Statistics

Lecture 14

Feb 19-8:47 AM

Class Quiz 7

6 Females, 9 Males Select 4 people

order does not matter.

P(2F and 2M) in reduced fraction.

$$P(2F \text{ \& } 2M) = \frac{{}_6C_2 \cdot {}_9C_2}{{}_{15}C_4} = \frac{540}{1365} = \boxed{\frac{36}{91}}$$

$$\approx .396$$

Oct 9-2:30 PM

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

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Let X be a discrete random variable with prob. dist. $P(X)$.

What is Prob. dist.?

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

It could be
1) in the form of a table or chart
2) in the form of a graph
3) using certain formulas
4) using concept of prob.

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For prob. dist. $P(x)$

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

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

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

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

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

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Consider the chart below

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

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

$.2 + .5 + .3 = 1$ ✓

2) $P(x \le 2)$

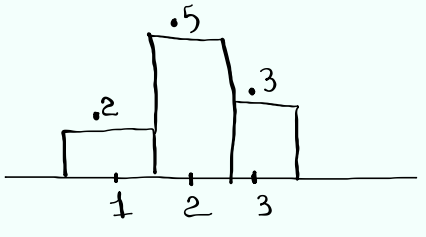
$.2 + .5 = \boxed{.7}$

3) $P(x \ge 2) = .5 + .3 = \boxed{.8}$

4) Draw Prob. Dist. Histogram.

$x \to$ Midpoint

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



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Consider the chart below

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

1) $P(x=4)$

$= 1 - [.2 + .3 + .4]$

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

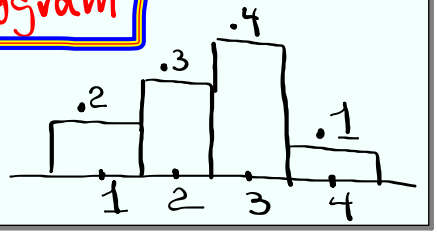
2) $P(x=1 \text{ or } x=3)$

$= .2 + .4 = \boxed{.6}$

3) Draw Prob. dist. histogram

$x \rightarrow$ Midpoint

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



Oct 14-12:30 PM

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) $\sum xP(x) = 1.9$

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

4) Compute $\sum x^2P(x) - (\sum xP(x))^2$

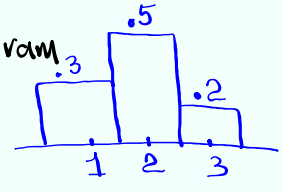
$= 4.1 - 1.9^2 = \boxed{.49}$

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

6) Draw Prob. dist. histogram

$x \rightarrow$ Midpoint

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



Oct 14-12:35 PM

Complete the chart below

x	$P(x)$	$xP(x)$	$x^2P(x)$
1	.2	.2	.2
2	.3	.6	1.2
3	.1	.3	.9
4	.4	1.6	6.4

1) $\sum P(x) = 1$ ✓

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

3) $\sum x^2p(x) = 8.7$

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

$= 8.7 - 2.7^2 = \boxed{1.41}$

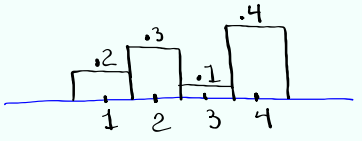
5) $\sqrt{\text{last ans}} = \sqrt{1.41} \approx \boxed{1.187}$

6) $P(x \geq 2) = 1 - P(x = 1) = 1 - .2 = \boxed{.8}$

7) Draw Prob. dist. Histogram

$x \rightarrow$ Midpoint

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



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Mean μ (mu) $\quad \mu = \sum xp(x)$

