Statistics

Lecture 8

Feb 19-8:47 AM

3 Females & 5 males were hired.

SG 13

The manager needs 4 for morning shift, 3 for afternoon shift, and 1 for night shift.

Focus on afternoon shift,

1) P(all females) = P(FFF) = $\frac{3}{8} \cdot \frac{2}{7} \cdot \frac{1}{6} = \boxed{\frac{1}{56}}$

2) P(all males) = P(MMM) = $\frac{5}{8} \cdot \frac{4}{7} \cdot \frac{3}{6} = \boxed{\frac{5}{28}}$

3) P(are same gender) = P(FFF or MMM)

$= \frac{1}{56} + \frac{5}{28} = \boxed{\frac{11}{56}}$

4) P(are not same gender) = P($\overline{\text{Same gender}}$)

$= 1 - P(\text{Same Gender})$

$= 1 - \frac{11}{56} = \boxed{\frac{45}{56}}$

Oct 17-8:01 AM

5) P(at least 1 Female)

FFF

Some F & Some M

MMM

$= 1 - P(\text{No Females})$

↑ Total Prob.

$= 1 - P(\text{All Males})$

$= 1 - \frac{5}{28} = \boxed{\frac{23}{28}}$

6) P(at least 1 Male)

FFF

Some F & Some M

MMM

$= 1 - P(\text{No males})$

$= 1 - P(\text{All Females})$

$= 1 - P(FFF)$

$= 1 - \frac{1}{56} = \boxed{\frac{55}{56}}$

7) P(exactly 1 Female)

FMM
MFM
MMF

$= 3 \cdot \frac{3}{8} \cdot \frac{5}{7} \cdot \frac{4}{6} = \boxed{\frac{15}{28}}$

8) P(exactly 2 Females)

FFM
FMF
MFF

$= 3 \cdot \frac{3}{8} \cdot \frac{2}{7} \cdot \frac{5}{6} = \boxed{\frac{15}{56}}$

Oct 17-8:10 AM

# Females (L1)	P(# Females) (L2)
3	1/56
2	15/56
1	15/28
0	5/28

STAT → CALC

1:1-Var Stats

List:L1

FreqList:L2

Calculate

$\bar{x} = 1.125$

$S = S_x =$ Blank

$\sum P(E) = 1$ → $n = 1$

Oct 17-8:24 AM

Suppose $P(A) = .5$, $P(B) = .8$, $P(A \text{ and } B) = .45$

1) $P(\overline{B}) = 1 - P(B) = \boxed{.2}$

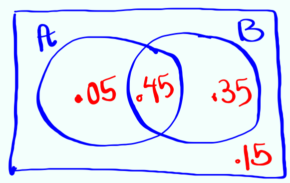
2) $P(\overline{A \text{ and } B}) = 1 - .45 = \boxed{.55}$

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

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

$= .5 + .8 - .45 = \boxed{.85}$

4) Construct Venn diagram.



Total = 1

5) $P(B \mid A) = \dfrac{P(A \text{ and } B)}{P(A)} = \dfrac{.45}{.5} = \boxed{.9}$

6) $P(A \mid B) = \dfrac{P(A \text{ and } B)}{P(B)} = \dfrac{.45}{.8} = .5625 \approx \boxed{.563}$

Oct 17-8:31 AM

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

$P(\text{pants}) = .5$

$P(\text{shoes} \mid \text{Pants}) = .6$

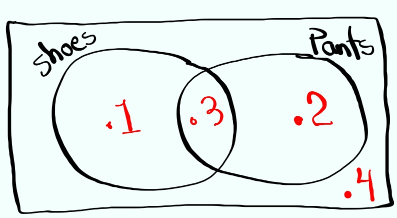
$P(\text{Shoes} \mid \text{Pants}) = \dfrac{P(\text{Shoes } \& \text{ Pants})}{P(\text{pants})}$

$.6 = \dfrac{P(\text{Shoes } \& \text{ Pants})}{.5}$

Cross-Multiply

$P(\text{Shoes and pants}) = (.6)(.5) = \boxed{.3}$

$P(\text{Shoes and Pants})$



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

Oct 17-8:40 AM

SG 14

Data
- 1) Qualitative
- 2) Quantitative
  - 1) Discrete "Countable"
  - 2) Continuous "Measureable"

Oct 17-9:06 AM

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

Prob. dist. gives the prob. of all Possible outcomes.

