Statistics

Lecture 12

Feb 19-8:47 AM

SG 19

Consider the Population 2, 4, 6, and 8.

Clear all lists $\boxed{2nd}$ $\boxed{+}$ $\boxed{4:clearAllLists}$ $\boxed{Enter}$

Store 2, 4, 6, 8 in L1 $\boxed{STAT}$ Edit $\boxed{1: Edit}$

$\boxed{STAT}$ $\boxed{\rightarrow}$ CALC $\boxed{1\text{-}Var\ Stats}$

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

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

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

Now take all Samples of $\boxed{Size\ 2}$ with replacement from this data.

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 $\bar{x}$ of each Sample.

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

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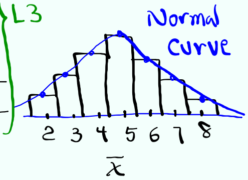
2	3	4	5
3	4	5	6
4	5	6	7
5	6	7	8

16 Means

$\bar{x}$ (L2)	$P(\bar{x})$ (L3)
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

Draw Prob. dist. histogram for $\bar{x}$ & $P(\bar{x})$



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

$\boxed{\text{STAT}}$ $\boxed{\rightarrow}$ CALC

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

With Menu: List: L2, FreqList: L3, $\boxed{\text{Calculate}}$

No Menu: L2, L3 $\boxed{\text{enter}}$ $\boxed{}$

$\mu = 5$

$\sigma = 1.581$

Sample Size

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

$\boxed{\text{VARS}}$

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

$\boxed{4: \sigma_x}$ $\boxed{x^2}$

$\boxed{\text{Enter}}$

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Consider the Population 2, 4, 6, 8, 10.

Clear all lists

Store 2, 4, 6, 8, 10 in L1

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

$\mu = 6$ $\quad \sigma = 2.828$ $\quad \sigma^2 = 8$

let's take all samples of $\boxed{\text{Size 2}}$ from this data with replacement

2,2	2,4	2,6	2,8	2,10
4,2	4,4	4,6	4,8	4,10
6,2	6,4	6,6	6,8	6,10
8,2	8,4	8,6	8,8	8,10
10,2	10,4	10,6	10,8	10,10

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

2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

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2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

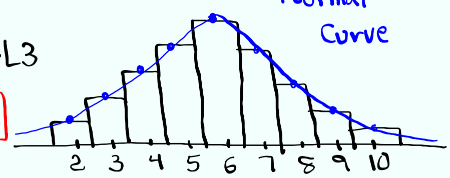
25 means

$\bar{x}$ (L2)	$P(\bar{x})$ (L3)
2	1/25
3	2/25
4	3/25
5	4/25
6	5/25
7	4/25
8	3/25
9	2/25
10	1/25

Prob. dist. histogram for $\bar{x}$ & $P(\bar{x})$

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

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



$\mu = \boxed{6}$ $\sigma = \boxed{2}$ $\sigma^2 = \boxed{4} = \boxed{\frac{8}{2}}$

Jul 17-5:03 PM

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

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

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

Central-Limit Theorem

Given $N(35, 6)$ Normal dist with $\mu = 35$, $\sigma = 6$

If we take all Samples of Size 4.

$\mu_{\bar{x}} = \mu = \boxed{35}$ $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{6}{\sqrt{4}} = \frac{6}{2} = \boxed{3}$

CLT

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Salaries of all nurses are normally dist. with $\mu = \$6800$ & $\sigma = \$500$

If we randomly selected groups of 16 nurses,

$\mu_{\bar{x}} = \mu = \boxed{6800}$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{500}{\sqrt{16}} = \frac{500}{4} = \boxed{125}$

CLT

Jul 17-5:17 PM

Scores of math exams are normally dist. with $\mu = 82$ & $\sigma = 10$. $N(82, 10)$

If we randomly select 4 exams ($n=4$), find the Prob. that their mean ($\bar{x}$) is between 75 and 90.

$P(75 < \bar{x} < 90)$

$= \text{normalcdf}(75, 90, 82, 5)$

$= \boxed{.864}$

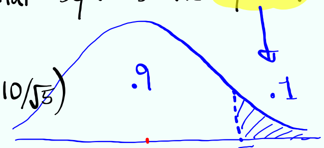
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = 5 \end{cases}$

For randomly selected groups of 5 exams, find the mean ($\bar{x}$) that separates the top 10% from the rest.

