Statistics

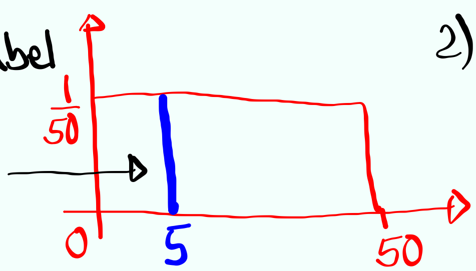
Lecture 11

Feb 19-8:47 AM

Consider a uniform Prob. dist. for all values from 0 to 50.

1) Draw & label

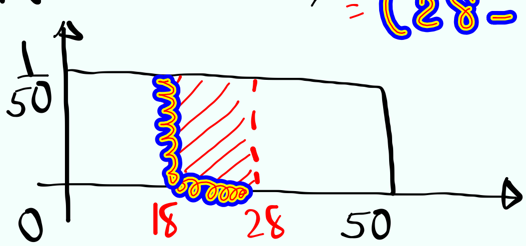
Total Area = 1



2) $P(x=5) = 0$

Line

3) $P(18 < x < 28) = (28-18) \cdot \frac{1}{50} = \frac{10}{50} = \boxed{\frac{1}{5}}$

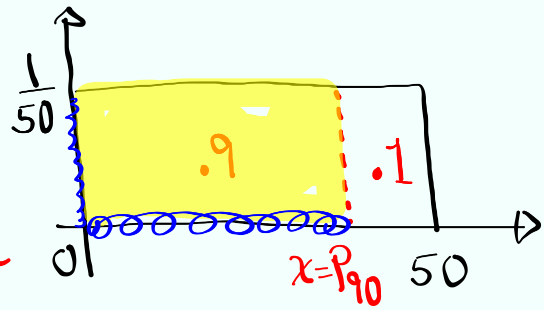


Jan 28-4:34 PM

4) find $x = P_{90}$

90% below Left

10% above Right



$$(x-0)\cdot\frac{1}{50} = .9$$

$$x \cdot \frac{1}{50} = .9$$

$$x = 50(.9)$$

$$\boxed{x = 45}$$

Jan 28-4:38 PM

find $P(Z < 1.85)$

$N(0,1)$

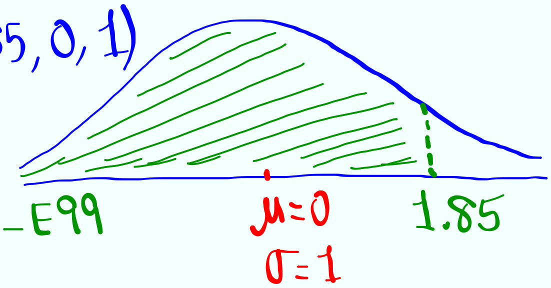
Left Area shaded.

$= \text{normalcdf}(-E99, 1.85, 0, 1)$

(-)

$\boxed{2nd}$ $\boxed{9}$

$\boxed{7}$



$= \boxed{.968}$

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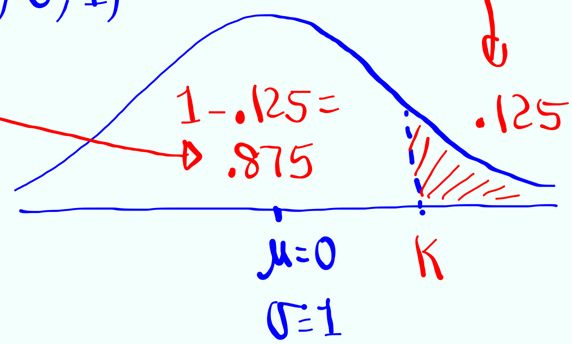
Find K such that $P(Z > K) = .125$

N(0,1) Right Area

$K = \text{invNorm}(.875, 0, 1)$

$= \boxed{1.150}$



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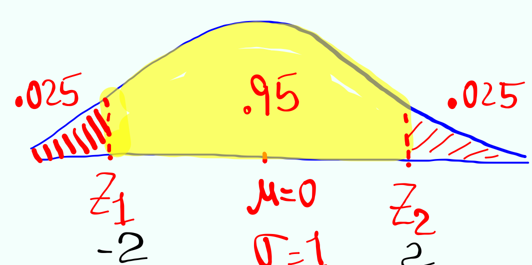
Find two Z-values that separate the middle 95% from the rest. Round to whole #.

