Statistics

Summer 2021

Lecture 11

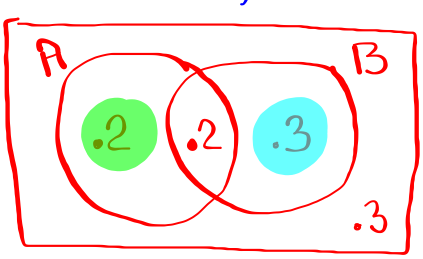
Class QZ 13

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

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

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

3) Venn Diagram



4) P(A only or B only not both)
$= .2 + .3 = \boxed{.5}$

There are $\underbrace{\text{18 males and 32 females}}_{\text{50 Total}}$ in a classroom.

1) Find P(Selecting one male)

$= \frac{18}{50} = \boxed{\frac{9}{25}} = \boxed{.36}$

2) Find P(Selecting one female)

$= \frac{32}{50} = \boxed{\frac{16}{25}} = \boxed{.64}$

3) What are the odds of Selecting one male?

18 males : 32 males $\Rightarrow \boxed{9:16}$

4) What are the odds against selecting one female?

#Females : #Females

$18 : 32 \Rightarrow \boxed{9:16}$

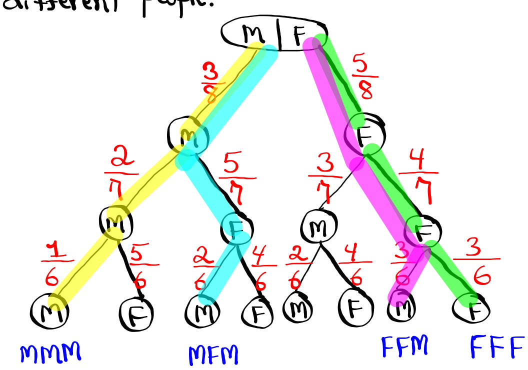
There are 8 people in a group.

3 males & 5 Females. → No replacement

Select 3 different people.

M → Male

F → Female



$P(3\text{ Males}) = P(MMM) = \frac{3}{8}\cdot\frac{2}{7}\cdot\frac{1}{6} = \boxed{\frac{1}{56}}$

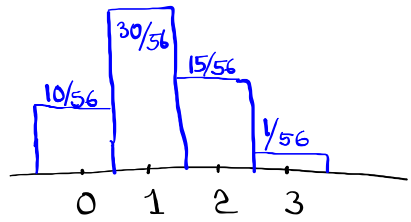
$P(2\text{ males}) = P(MMF, MFM, FMM) = 3\cdot\frac{3}{8}\cdot\frac{5}{7}\cdot\frac{2}{6} = \boxed{\frac{15}{56}}$

$P(1\text{ Male}) = P(MFF, FMF, FFM) = 3\cdot\frac{5}{8}\cdot\frac{4}{7}\cdot\frac{3}{6} = \boxed{\frac{30}{56}}$

$P(0\text{ male}) = P(FFF) = \frac{5}{8}\cdot\frac{4}{7}\cdot\frac{3}{6} = \boxed{\frac{10}{56}}$

# Males	P(# Males)
3	1/56
2	15/56
1	30/56
0	10/56

Prob. Dist. Histogram



Males → L1

P(# Males) → L2

Use L1 & L2 with 1-Var Stats to find

$\bar{x} = 1.125$ S = blank n = 1

[VARS] [5: Statistics] [4: σ_x] [x^2] [MATH] [1: ▸Frac] [Enter]

$\sigma^2 = \frac{225}{448}$

Not to worry what that is yet.

# Males	P(# Males)
3	1/56
2	15/56
1	30/56
0	10/56

Prob. with at least one

P(at least 1) = 1 − P(None)

P(at least 1 Male) =

1 − P(No Males) =

$1 - \frac{10}{56} = \boxed{\frac{23}{28}}$

1 [−] 10 [÷] 56 [Math] [1:] [Enter]

From a standard full-deck of playing cards, we draw 3 cards without replacement.

