Statistics

Lecture 14

Feb 19-8:47 AM

Class Qz 7

open notes

Consider a binomial Prob. dist with $n=400$ & $P=.5$

Find

1) $\mu = np$
$= 400(.5)$
$= \boxed{200}$

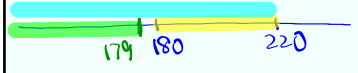
2) $\sigma^2 = npqp$
$= 400(.5)(.5)$
$= \boxed{100}$

3) $\sigma = \sqrt{\sigma^2}$
$= \sqrt{100}$
$= \boxed{10}$

usual Range $\mu \pm 2\sigma =$
$200 \pm 2(10) \Rightarrow \boxed{180 \text{ to } 220}$

$P(x < 210) = P(x \leq 209) = \text{binomcdf}(400, .5, 209)$
$= \boxed{.829}$

$P(180 \leq x \leq 220) = P(x \leq 220) - P(x \leq 179)$



$= \text{binomcdf}(400, .5, 220) - \text{binomcdf}(400, .5, 179)$
$= \boxed{.960}$

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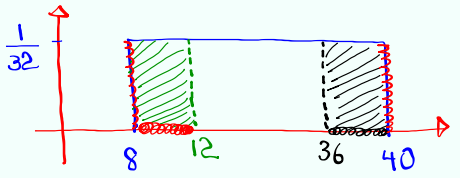
Consider a uniform Prob. dist for all values from 8 to 40.



1) $P(x<12)$

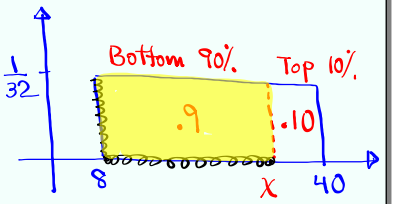
$= (12-8)\cdot\frac{1}{32} = \frac{4}{32} = \boxed{\frac{1}{8}}$

2) $P(x>36)$

$= (40-36)\cdot\frac{1}{32}$

$= \frac{4}{32} = \boxed{\frac{1}{8}}$

3) Find x-value that separates the top 10% from the rest.



$(x-8)\cdot\frac{1}{32} = .9$

$x-8 = 32(.9)$

$x = 8+32(.9) = \boxed{36.8}$

36.8

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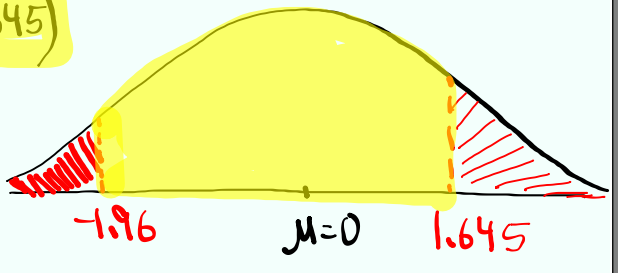
Find $P(Z<-1.96 \text{ or } Z>1.645)$

$= 1 - P(-1.96<Z<1.645)$

Total Area

Total Prob.



σ=1

$= 1 - \text{normalcdf}(-1.96, 1.645, 0, 1)$

(-)

$= .075$

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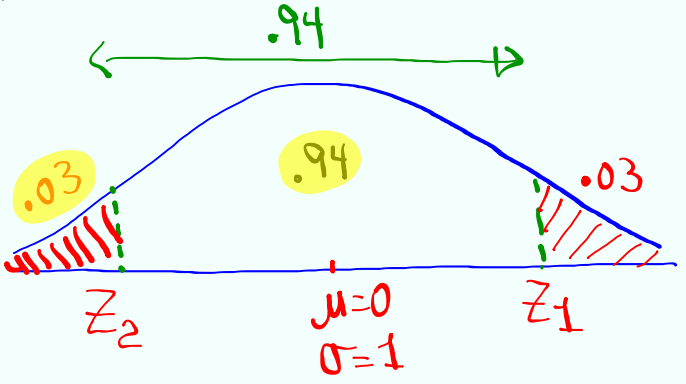
Find two z-values that separate the middle 94% from the rest.

$1 - .94 = .06$

$.06 \div 2 = .03$



$Z_2 = \text{invNorm}(.03, 0, 1) \approx \boxed{-1.881}$

$Z_1 = \text{invNorm}(.97, 0, 1) = \boxed{1.881}$

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Consider a normal prob. dist. with mean of 124 and standard dev. of 15.

