# Statistics

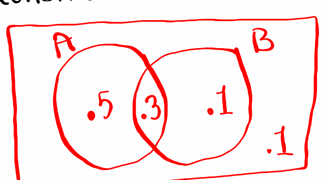
# Lecture 7

Feb 19-8:47 AM

Class QZ 10

Given $P(A) = .8$ , $P(B) = .4$ , $P(A \text{ and } B) = .3$

1) Construct the Venn Diagram




2) $P(\bar{A}) = 1 - .8 = \boxed{.2}$

3) $P(A \text{ only}) = \boxed{.5}$

4) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$= .8 + .4 - .3 = \boxed{.9}$

$P(\bar{A} \text{ and } \bar{B}) = P(\overline{A \text{ or } B}) = 1 - .9 = \boxed{.1}$

De Morgan's Law

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

$P(A \text{ only OR } B \text{ only}) = .5 + .1 = \boxed{.6}$

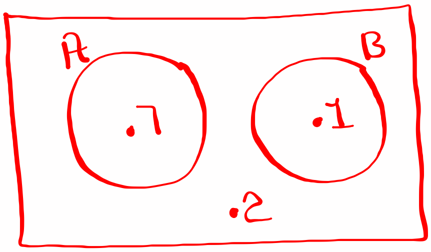
Oct 10-6:29 PM

Class QZ 9

Given $P(A) = .7$ , $P(B) = .1$ M.E.E.

A and B are $\boxed{\text{disjoint events.}}$

1) Draw Venn Diagram




Total = 1

2) Find P(A and B)

$= \boxed{0}$ ✓

3) Find P(A or B)

$= .7 + .1 - 0$

$= \boxed{.8}$ ✓

Oct 3-9:12 PM

Suppose $P(A) = .5$ , $P(B) = .4$ ,

A and B are independent events.

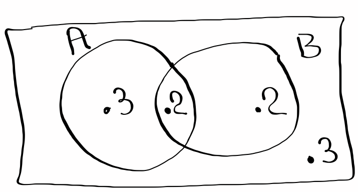
1) $P(\bar{B}) = 1 - .4 = \boxed{.6}$

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

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

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

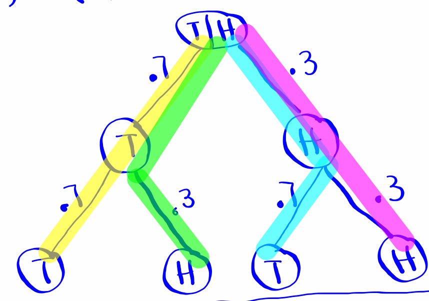
4) Make Venn Diagram




Oct 10-7:07 PM

Suppose we flip a loaded coin twice.

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




| TT | TH | HT | HH |

Sample space

$P(2 \text{ Tails}) = (.7)(.7) = \boxed{.49}$

$P(1 \text{ Tails}) = P(TH \text{ or } HT) = 2(.7)(.3) = \boxed{.42}$

$P(\text{No Tails}) = P(HH) = (.3)(.3) = \boxed{.09}$

Oct 10-7:14 PM

Prob. with at least one:

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

$P(\text{at least } 1 \text{ Tail}) = 1 - P(\text{No tails})$

$= 1 - P(HH)$

$= 1 - .09 = \boxed{.91}$

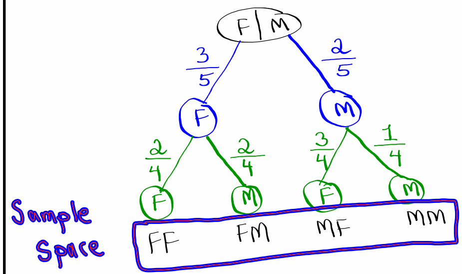
$P(\text{at least } 1 \text{ Head}) = 1 - P(\text{No Heads})$

$= 1 - P(TT)$

$= 1 - .49 = \boxed{.51}$

Oct 10-7:20 PM

There are 3 Females & 2 Males.
Select 2 people without replacement




$P(2 \text{ Females}) = \frac{3}{5} \cdot \frac{2}{4} = \boxed{.3}$ ✓

$P(1F \text{ \& } 1M) = 2\left(\frac{3}{5} \cdot \frac{2}{4}\right) = \boxed{.6}$ ✓

$P(2 \text{ Males}) = \frac{2}{5} \cdot \frac{1}{4} = \boxed{.1}$ ✓

$P(\text{at least 1 Female}) = 1 - P(\text{No Female})$
$= 1 - P(MM) = 1 - .1 = \boxed{.9}$

$P(\text{at least 1 male}) = 1 - P(\text{No male})$
$= 1 - P(FF)$
$= 1 - .3 = \boxed{.7}$

Oct 10-7:23 PM

A standard deck of playing cards has 52 Cards, 26 Red, 12 face, and 4 aces.
Draw 3 Cards, No replacement.

