Statistics

Lecture 11

Feb 19-8:47 AM

Consider the chart below

SG 14
⋮
SG 15

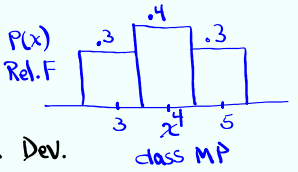
x	P(x)
3	.3
4	.4
5	.3

1) $\sum P(x) =$
$.3 + .4 + .3 = 1$ ✓

2) $P(x=3 \text{ or } x=5)$
$= .3 + .3 = .6$

3) $P(x \geq 4) = .4 + .3 = .7$

4) Draw Prob. dist. histogram



5) find μ, σ, and σ^2
mu = mean
Sigma = Standard Dev.

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

STAT → CALC
1:1-Var Stats
List: L1
FreqList: L2
Calculate

$\bar{x} = \mu = 4$
$\sigma = \sigma_x = .775$
$n = 1$

VARS
5: Statistics
4: σ_x
x^2
Math 1: Frac
Enter

$\sigma^2 = \frac{3}{5}$

Mar 18-6:50 PM

A box has 5 nickels & 3 quarters.

Take 2 coins, No replacement

NN
NQ
QN
QQ
} Sample space

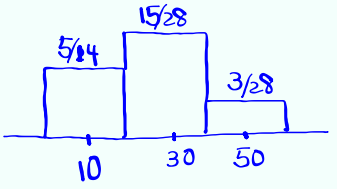
NN → 10¢ $P(10¢) = \frac{5}{8}\cdot\frac{4}{7} = \frac{5}{14}$

NQ
QN → 30¢ $P(30¢) = \frac{15}{28}$

QQ → 50¢ $P(50¢) = \frac{3}{8}\cdot\frac{2}{7} = \frac{3}{28}$

$1 - \left(\frac{5}{14} + \frac{3}{28}\right) = 1 - \frac{13}{28} = \frac{15}{28}$

Total ¢	P(Total)
10	5/14
30	15/28
50	3/28



Total → L1

P(Total) → L2

use 1-Var Stats with L1 & L2

$\mu = \bar{x} = 25$

$\sigma = \sigma_x = 12.677$

$n = 1$

$\sigma^2 = \frac{1125}{7}$

Mar 18-7:01 PM

A prob. dist. had a mean of 32 and standard dev. of 6.

$\mu = 32$

$\sigma = 6$

68% Range $\mu \pm \sigma = 32 \pm 6 \rightarrow$ 26 to 38

Usual Range
95% Range $\mu \pm 2\sigma = 32 \pm 2(6) \rightarrow$ 20 to 44

Mar 18-7:11 PM

You attend a fund raising.

1000 tickets sold for 100 each.

one ticket is drawn, winner gets a car worth $40,000. Find expected value per ticket sold for fundraisers.

Net	P(Net)
100-40000	1/1000
100 - 0	999/1000

Net → L1

P(Net) → L2

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

$60

House makes $60 / TKT Sold.

Mar 18-7:15 PM

You are going on a trip

You buy a policy of $50

Any damages to your luggage, airlines pay you $1000.

P(Possible damage) = .2% = .002

Find E.V. for policy sold.

Net	P(Net)
50 - 1000	.002
50 - 0	.998

Damage

Damage

Net → L1

P(Net) → L2

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

$48

Mar 18-7:21 PM

Pay me $10

Draw one Card from a standard deck of playing Cards.

If You draw an Ace, I give You $100

If " " a face, " " = $10

Any other Cards, I give You nothing.

Net	P(Net)	
10 - 100	4/52	Ace
10 - 10	12/52	face
10 - 0	36/52	Any other Cards

Net → L1

P(Net) → L2

E.V. Per play for the house

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

SG 14 & 15

Mar 18-7:27 PM

Binomial Prob. Dist. SG 16

1) We have n independent events.

2) Each event has only two outcomes.

