Statistics

Lecture 15

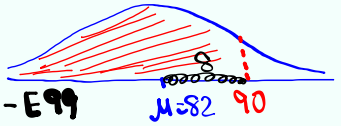
Feb 19-8:47 AM

Class QZ 8

open Notes

Given $N(82, 8)$, find

1) $P(x < 90)$

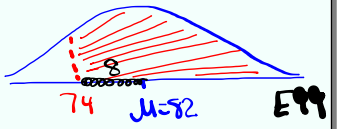


σ=8

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

= .841 ✓

2) $P(x > 74)$

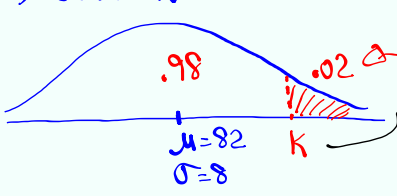


σ=8

= normalcdf(74, E99, 82, 8)

= .841 ✓

3) Find K such that $P(x > K) = .02$



Right Area

σ=8

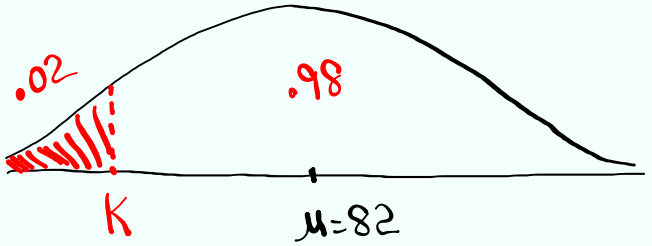
→ invNorm(.98, 82, 8)

= 98.430 ≈ 98

Mar 30-8:39 PM

4) Find K such that $P(x < K) = .02$

Left Area



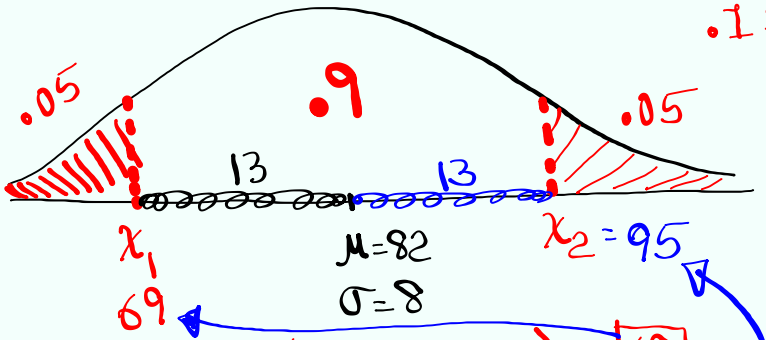
$K = \text{invNorm}(.02, 82, 8) \approx \boxed{66}$

Apr 1-6:59 PM

5) Find two values that separate the **middle 90%** from the rest.

$1 - .9 = .1$

$.1 \div 2 = .05$



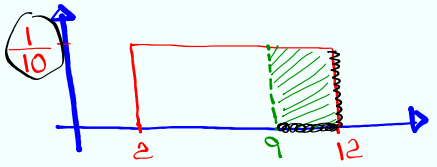
69

$x_1 = \text{invNorm}(.05, 82, 8) \approx \boxed{69}$

$x_2 = \text{invNorm}(.95, 82, 8) \approx 95$

Apr 1-7:02 PM

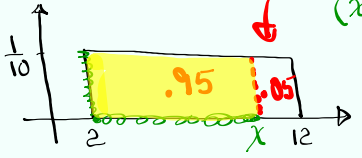
Wait time for customer service to answer a call has a uniform Prob. dist. and it takes 2 minutes to 12 minutes.



P(wait time is more than 9 minutes)

$P(x>9) = (12-9)\cdot\frac{1}{10} = \boxed{\frac{3}{10}}$

Find the time that separates the top 5% from the rest.



$(x-2)\cdot\frac{1}{10} = .95$

$x-2 = 10(.95)$

$x = 2+9.5$

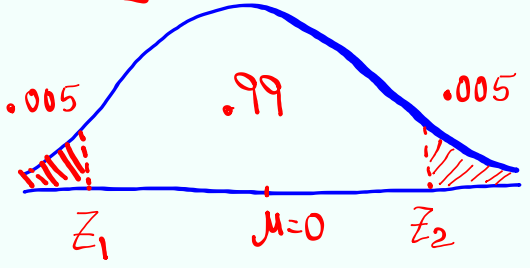
$\boxed{x = 11.5}$

Apr 1-7:07 PM

Find two $\boxed{Z\text{-values}}$ that separate the $\boxed{\text{middle } 99\%}$ from the rest. Round to 3-dec. places.

