Statistics

Lecture 10

Feb 19-8:47 AM

Consider a geometric Prob. dist with $p = .4$
Let x be # number when first success happens, find

1) $P(x=4) =$ geometpdf$(.4, 4) = \boxed{.086}$

2) $P(x<4) = P(x \le 3) =$ geometcdf$(.4, 3) = \boxed{.784}$

3) $P(x>4) = P(x \ge 5) = 1 - P(x \le 4)$

4 5

$= 1 -$ geometcdf$(.4, 4)$

$= \boxed{.130}$

4) $q = 1 - p = \boxed{.6}$ 5) $\mu = \frac{1}{p} = \frac{1}{.4} = \boxed{2.5}$

6) $\sigma^2 = \frac{q}{p^2} = \frac{.6}{.4^2} = \boxed{3.75}$ 7) $\sigma = \sqrt{\sigma^2} = \sqrt{3.75} \approx \boxed{1.936}$

$\mu \approx 3$
$\sigma \approx 2$ $\rightarrow$ 68% Range $\mu \pm \sigma = 3 \pm 2$

$\Rightarrow \boxed{1 \text{ to } 5}$

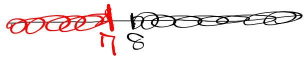
Oct 31-6:16 PM

Consider a Poisson Prob. dist with mean of 10 in a fixed interval.

Let x be # of successes in that interval.

1) $P(x \le 12) = \text{Poissoncdf}(10,12) = \boxed{.792}$

2) $P(x \ge 8) = 1 - P(x \le 7) = 1 - \text{Poissoncdf}(10,7)$



$= \boxed{.780}$

3) $P(x = 8 \text{ or } x = 12) =$

$\text{Poissonpdf}(10,8) + \text{Poissonpdf}(10,12) = \boxed{.207}$

4) $\sigma^2 = \mu = \boxed{10}$

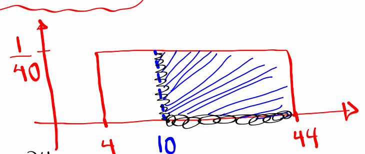
5) $\sigma = \sqrt{\sigma^2} = \sqrt{10} \approx \boxed{3}$

Usual Range
"95% Range"

$\mu \pm 2\sigma = 10 \pm 2(3) \Rightarrow \boxed{4 \text{ to } 16}$

Oct 31-6:24 PM

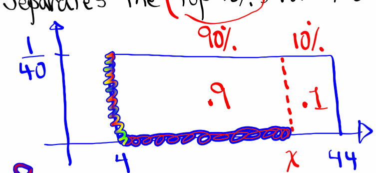
Use Uniform Prob. dist for all values from 4 to 44.



$P(x > 10)$

$= (44-10) \cdot \frac{1}{40} = \frac{34}{40} = \boxed{\frac{17}{20}} = \boxed{.85}$

Find x that separates the top 10% from the rest.



$(x-4) \cdot \frac{1}{40} = .9$

$x - 4 = 40(.9)$

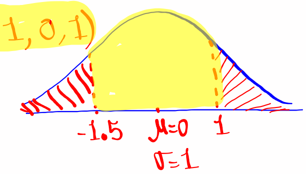
$x - 4 = 36$

$\boxed{x = 40}$

Oct 31-6:32 PM

Find $P(Z < -1.5 \text{ OR } Z > 1)$

$= 1 - \text{normalcdf}(-1.5, 1, 0, 1)$

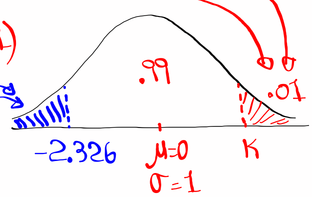


$= \boxed{.225}$

Find K such that $P(Z > K) = .01$

$K = \text{invNorm}(.99, 0, 1)$

$= \boxed{2.326}$



$P(Z < K) = .01$

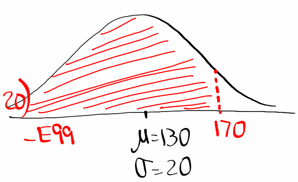
$K = \text{invNorm}(.01, 0, 1)$

Oct 31-6:37 PM

Consider a normal Prob. dist. with $\mu = 130$ and $\sigma = 20$.

Find $P(x < 170)$

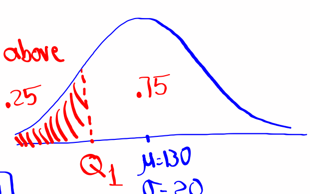
$= \text{normalcdf}(-E99, 170, 130, 20)$



$= \boxed{.977}$

Find $x = Q_1$ Round to whole #

25% below 75% above



$x = \text{invNorm}(.25, 130, 20)$

$= 116.510$ $\boxed{x \approx 117}$

Oct 31-6:44 PM

(SG 20)

Clear all lists.

