Statistics

Lecture 15

Feb 19-8:47 AM

SG 14

Consider the chart below

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

1) $P(x=1)$

$= 1 - [.3 + .25 + .15 + .1] = .2$

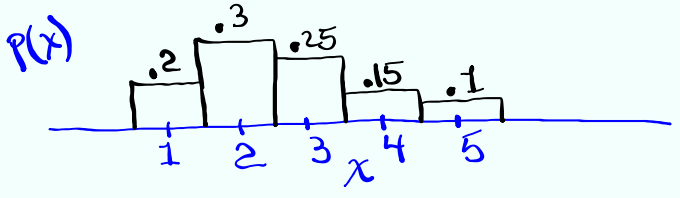
2) $P(2 \le x \le 4)$

$= .3 + .25 + .15 = .7$

3) $P(x \le 4)$

$= 1 - P(x=5) = 1 - .1 = .9$

4) Draw Prob. dist. histogram



Apr 20-9:56 AM

Clear all lists

$x \to L1$

$P(x) \to L2$

L1	L2
1	.2
2	.3
3	.25
4	.15
5	.1

STAT → CALC

1:1-Var Stats

List: L1

Freq List: L2

Calculate

$\mu = \bar{x} = 2.65 \approx 3$

$\sigma = \sigma_x = 1.236 \approx 1$

$n = 1$ ← Total Prob.

Find σ^2

VARS | 5:Statistics

4: σ_x | x^2 | Enter

$\sigma^2 = 1.5275$

Math | 1: ▶Frac | Enter

$\sigma^2 = \frac{611}{400}$

$\mu \approx 3$, $\sigma \approx 1$

68% Range $\mu \pm \sigma \to$ 2 to 4

95% Range $\mu \pm 2\sigma \to$ 1 to 5

usual Range

Apr 20-10:03 AM

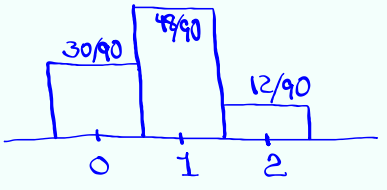
4 Females, 6 Males, Select 2 people

FF $P(2 \text{ Females}) = \frac{4}{10} \cdot \frac{3}{9} = \frac{12}{90}$

FM, MF $P(1 \text{ Female}) = 2 \cdot \frac{4}{10} \cdot \frac{6}{9} = \frac{48}{90}$

MM $P(0 \text{ Female}) = \frac{6}{10} \cdot \frac{5}{9} = \frac{30}{90}$

#F	P(#F)
2	12/90
1	48/90
0	30/90



#F → x → L1

P(#F) → P(x) → L2

use 1-Var Stats with L1 & L2

$\mu = \bar{x} = .8$

$\sigma = \sigma_x = .653$

$n = 1$ ✓

$\sigma^2 = .42\overline{6} = \frac{32}{75}$

Apr 20-10:12 AM

Pay me \$5, choose a number from 1 to 50.
One number is randomly selected,
if you selected the same number, I give you \$100, otherwise nothing.
Find expected earning for me for each bet.

Net	P(Net)	
5 − 100	1/50	house loses
5 − 0	49/50	house wins

net → L1
P(Net) → L2
E.V. = $\mu = \bar{x}$
\$3

$\sigma^2 = 196$

SG 14 & 15

Apr 20-10:24 AM

! Factorial

$0! = 1$

$1! = 1$

$2! = 2 \cdot 1 = 2$

$3! = 3 \cdot 2 \cdot 1 = 6$

$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

$10! = 3{,}628{,}800$

10 Math → PRB ↓ 4:! Enter

$n! = n(n-1)(n-2)(n-3)\cdots 3 \cdot 2 \cdot 1$

using TI:

5 Math → PRB ↓ 4:! Enter

5! = 120

Apr 20-10:32 AM

Combination formula

$$_nC_r = \frac{n!}{r!\cdot(n-r)!}$$

$$_5C_2 = \frac{5!}{2!\cdot(5-2)!} = \frac{5!}{2!\cdot 3!} = \frac{5\cdot 4\cdot 3\cdot 2\cdot 1}{2\cdot 1\cdot 3\cdot 2\cdot 1} = \frac{10}{1} = 10$$

using TI

5 [math] → PRB ↓ [3: nCr] 2 [Enter] 10

use TI to find

$_{15}C_5 = 3003$

$_{50}C_5 = 2\,118\,760$

what is $_nC_r$? It is # of combinations for selecting r items from n items, no replacement, and order does not matter.

Suppose there are 8 people, we need to select 3 of them with no replacement and order does not matter.

# of ways this can be done $_8C_3 = 56$

Apr 20-10:37 AM

Binomial Prob. dist.:

1) There are n independent trials.

2) Each trial has only two outcomes.

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

$p + q = 1$

$q = 1 - p$

p & q remain unchanged for all events.

3) $x \rightarrow$ # of Successes

$n - x \rightarrow$ # of failures

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

Apr 20-10:50 AM

Consider a binomial Prob. dist. with $n=8$ and $p=.6$

1) $q = 1-p$
$= 1-.6 = \boxed{.4}$

2) $np = 8(.6) = \boxed{4.8}$

3) $npq = 8(.6)(.4) = \boxed{1.92}$

4) $\sqrt{npq} = \sqrt{1.92}$
$\approx \boxed{1.386}$

5) P(5 Successes)

$P(x=5) = {}_8C_5 \cdot (.6)^5 \cdot (.4)^3 = \boxed{.279}$

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

$= 56$ [x] $.6$ [^] 5 [x] $.4$ [^] 3 [Enter]

Apr 20-10:56 AM

Flip a fair coin 10 times.
Success is to land tails.

1) $n = \boxed{10}$

2) $p = .5$

3) $q = .5$

4) $np = 10(.5) = 5$

5) $npq = 10(.5)(.5) = 2.5$

6) $\sqrt{npq} = \sqrt{2.5} = \boxed{1.581}$

7) P(lands exactly 5 tails)

$P(x=5) = {}_{10}C_5 \cdot (.5)^5 \cdot (.5)^5$

${}_nC_x \cdot p^x \cdot q^{n-x}$

$= 252$ [x] $.5$ [^] 5 [x] $.5$ [^] 5 [Enter]

$= \boxed{.246}$

using TI:

[2nd] [VARS] ↓ [binompdf]

Trials: 10
p: .5
x value: 5
[Paste] [Enter]

$\approx \boxed{.246}$

Apr 20-11:05 AM