$1-.99 = .01$

$.01 \div 2 = .005$



$Z_1 = \text{invNorm}(.005, 0, 1) = \boxed{-2.576}$

$Z_2 = \text{invNorm}(.995, 0, 1) = \boxed{2.576}$

Apr 1-7:14 PM

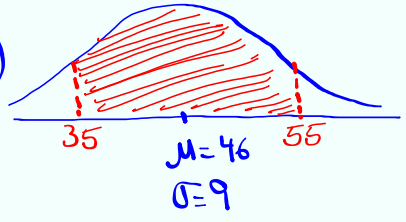
Ages of nurses are normally distributed with the mean of 46 yrs and standard deviation of 9 yrs. $N(46,9)$

If we randomly select **1 nurse**, find the prob. that **his/her age** (x) is between 35 and 55 yrs.

$P(35<x<55)$

= normalcdf(35, 55, 46, 9)

= **.731**



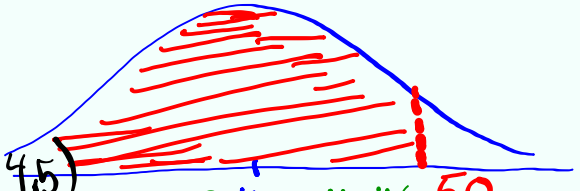
Apr 1-7:20 PM

If we randomly select **4 nurses** ($n=4$), find the prob. that **their mean age** ($\bar{x}$) is **below 50** yrs.

$P(\bar{x}<50)$

= normalcdf(-E99, 50, 46, 4.5)

= **.813**



CLT $\begin{cases} \mu_{\bar{x}} = \mu = 46 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{9}{\sqrt{4}} = 4.5 \end{cases}$

Apr 1-7:26 PM

SAT Scores are N.D. with $\mu = 1275$ and $\sigma = 100$.

$N(1275, 100)$

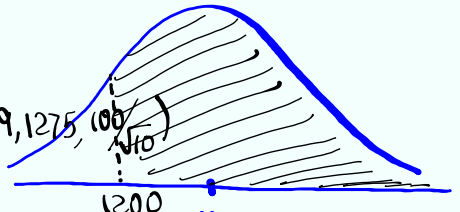
$n = 10$

for randomly Selected 10 SAT exams,

find the prob. that their mean Score $\bar{x}$ is above 1200.

$P(\bar{x} > 1200)$

$= \text{normalcdf}(1200, E99, 1275, \frac{100}{\sqrt{10}})$



$= .991$

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 1275 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{10}} \end{cases}$

Apr 1-7:30 PM

find $\bar{x} = P_{95}$ for randomly Selected 16 SAT exams.

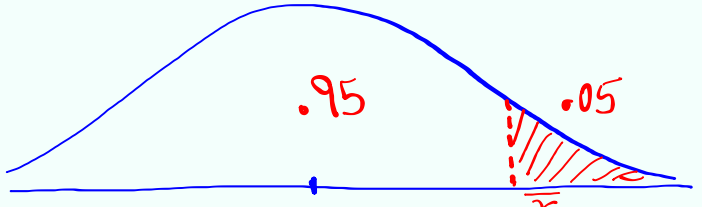
95% below, 5% above

Left Area, Right Area

.95 .05

$\bar{x} = \text{invNorm}(.95, 1275, 25)$

≈ 1316



SE 17-20 ✓

CLT $\begin{cases} \mu_{\bar{x}} = \mu = 1275 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{100}{\sqrt{16}} = \frac{100}{4} = 25 \end{cases}$

Apr 1-7:36 PM

Z - Dist.