$1 - .95 = .05$

$.05 \div 2 = .025$



$Z_1 = \text{invNorm}(.025, 0, 1) = -1.960 \approx \boxed{-2}$

$Z_2 = \text{invNorm}(.975, 0, 1) = 1.960 \approx \boxed{2}$

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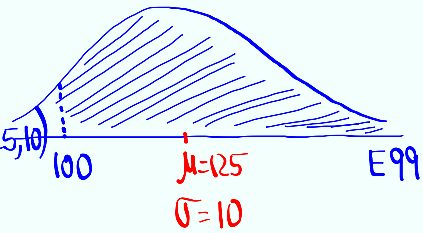
Given $N(125, 10)$

Normal Prob. Dist. ; μ ; σ

$P(x > 100)$

$= \text{normalcdf}(100, E99, 125, 10)$

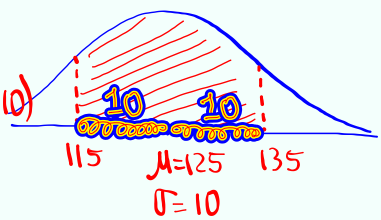
$= \boxed{.994}$



$P(115 < x < 135)$

$= \text{normalcdf}(115, 135, 125, 10)$

$\approx \boxed{.682} \approx 68\%$



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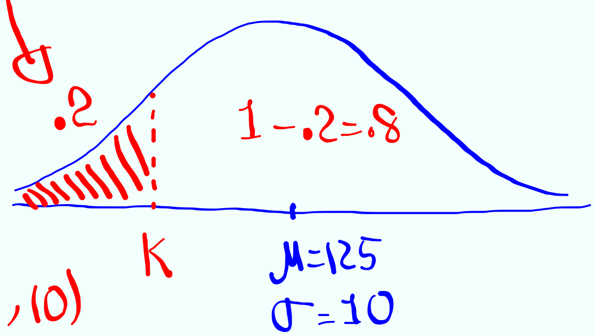
Find K such that $P(x < K) = .2$

Round to whole #.

Left Area



$K = \text{invNorm}(.2, 125, 10)$

$= 116.584 \approx \boxed{117}$

Jan 28-5:03 PM

Credit Scores are normally dist. with mean of 750 and Standard deviation of 40. $N(750, 40)$

If $\boxed{\text{one person}}$ is randomly Selected, x
find the prob. that $\boxed{\text{his/her Credit Score}}$ is $\boxed{\text{between 670 and 830.}}$

$P(670 < x < 830)$

$= \text{normalcdf}(670, 830, 750, 40)$

$= \boxed{.954} \approx 95\%$

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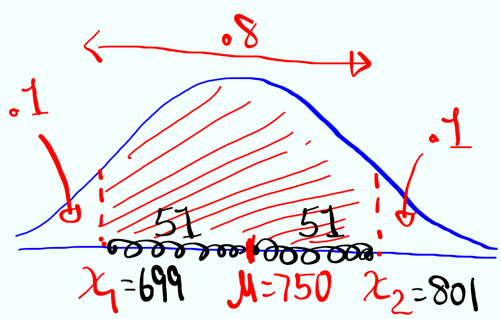
Find two credit Scores that Separate the $\boxed{\text{middle 80\%.}}$ from the rest.

Round to whole #.

$1 - .8 = .2$

$.2 \div 2 = .1$



$x_1 = \text{invNorm}(.1, 750, 40)$

$= 698.738 \approx \boxed{699}$

$x_2 = \text{invNorm}(.9, 750, 40) = 801.262 \approx \boxed{801}$

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Clear all lists

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

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

$\mu = \bar{x} = \boxed{5}$ $\sigma = \sigma_x = \boxed{2.828}$ $\sigma^2 = \boxed{8}$

Find all samples of $\boxed{\text{Size } 2}$ with replacement

$n = 2$

from this data.

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

25 of them

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Find $\bar{x}$ of all these samples.

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

25 $\bar{x}$s

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

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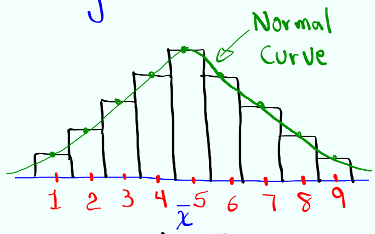
$\bar{x}$	$P(\bar{x})$
1	1/25
2	2/25
3	3/25
4	4/25
5	5/25
6	4/25
7	3/25
8	2/25
9	1/25

Draw Prob. Dist. histogram using $\bar{x}$ & $P(\bar{x})$



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

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

List   freq List

$\mu = 5$ $\sigma = 2$ $\sigma^2 = 4$

$\mu_{\bar{x}} = 5$ $\sigma_{\bar{x}} = 2$ $\sigma^2_{\bar{x}} = 4 = \frac{8}{2}$

