Math 227

Spring 2021

Lecture 13

Class QZ 15

$P(E) = .625$

1) $P(\bar{E}) = 1 - P(E) = 1 - .625 = \boxed{.375}$

2) odds in favor of event E.

$P(E) : P(\bar{E}) \Rightarrow .625 : .375 \Rightarrow \boxed{5:3}$

3) odds against event E.

$\boxed{3:5}$

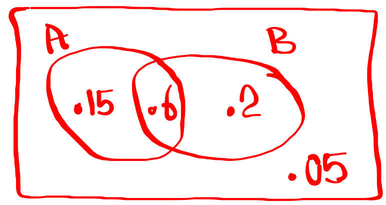
$P(A) = .75$ $\quad$ $P(B) = .8$ $\quad$ A & B are independent.

1) $P(A \text{ and } B) = P(A) \cdot P(B) = (.75)(.8) = \boxed{.6}$

2) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .75 + .8 - .6$

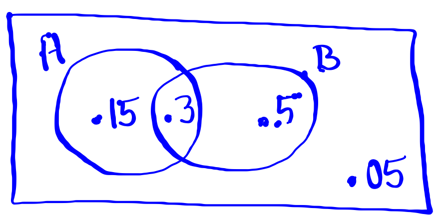
$= \boxed{.95}$

3) Construct Venn Diagram



$P(A) = .45$ $\quad$ $P(B) = .8$ $\quad$ $P(A \text{ and } B) = .3$

1) Venn Diagram



2) $P(A \text{ or } B) = .15 + .3 + .5 = \boxed{.95}$

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

$= \dfrac{.3}{.8} = \boxed{\dfrac{3}{8}} = \boxed{.375}$

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

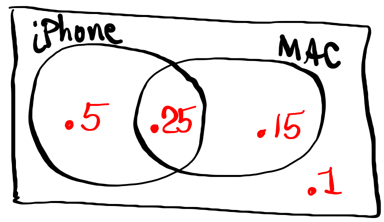
$= \dfrac{.3}{.45} = \boxed{\dfrac{2}{3}} = \boxed{.667}$

May 4, 2021

P(iPhone) = .75

P(MAC) = .4

P(iphone and MAC) = .25



1) Venn Diagram

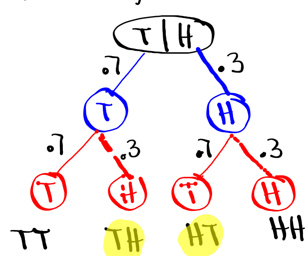
2) $P(\text{MAC} \mid \text{iphone}) = \dfrac{.25}{.75} = \boxed{\dfrac{1}{3}}$

3) $P(\text{iPhone} \mid \text{MAC}) = \dfrac{.25}{.4} = \boxed{.625}$

A loaded coin is tossed two times.

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

Make the tree diagram



← Sample Space

P(2 tails) = (.7)(.7) = .49

P(1T & 1H) = 2(.7)(.3) = .42

P(No tails) = (.3)(.3) = .09

# tails (L1)	P(# tails) (L2)
2	.49
1	.42
0	.09

tails → L1 , P(# tails) → L2

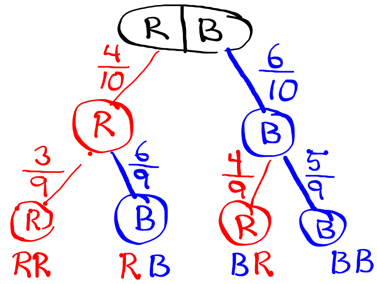
Use L1 & L2 to find $\bar{x} = 1.4$ ✓ S = blank ✓ $n = 1$ ✓

May 4, 2021

A box has 4 Red & 6 Blue balls.

Draw 2 balls, No replacement.

Tree Diagram



$P(2R) = \frac{4}{10}\cdot\frac{3}{9} = \frac{12}{90}$

$P(1R\ 1b) = 2\cdot\frac{4}{10}\cdot\frac{6}{9} = \frac{48}{90}$

$P(\text{No } R) = \frac{6}{10}\cdot\frac{5}{9} = \frac{30}{90}$

# Red	P(# R)
2	12/90
1	48/90
0	30/90

Red → L1

P(# Red) → L2

Use L1 & L2 → $\bar{x} = .8$

S = Blank

n = 1

5 Females and 10 males

Select 3 people

$P(3 \text{ Females}) = \frac{5}{15}\cdot\frac{4}{14}\cdot\frac{3}{13} = \frac{2}{91}$

$P(3 \text{ Males}) = \frac{10}{15}\cdot\frac{9}{14}\cdot\frac{8}{13} = \boxed{\frac{24}{91}}$

P(at least 1 Female) = 1 − P(No Females)

$= 1 - P(\text{all males}) = 1 - \frac{24}{91} = \boxed{\frac{67}{91}}$

P(at least 1 Male) = 1 − P(No Male)

= 1 − P(All Females)