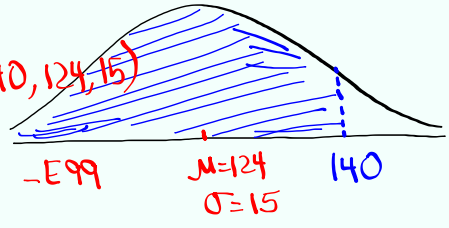
$N(124, 15)$

1) $P(x < 140)$

= normal cdf(−E99, 140, 124, 15)

(−) 2nd [9]

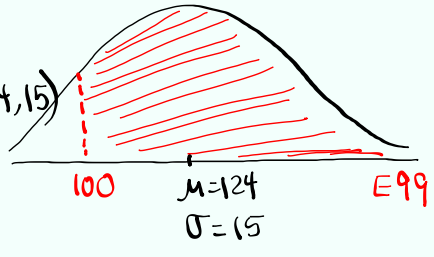
$= \boxed{.857}$



$P(x > 100)$

= normalcdf(100, E99, 124, 15)

$= \boxed{.945}$



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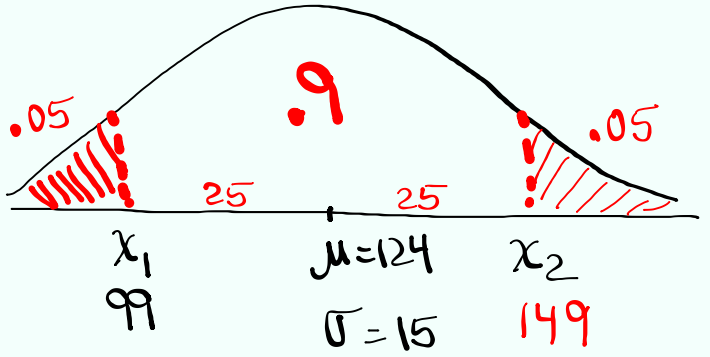
Find two x-values, rounded to whole #, that separate the **middle 90%** from the rest.

$1 - .9 = .1$

$.1/2 = .05$



$x_1 = \text{invNorm}(.05, 124, 15) \approx \boxed{99}$

$x_2 = \text{invNorm}(.95, 124, 15) \approx \boxed{149}$

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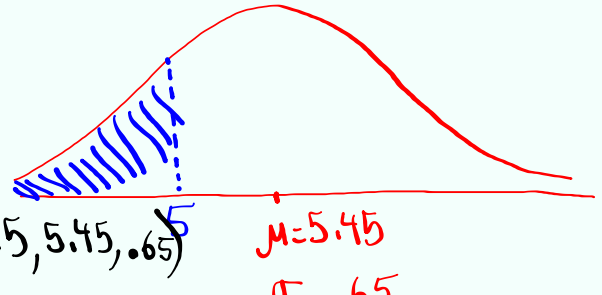
Gas prices are normally dist. with mean of \$5.45 with standard dev. of \$.65.

If we randomly select one gas station, find the prob. that the gas price is below \$5.

$P(x < 5) =$



$= \text{normalcdf}(-E99, 5, 5.45, .65)$

$= \boxed{.244}$

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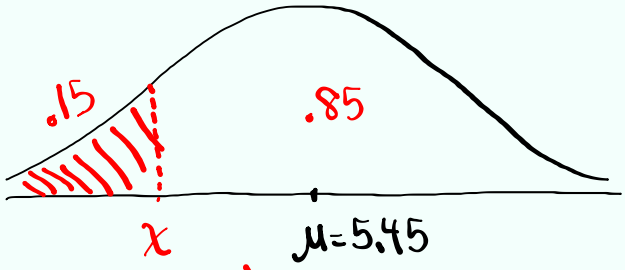
Find a gas price that separates the bottom 15% from the rest.



$x = \text{invNorm}(.15, 5.45, .65)$

$\approx \$4.78$

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Clear all lists.

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

Use 1-Var Stats with L1 only to find

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

Take all Samples with Size 2 from this list with replacement.