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

Central Limit Theorem

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Given $N(250, 20)$

Normal Prob. dist. μ σ

If we randomly take all Samples of Size 4,

$\mu_{\bar{x}} = \mu = \boxed{250}$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{20}{\sqrt{4}} = \frac{20}{2} = \boxed{10}$

$\sigma^2_{\bar{x}} = \frac{\sigma^2}{n} = \frac{20^2}{4} = \frac{400}{4} = \boxed{100}$

Jan 28-5:39 PM

Exam Scores are normally dist. with mean of 82 and standard dev. of 8.

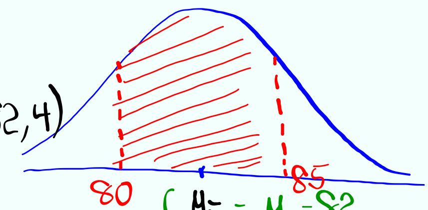
$N(82, 8)$

If we randomly Select $\boxed{4 \text{ exams}}$ ($n=4$), find the prob. that $\boxed{\text{their mean score}}$ ($\bar{x}$) is $\underbrace{\text{between 80 and 85.}}$

$P(80 < \bar{x} < 85)$

$= \text{normalcdf}(80, 85, 82, 4)$

$= \boxed{.465}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{4}} = \frac{8}{2} = 4 \end{cases}$

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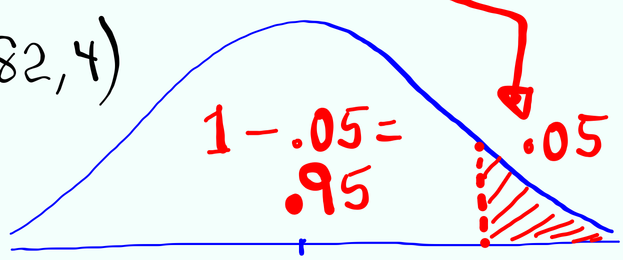
For randomly Selected 4 exams, find $\bar{x}$ that Separates the $\boxed{\text{top } 5\%}$ from the rest.

$\bar{x} = \text{invNorm}(.95, 82, 4)$

$= 88.579$

$\approx \boxed{89}$



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 82 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{4}} = 4 \end{cases}$

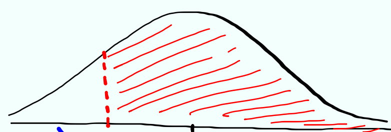
Jan 28-6:08 PM

Salaries of nurses in So. CA has a normal dist. with mean of \$6800/mo. and Standard dev. of \$500/mo.

$N(6800, 500)$ → $n=5$

If we randomly Select 5 nurses, find the prob. that their mean Salary is above \$6500/mo. → $\bar{x}$

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



$= \text{normalcdf}(6500, E99, 6800, 500/\sqrt{5})$

$= \boxed{.910}$

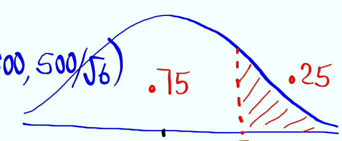
CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6800 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{500}{\sqrt{5}} \end{cases}$

Jan 28-6:13 PM

Find $\boxed{\bar{x}} = Q_3$ for randomly Selected groups of $\boxed{6 \text{ nurses}}$

Round to whole #.

$\bar{x} = \text{invNorm}(.75, 6800, 500/\sqrt{6})$



$= 6937.679....$

$\approx \boxed{6938}$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 6800 \\ \sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{500}{\sqrt{6}} \end{cases}$

25% | 75%
Q_1

75% | 25%
Q_3

SG 17-20 ✓

Jan 28-6:20 PM

t - Dist.

1) It is symmetric, bell-shaped with total area = 1.

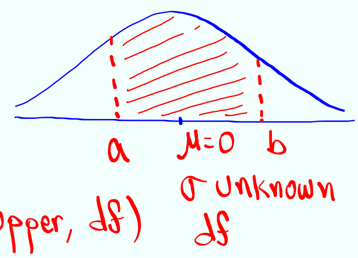
2) Mean, mode, median are the Same

3) $\mu = 0$ but σ unknown

4) It comes with degrees of freedom.

to Find

$P(a < t < b)$



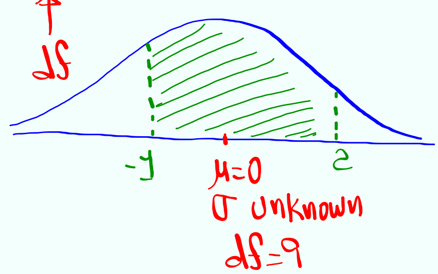
$\boxed{2nd}$ $\boxed{VARS}$

tcdf(Lower, Upper, df)

Jan 28-6:27 PM

Find $P(-1 < t < 2)$ with $df = 9$.