$= 1 - \frac{2}{91} = \boxed{\frac{89}{91}}$

$$P(1F \text{ and } 2M) = \frac{{}_5C_1 \cdot {}_{10}C_2}{{}_{15}C_3} = \boxed{\frac{45}{91}}$$

$$P(2F \text{ and } 1M) = \frac{{}_5C_2 \cdot {}_{10}C_1}{{}_{15}C_3} = \boxed{\frac{20}{91}}$$

A deck of cards has 40 cards with
10 face and 3 Ace cards.
Draw 4 cards, No replacement

$$P(2\ F\ \&\ 2\ A) = \frac{{}_{10}C_2 \cdot {}_3C_2}{{}_{40}C_4} = \boxed{.001}$$

$$P(\text{All face cards}) = \frac{{}_{10}C_4}{{}_{40}C_4} = \boxed{\frac{21}{9139}}$$

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

10 face , 30 $\overline{\text{face}}$

$$= 1 - \frac{{}_{30}C_4}{{}_{40}C_4}$$

$$= 1 - \underline{\quad} = \boxed{.700}$$

wheel has 20 equal Sectors.

9 Black 9 Red 2 Green.

Spin it twice

$P(BB) = \frac{9}{20} \cdot \frac{9}{20} = \frac{81}{400}$

$P(RR) = \frac{9}{20} \cdot \frac{9}{20} = \frac{81}{400}$

$P(GG) = \frac{2}{20} \cdot \frac{2}{20} = \frac{4}{400}$

P(Same color)

$= \frac{81}{400} + \frac{81}{400} + \frac{4}{400} = \frac{166}{400}$

P(Different Color) =

$1 - P(\text{Same Color}) = \frac{234}{400}$

Math dept has 10 classes to offer to 10 instructors.

They need 6 classes in morning,

3 classes in the afternoon, and 1 at evening.

How many ways can this be done?

Morning Afternoon Evening

${}_{10}C_6 \cdot {}_4C_3 \cdot {}_1C_1 = \boxed{840}$

Evening Afternoon Morning

${}_{10}C_1 \cdot {}_9C_3 \cdot {}_6C_6 = \boxed{840}$

May 4, 2021

A full-deck of playing Cards has 52 Cards and 12 face Cards. Draw 3 Cards, No replacement, order does not matter.

1) $P(\text{3 face Cards}) = \dfrac{{}_{12}C_3 \cdot {}_{40}C_0}{{}_{52}C_3} = \dfrac{11}{1105}$

2) $P(\text{exactly 2 face Cards}) = \dfrac{{}_{12}C_2 \cdot {}_{40}C_1}{{}_{52}C_3} = \dfrac{132}{1105}$

3) $P(\text{exactly 1 face Card}) = \dfrac{{}_{12}C_1 \cdot {}_{40}C_2}{{}_{52}C_3} = \dfrac{36}{85}$

4) $P(\text{No face Cards}) = \dfrac{{}_{12}C_0 \cdot {}_{40}C_3}{{}_{52}C_3} = \dfrac{38}{85}$

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

$= 1 - \dfrac{38}{85} = \boxed{\dfrac{47}{85}}$

# face Card (L1)	P(# face Cards) (L2)
3	11/1105
2	132/1105
1	36/85
0	38/85

Use L1 & L2 to find

$\bar{x} = .692$

S = blank

n = 1

A 4-Sided loaded die is numbered 1, 2, 3, 4.

P(land 1) = .18

P(land 2) = .32

P(Land 3) = .35

P(land 4) = .15

Land (L1)	P(land) (L2)
1	.18
2	.32
3	.35
4	.15

Use L1 & L2 to find $\bar{x} = 2.47$

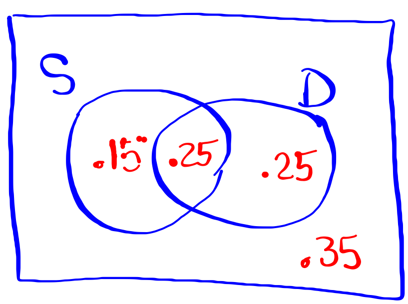
S = Blank

$n = 1$

P(Smoker) = .4

P(Drinker) = .5

P(Smoker and Drinker) = .25



$$P(\text{Smoker} \mid \text{Drinker}) = \frac{.25}{.5} = \boxed{.5}$$

$$P(\text{Drinker} \mid \text{Smoker}) = \frac{.25}{.4} = \boxed{.625}$$

$P(A) = .35$

$P(B) = .8$

$P(A|B) = .4$

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

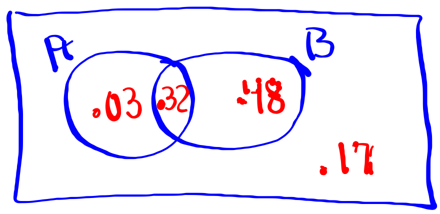
$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$

$$.4 = \frac{P(A \text{ and } B)}{.8}$$

Cross-Multiply

$P(A \text{ and } B) = \boxed{.32}$

2) Venn Diagram



3) $P(B|A) = \frac{.32}{.35} = \boxed{\frac{32}{35}}$

Class QZ 16

$P(A) = .4$ $P(B) = .5$ $P(A \text{ and } B) = .3$

1) Venn Diagram

2) $P(A|B)$

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