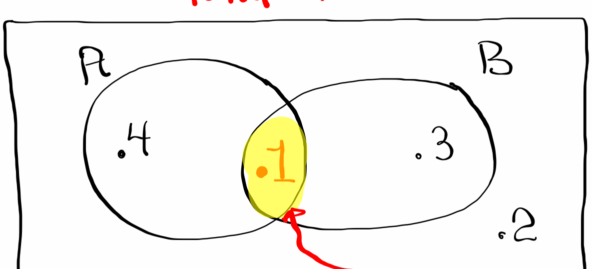
Fall 2022

Lecture 6

Class QZ 8

Complete the Venn Diagram Below:

Total = 1



$1-[.4+.3+.2]=\boxed{.1}$

① find $P(B)$

$= .1+.3=\boxed{.4}$

② find $P(\bar{A} \text{ or } \bar{B})$

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

By De Morgan's Law

$= 1 - P(A \text{ and } B)$

$= 1 - .1 = \boxed{.9}$

Class QZ 7:

Given: $P(A) = .25$, $P(B) = .55$,

$P(A \text{ and } B) = .15$

1) $P(\overline{B}) = 1 - .55 = \boxed{.45}$ ✓

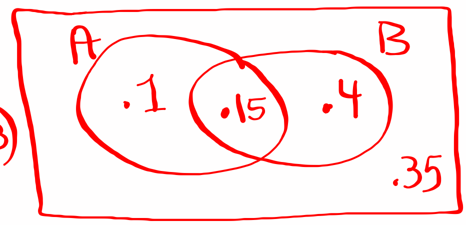
$= 1 - P(B) =$

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

$= .25 + .55 - .15$

$= \boxed{.65}$ ✓

3) Construct Venn Diagram.



Total $= 1$

Multiplication Rule:

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

Given

If A & B are independent events,
$P(A \text{ and } B) = P(A) \cdot P(B)$

Suppose a loaded coin is tossed two times, and $P(\text{Tails}) = .2$, $P(\text{Heads}) = .8$

TT $\quad P(TT) = (.2)(.2) = \boxed{.04}$

TH $\quad \to P(1T \,\&\, 1H) = P(TH \text{ or } HT) = 2(.2)(.8) = \boxed{.32}$

HT

HH $\quad P(HH) = (.8)(.8) = \boxed{.64}$

A box has 3 Red and 7 Blue balls.

Randomly draw 2 balls, No replacement.

RR

RB

BR

BB

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

$P(1R\ 1B) = P(RB \text{ or } BR) = 2 \cdot \frac{3}{10} \cdot \frac{7}{9} = \boxed{\frac{42}{90}}$

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

A standard deck of playing cards has 52 Cards & 4 Aces. 48 $\overline{\text{Aces}}$

Draw 3 Cards, No replacement.

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

$P(\text{No Aces}) = \frac{48}{52} \cdot \frac{47}{51} \cdot \frac{46}{50} = \boxed{\frac{4324}{5525}}$

Conditional Prob.

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

Given

$P(A) = .5$

$P(B) = .4$

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

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

$$P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.3}{.4} = \frac{3}{4} = \boxed{.75}$$

$P(HB) = .6$

$P(FF) = .4$

$P(HB \text{ and } FF) = .3$

$$P(FF \mid HB) = \frac{P(HB \text{ and } FF)}{P(HB)} = \frac{.3}{.6} = \boxed{.5}$$

$$P(HB \mid FF) = \frac{P(HB \text{ and } FF)}{P(FF)} = \frac{.3}{.4} = \boxed{.75}$$

Counting Methods:

If You have n different objects, and You choose r of them without replacement, and order does not matter,

\# of Selections $_nC_r = \frac{n!}{r! \cdot (n-r)!}$

Combination →

5 Men, I want to Select 2 of them

No replacement, order does not matter,

$$_5C_2 = \frac{5!}{2! \cdot (5-2)!} = \frac{5!}{2! \cdot 3!} = \frac{5 \cdot 4 \cdot \cancel{3!}}{2 \cdot 1 \cdot \cancel{3!}} = \boxed{10}$$

5 [Math] → PRB ↓ [$_nC_r$] 2 [Enter]

Find $_7C_3$

7 [MATH] [→] PRB [↓] [$_nC_r$] 3 [Enter] $\boxed{35}$

Find $_{10}C_4 = \boxed{210}$

There are 4 Women & 8 Men.

I need to Select 3 different people

$$P(1W \,\&\, 2M) = \frac{{}_4C_1 \cdot {}_8C_2}{{}_{12}C_3} = \frac{112}{220} = \boxed{\frac{28}{55}}$$

$$P(2W \,\&\, 1M) = \frac{{}_4C_2 \cdot {}_8C_1}{{}_{12}C_3} = \frac{48}{220} = \boxed{\frac{12}{55}}$$

$$P(\text{All Men}) = \frac{{}_4C_0 \cdot {}_8C_3}{{}_{12}C_3} = \frac{56}{220} = \boxed{\frac{14}{55}}$$

$$P(\text{All Women}) = \frac{{}_4C_3 \cdot {}_8C_0}{{}_{12}C_3} = \frac{4}{220} = \boxed{\frac{1}{55}}$$

You must watch All videos on the right Side of SG 10-13 This week and make notes.