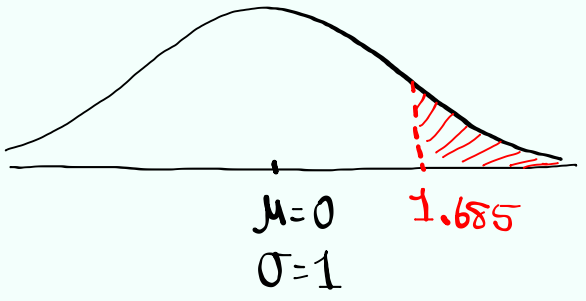
Bell-Shape

Symmetric

Total Area = 1

$\mu = 0$, $\sigma = 1$

$P(Z > 1.685)$



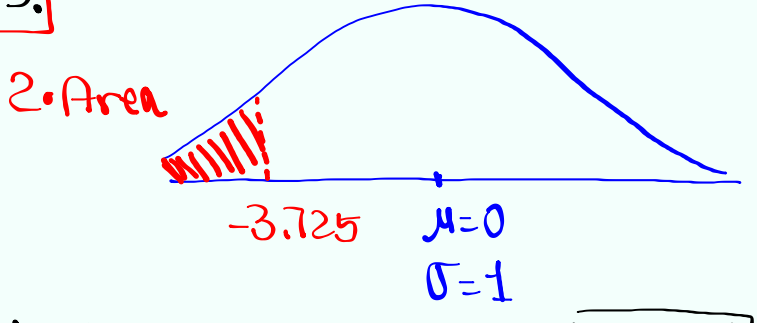
= normalcdf(1.685, E99, 0, 1)

= .046

Apr 1-7:42 PM

Find twice the area to the left of

$Z = -3.725$.



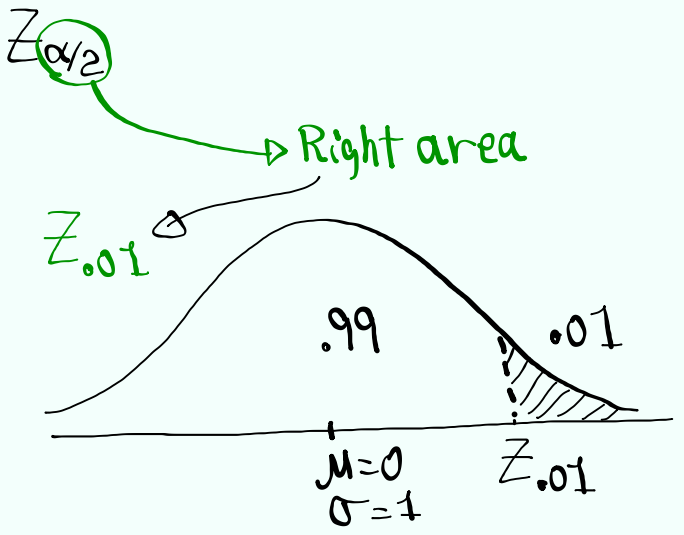
2 • normalcdf(−E99, −3.725, 0, 1) = 1.95×10^{-4}

Apr 1-7:45 PM

$z_{\alpha/2}$

Alpha

$0 < \alpha < 1$

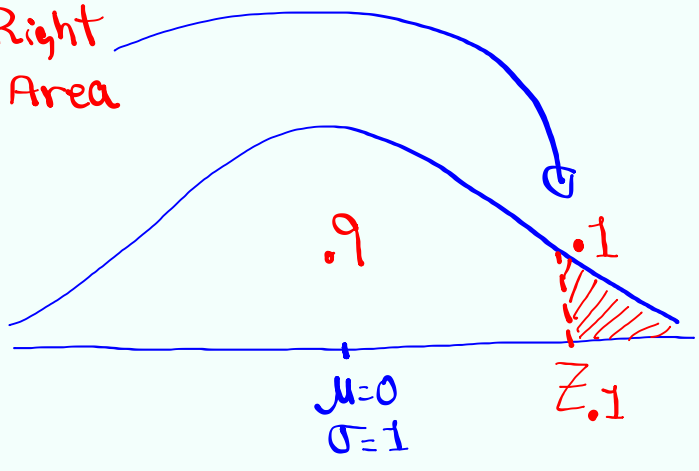


$z_{.01} = \text{invNorm}(.99, 0, 1) = \boxed{2.326}$

Apr 1-7:50 PM

Find $z_{.1}$

Right Area



$z_{.1} = \text{invNorm}(.9, 0, 1) = \boxed{1.282}$

Apr 1-7:54 PM

t - Dist.