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

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

Oct 14-12:54 PM

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

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

STAT → CALC

1:1-Var Stats

List: L1

FreqList: L2

Calculate

L1, L2 Enter

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

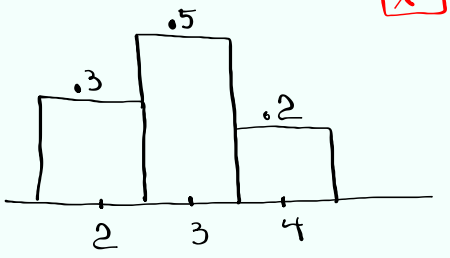
$\sigma = \sigma_x = .7$

$n = 1$

VARS Statistics 4: σ_x

x^2 Enter

$\sigma^2 = .49 = \frac{49}{100}$



Oct 14-12:56 PM

2 Dimes, 3 Nickels

Take 2 Coins with replacement

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

DN, ND → 15¢ $P(15¢) = 2 \cdot \frac{2}{5} \cdot \frac{3}{5} = .48$

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

Total ¢	P(Total ¢)
20	.16
15	.48
10	.36

Total ¢ → L1

P(Total ¢) → L2

Use 1-Var Stats with L1 & L2 to find

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

$\sigma = \sigma_x \approx 3.464$

$n = 1$

Find σ^2

VARS 5: Statistics

4: σ_x x^2 Enter

$\sigma^2 = 12$

Oct 14-1:03 PM

2 quarters 8 dimes

Take 2 coins, No replacement

DD → 20¢ $P(20¢) = \frac{8}{10} \cdot \frac{7}{9} = \frac{56}{90}$

DQ, QD → 35¢ $P(35¢) = 2 \cdot \frac{8}{10} \cdot \frac{2}{9} = \frac{32}{90}$

QQ → 50¢ $P(50¢) = \frac{2}{10} \cdot \frac{1}{9} = \frac{2}{90}$

Total ¢	P(Total ¢)
20	56/90
35	32/90
50	2/90

Total ¢ → L1

P(Total ¢) → L2

1-Var Stats with L1, L2

$\mu = \bar{x} = 26$

$\sigma = \sigma_x = 8$

$n = 1$

VARS

5: Statistics

4: σ_x x^2 Enter

$\sigma^2 = 64$

Oct 14-1:12 PM

25 Students each pay $10 for ticket

1 Ticket is drawn.

Winner gets a Calc worth $100.

I collect $25(10) = \$250$

I give away $\$100$

Net profit $\$150$

Net Profit/TKT $\$150/25$

$\$6$

↑ Expected Value/TKT

Net Profit	P(Net Profit)
\$10 − \$100	1/25
\$10 − 0	24/25

Net Profit → L1

P(Net Profit) → L2

1-Var Stats with L1 & L2

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

Oct 14-1:35 PM

You are going on a flight

You buy insurance for your luggage.

You pay $50, any damages, airline pays $500.

Prob. of damage is .02.

Expected value per policy sold.

Net	P(Net)	
50 − 500	.02	damage
50 − 0	.98	damage

Net → L1

P(Net) → L2

E.V. = $\mu = \bar{x} =$ $40

Oct 14-1:42 PM

Pay me $5

Draw a Card from a full-deck of playing Cards

Ace → I pay you $25

Face → " " " $5

otherwise → I pay you nothing.

Expected value per bet for the house

Net	P(Net)	
5 − 25	4/52	Ace
5 − 5	12/52	face
5 − 0	36/52	other Cards

Net → L1

P(Net) → L2

E.V. = $\mu = \bar{x} \approx$ $1.92

Oct 14-1:47 PM

3 females, 7 males, select 3 people

FFF

2F 1M

1F 2M

MMM

$P(3F,0M) = \frac{{}_3C_3 \cdot {}_7C_0}{{}_{10}C_3} = \frac{1}{120}$

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

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

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

L1 #F	L2 P(#F)
3	1/120
2	21/120
1	63/120
0	35/120

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

1-Var Stats with L1 & L2

.9

Oct 14-1:54 PM

A box has 12 Red, 18 white, and 20 blue balls.

1) odds in favor of selecting a red ball.

Red : # Red

12 : 38 → 6 : 19

2) odds against selecting a blue ball.

blue : # blue

30 : 20 → 3 : 2

3) odds in favor of Red or Blue

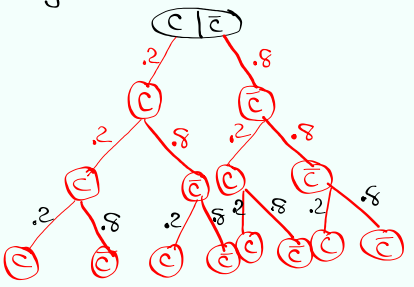
Red or Blue : # Red or Blue

32 : 18

16 : 9

Oct 14-2:02 PM

A quiz has 3 questions.
Each question has 5 choices, only one correct choice
Making Random guesses



P(3 correct ans) = (.2)(.2)(.2) = .008

P(2C & 1C̄) = 3(.2)(.2)(.8) = .096
CCC̄, CC̄C, C̄CC

P(1C & 2C̄) = 3(.8)(.8)(.2) = .384
CC̄C̄ C̄CC̄ C̄C̄C

P(0C & 3C̄) = (.8)(.8)(.8) = .512

Oct 14-2:08 PM

#C	P(#C)
3	.008
2	.096
1	.384
0	.512

L1 L2

1-Var Stats
L1 & L2
$\mu = \bar{x} = .6$
$\sigma = \sigma_x = .693$
$n = 1$

σ^2 in Reduced fraction $\sigma^2 = \frac{12}{25}$

Sc 14 & Sc 15 ✓

Oct 14-2:15 PM

Consider the table below

x	y
3	8
4	10
2	6
5	12
5	10

1) $\Sigma x = 19$ $\Sigma y = 46$

$\Sigma x^2 = 79$ $\Sigma y^2 = 444$

$n = 5$ $\Sigma xy = 186$

2) $a = 2.941$

$b = 1.647$

$r^2 = .887$

$r = .942$

$y \approx 3 + 2x$

$r^2 \approx 89\%$

Predict y if $x = 3$

1) Assume r is Significant

$y \approx 3 + 2(3)$

$y \approx 9$

2) Assume r is not Signifi...

use $\bar{y} \approx 9.2$

Watch videos on Binomial Prob. dist.

Oct 14-2:20 PM