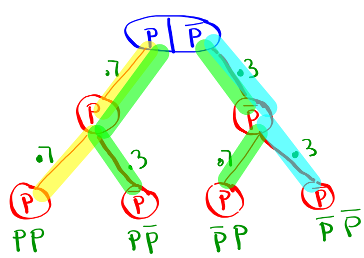
Math 110
Winter 2021
Lecture 10

More on Prob.

Suppose Prob. of passing a math class is .7.

Randomly select 2 students.



P(Both pass) = P(P P) = (.7)(.7) = $\boxed{.49}$

P(exactly one pass) = P(P $\bar{P}$ or $\bar{P}$ P) = (.7)(.3) + (.3)(.7)

= $\boxed{.42}$

P(None of pass) = P($\bar{P}$ $\bar{P}$) = (.3)(.3) = $\boxed{.09}$

P(at least one passes) = 1 − P(None)

= 1 − .09 = $\boxed{.91}$

A box has 4 Red and 6 Blue balls

Draw 3 balls, No replacement

R → Red

B → Blue

Sample Space

RRR ✓

RRB

RBR

RBB

BRR

BRB

BBR

BBB

$P(3R) = \frac{4}{10} \cdot \frac{3}{9} \cdot \frac{2}{8} = \frac{1}{30}$

$P(2R, 1B) = \frac{4}{10} \cdot \frac{3}{9} \cdot \frac{6}{8} \cdot 3 = \frac{3}{10}$

$P(1R, 2B) = \frac{4}{10} \cdot \frac{6}{9} \cdot \frac{5}{8} \cdot 3 = \frac{1}{2}$

Zero

$P(0R) = \frac{6}{10} \cdot \frac{5}{9} \cdot \frac{4}{8} = \frac{1}{6}$

# Red	P(# Red)
3	1/30
2	3/10
1	1/2
0	1/6

Clear all lists

Reds → L1, P(# Reds) → L2

Use L1 & L2 to find

$\bar{x} = 1.2$ S = blank n = 1

P(at least 1 Red ball) = 1 − P(No Red Ball)

$= 1 - P(\text{All Blue}) = 1 - \frac{1}{6} = \boxed{\frac{5}{6}}$

P(at least 1 Blue ball) = 1 − P(No Blue Ball)

$= 1 - P(\text{All Red}) = 1 - \frac{1}{30} = \boxed{\frac{29}{30}}$

Hypergeometric Prob:

3 Females & 7 Males, Select 3 people

✓FFF

FFM

FMF

FMM

MFF

MFM

MMF

MMM

$P(3\ \text{Females}) = \frac{{}_3C_3 \cdot {}_7C_0}{{}_{10}C_3} = \frac{1}{120}$

$P(2F\ \&\ 1M) = \frac{{}_3C_2 \cdot {}_7C_1}{{}_{10}C_3} = \frac{21}{120}$

$P(1F\ \&\ 2M) = \frac{{}_3C_1 \cdot {}_7C_2}{{}_{10}C_3} = \frac{63}{120}$

$P(0F, 3M) = \frac{{}_3C_0 \cdot {}_7C_3}{{}_{10}C_3} = \frac{35}{120}$

# F	P(# F)
3	1/120
2	21/120
1	63/120
0	35/120

#F → L1, P(#F) → L2

Use L1 & L2 to find

$\bar{x} = .9$ S = blank n = 1

P(at least one Female) = 1 − P(None) = 1 − P(No Female)

$= 1 - \frac{35}{120} = \boxed{\frac{17}{24}}$

P(at least one Male) = 1 − P(No male)

$= 1 - P(\text{All Female}) = 1 - \frac{1}{120} = \boxed{\frac{119}{120}}$

January 21, 2021

Standard deck of playing Cards.

Draw 5 Cards, No replacement.

$$P(2\text{ Aces } \& \text{ } 3\text{ Face cards}) = \frac{{}_4C_2 \cdot {}_{12}C_3}{{}_{52}C_5} = \frac{132\cancel{0}}{259896\cancel{0}} = \frac{132}{259896} = \frac{66}{129948} = \frac{33}{64974} = \boxed{\frac{11}{21658}}$$

Draw 5 Cards

$P(2\text{Aces } \& \text{ } 2\text{ Face Cards})$

$$= \frac{{}_4C_2 \cdot {}_{12}C_2 \cdot {}_{36}C_1}{{}_{52}C_5} = \frac{14256}{2598960}$$

other Card.

14256 ÷ 2598960 Math 1: Enter

$\approx .005$

4 Aces
12 Faces
36 other Cards
52 Cards

Mt. SAC Lotto

Select 4 numbers from 1 to 30.

4 Numbers are drawn (Winning #)

26 Numbers are not drawn (losing #)

$$P(4\text{ Winning }\#) = \frac{{}_4C_4 \cdot {}_{26}C_0}{{}_{30}C_4} = \frac{1}{27405}$$

$$P(\text{exactly } 3\text{ W}\#) = \frac{{}_4C_3 \cdot {}_{26}C_1}{{}_{30}C_4} = \frac{104}{27405}$$

$$P(\text{exactly } 2\text{ W}\#) = \frac{{}_4C_2 \cdot {}_{26}C_2}{{}_{30}C_4} = \frac{1950}{27405}$$

$$P(\text{exactly } 1\text{ W}\#) = \frac{{}_4C_1 \cdot {}_{26}C_3}{{}_{30}C_4} = \frac{10400}{27405}$$

$$P(\text{No winning }\#) = \frac{{}_4C_0 \cdot {}_{26}C_4}{{}_{30}C_4} = \frac{14950}{27405}$$

A deck of Cards has 40 Cards, 25 Red, 10 Face, and 3 Aces.