$P(\text{All Red}) = \frac{26}{52} \cdot \frac{25}{51} \cdot \frac{24}{50} = \boxed{\frac{2}{17}}$

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

$P(\text{at least 1 face Card}) = 1 - P(\text{No face Cards})$

40 $\bar{F}$
12 F

$= 1 - \frac{40}{52} \cdot \frac{39}{51} \cdot \frac{38}{50}$

$= \boxed{\frac{47}{85}}$

Oct 10-7:32 PM

I tossed a coin 200 times, and it landed 125 tails.

1) odds in favor of landing tails.

$\#$ Tails : $\#$ $\overline{\text{Tails}}$

$125 : 75 \longrightarrow \boxed{5:3}$

2) odds against landing tails.

$\boxed{3:5}$

Oct 10-7:41 PM

odds in favor of LA Rams win the SB this year are $3:47$

\$3 bet $\rightarrow$ \$47 Net

1) odds against $47:3$

2) $P(W) = \frac{3}{3+47} = \frac{3}{50} = .06$

3) $P(\overline{W}) = \frac{47}{3+47} = \frac{47}{50} = .94$

Oct 10-7:44 PM

Suppose $P(E) = .02$

1) $P(\bar{E}) = 1 - P(E) = 1 - .02 = \boxed{.98}$

2) odds in favor of $E$.

$P(E) : P(\bar{E})$

$.02 : .98 \longrightarrow \boxed{1 : 49}$

3) odds against $E$. $\longrightarrow \boxed{49 : 1}$

Oct 10-7:46 PM

Multiplication General Rule:

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

A happens,

then B happens.

Given

4 Females and 6 Males.

Select 2 people, NO replacement

$P(\text{Female, then Male}) = \frac{\cancel{4}^{2}}{\cancel{10}_{5}} \cdot \frac{\cancel{6}^{2}}{\cancel{9}_{3}} = \boxed{\frac{4}{15}}$

$P(\text{Male, then another male}) = \frac{\cancel{6}^{2}}{\cancel{10}_{2}} \cdot \frac{\cancel{5}^{1}}{\cancel{9}_{3}} = \boxed{\frac{1}{3}}$

Oct 10-8:01 PM

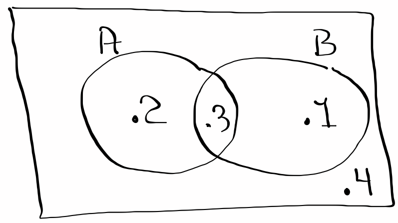
$$P(A \text{ and } B) = P(A) \cdot \boxed{P(B|A)}$$

$$P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$$ Conditional Prob.

$P(A) = .5$

$P(B) = .4$

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




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

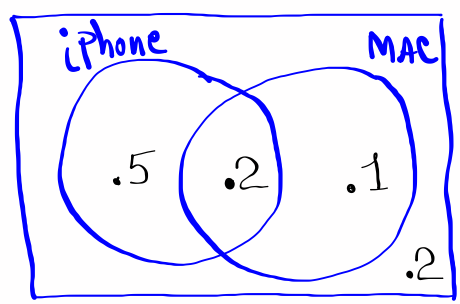
$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = \frac{.3}{.4} = \boxed{.75}$$

Oct 10-8:06 PM

$P(\text{iPhone}) = .7$

$P(\text{MAC}) = .3$

$P(\text{iphone and MAC}) = .2$




$$P(\text{MAC}|\text{iphone}) = \frac{P(\text{iphone and MAC})}{P(\text{iPhone})} = \frac{.2}{.7} = \frac{2}{7} = \boxed{.286}$$

$$P(\text{iphone}|\text{MAC}) = \frac{P(\text{iphone and MAC})}{P(\text{MAC})} = \frac{.2}{.3} = \frac{2}{3} = \boxed{.667}$$

Oct 10-8:11 PM

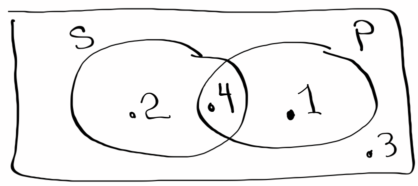
$P(\text{shirt}) = .6$

$P(\text{pants}) = .5$

$P(\text{shirt} \mid \text{pants}) = .8$

$P(\text{shirt and Pants})$

$= \cancel{(.6)(.5)} = .3$




$$\underbrace{P(\text{shirt} \mid \text{Pants})} = \frac{P(S \text{ and } P)}{P(P)}$$

$$.8 = \frac{P(S \text{ and } P)}{.5}$$

Cross-Multiply

$P(S \text{ and } P) = .4$

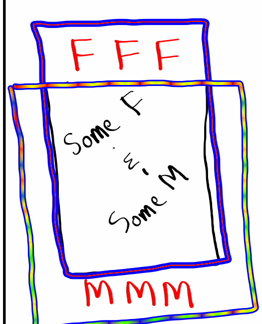
$P(\text{Pants} \mid \text{Shirt})$

$$= \frac{P(S \text{ and } P)}{P(S)} = \frac{.4}{.6}$$

$$= \frac{2}{3} = \boxed{.667}$$

Oct 10-8:15 PM

4 Females, 6 Males, Select 3 people, No replacement




$$P(\text{all Females}) = \frac{4}{10} \cdot \frac{3}{9} \cdot \frac{2}{8}$$

$$= \boxed{\frac{1}{30}}$$

$$P(\text{all Males}) = \frac{6}{10} \cdot \frac{5}{9} \cdot \frac{4}{8} = \boxed{\frac{1}{6}}$$

