Statistics

Lecture 15

Feb 19-8:47 AM

Consider the chart below

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

1) Verify $\sum P(x) = 1$ ✓

$.1 + .15 + .2 + .25 + .3 = 1$

2) $P(x=2 \text{ or } x=4)$

$= .15 + .25 = \boxed{.4}$

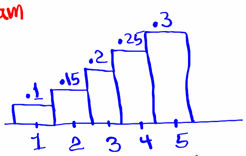
3) $P(x \geq 2) = 1 - P(x=1)$

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

4) $P(x \leq 4) = 1 - P(x=5)$

$= 1 - .3 = \boxed{.7}$

5) Draw Prob. dist. histogram



$x \to L1$

$P(x) \to L2$

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

to find $\bar{x} = 3.5$ S_x = Blank $n = 1 \leftarrow$ Total Prob.

Nov 15-7:21 AM

2 dimes, 8 nickels, take 2 coins, No replacement

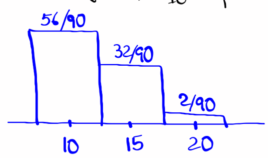
NN → 10¢
ND → 15¢ (Sample Space)
DN
DD → 20¢

$P(10¢) = \frac{8}{10} \cdot \frac{7}{9} = \frac{56}{90}$

$P(15¢) = 2 \cdot \frac{8}{10} \cdot \frac{2}{9} = \frac{32}{90}$

$P(20¢) = \frac{2}{10} \cdot \frac{1}{9} = \frac{2}{90}$

Total ¢ (L1)	P(Total ¢) (L2)
10	56/90
15	32/90
20	2/90



Total ¢ → L1

P(Total ¢) → L2

use $\boxed{\text{1-Var Stats}}$ with L1 & L2 to find

$\bar{x} = 12$ $\quad S_x$ = Blank $\quad n = 1$

Nov 15-7:31 AM

For random variable x with prob. dist. $P(x)$

Mean μ "mu"

Variance σ^2 "sigma^2"

Standard deviation σ "Sigma"

$$\boxed{\begin{gathered}\mu = \sum x P(x) \\ \sigma^2 = \sum x^2 P(x) - \mu^2 \\ \sigma = \sqrt{\sigma^2}\end{gathered}}$$

x	$P(x)$	$x\,P(x)$	$x^2 P(x)$
1	.4	.4	.4
2	.5	1.0	2.0
3	.1	.3	.9

$\mu = \sum x P(x) = 1.7$

$\sum x^2 P(x) = 3.3$

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

$= 3.3 - 1.7^2$

$\boxed{\sigma^2 = .41}$

$\sigma = \sqrt{\sigma^2} = \sqrt{.41} \approx \boxed{.640}$

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

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

$\mu = \bar{x} = 1.7$

$\sigma = \sigma_x = .640$

$n = 1$

For σ^2:

$\boxed{\text{VARS}}$ $\boxed{\text{5: Statistics}}$ $\boxed{4: \sigma_x}$ $\boxed{x^2}$ $\boxed{\text{Enter}}$

$\sigma^2 = .41$

in reduced fraction $\quad \sigma^2 = \frac{41}{100}$

$\boxed{\text{MATH}}$ $\boxed{\text{1:▸Frac}}$ $\boxed{\text{Enter}}$

Nov 15-7:42 AM

Consider the chart below

x	$P(x)$
2	.15
4	.25
6	.35
8	.15
10	.10

1) $P(x = 10)$
$= 1 - [.15 + .25 + .35 + .15] = \boxed{.10}$

2) $P(x = 4 \text{ or } x = 6)$
$= .25 + .35 = \boxed{.6}$

3) $P(x \geq 4) = 1 - .15 = \boxed{.85}$

4) $P(x \leq 8) = 1 - .1 = \boxed{.9}$

$x \to L1$
$P(x) \to L2$
use [1-Var Stats] with L1 & L2

$\mu = \bar{x} = 5.6$ $\sigma = \sigma_x = 2.332$ $n = 1$

Find σ^2 in reduced fraction

[VARS] [5: Statistics] [4: σ_x] [x^2]

[MATH] [1: ▸Frac] [Enter] $\boxed{\sigma^2 = \frac{136}{25}}$

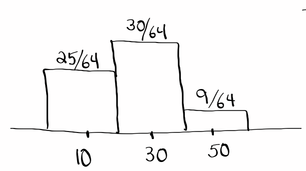
Nov 15-7:54 AM

3 Quarters, 5 nickels, Take 2 coins with replacement

NN → 10¢ $P(10¢) = \frac{5}{8} \cdot \frac{5}{8} = \frac{25}{64}$

NQ, QN (Sample Space) → 30¢ $P(30¢) = 2 \cdot \frac{5}{8} \cdot \frac{3}{8} = \frac{30}{64}$