1) Table or chart
2) Graph
3) Formula
4) using def. of Prob.

Some rules

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

Oct 17-9:09 AM

Consider the chart below

x	$P(x)$
1	.2
2	.5
3	.3

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

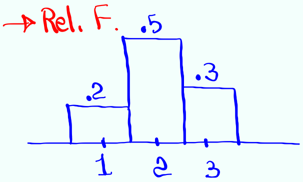
$.2 + .5 + .3 = 1$

2) Find $P(x \leq 2) =$

$= .2 + .5 = \boxed{.7}$

3) Draw Prob. dist. histogram.

$x \rightarrow$ Midpoint, $P(x) \rightarrow$ Rel. F.



4) $x \rightarrow L1$, $P(x) \rightarrow L2$

Use $\boxed{\text{1 - Var Stats}}$ with L1 & L2

Find

$\bar{x} = 2.1$

$S = S_x =$ Blank

$n = 1 \leftarrow$ Total Prob.

Oct 17-9:14 AM

Use the chart below

x	$P(x)$
1	.1
2	.3
3	.5
4	.1

1) Find $P(x = 4)$

$= 1 - (.1 + .3 + .5)$

Total Prob.

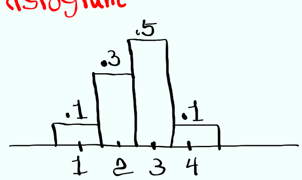
$= 1 - .9$

$= \boxed{.1}$

2) Find $P(2 \leq x \leq 3)$

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

3) Draw Prob. dist. histogram



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

Use $\boxed{\text{1 - Var Stats}}$ with L1 & L2

Find

$\bar{x} = 2.6$

$S = S_x =$ Blank

$n = 1 \leftarrow$ Total Prob.

Oct 17-9:22 AM

A piggy bank has 2 dimes & 3 nickels.
Take 2 coins with replacement.

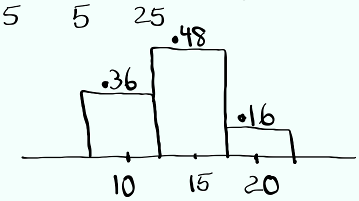
DD — 20¢
DN, ND — 15¢
NN — 10¢

$P(20¢) = P(DD) = \frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25} = .16$

$P(15¢) = P(DN \text{ or } ND) = 2 \cdot \frac{2}{5} \cdot \frac{3}{5} = \frac{12}{25} = .48$

$P(10¢) = P(NN) = \frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25} = .36$

¢	P(¢)
20	.16
15	.48
10	.36



¢ → L1 , P(¢) → L2
use [1-Var Stats] with L1 & L2

$\bar{x} = 14$
$S = S_x =$ Blank
$n = 1$

Oct 17-9:29 AM

Complete the chart below

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.2	.2	.2
2	.5	1.0	2.0
3	.3	.9	2.7

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

2) $\sum x\,p(x) = 2.1$

3) $\sum x^2 p(x) = 4.9$

4) Compute $\sum x^2 p(x) - \left(\sum x \cdot P(x)\right)^2$

$= 4.9 - 2.1^2 = \boxed{.49}$

5) $\sqrt{\text{Last answer}} = \sqrt{.49} = \boxed{.7}$

Oct 17-9:39 AM

Complete the chart below

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.1	.1	.1
2	.2	.4	.8
3	.4	1.2	3.6
4	.3	1.2	4.8