$\bar{x} = \text{invNorm}(.9, 82, 10/\sqrt{5})$

$= 87.731$

$\approx \boxed{88}$



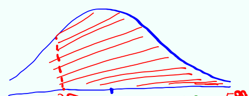
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}} \end{cases}$

Jul 17-5:21 PM

Ages of students are normally dist. with mean of 32 Yrs and standard dev. of 7 Yrs. $N(32, 7)$

If we randomly select 3 students ($n=3$), find the prob. that their mean age ($\bar{x}$) is more than 28 Yrs.

$P(\bar{x} > 28)$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{7}{\sqrt{3}} \end{cases}$

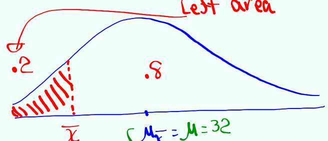
$= \text{normalcdf}(28, E99, 32, 7/\sqrt{3})$

$\boxed{2nd}\boxed{,}$

$= \boxed{.839}$

For randomly selected groups of 5 ($n=5$), find the mean ($\bar{x}$) that separates the bottom 20% from the rest.

Left area



SG 19

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 32 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{7}{\sqrt{5}} \end{cases}$

$\bar{x} = \text{invNorm}(.2, 32, 7/\sqrt{5})$

$\approx 29.365 \approx \boxed{29}$

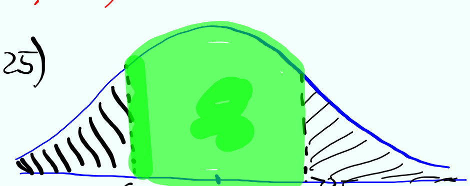
Jul 17-5:32 PM

Credit Scores are normally dist. with the mean 700 and standard dev. of 80.

If we randomly select group of 4 ($n=4$), find the Prob. that their mean ($\bar{x}$) credit score is below 675 or above 725. $N(700, 80)$

$P(\bar{x} < 675 \text{ OR } \bar{x} > 725)$

$= 1 - P(675 < \bar{x} < 725)$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 700 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{80}{\sqrt{4}} = 40 \end{cases}$

$= 1 - \text{normalcdf}(675, 725, 700, 40)$

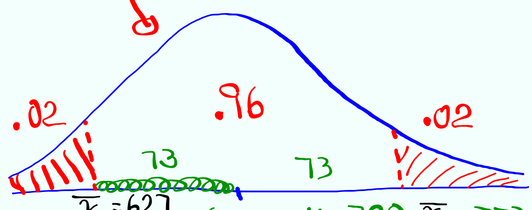
$= \boxed{.532}$

Jul 17-5:59 PM

Find two means ($\bar{x}_1$ & $\bar{x}_2$), rounded to whole numbers, for randomly selected groups of 5 ($n=5$) that separate the middle 96% from the rest.

$1 - .96 = .04$

$.04 \div 2 = .02$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 700 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{80}{\sqrt{5}} \end{cases}$

$\bar{x}_1 = \text{invNorm}(.02, 700, 80/\sqrt{5})$

$\approx \boxed{627}$

$\bar{x}_2 = \text{invNorm}(.98, 700, 80/\sqrt{5}) \approx \boxed{773}$

Jul 17-6:06 PM

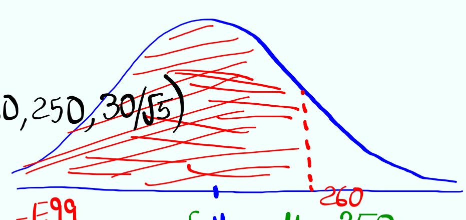
Length of pergnancy is normally dist. with the mean of 250 days and standard dev. of 30 days. $N(250, 30)$

If we randomly select 5 pregnant women ($n=5$), find the prob. that their mean ($\bar{x}$) pregnany time is below 260 days.

$P(\bar{x} < 260)$

$= \text{normalcdf}(-E99, 260, 250, 30/\sqrt{5})$

(−) 2nd ,



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 250 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{30}{\sqrt{5}} \end{cases}$

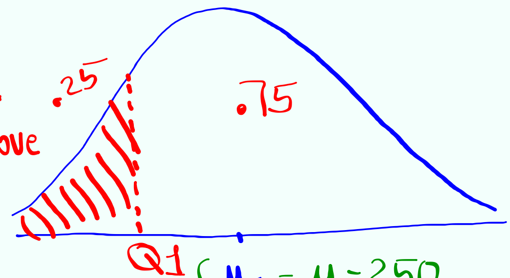
$= \boxed{.772}$

Jul 17-6:15 PM

Find $\bar{x} = Q_1$ for randomly selected groups of 8 pregnant women.

