Statistics

Lecture 12

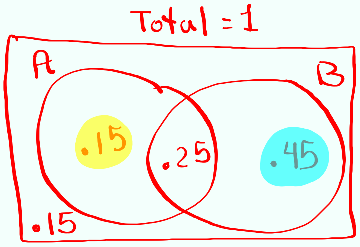
Feb 19-8:47 AM

Given $P(A) = .4$, $P(B) = .7$, $P(A \text{ and } B) = .25$

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

$= \boxed{.6}$

3) Construct Venn Diagram.



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

$= .4 + .7 - .25$

$= \boxed{.85}$

4) $P(A \text{ only} \text{ or } B \text{ only}) = .15 \quad .45 = \boxed{.6}$

5) $P(\overline{A} \text{ and } \overline{B}) = P(\overline{A \text{ or } B}) = 1 - .85 = \boxed{.15}$

De Morgan's Law

6) $P(\overline{A} \text{ or } \overline{B}) = P(\overline{A \text{ and } B}) = 1 - .25 = \boxed{.75}$

Oct 7-12:26 PM

Odds in favor of event E are $\boxed{3:37}$.

1) odds against E. $\boxed{37:3}$

2) $P(E) = \frac{3}{3+37} = \frac{3}{40}$

3) $P(\bar{E}) = \frac{37}{3+37} = \frac{37}{40}$

Oct 7-12:34 PM

$P(A) = .08$

1) write $P(A)$ in % notation

$.08(100\%) = 8\%$

2) write $P(A)$ in reduced fraction

.08 [Math] [1:▶Frac] [Enter] $\frac{2}{25}$

3) find $P(\bar{A})$ in decimal.

$= 1 - P(A) = 1 - .08 = \boxed{.92}$

4) Find odds in favor of event A.

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

$.08 : .92$ → $.08 \boxed{\div} .92$ MATH 1:▶Frac Enter $\boxed{2:23}$

5) find odds against event A.

$\boxed{23:2}$

Oct 7-12:37 PM

$P(A) = .6$, $P(B) = .5$, Find $P(A \text{ or } B)$

1) if A & B are M.E.E.

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

$= .6 + .5 - 0 = 1.1$

Impossible

2) If A & B are independent Events

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

$= .6 + .5 - (.6)(.5)$

$= .6 + .5 - .3 = \boxed{.8}$

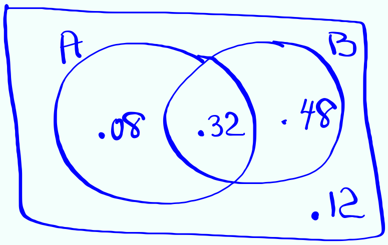
Oct 7-12:42 PM

$P(A) = .4$, $P(B) = .8$ A & B are independent Events

1) $P(A \text{ and } B) = (.4)(.8) = \boxed{.32}$

2) $P(A \text{ or } B) = .4 + .8 - .32 = \boxed{.88}$

3) Construct Venn Diagram



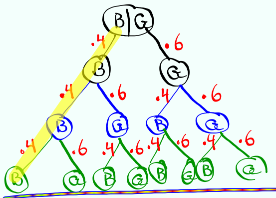
Oct 7-12:47 PM

for Some reason

P(Newborn is a boy) = .4

P(Neborn is a girl) = .6

3 newborns were randomly Selected



BBB BBG BGB BGG

GBB GBG GGB GGG

P(3 Boys) = (.4)(.4)(.4) = $\boxed{.064}$

P(2 Boys & 1G) = 3(.4)(.4)(.6) = $\boxed{.288}$

P(1 Boy & 2 girls) = 3(.4)(.6)(.6) = $\boxed{.432}$

P(No boys) = P(All girls) = (.6)(.6)(.6) = $\boxed{.216}$

P($\underbrace{\text{at least 1}}$ boy) = 1 − P(No boys)
= 1 − .216 = $\boxed{.784}$

P($\underbrace{\text{at least 1}}$ girl) = 1 − P(No girls)
= 1 − P(All boys)
= 1 − .064 = $\boxed{.936}$

Oct 7-12:53 PM

# Boys	P(# Boys)
3	.064
2	.288
1	.432
0	.216

L1

L2

$\boxed{\text{STAT}}$ $\boxed{\rightarrow}$ CALC

$\boxed{\text{1:1-Var Stats}}$

L1 & L2

$\bar{x} = 1.2$

S_x = blank

n = 1 ← Total Prob.