$P(\text{Success}) = p \qquad P(\text{Failure}) = q$

$p + q = 1$

p & q remain unchanged for all events

3) $x \rightarrow$ # of Successes

$n - x \rightarrow$ # of failures

$$P(x) = {}_nC_x \cdot p^x \cdot q^{n-x}$$

Combination

${}_nC_x$ → tells us how many ways we can have x Successes out of n events.

Mar 18-7:36 PM

How many ways can we have 2 successes in 5 attempts?

$5C_2$

$$nC_x = \frac{n!}{x! \cdot (n-x)!}$$

$$5C_2 = \frac{5!}{2! \cdot (5-2)!} = \frac{5!}{2! \cdot 3!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = 10$$

5 [Math] → PRB ↓ [nCr] 2 [Enter]

Mar 18-7:43 PM

Flip a Coin 10 times

Success is getting tails

How many ways can we get 4 tails.

T T T T H H H H H H

T H T H T H T H H H

H H H H H H T T T T

$10C_4$

210

10 [Math] → PRB ↓ [nCr] 4 [Enter]

CA Lotto

Pick 5 numbers from 1 to 50.

$50C_5 = 2,118,760$

Mar 18-7:48 PM

Flip a fair coin 10 times.

Success is to land tails.

$n=10$

$p=.5$

$q=.5$

P(exactly 4 tails)

$P(x=4) = {}_{10}C_4 \cdot (.5)^4 \cdot (.5)^6 = .205$

$P(x) = {}_nC_x \cdot p^x \cdot q^{n-x}$

10 Math PRB nCr 4 * .5 ^ 4 → * .5 ^ 6 Enter

Mar 18-7:55 PM

You are taking a True/False exam.

You are guessing.

12 questions.

$p=.5$

$q=.5$

$n=12$

P(Guess correctly on exactly 5 questions)

$P(x=5) = {}_{12}C_5 \cdot (.5)^5 \cdot (.5)^7 = .193$

$P(x) = {}_nC_x \cdot p^x \cdot q^{n-x}$

Mar 18-8:02 PM

Flip a loaded coin 20 times

Success is to land tails

Prob. of landing tails on each flip is .6.

$n = 20$

$p = .6$

$q = .4$

P(land exactly 10 tails)

$x = 10$

$$P(x=10) = {}_{20}C_{10} \cdot (.6)^{10} \cdot (.4)^{10} = .117$$

Mar 18-8:07 PM

You are guessing on a multiple choice exam.

There are 25 questions.

Each question has 4 choices but only one correct choice.

$n = 25$

$p = \frac{1}{4} = .25$

$q = \frac{3}{4} = .75$

P(Guess correctly on exactly 10 questions)

$$P(x=10) = {}_{25}C_{10} \cdot (.25)^{10} \cdot (.75)^{15} = .042$$

($x = 10$)

2nd VARS ↓ binompdf(

Trials : 25

p = .25

x-value : 10

Paste Enter

Your work:

$P(x=10) = \text{binompdf}(25, .25, 10) = .042$

Mar 18-8:11 PM

Flip a fair coin 100 times

Success is to land tails.

$n = 100$
$p = .5$
$q = .5$

P(get exactly 60 tails)

$P(x = 60) = \text{binompdf}(100, .5, 60)$
$= \boxed{.011}$

P(get at most 60 tails)

$x \leq 60$

$P(x \leq 60) = \text{binomcdf}(100, .5, 60) = \boxed{.982}$

Mar 18-8:23 PM

Prob. that any ups package arrive on time is .9.

Randomly Select 50 packages.

P(at most 45 are on time)

$P(x \leq 45) = \text{binomcdf}(50, .9, 45) = \boxed{.569}$

P(at least 35 arrive on time)

$P(x \geq 35) = 1 - P(x \leq 34)$

we don't 34 | we want 35

$= 1 - \text{binomcdf}(50, .9, 34)$
$= \boxed{.9999} \approx 1$

Work on SG 14 & 15.

Watch the recommended videos for this weekend.

Mar 18-8:30 PM