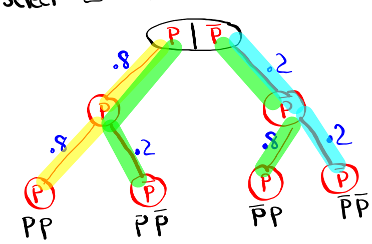
# Math 110

# Winter 2021

# Lecture 10

Suppose prob. of passing a math class is .8 for any student.

Randomly select 2 students




P(both pass) $=(.8)(.8)=\boxed{.64}$

P(1 pass & 1 $\overline{\text{pass}}$) $= P(P\bar{P}$ or $\bar{P}P) = (.8)(.2)+(.2)(.8)=\boxed{.32}$

P(Neither pass) $= P(\bar{P}\bar{P}) = (.2)(.2) = \boxed{.04}$

| # Pass (L1) | P(# Pass) (L2) |
|---|---|
| 2 | .64 |
| 1 | .32 |
| 0 | .04 |

Clear all lists

# Pass → L1 , P(# pass) → L2

Use L1 & L2 to find

$\bar{x}=1.6$  S= blank  $n=1$

P(at least 1 pass) = 1 − P(None pass) $= 1-.04 = \boxed{.96}$

A box has 3 Red and 7 Blue balls.

Randomly draw 3 balls, No replacement.

R→Red

B→Blue

Sample Space: {RRR, RRB, RBR, RBB, BRR, BRB, BBR, BBB}

$$P(\text{3 Reds}) = \frac{\cancel{3}^{1}}{10}\cdot\frac{\cancel{2}^{1}}{\cancel{9}_{3}}\cdot\frac{1}{\cancel{8}_{4}} = \frac{1}{120}$$

$$P(\text{exactly 2 Reds}) = \cancel{3}\cdot\frac{\cancel{3}}{10}\cdot\frac{\cancel{2}}{\cancel{9}}\cdot\frac{7}{\cancel{8}_{4}} = \frac{7}{40}$$

$$P(\text{exactly 1 Red}) = \cancel{3}\cdot\frac{\cancel{3}}{10}\cdot\frac{7}{\cancel{9}}\cdot\frac{\cancel{6}^{3}}{\cancel{8}_{4}} = \frac{21}{40}$$

$$P(\text{No Red}) = \frac{7}{\cancel{10}_{2}}\cdot\frac{\cancel{6}^{\cancel{3}}}{\cancel{9}_{3}}\cdot\frac{\cancel{5}}{8} = \frac{7}{24}$$

| L1 #R | L2 P(#R) |
|---|---|
| 3 | 1/120 |
| 2 | 7/40 |
| 1 | 21/40 |
| 0 | 7/24 |

#R → L1

P(#R) → L2

Use L1 & L2 to find

$\bar{x} = .9$

S = blank

n = 1

$$P(\text{at least 1 Red Ball}) = 1 - P(\text{No Red ball}) = 1 - \frac{7}{24} = \boxed{\frac{17}{24}}$$

$$P(\text{at least 1 Blue Ball}) = 1 - P(\text{No Blue ball}) = 1 - P(\text{All Red}) = 1 - \frac{1}{120} = \boxed{\frac{119}{120}}$$

Hypergeometric Prob.:

3 Females & 7 Males

Select 3 people, No replacement

FFF, FFM, FMF, FMM, MFF, MFM, MMF, MMM

$$P(\text{3 Males}) = \frac{{}_3C_0\cdot{}_7C_3}{{}_{10}C_3} = \frac{35}{120} = \frac{7}{24}$$

$$P(\text{2 M \& 1 F}) = \frac{{}_3C_1\cdot{}_7C_2}{{}_{10}C_3} = \frac{63}{120} = \frac{21}{40}$$

$$P(\text{1 M \& 2 F}) = \frac{{}_3C_2\cdot{}_7C_1}{{}_{10}C_3} = \frac{21}{120} = \frac{7}{40}$$

$$P(\text{No males \& 3 F}) = \frac{{}_3C_3\cdot{}_7C_0}{{}_{10}C_3} = \frac{1}{120}$$

January 21, 2021

Mt. SAC Lotto

Choose 4 numbers from 1 to 30.

The host draws 4 numbers as well.

4 winning numbers.

26 Losing Numbers.

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

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

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

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

$P(\text{NO win. }\#) = \frac{{}_4C_0 \cdot {}_{26}C_4}{{}_{30}C_4} = \frac{14950}{27405}$

A deck of Cards has 40 Cards, 25 Red, 10 face cards, and 3 aces.

Find the odds in favor of drawing

1) Red Card

25 Reds : 15 $\overline{\text{Reds}}$

$\boxed{5:3}$

2) Face Card

10 Face : 30 $\overline{\text{Face}}$

$\boxed{1:3}$

3) an Ace

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

$\boxed{3:37}$

4) Face or Ace.