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

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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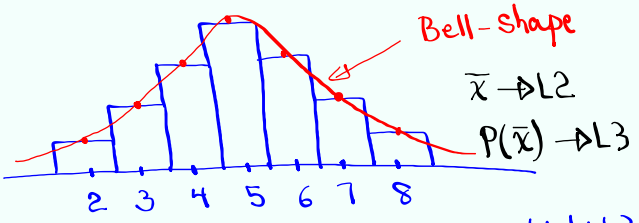
Find $\bar{x}$ of each Sample

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



$\bar{x} \rightarrow$ L2

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

Use 1-Var Stats List:L2, Freq List:L3

$\mu = \bar{x} = 5$ $\quad \sigma = \sigma_{\bar{x}} = 1.581$ $\quad \sigma^2 = 2.5 = \frac{5}{2}$

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Clear all lists.

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

Use 1-Var Stats with L1 only to find

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

Take all Samples of Size 2 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

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

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

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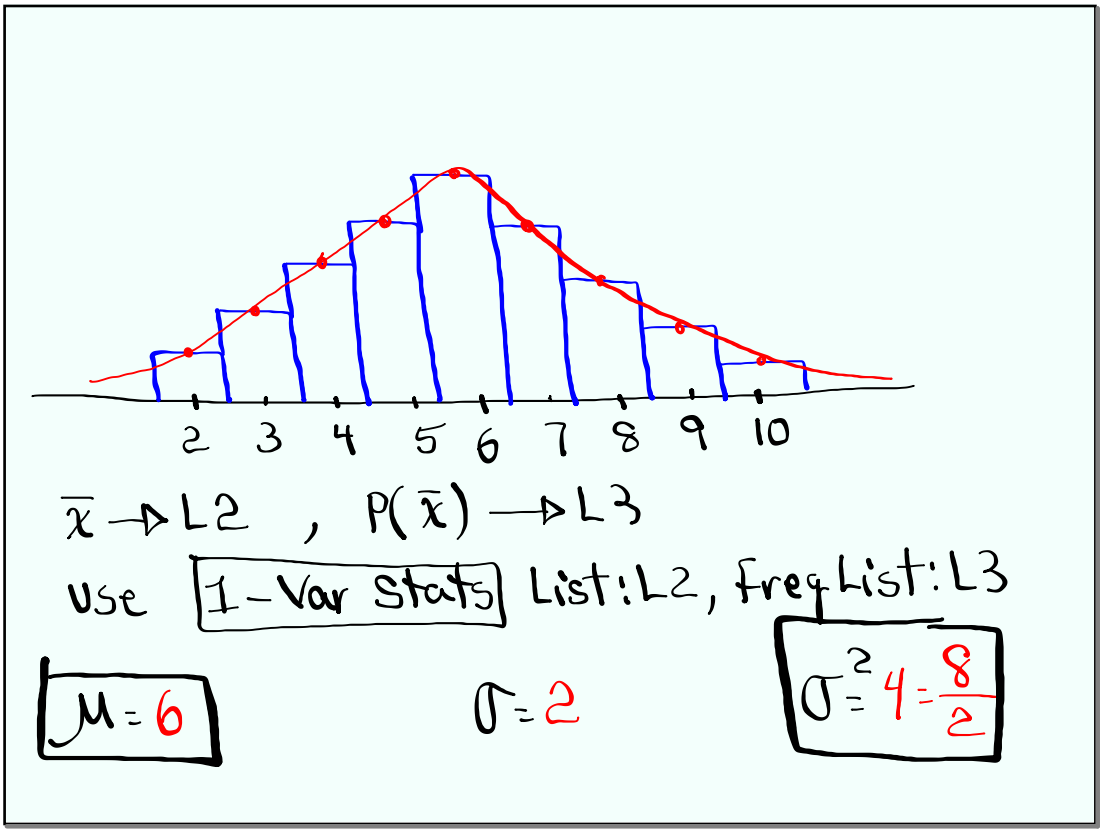

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Central Limit Theorem

CLT

$\mu_{\bar{x}} = \mu$ $\quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ $\quad \sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}$

Given $N(80, 10)$ $\quad \mu = 80$, $\sigma = 10$

Normal Prob. Dist.

If we take all samples of size 4 ($n=4$)

$\mu_{\bar{x}} = \mu = 80$ $\quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = \frac{10}{2} = 5$

Ages of all students normally dist. with $\mu = 28$ and $\sigma = 8$.