Find the odds to draw a

1) Red Card $25\ \text{Red} : 15\ \overline{\text{Red}}$ $\boxed{5:3}$

2) Face Card

$10\ \text{Face} : 30\ \overline{\text{Face}}$ $\boxed{1:3}$

3) Ace

$3\ \text{Aces} : 37\ \overline{\text{Aces}}$

$\boxed{3:37}$

4) Face or Ace $\boxed{13:27}$

10 3

Suppose $P(E) = .16$

1) $P(\overline{E}) = 1 - P(E) = \boxed{.84}$

2) Find odds in Favor of event E

$.16 \div .84$ $\boxed{\text{Math}}$ $\boxed{1:}$ $\boxed{\text{Enter}}$ $\frac{4}{21}$

$$\frac{P(E)}{P(\overline{E})} = \frac{.16}{.84}$$

4:21

3) Find odds against event E.

$\boxed{21:4}$

SG 13 & 14 ✓

Ch.5 SG 15 – 18

Data
- 1) Qualitative
  - Non-Numerical
- 2) Quantitive
  - Numerical
    - 1) Discrete
      - Countable
    - 2) Continuous
      - Measureable

Probability Distribution

It is a way to provide prob. of all possible outcome.

It can be in the form of

- Table
- Graph
- Formula

Ch. 5: Prob. dist with discrete variable

Ch. 6 Prob. dist with Continuous Variable

Let x be a discrete random Variable with Prob. dist. $P(x)$,

1) $0 \le P(x) \le 1$

2) $\sum P(x) = 1$

3) $P(x) = 0 \iff$ Impossible event

4) $P(x) = 1 \iff$ Sure event

5) $0 < P(x) \le .05 \iff$ Rare Event

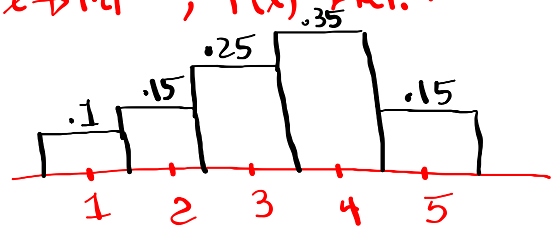
Consider the following chart:

x	$P(x)$
1	.1
2	.15
3	.25
4	.35
5	.15

1) Verify $\sum P(x) = 1$ ✓

2) Draw Prob. Dist. histogram

$x \to MP$, $P(x) \to$ Rel. F



$x \to L1$, $P(x) \to L2$

Use $L1$ & $L2$ to find $\bar{x} = 3.3$ ✓ S: blank ✓ $n = 1$ ✓

Mean μ (mu) $\mu = \sum x\,P(x)$

Variance σ^2 (Sigma^2) $\sigma^2 = \sum x^2 P(x) - \mu^2$

Standard Deviation σ (Sigma) $\sigma = \sqrt{\sigma^2}$

$x \to L1$ $\boxed{STAT}\ \boxed{\rightarrow}$ CALC list: L1

$P(x) \to L2$ $\boxed{1: 1\text{-Var Stats}}$ freq list: L2

Calculate

$\mu = \bar{x}$ $\sigma = \sigma_x$

To find σ^2: $\boxed{VARS}\ \boxed{5: Statistics}\ \boxed{4: \sigma_x}\ \boxed{x^2}\ \boxed{Enter}$

Using Last example

$\mu = \bar{x} = 3.3$ $\boxed{VARS}\ \boxed{5:}\ \boxed{4: \sigma_x}$

$\sigma = \sigma_x = 1.187$ $\boxed{x^2}\ \boxed{Math}\ \boxed{1:}$ Enter $\boxed{\frac{141}{100}}$

Consider the chart below:

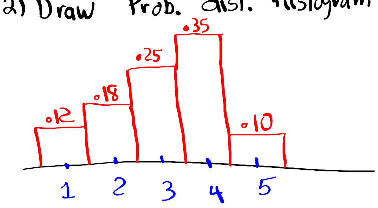
x	$P(x)$
1	.12
2	.18
3	.25
4	.35
5	.10

1) Find $P(x=5)$

$= 1 - [.12 + .18 + .25 + .35]$

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

2) Draw Prob. dist. histogram



3) Find μ & σ

$x \to L1$

$P(x) \to L2$ $\Rightarrow$ $\mu = 3.13$ $\sigma = 1.180$

4) Find σ^2 in reduced fraction. $\sigma^2 = 1.393$

$\boxed{\sigma^2 = \frac{1393}{1000}}$

Round μ & σ to 1-decimal,

$\mu = 3.1$ $\sigma = 1.2$

then find Usual Range. $\mu \pm 2\sigma$

95% Range $= 3.1 \pm 2(1.2) \Rightarrow \boxed{.7 \text{ to } 5.5}$

Class QZ 6

Given $P(A) = .65$ $P(B) = .45$ $P(A \text{ and } B) = .25$

1) Venn Diagram

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

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