10 + 3 = 13

$\boxed{13:27}$

Suppose $P(E) = .75$

1) Find $P(\bar{E})$

$P(\bar{E}) = 1 - P(E) = \boxed{.25}$

2) Find odds in favor of event E. → 3:1

$$\frac{P(E)}{P(\bar{E})} = \frac{.75}{.25} = 3 = \frac{3}{1}$$

3) Find odds against event E. → $\boxed{1:3}$

$$\frac{P(\bar{E})}{P(E)} = \frac{.25}{.75} = \frac{1}{3}$$

Ch. 5 ⇒ SG 15 – 18

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

Prob. Distribution:

It is a way that provides the prob. of all possible outcomes.

- By Table/chart
- By Graph
- By Formula / Computation

Ch. 5: Prob. dist. with discrete random Variable.

Ch. 6: Prob. dist. with Continuous random Variable

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

1) $0 \leq P(x) \leq 1$
2) $\sum P(x) = 1$
3) $P(x) = 1 \iff$ Sure event
4) $P(x) = 0 \iff$ Impossible event
5) $0 < P(x) \leq .05 \iff$ Rare event

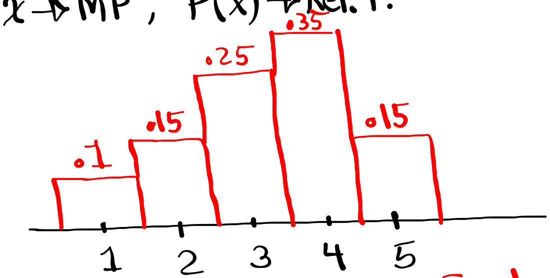
Consider the chart below:

| $x$ | $P(x)$ |
|---|---|
| 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.




③ $x \to L1$, $P(x) \to L2$ use L1 & L2 to find

$\bar{x} = 3.3$   S = blank   $n = 1$

Mean   $\mu$ (mu)   $\mu = \sum x\,p(x)$

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

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

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

$\boxed{\text{STAT}}$ $\boxed{\to}$ CALC $\boxed{1:}$

list: L1
freqlist: L2
$\boxed{\text{Calculate}}$

L1, L2 $\boxed{\text{enter}}$

$\mu = \bar{x}$   use last example $\mu = 3.3$

$\sigma = \sigma_x$   $\sigma = 1.187$

Now $\sigma^2$   $\boxed{\text{VARS}}$ $\boxed{5:}$ $\boxed{4{:}\sigma_x}$ $\boxed{x^2}$

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

Consider the Following Chart

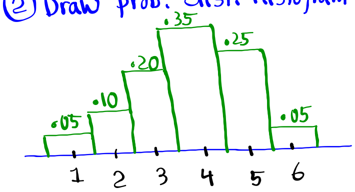
| $x$ | $P(x)$ |
|---|---|
| 1 | .05 |
| 2 | .10 |
| 3 | .20 |
| 4 | .35 |
| 5 | .25 |
| 6 | .05 |

1) Find $P(x=6)$

$=1-[.05+.10+.20+.35+.25]$

$=\boxed{.05}$

2) Draw prob. dist. histogram




3) Find $\mu$ & $\sigma$

$x \to L1$ STAT CALC 1-Var Stats L1 & L2

$P(x) \to L2$ $\mu=3.8$ $\sigma=1.208$

4) Find $\sigma^2$ in reduced fraction

VARS

5:

4:

$x^2$

Math 1: Enter $\sigma^2 = \frac{73}{50}$

5) Round $\mu$ & $\sigma$ to 1-decimal, then find

$\mu=3.8$, $\sigma=1.2$

a) 68% Range

$\mu \pm \sigma = 3.8 \pm 1.2 \Rightarrow \boxed{2.6 \text{ to } 5}$

b) Usual Range

"95% Range"

$\mu \pm 2\sigma = 3.8 \pm 2(1.2)$

$= 3.8 \pm 2.4$

$\Rightarrow \boxed{1.4 \text{ to } 6.2}$

Pay me \$10, Draw a ticket, If You have the winning ticket, I give You a TI-84 worth \$125.

Expected Value = $\mu$ (host)

I Sold 40 Tickets

| Net | P(Net) |
|---|---|
| 10 − 125 | $\frac{1}{40}$ |
| 10 − 0 | $\frac{39}{40}$ |

Net → L1

P(Net) → L2

Use L1 & L2 to find

$\bar{x} = \mu =$ Expected Value $\Rightarrow \boxed{\$6.875/\text{tkt}}$

Class QZ 6

Given: P(A)=.65 P(B)=.45 P(A and B)=.25

1) Venn Diagram

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

3) P(A or B)