25% below

75% above



$\bar{x} = \text{invNorm}(.25, 250, 30/\sqrt{8})$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 250 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{30}{\sqrt{8}} \end{cases}$

$\approx \boxed{243}$ days

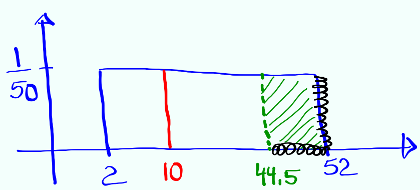
SG 20 ✓

Jul 17-6:23 PM

Consider a uniform Prob. dist. for all Values from 2 to 52.

$52 - 2 = 50$

1) Draw & label



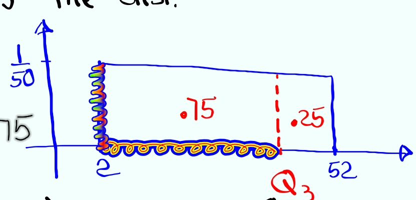
2) $P(x = 10) = 0$

line

3) $P(x > 44.5) = (52 - 44.5) \cdot \frac{1}{50} = \frac{7.5}{50} = \boxed{.15} = \frac{3}{20}$

4) Find Q_3 of the dist.

$(Q_3 - 2) \cdot \frac{1}{50} = .75$



$Q_3 - 2 = 50(.75)$

$Q_3 = 2 + 50(.75) = \boxed{39.5}$

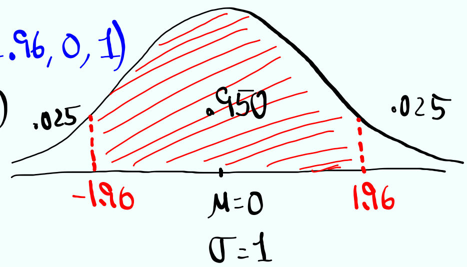
Jul 17-6:29 PM

Find $P(-1.96 < Z < 1.96)$

$= \text{normalcdf}(-1.96, 1.96, 0, 1)$ (−)

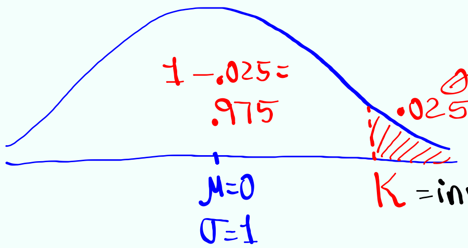
$= \boxed{.950}$

95%



Find K such that $P(Z > K) = .025$

Right Area



$K = \text{invNorm}(.975, 0, 1)$

$= \boxed{1.960}$

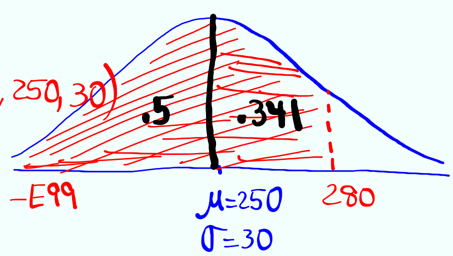
Jul 17-6:38 PM

Given $N(250, 30)$

$P(x < 280)$

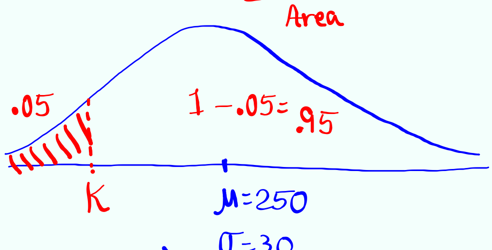
$= \text{normalcdf}(-E99, 280, 250, 30)$

$= \boxed{.841}$



Find K such that $P(x < K) = .05$

left Area



$K = \text{invNorm}(.05, 250, 30) \approx 201$

Jul 17-6:45 PM

Consider a binomial Prob. dist with $n=80$, and $p=.75$.

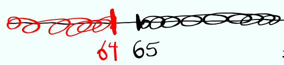
1) $q = 1-p = \boxed{.25}$ 2) $\mu = np = 60$

3) $\sigma^2 = npq = \boxed{15}$ 4) $\sigma = \sqrt{\sigma^2} = \sqrt{15} \approx 4$

5) Usual Range $\mu \pm 2\sigma = 60 \pm 2(4) \Rightarrow 52$ to 68

6) $P(\overbrace{\#\text{Successes}}^{x} \geq 65) = P(x \geq 65)$

$= 1 - P(x \leq 64)$



$= 1 - \text{binomcdf}(80, .75, 64)$

$= \boxed{.121}$

7) P(# Successes is between 52 to 68, inclusive)

$P(52 \leq x \leq 68)$ Reduce by 1

$= \text{binomcdf}(80, .75, 68) - \text{binomcdf}(80, .75, 51)$

$\approx \boxed{.973}$

Jul 17-6:54 PM