Statistics

Lecture 14

Feb 19-8:47 AM

SG 14

Data
- 1) Qualitative
- 2) Quantitative
  - 1) Discrete
  - 2) Continuous

Let x be a discrete random variable with $\underbrace{\text{Prob. dist. } P(x)}$.

what is Prob. dist.?

It gives us the Prob. of all possible outcomes

1) Table or chart

2) Graph

3) Formula

4) use of def. of Prob.

Oct 22-10:36 AM

Some rules:

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

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

3) $P(x) = 1 \longleftrightarrow$ Sure event

4) $P(x) = 0 \longleftrightarrow$ Impossible event

5) $0 < P(x) \le .05 \longleftrightarrow$ Rare event

Oct 22-10:41 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 $P(x \ge 2)$

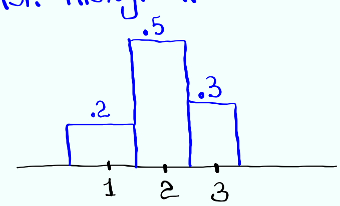
$= .5 + .3 = \boxed{.8}$

3) Find $P(x \le 2) = .5 + .2 = \boxed{.7}$

4) Draw Prob. dist. histogram.

$x \to$ class MP

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



Clear all lists

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

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

with L1 & L2.

$\bar{x} = 2.1$

$S = S_x =$ Blank

$n = 1 \leftarrow$ Total Prob.

Oct 22-10:44 AM

Consider the chart below:

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

1) Find $P(x=4)$

$= 1 - (.1+.3+.4) = 1-.8$

Total Prob.

$= \boxed{.2}$

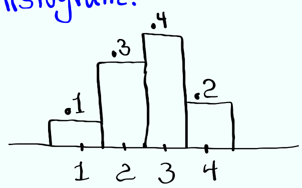
2) Find $P(2 \le x \le 3)$

$= .3 + .4 = \boxed{.7}$

3) Draw Prob. dist. histogram.

$x \to$ class MP

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



Clear all lists

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

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

with L1 & L2 to find

$\bar{x} = 2.7$

$S = S_x =$ Blank

$n = 1 \leftarrow$ Total Prob.

Oct 22-10:53 AM

A piggy bank has 3 nickels & 2 dimes.

Take 2 Coins $\boxed{\text{with replacement}}$

NN	ND	DN	DD
10¢	15¢	15¢	20¢

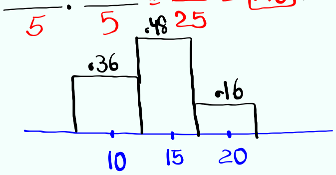
$P(10¢) = P(NN) = \frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25} = \boxed{.36}$ ✓

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

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

¢	P(¢)
10	.36
15	.48
20	.16

L1, L2



¢ $\to L1$, $P(¢) \to L2$

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

with L1 & L2

$\bar{x} = 14$

$S = S_x =$ Blank

$n = 1$

Oct 22-11:01 AM

Working with x & $P(x)$:

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

mu

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

Sigma

Standard deviation $\sigma = \sqrt{\sigma^2}$

Oct 22-11:11 AM

Complete the chart below:

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.3	.3	.3
2	.5	1.0	2.0
3	.2	.6	1.8

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

2) $\sum x p(x) = 1.9$

3) $\sum x^2 p(x) = 4.1$

4) $\mu = \sum x p(x) = \boxed{1.9}$

5) $\sigma^2 = \sum x^2 p(x) - \mu^2 = 4.1 - 1.9^2 = \boxed{.49}$

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

68% Range $\mu \pm \sigma = 1.9 \pm .7$

$\Rightarrow \boxed{1.2 \text{ to } 2.6}$

Oct 22-11:15 AM

Complete the chart below:

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.1	.1	.1
2	.3	.6	1.2
3	.4	1.2	3.6
4	.2	.8	3.2

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

2) $\sum xp(x) = 2.7$

3) $\sum x^2p(x) = 8.1$

4) $\mu = \sum xp(x) = \boxed{2.7}$

5) $\sigma^2 = \sum x^2p(x) - \mu^2 = 8.1 - 2.7^2 = \boxed{.81}$

6) $\sigma = \sqrt{\sigma^2} = \sqrt{.81} = \boxed{.9}$

Usual Range $\quad \mu \pm 2\sigma = 2.7 \pm 2(.9)$

95% Range $\quad = 2.7 \pm 1.8 \Rightarrow \boxed{.9 \text{ to } 4.5}$

Oct 22-11:23 AM

How to find μ, σ, and σ^2 using TI:

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

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

$\mu = \bar{x}$ $\qquad \sigma = \sigma_x$ $\qquad \sigma^2$

From last example

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

$\mu = \bar{x} = 2.7$

$\sigma = \sigma_x = .9$

$\sigma^2 = \sigma_x^2 = .81$

$\boxed{\text{VARS}}$

$\boxed{\text{5: Statistics}}$

$\boxed{4: \sigma_x}$

$\boxed{x^2}$ $\boxed{\text{Enter}}$

Oct 22-11:35 AM

A piggy bank has 3 nickels & 2 dimes.

Take 2 coins $\boxed{\text{without replacement}}$

NN ND DN DD

10¢ 15¢ 20¢

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

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

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

¢	P(¢)
10	.3
15	.6
20	.1

¢ → L1 P(¢) → L2

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

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

$\sigma = \sigma_x = 3$

$\sigma^2 = \sigma_x^2 = 9$

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

99.7% Range

$\mu \pm 3\sigma = 14 \pm 3(3) = 14 \pm 9$

$\Rightarrow \boxed{5 \text{ to } 23}$

Oct 22-11:41 AM

Application:

Expected Value $= \mu = \bar{x}$

I Sold 25 tickets for \$10 each.

one ticket is randomly drawn

owner wins a Calc. worth \$100.

Find expected Value per ticket Sold.

Net	P(Net)	
10 − 100	1/25	winning TKt
10 − 0	24/25	Losing tkts

Net → x → L1

P(Net) → P(x) → L2

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

$E.V. = \mu = \bar{x} = \boxed{6}$

$\sigma^2 = 384$

Oct 22-11:53 AM

You buy insurance for your luggage for \$100.

Any damages, airline pays you \$1000

Prob. of damage is .5%

Find expected value per policy sold.

Net	P(Net)	
100 − 1000	.5% = .005	damage
100 − 0	.995	$\overline{\text{damage}}$

Net → X → L1

P(Net) → P(X) → L2

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

E.V. = $\mu = \bar{x} = \boxed{95}$

$\sigma^2 = 4975$

Oct 22-12:02 PM

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

If you draw	I pay you
Ace	\$50
Face	\$5
any other card	Nothing

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

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

E.V. = $\mu = \bar{x} = \boxed{0}$

$\sigma^2 = \dfrac{2250}{13}$

Reduced Fraction

SG 14 & 15

Oct 22-12:08 PM