If we take Samples of Size 16, ($n=16$)

$\mu_{\bar{x}} = \mu = 28$ $\quad \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{16}} = 2$

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Salaries of all nurses in So. CA are normally dist with $\mu = \$6500$ and $\sigma = \$400$. $N(6500, 400)$

If we randomly select 4 nurses, ($n=4$)

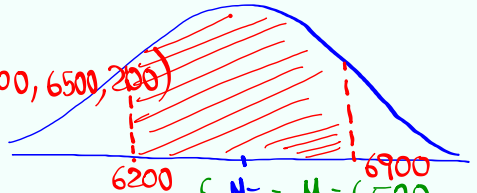
find the Prob. that their mean Salary ($\bar{x}$)

is between \$6200 and \$6900.

$P(6200 < \bar{x} < 6900)$

= normalcdf(6200, 6900, 6500, 200)

= .910



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6500 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{400}{\sqrt{4}} = 200 \end{cases}$

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Exam Scores are N.D. with $\mu = 85$ and $\sigma = 10$.

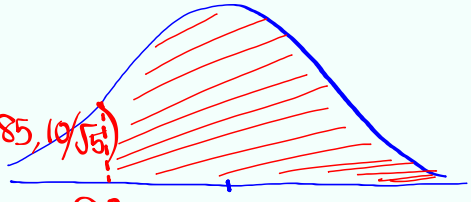
If we randomly Select 5 exams, ($n = 5$)

find the prob. that their mean ($\bar{x}$) is above 80.

$P(\bar{x} > 80)$

= normalcdf(80, E99, 85, $10/\sqrt{5}$)

= .868



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 85 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}} \end{cases}$

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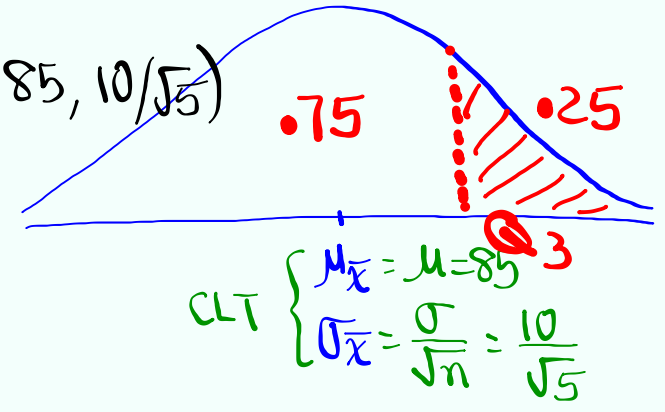
Find $\bar{x} = Q_3$ for randomly selected 5 exams.

Round to whole #.

$\bar{x} = \text{invNorm}(.75, 85, 10/\sqrt{5})$

$\approx \boxed{88}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 85 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}} \end{cases}$

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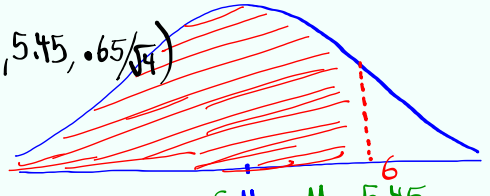
Gas prices are N.D. with $\mu = \$5.45$ with $\sigma = \$.65$.

If we randomly select 4 ($n=4$) gas stations, find the prob. that their mean gas price ($\bar{x}$) is below \$6/gal.

$P(\bar{x} < 6)$

$= \text{normalcdf}(-E99, 6, 5.45, .65/\sqrt{4})$

$\approx \boxed{.955}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 5.45 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{.65}{\sqrt{4}} \end{cases}$

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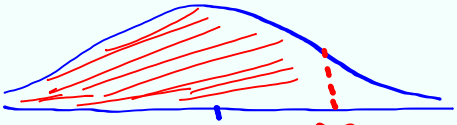
Class QZ 8

open notes

Given $N(82, 8)$, find

1) $P(x < 90)$

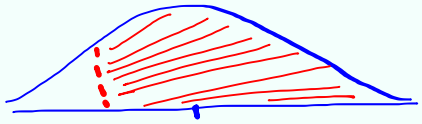


σ=8

=normalcdf(-E99, 90, 82, 8)

=.841

2) $P(x > 74)$



σ=8

=normalcdf(74, E99, 82, 8)

=.841

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