Symmetric

Bell-Shape

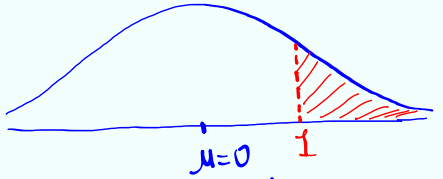
Total area = 1

$\mu = 0$

σ unknown

it comes with degrees of freedom df

$P(t > 1)$ with $df = 9$.



$\mu = 0$
σ unknown
$df = 9$

2nd VARS

tcdf(1 , E99, 9)
L U df

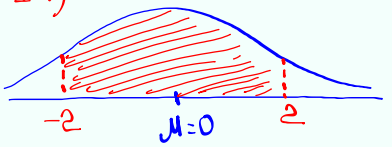
= .172

Apr 1-7:56 PM

Find $P(-2 < t < 2)$ with $df = 19$.

= tcdf(−2 , 2 , 19)

= .940



$\mu = 0$
σ unknown
$df = 19$

Find twice the area to the left of $t = -1.75$ with $df = 15$.

2 · tcdf(-E99, -1.75, 15)

= .101

$\mu = 0$
σ unknown
$df = 15$

Apr 1-8:01 PM

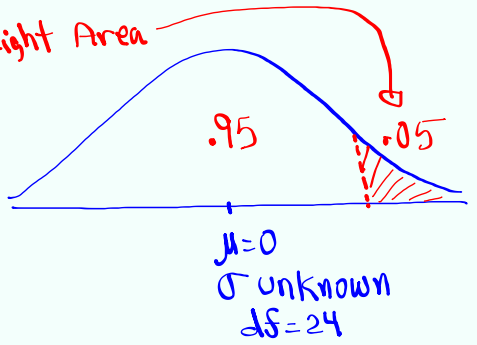
Find $t_{.05}$ with df = 24.

2nd VARS

Right Area

invT(.95, 24)

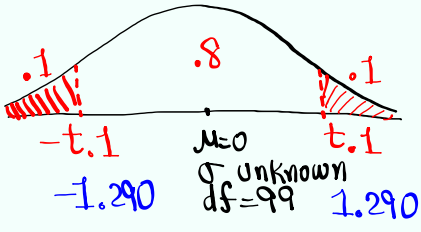
= 1.711



Find $\pm t_{.1}$ with df = 99.

invT(.9, 99)

= 1.290



Apr 1-8:06 PM

What is degrees of freedom?

20 students,

I bring 20 donuts

First person — 20 choices

Second " — 19 choice

Third " — 18 "

⋮

Last person — 1 Donut left (0 choice)

19 had choices → df = 19

Apr 1-8:14 PM

7 clean shirts

Monday 7 choices

Tuesday 6 "

$df = 6$

⋮

Sunday 1 clean shirt

Pick 2 positives # total 10

Carla 9 → I have to pick 1.

$df = 1$

Yasmin, Ramon, and me

Pick 3 pos. # to sum 10.

→ 2 + 5 + 3 = 10

$df = 2$

degrees of freedom will be determined by the topic in Statistics.

Apr 1-8:17 PM

Chi – Square dist.

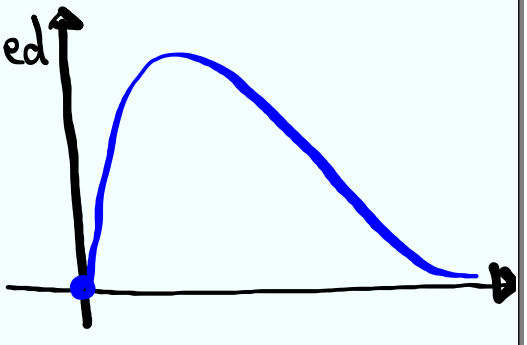
χ^2

Graph begins at 0

and positively Skewed

not Symmetric

not bell-Shape

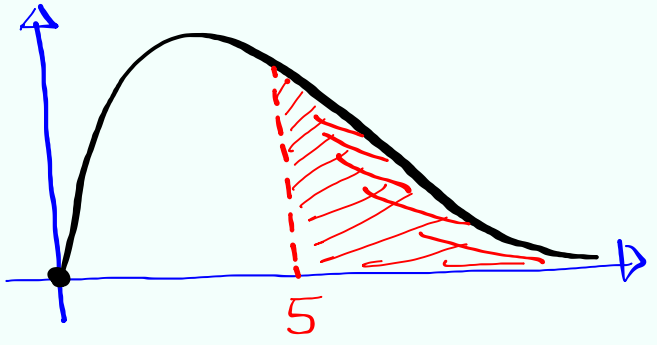


Total area = 1

It comes with df.