$= \text{tcdf}(\underset{\text{Lower}}{-1}, \underset{\text{Upper}}{2}, \underset{\text{df}}{9}) = \boxed{.790}$



Find $P(t > -1.5)$ with $df = 24$.

$= \text{tcdf}(-1.5, E99, 24)$

$= \boxed{.927}$

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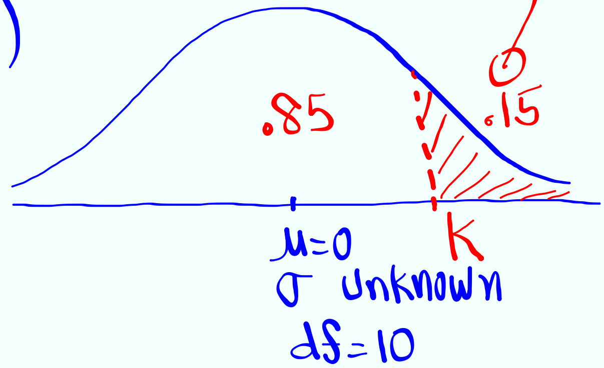
Find K such that $P(t>K)=.15$ with $df=10$.

Right Area

$K=\text{invT}(.85, 10)$

left Area   df

$\approx \boxed{1.093}$



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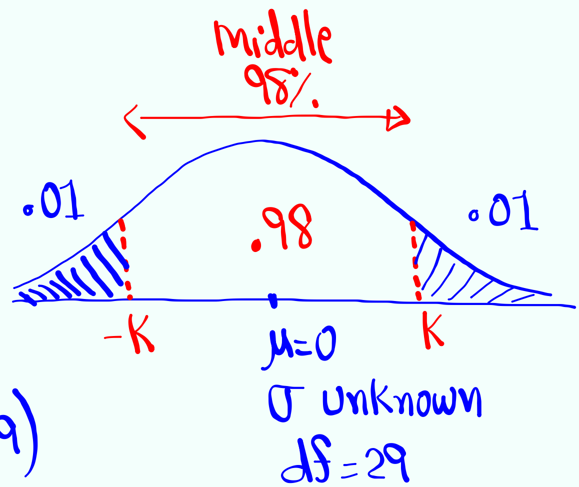
Find K such that $P(-K<t<K)=.98$ with $df=29$.



$K=\text{invT}(.99, 29)$

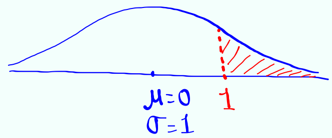
$\approx \boxed{2.462}$

Jan 28-6:42 PM

Find $P(Z>1)$

$= \text{normalcdf}(1, E99, 0, 1)$

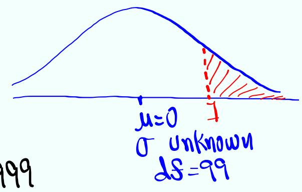
$= \boxed{.159}$



Find $P(t>1)$ with $df=99$.

$= \text{tcdf}(1, E99, 99)$

$= \boxed{.160}$



Redo with $df=999$

$\text{tcdf}(1, E99, 999) = \boxed{.159}$

As df gets bigger Z & t dist. are almost the Same.

Jan 28-6:46 PM

What is degrees of freedom?

Two numbers with Sum of 10.

$5 + \square = 10$

fixed.

df=1

$2 + \square = 10$

Give me 3 numbers with Sum of 10.

$4 + 2 + \square = 10$

fixed.

df=2

degrees of freedom is the number of choices You are free to have.

df will be determined by topics.

Jan 28-6:54 PM

I will bring 10 donuts to class

Dana	has	10	choices
Melissa	"	9	"
Hailey	"	8	"
Kabir	"	7	"
⋮	⋮	⋮	
bella	"	0 (1 donut left)	

$\boxed{df = 9}$

Jan 28-6:59 PM

You have 7 clean shirts.

You only wear a clean shirt daily

Monday	7	choices
Tuesday	6	"
Wednesday	5	"
⋮		
Sunday	1 clean shirt (0 choices)	

$\boxed{df = 6}$

Jan 28-7:01 PM