QQ → 50¢ $P(50¢) = \frac{3}{8} \cdot \frac{3}{8} = \frac{9}{64}$



Total ¢	P(Total ¢)
10	25/64
30	30/64
50	9/64

Total ¢ → L1
P(Total ¢) → L2
1-Var Stats with L1 & L2

$\mu = \bar{x} = 25$ $\sigma = \sigma_x = 13.693$ $n = 1$

Find σ^2 in reduced fraction

[VARS] [5: Statistics] [4: σ_x]

[x^2] [MATH] [1: ▸Frac] [Enter]

$\boxed{\sigma^2 = \frac{375}{2}}$

Nov 15-8:07 AM

Empirical Rule:

68% Range $\rightarrow \mu \pm \sigma$

95% Range $\rightarrow \mu \pm 2\sigma$ Usual Range

99.7% Range $\rightarrow \mu \pm 3\sigma$

Suppose a prob. dist. has $\mu = 18$ and $\sigma = 4$

68% Range $\rightarrow \mu \pm \sigma = 18 \pm 4 \rightarrow \boxed{14 \text{ to } 22}$

Usual Range $\rightarrow \mu \pm 2\sigma = 18 \pm 2(4) \rightarrow \boxed{10 \text{ to } 26}$

95% Range

99.7% Range $\rightarrow \mu \pm 3\sigma = 18 \pm 3(4) \rightarrow \boxed{6 \text{ to } 30}$

Nov 15-8:18 AM

Use the chart below

x	$P(x)$
1	.05
2	.15
3	.25
4	.35
5	.15
6	.05

$x \rightarrow L1$

$P(x) \rightarrow L2$

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

$\mu = \bar{x} = 3.55$ $\sigma = \sigma_x = 1.203$ $n = 1$

Find σ^2 in reduced fraction

$\boxed{\sigma^2 = \frac{579}{400}}$

Round up μ & σ to whole

$\mu = 4$, $\sigma = 2$

68% Range $= \mu \pm \sigma = 4 \pm 2 \rightarrow \boxed{2 \text{ to } 6}$

95% Range $= \mu \pm 2\sigma = 4 \pm 2(2) \rightarrow \boxed{0 \text{ to } 8}$

Usual Range

Nov 15-8:24 AM

Application

Expected Value → μ → $\bar{x}$

I Sold 20 TKTs, \$10 each.

one ticket randomly drawn, owner of the TKT gets a Calc. worth \$120.

what is expected Value for TKT Sold for me?

Net	P(Net)	
10 − 120	1/20	Winning TKT
10 − 0	19/20	losing TKTS

Net → L1

P(Net) → L2

E.V. = μ = $\bar{x}$

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

$\boxed{\text{E.V. \$4}}$

find σ^2 → 684

Nov 15-8:53 AM

You Pay \$100 for luggage insurance.

Any damages, Airline pays You \$1000

P(damage) = .5% = .005

Net	P(Net)	
100 − 1000	.005	Damage
100 − 0	.995	~~Damage~~

Net → L1

P(Net) → L2

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

E.V. = μ = $\bar{x}$

\$95

find σ^2 → 4975

Nov 15-9:00 AM

A deck of cards has 40 cards, 10 face cards, and 2 aces.
Pay me \$5 and draw a card.
If you have an ace → I give you \$25
" " " a face → " " " \$10
Any other card, I give you nothing.
Find E.V. for each bet for the house.

Net	P(Net)	
5 − 25	2/40	Ace
5 − 10	10/40	Face
5 − 0	28/40	Any other card

Net → L1
P(Net) → L2
$\boxed{\text{1-Var Stats}}$ with L1 & L2
E.V. = $\mu = \bar{x}$ → $\boxed{\$1.25}$

Find σ^2 in reduced fraction

$$\boxed{\sigma^2 = \frac{675}{16}}$$

Nov 15-9:05 AM

At a fundraising event,
You buy one ticket for \$500.
250 tickets are sold, one ticket drawn,
winner gets a brand new car worth \$25000.
Find expected value for fundraisers per ticket sold.

Net	P(Net)	
500 − 25000	1/250	Winning TKT
500 − 0	249/250	Losing TKTS

E.V. = $\mu = \bar{x}$
\$ 400
$\boxed{\text{1-Var Stats}}$ with L1 & L2
Net P(Net)

σ^2 → 2,490,000

SG 14 & 15
Exam 2: SG 1−15
Review exam 1

I strongly urge you to make a summary cheat sheet for exam2

Nov 15-9:14 AM