Apr 1-8:24 PM

Find $P(\chi^2 > 5)$ with $df = 6$.

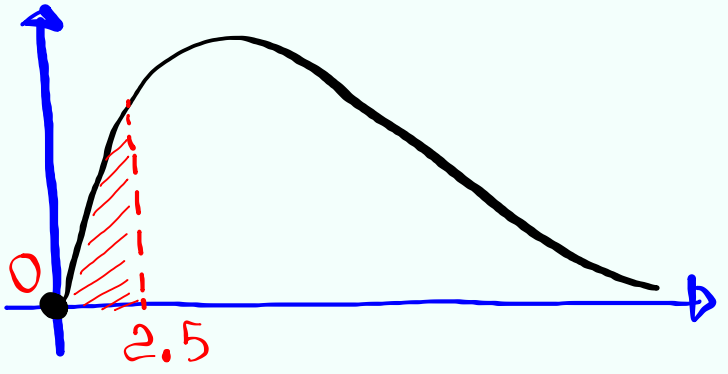


2nd VARS

$\chi^2cdf(5, E99, 6) = .544$

Apr 1-8:27 PM

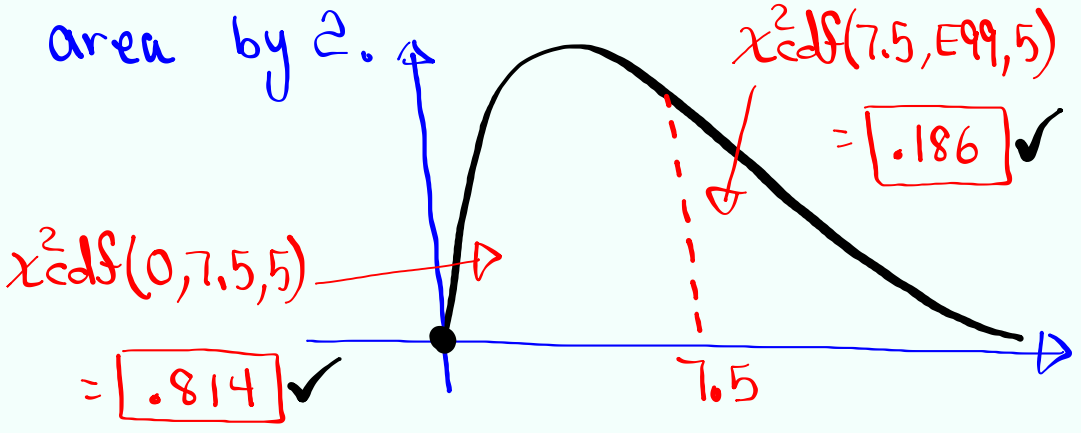
Find $P(\chi^2 < 2.5)$ with $df = 9$.



$\chi^2cdf(0, 2.5, 9) = .019$

Apr 1-8:30 PM

Find area on both sides of $\chi^2 = 7.5$ with $df = 5$, then multiply the smaller area by 2.



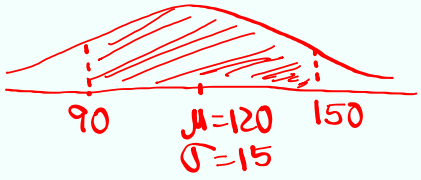
2 · Smaller area = 2(.186) = .372

Apr 1-8:34 PM

Bonus Quiz

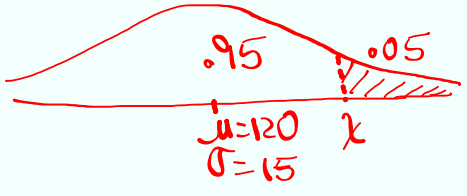
Given $N(120, 15)$

1) Find $P(90 < x < 150)$ = normalcdf(90, 150, 120, 15)
= .954



2) Find $x = P_{95}$, Round to whole #.

x = invNorm(.95, 120, 15)
= 144.673 ≈ 145



Apr 1-8:41 PM