Oct 7-1:07 PM

5 Females, 10 Males, Select 2 people

No Replacement

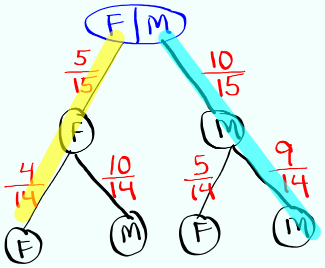
Sample Space

FF

FM ✓

MF ✓

MM ✓



$P(\text{2 Females}) = \frac{5}{15} \cdot \frac{4}{14} = \boxed{\frac{2}{21}}$

$P(\text{1M \& 1F}) = 2 \cdot \frac{5}{15} \cdot \frac{10}{14} = \boxed{\frac{10}{21}}$

$P(\text{2 Males}) = \frac{10}{15} \cdot \frac{10}{14} = \boxed{\frac{9}{21}}$

#F	P(#F)
2	2/21
1	10/21
0	3/7

$P(\underbrace{\text{at least 1 Female}}) = 1 - P(MM) = 1 - \frac{9}{21} = \frac{12}{21} = \boxed{\frac{4}{7}}$

$P(\underbrace{\text{at least 1 Male}}) = 1 - P(FF) = 1 - \frac{2}{21} = \boxed{\frac{19}{21}}$

Oct 7-1:13 PM

#F	P(#F)
2	2/21
1	10/21
0	3/7

L1

L2

Use 1-Var Stats with L1 & L2 to Find

$\bar{x} = .\overline{6}$

$S_x =$ blank

$n = 1$

Oct 7-1:24 PM

Dependent Events

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

Given

52 Cards, 12 face Cards, 4 Aces

Draw 2 Cards, No replacement

$$P(\text{Face then Ace}) = \frac{12}{52} \cdot \frac{4}{51} = \boxed{\frac{4}{221}}$$

$$P(\text{Two Aces}) = \frac{4}{52} \cdot \frac{3}{51} = \boxed{\frac{1}{221}}$$

$$P(\text{No face Cards}) = \frac{40}{52} \cdot \frac{39}{51} = \boxed{\frac{10}{17}}$$

Oct 7-1:45 PM

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

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

Conditional Prob.

Oct 7-1:51 PM

$P(\text{Coffee}) = .8$

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

$P(\text{Coffee and Donuts}) = .3$

$$P(\text{Donuts} \mid \text{Coffee}) = \frac{P(\text{Coffee and Donuts})}{P(\text{Coffee})} = \frac{.3}{.8} = \frac{3}{8} = \boxed{.375}$$

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

Oct 7-1:53 PM

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

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

$P(\text{Pants and shirt}) = .3$

$$P(\text{shirt} \mid \text{pants}) = \frac{P(\text{shirt and Pants})}{P(\text{Pants})} = \frac{.3}{.7} = \frac{3}{7} \approx .429$$

$$P(\text{Pants} \mid \text{shirt}) = \frac{P(\text{Pants \& shirt})}{P(\text{shirt})} = \frac{.3}{.4} = \boxed{.75}$$

Oct 7-1:58 PM

5 people

Adam Bill Carol David Eddie

Need to select 2 people

~~AB~~	~~AC~~	~~AD~~	~~AE~~
BA	~~BC~~	~~BD~~	~~BE~~
CA	CB	~~CD~~	~~CE~~
DA	DB	DC	~~DE~~
EA	EB	EC	ED

First second

$5 \cdot 4$

$= 20$ choices

Assume order does not matter

$_5C_2$

10 choices

5 $\boxed{\text{MATH}}$ → PRB ↓ 2 $\boxed{\text{Enter}}$

$\boxed{_nC_r}$

Oct 7-2:04 PM

12 players

5 can play

How many ways can this happen?

12 MATH → PRB ↓ 5 $\boxed{\text{enter}}$

$_nC_r$

$_{12}C_5 = \boxed{792}$

Oct 7-2:11 PM

Ca Lotto

50 numbers

choose 5 of them

\# of ways $_{50}C_5$

2,118,760

Oct 7-2:14 PM

4 Women & 6 Men

Select 3 people

1) # of ways you can do that

$_{10}C_3 = 120$

2) # of ways we can select 1 W & 2M

$_4C_1 \cdot {}_6C_2 = 60$

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

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

Oct 7-2:16 PM

A company hired 12 people.

5 W & 7 M.

8 Morning shift & 4 Evening shift.

1) How many ways can we staff the evening shift? $_{12}C_4 = 495$

2) How many ways can we staff the evening shift with 2W & 2M?

$$_5C_2 \cdot {_7C_2} = 210$$

3) P(2W & 2M in the evening shift)

$$= \frac{_5C_2 \cdot {_7C_2}}{_{12}C_4} = \frac{210}{495} = \boxed{\frac{14}{33}}$$

$$= \boxed{.424}$$

4) P(No men in the evening shift)

$$= \frac{_5C_4 \cdot {_7C_0}}{_{12}C_4} = \frac{5}{495} = \boxed{\frac{1}{99}}$$

5) P($\underbrace{\text{at least 1 W}}$ in the evening shift)

$= 1 - $ P(No Women) $= 1 - $ P(All Men)

$$= 1 - \frac{_5C_0 \cdot {_7C_4}}{_{12}C_4} = \boxed{\frac{92}{99}}$$

Oct 7-2:22 PM