$P(\text{at least 1 Female}) = 1 - P(\text{No Females})$

$$= 1 - \frac{1}{6} = \boxed{\frac{5}{6}}$$

$P(\text{at least 1 Male}) = 1 - P(\text{No males})$

$$= 1 - \frac{1}{30} = \boxed{\frac{29}{30}}$$

Oct 10-8:22 PM

$_nC_r$ Combination
$n$ different objects
Select $r$ of them
No replacement, order does not matter.

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

$$_5C_3 = \frac{5!}{3! \cdot (5-3)!} = \frac{5!}{3! \cdot 2!} = \frac{5 \cdot \overset{2}{\cancel{4}} \cdot \cancel{3 \cdot 2 \cdot 1}}{\cancel{3 \cdot 2 \cdot 1} \cdot \cancel{2} \cdot 1}$$

5 $\boxed{\text{MATH}}$ PRB $\boxed{3{:}\,_nC_r}$ 3 $\boxed{\text{Enter}}$ $= \boxed{10}$

Oct 10-8:28 PM

A basketball team has 12 players, and we need 5 of them to start.
How many ways can this be done?

$_{12}C_5$

12 $\boxed{\text{MATH}}$ PRB $\boxed{3{:}\,_nC_r}$ 5 $\boxed{\text{Enter}}$ $\boxed{792}$

CA Lotto : 50 numbers, choose 5
How many Selections?

$_{50}C_5 = 2{,}118{,}760$

Oct 10-8:33 PM

4 Females, 6 Males, Select 3 people,
order does not matter, No replacement.

1) How many ways can this be done?

$$_{10}C_3 = \boxed{120}$$

2) How many ways can we Select 3 Females?

$$_4C_3 = \boxed{4}$$

3) $P(\text{3 Females}) = \frac{_4C_3}{_{10}C_3} = \frac{4}{120} = \boxed{\frac{1}{30}}$

4) How many ways can we Select 3 Males?

$$_6C_3 = \boxed{20}$$

5) $P(\text{3 Males}) = \frac{_6C_3}{_{10}C_3} = \frac{20}{120} = \boxed{\frac{1}{6}}$

6) $P(1F \,\&\, 2M) = \frac{_4C_1 \cdot {_6C_2}}{_{10}C_3} = \frac{60}{120} = \boxed{\frac{1}{2}}$

7) $P(2F \,\&\, 1M) = \frac{_4C_2 \cdot {_6C_1}}{_{10}C_3} = \frac{36}{120} = \boxed{\frac{3}{10}}$

Oct 10-8:39 PM

A standard deck of playing Cards has
52 Cards, 12 Face, and 4 Aces.
Select 5 Cards,

$$P(3F \text{ and } 2A) = \frac{_{12}C_3 \cdot {_4C_2}}{_{52}C_5}$$

$$= \frac{1320}{2598960} \approx 5.1 \times 10^{-4}$$

$$P(2F \text{ and } 3A) = \frac{_{12}C_2 \cdot {_4C_3}}{_{52}C_5}$$

$$= \frac{264}{2598960}$$

$$\approx 1.02 \times 10^{-4}$$

Oct 10-8:49 PM

A box has $\boxed{\text{2 Red, 3 white, and 5 Blue}}$ color balls

Select 3 balls, No replacement

$$P(\text{one of each color}) = \frac{{}_2C_1 \cdot {}_3C_1 \cdot {}_5C_1}{{}_{10}C_3}$$

$$= \frac{30}{120} = \boxed{\frac{1}{4}}$$

$$P(\text{2 white \& 1 Blue}) = \frac{{}_2C_0 \cdot {}_3C_2 \cdot {}_5C_1}{{}_{10}C_3}$$

$$= \frac{15}{120} = \boxed{\frac{1}{8}}$$

$$P(\text{1 white \& 2 Blue}) = \frac{{}_2C_0 \cdot {}_3C_1 \cdot {}_5C_2}{{}_{10}C_3} = \frac{30}{120} = \boxed{\frac{1}{4}}$$

Oct 10-8:58 PM

| L1 | L2 |
|---|---|
| 1 | .1 |
| 2 | .2 |
| 3 | .3 |
| 4 | .4 |

Class QZ 11

Use 1-Var stats with L1 & L2 to find

1) $\bar{x} = 3$

2) $S_x$ = blank

3) $n = 1$

Oct 10-9:07 PM