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

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

P(at least one red Color Card) =

$$P(\text{at least one Red}) = 1 - P(\text{No red})$$
$$= 1 - P(\text{All Black})$$
$$= 1 - \frac{2}{17} = \boxed{\frac{15}{17}}$$

15 Coins in a piggy bank. 6 Dimes & 9 Nickels

Select 3 different Coins

$$P(\text{All Dimes}) = \frac{6}{15} \cdot \frac{5}{14} \cdot \frac{4}{13} = \boxed{\frac{4}{91}}$$

$$P(\text{All Nickels}) = \frac{9}{15} \cdot \frac{8}{14} \cdot \frac{7}{13} = \boxed{\frac{12}{65}}$$

$$P(\text{at least 1 Dime}) = 1 - P(\text{No dime})$$
$$= 1 - P(\text{all nickels}) = 1 - \frac{12}{65} = \boxed{\frac{53}{65}}$$

$$P(\text{at least 1 Nickel}) = 1 - P(\text{None})$$
$$= 1 - P(\text{No nickel})$$
$$= 1 - P(\text{All Dimes})$$
$$= 1 - \frac{4}{91} = \boxed{\frac{87}{91}}$$

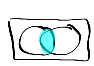
work on

SG 11
Try to Finish

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

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

$$.85 = .55 + .75 - P(A \text{ and } B)$$



Exam II : July 12
Monday

No School : July 5th.

Multiplication Rule

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

Given

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

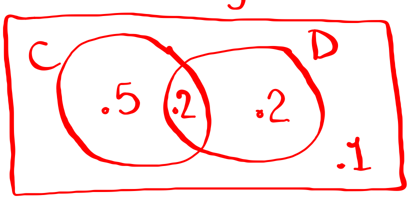
Conditional Prob.

$P(\text{coffee}) = .7$ $\qquad P(C) = .7$

$P(\text{Donut}) = .4$ $\qquad P(D) = .4$

$P(\text{coffee and Donut}) = .2$ $\qquad P(C \text{ and } D) = .2$

Venn Diagram



$P(\text{Donut given coffee})$

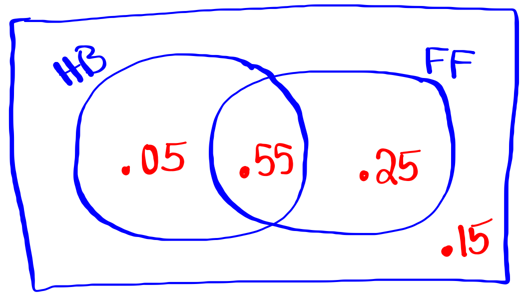
$$P(D|C) = \frac{P(C \text{ and } D)}{P(C)} = \frac{.2}{.7} = \boxed{.286}$$

$$P(\text{Coffee given Donut}) = P(C|D) = \frac{P(C \text{ and } D)}{P(D)} = \frac{.2}{.4} = \boxed{.5}$$

July 1, 2021

$P(HB) = .6$

Venn Diagram



$P(FF) = .8$

$P(HB \text{ and } FF) = .55$

$P(HB \text{ or } FF) = .05 + .55 + .25 = \boxed{.85}$

$P(FF \mid HB) = \dfrac{P(HB \text{ and } FF)}{P(HB)} = \dfrac{.55}{.6} = \boxed{.917}$

$P(HB \mid FF) = \dfrac{P(HB \text{ and } FF)}{P(FF)} = \dfrac{.55}{.8} = \boxed{.688}$

$P(\text{shoes}) = .4$

Find $P(\text{shoes and pants})$

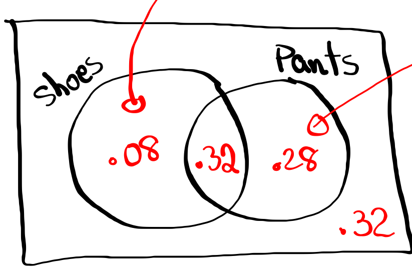
$P(\text{pants}) = .6$

$P(\text{Pants} \mid \text{shoes}) = \dfrac{P(\text{shoes and Pants})}{P(\text{shoes})}$