Store 2, 4, 6, and 8 in L1.

Use 1-Var Stats with L1 to find

$\mu = \bar{x} = \boxed{5}$ $\sigma = \sigma_x = \boxed{2.236}$ $\sigma^2 = \boxed{5}$

Let's take all Samples of $\boxed{\text{Size } 2}$ with replacement from our list.

2,2	2,4	2,6	2,8
4,2	4,4	4,6	4,8
6,2	6,4	6,6	6,8
8,2	8,4	8,6	8,8

Now find $\bar{x}$ for each Sample

2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

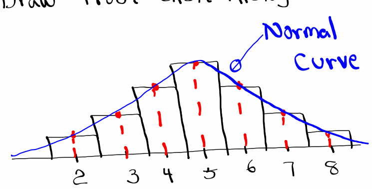
$\bar{x}$	$P(\bar{x})$
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

Oct 31-6:49 PM

$\bar{x}$	$P(\bar{x})$
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

L2 L3

Draw Prob. dist. histogram



$\bar{x} \rightarrow L2$, $P(\bar{x}) \rightarrow L3$

Use $\boxed{\text{1-VarStats}}$ with L2 & L3, find

$\mu = 5$ $\sigma = 1.581$ $\sigma^2 = 2.5 = \frac{5}{2}$

Oct 31-6:58 PM

Clear all lists.

Store 1, 3, 5, 7, and 9 in L1

Use $\boxed{\text{1-Var Stats}}$ with L1 only to find

$\mu = 5$ $\quad \sigma = 2.828 \quad \sigma^2 = 8$

Now take all samples of $\boxed{\text{Size 2}}$ from our list with replacement.

1,1	1,3	1,5	1,7	1,9
3,1	3,3	3,5	3,7	3,9
5,1	5,3	5,5	5,7	5,9
7,1	7,3	7,5	7,7	7,9
9,1	9,3	9,5	9,7	9,9

Now find $\bar{x}$ for each sample

1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9

$\bar{x}$	$P(\bar{x})$
1	1/25
2	2/25
3	3/25
4	4/25
5	5/25
6	4/25
7	3/25
8	2/25
9	1/25

Oct 31-7:03 PM

$\bar{x}$	$P(\bar{x})$
1	1/25
2	2/25
3	3/25
4	4/25
5	5/25
6	4/25
7	3/25
8	2/25
9	1/25

L2 L3

Draw Prob. dist. histogram

$\bar{x} \to L2$, $P(\bar{x}) \to L3$

Use $\boxed{\text{1-Var Stats}}$ with L2 & L3

$\mu = 5$

$\sigma = 2$ $\quad \boxed{\sigma^2 = 4 = \frac{8}{2}}$

Oct 31-7:12 PM

Central Limit Theorem

$\boxed{\mu_{\bar{x}} = \mu}$

$\sigma^2_{\bar{x}} = \frac{\sigma^2}{n}$

$\boxed{\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}}$

Oct 31-7:19 PM

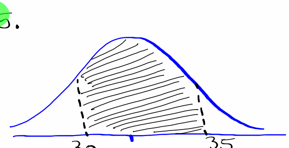
Ages of students are normally dist. with $\mu = 32$ and $\sigma = 6$.

If we randomly select $\overset{n=4}{\text{4 students}}$, find the prob. that $\overbrace{\text{their mean age}}^{\bar{x}}$ is between 30 and 35.

$P(30 < \bar{x} < 35)$

$= \text{normalcdf}(30, 35, 32, 3)$

$= \boxed{.589}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{4}} = 3 \end{cases}$

Find $\bar{x} = Q_3$ for randomly selected groups of 4 students. Round to 1-decimal

$\bar{x} = Q_3 = \text{invNorm}(.75, 32, 3)$

$= \boxed{34.0}$

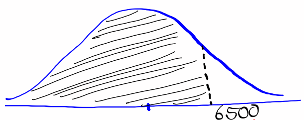
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{4}} = 3 \end{cases}$

Oct 31-7:22 PM

Salaries of nurses are Normally Dist. with $\boxed{\mu = 6400}$ and $\sigma = 500$.

If we randomly Select 10 nurses ($n=10$), find the Prob. that their mean Salary ($\bar{x}$) is below \$6500.

$P(\bar{x} < 6500)$



$= \text{normalcdf}(-E99, 6500, 6400, 500/\sqrt{10})$

$= \boxed{.736}$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6400 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{500}{\sqrt{10}} \end{cases}$

Oct 31-7:30 PM