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

2) $\sum xp(x) = 2.9$

3) $\sum x^2p(x) = 9.3$

4) Compute $\sum x^2p(x) - \left(\sum xp(x)\right)^2$

$= 9.3 - (2.9)^2 = .89$

5) $\sqrt{\text{Last answer}} = \sqrt{.89} \approx .943$

Oct 17-9:47 AM

Working with x & $P(x)$

Mean $\mu = \sum xp(x)$ (mu)

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

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

Oct 17-10:06 AM

x	$P(x)$	$xP(x)$	$x^2P(x)$
2	.3	.6	1.2
3	.5	1.5	4.5
4	.2	.8	3.2

$\mu = \sum xP(x) = .6 + 1.5 + .8 = \boxed{2.9}$

$\sigma^2 = \sum x^2P(x) - \mu^2 = 1.2 + 4.5 + 3.2 - 2.9^2 = \boxed{.49}$

$\sigma = \sqrt{\sigma^2} = \sqrt{.49} = \boxed{.7}$

Oct 17-10:09 AM

Using TI to find μ, σ, and σ^2:

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

[STAT] [→] CALC

[1:1-Var Stats]

List: L1

FreqList: L2

[Calculate]

NO Menu

L1, L2

[7]

[Enter]

From Last example

$\mu = \bar{x} = 2.9$

[VARS] [5: Statistics]

[4: σ_x]

[x^2] [Enter]

$\sigma = \sigma_x = .7$

$n = 1$

$\sigma^2 = .49$

Oct 17-10:14 AM

A piggy bank has 2 dimes & 3 nickels.

Take 2 coins no replacement

DD — 20¢
DN, ND — 15¢
NN — 10¢

$P(20¢) = \frac{2}{5} \cdot \frac{1}{4} = \frac{2}{20} = \frac{1}{10} = .1$

$P(15¢) = P(DN \text{ or } ND) = 2 \cdot \frac{2}{5} \cdot \frac{3}{4} = \frac{12}{20} = \frac{6}{10} = .6$

$P(10¢) = \frac{3}{5} \cdot \frac{2}{4} = \frac{6}{20} = \frac{3}{10} = .3$

¢	P(¢)
20	.1
15	.6
10	.3

¢ → L1, P(¢) → L2

use [1-Var Stats] with L1 & L2

$\mu = \bar{x} = 14$

$\sigma = \sigma_x = 3$

$n = 1$

[VARS] [5: Statistics] [4: σ_x] [x^2] [Enter] → $\sigma^2 = \sigma_x^2 = 9$

Oct 17-10:20 AM

Application

Expected Value

I sold 20 tickets to give away a TI calc. each ticket was $10 and calc. worth $100. what is my expected value per TKT sold?

Draw 1 TKT

	Net	P(Net)		
L1	10 − 100	$\frac{1}{20}$	L2	winning TKT
	10 − 0	$\frac{19}{20}$		$\overline{\text{winning}}$ TKT

Net → L1

P(Net) → L2

[STAT] [→] CALC

[1: 1-Var Stats]

use L1 & L2

$E.V. = \mu = \bar{x} = \boxed{5}$

Oct 17-10:30 AM

You pay \$20 and buy a ticket.
5% chance of winning a laptop (\$1000)
10% 〃 〃 〃 a Calculator (\$100)
otherwise nothing. Find expected Value Per ticket Sold for the fundraisers.

Net	P(Net)	
20 − 1000	.05	laptop
20 − 100	.10	Calculator
20 − 0	.85	Lose

Net → L1
P(Net) → L2

Expected Value per tkt Sold $\mu = \bar{x} = -40$

Fundraisers are losing \$40 Per tkt Sold.

Oct 17-10:38 AM

Pay me \$5, draw a card from a full deck of playing cards

If you draw	I give you
Ace	\$50
Face	\$5
Any other Card	0

Net	P(Net)	
5 − 50	4/52	Ace
5 − 5	12/52	Face
5 − 0	36/52	Any other Card

Net → L1
P(Net) → L2
$E.V. = \mu = \bar{x}$
$= \boxed{0}$

SG 14 & 15 ✓

Oct 17-10:45 AM