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

$.4 - .32 = .08$

$.6 - .32 = .28$



$.8 = \dfrac{P(\text{Shoes and Pants})}{.4}$

Cross-Multiply

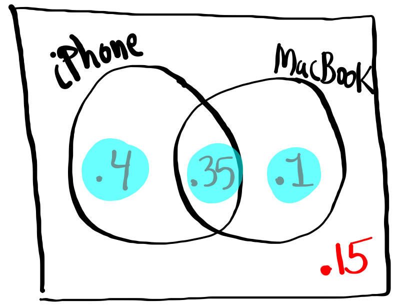
$\boxed{P(\text{shoes and pants}) = .32}$

$P(\text{shoes} \mid \text{Pants}) = \dfrac{P(\text{shoes and Pants})}{P(\text{pants})} = \dfrac{.32}{.6} = \boxed{.533}$

$P(\text{iPhone}) = .75$

$P(\text{Macbook Air}) = .45$

$P(\text{iPhone and MacBook Air}) = .35$



$P(\text{MacBook Air} \mid \text{iPhone}) = \dfrac{.35}{.75} = \boxed{.467}$

$P(\text{iPhone} \mid \text{MacBook Air}) = \dfrac{.35}{.45} = \boxed{.778}$

4 Women and 6 Men

Select 3 people ⇒ Order does not matter,
No replacement

$P(3 \text{ Women}) = \dfrac{4}{10} \cdot \dfrac{3}{9} \cdot \dfrac{2}{8} = \boxed{\dfrac{1}{30}}$

New Method

$P(3 \text{ Women}) = \dfrac{\text{Total \# of ways to Select 3 women}}{\text{Total \# of ways to Select 3 people}}$

$= \dfrac{{}_4C_3}{{}_{10}C_3} = \dfrac{4}{120} = \boxed{\dfrac{1}{30}}$

$$P(3\text{ Men}) = \frac{6}{10}\cdot\frac{5}{9}\cdot\frac{4}{8} = \boxed{\frac{1}{6}}$$

New Method

$$P(3\text{ Men}) = \frac{\text{Total \# of Selecting 3 Men}}{\text{Total \# of Selecting 3 people}}$$

$$= \frac{{}_6C_3}{{}_{10}C_3} = \frac{20}{120} = \frac{2}{12} = \boxed{\frac{1}{6}}$$

$$P(1\text{ Woman and 2 Men}) = 3\cdot\frac{4}{10}\cdot\frac{6}{9}\cdot\frac{5}{8} = \boxed{\frac{1}{2}}$$

W M M

M W M

M M W

New Method:

$$P(1W \,\&\, 2M) = \frac{\text{Total \# of ways to Select } 1W \,\&\, 2M}{\text{Total \# of ways to Select 3 people}}$$

$$= \frac{{}_4C_1\cdot{}_6C_2}{{}_{10}C_3} = \frac{60}{120} = \boxed{\frac{1}{2}}$$

$P(2W \;\&\; 1M) = 3 \cdot \frac{4}{10} \cdot \frac{3}{9} \cdot \frac{6}{8} = \boxed{\frac{3}{10}}$

WWM

WMW

MWW

New Method

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

Class QZ 14

x	$P(x)$
1	.1
3	.2
5	.3
7	.25
9	.15

1) Draw Prob. dist. histogram

2) $x \to L1$, $P(x) \to L2$
use L1 & L2 with 1-Var Stats
to find

$\bar{x} =$ $\quad$ $S =$ $\quad$ $n =$

3) Do $\boxed{\text{VARS}}$ $\boxed{\text{5: Statistics}}$ $\boxed{4: \sigma_x}$ $\boxed{x^2}$ $\boxed{\text{MATH}}$ $\boxed{\text{1: ▸Frac}}$ $\boxed{\text{Enter}}$

$\sigma^2 = \boxed{}$