Statistics

Lecture 17

Feb 19-8:47 AM

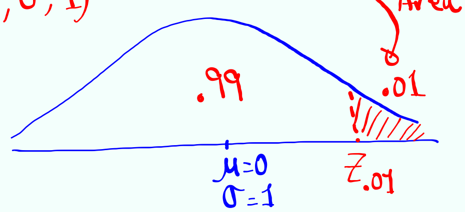
Find $z_{\alpha/2}$ for $\alpha = .02$

$\alpha/2 = .02/2 = .01$ Find $z_{.01}$

Right Area

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

$= \boxed{2.326}$



Find $\pm z_{\alpha/2}$ for $\underbrace{94\%}_{.94}$ Conf. level.

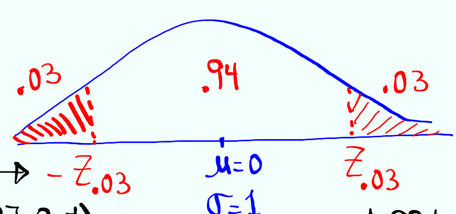
.94 middle Area

$1 - .94 = .06$

$.06 \div 2 = .03$

α $\alpha/2$

$-1.881 \longrightarrow$



$z_{.03} = \text{invNorm}(.97, 0, 1) = \boxed{1.881}$ 1.881

Apr 15-6:53 PM

In a Survey of 185 Students, 4.8% of them were left-handed. $n = 185$, $\hat{p} = .048$ → $x = n\hat{p} = 185(.048) = 8.88$ $\boxed{x = 9}$

C-level: .98

Find 98% Conf. interval for the proportion of all Students that are left-handed.

1-PropZInt

$x = 9$

$n = 185$

C-level: .98

$\boxed{\text{Calculate}}$

$\boxed{.01 < p < .09}$

we are 98% Confident that between 1% & 9% of all students are left-handed.

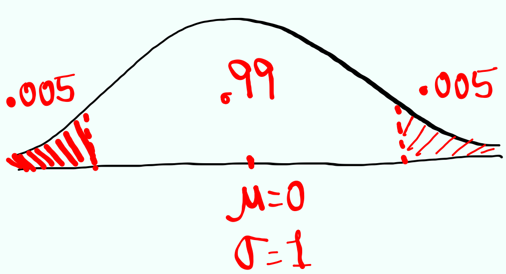
$E = \dfrac{.09 - .01}{2} = \boxed{.04}$

$\hat{p} = \dfrac{.09 + .01}{2} = \boxed{.05}$

Apr 15-7:00 PM

How many students should we survey if we wish to construct 99% Confidence and margin of error to be no more than 10% and $\hat{p} = .05$?

$1 - .99 = .01$, $.01 \div 2 = .005$



$Z_{.005} = \text{invNorm}(.995, 0, 1)$

$$n = \hat{p}\hat{q}\left(\frac{Z_{\alpha/2}}{E}\right)^2$$

$$n = (.05)(.95)\left(\frac{2.576}{.1}\right)^2$$

$= 31.51\ldots$

$\boxed{n = 32}$

Apr 15-7:08 PM

I randomly selected 35 exams, their mean score was 88.

$n=35$ $\bar{x}=88$ Point-estimate

Standard dev. of all exam scores is known to be 12. $\sigma=12$

C-level: .9

Find 90% Conf. interval for the mean of all exam scores.

$< \mu <$

σ known → Z Interval

inpt: $\boxed{\text{Stats}}$

$\sigma=12$

$\bar{x}=88$ ← Round to whole #

$n=35$

C-level: .9

$\boxed{\text{Calculate}}$

$E=\dfrac{91-85}{2}=\boxed{3}$

$\bar{x}=\dfrac{91+85}{2}=\boxed{88}$

$\boxed{85<\mu<91}$

We are 90% conf. that the mean of all exams is between 85 & 91.

Apr 15-7:15 PM

I randomly selected 20 students. Here are their ages:

28	32	18	25	40
30	24	19	29	45
50	28	35	30	40
60	55	32	25	20

1) Find $\bar{x}$

$\bar{x}=33.25$

$\approx\boxed{33}$

Assume that the standard dev. of ages of all students is 10. $\sigma=10$

Find conf. interval for the mean age of all students.

σ known → Z Interval

No C-level → use .95

Z Interval

inpt: $\boxed{\text{Stats}}$

$\sigma=10$

$\bar{x}=33$ ← whole

$n=20$

C-level: .95

$\boxed{\text{Calculate}}$

$E=\dfrac{37-29}{2}=\boxed{4}$

$\bar{x}=\dfrac{37+29}{2}=\boxed{33}$

$\boxed{29<\mu<37}$

Apr 15-7:25 PM

Estimating Population Mean

μ

$$\bar{x} - E < \mu < \bar{x} + E$$

Sample Mean, Point-estimate

Margin of error

Case I: σ Known	Case II: σ Unknown
$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$	$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$, $df = n-1$
$\boxed{\text{STAT}}$ TESTS $\boxed{\text{Z Interval}}$	$\boxed{\text{STAT}}$ TESTS $\boxed{\text{T Interval}}$
inpt: $\boxed{\text{STATS}}$	inpt: $\boxed{\text{Stats}}$
Follow the Screen	Follow the Screen

Apr 13-8:37 PM

Given: $n = 15$, $\bar{x} = 32.5$, $s = 8.5$, C-level: .98

Find conf. interval for μ.

σ unknown $\rightarrow$ TInterval

inpt: $\boxed{\text{Stats}}$

Round to 1-dec. $\longrightarrow$ $\bar{x} = 32.5$

$s = 8.5$

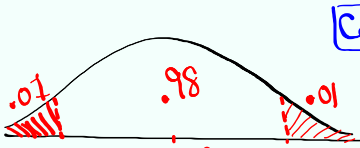
$df = 14$ $\longrightarrow$ $n = 15$

C-level: .98

$\boxed{\text{Calculate}}$

$$\boxed{26.7 < \mu < 38.3}$$

$$E = \frac{38.3 - 26.7}{2} = \boxed{5.8}$$



σ unknown

$df = 14$

$$t_{.01} = \text{invT}(.99, 14) \approx \boxed{2.624}$$

$$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}} = 2.624 \cdot \frac{8.5}{\sqrt{15}} \approx \boxed{5.759} \approx \boxed{5.8}$$

Apr 15-7:39 PM

The mean of 10 randomly Selected tax return was \$580 with Standard deviation of \$75.

find $\underbrace{\text{Conf.}\ \text{interval}}^{\text{No C-level .95}}$ for mean refund of all taxes.

$n = 10$

$\bar{x} = 580$

$S = 75$

Round to whole

σ Unknown $\rightarrow$ TInterval

$E = \frac{634 - 526}{2} = \boxed{54}$

$\boxed{526 < \mu < 634}$

$\bar{x} = \frac{634 + 526}{2} = \boxed{580}$

Apr 15-7:49 PM

12 exams were randomly Selected. Here are the Scores:

75	82	90	100
68	88	95	58
70	80	100	60

find

$\bar{x} = 80.5$

$S = 14.6$

Round to $\boxed{\text{1-dec}}$

find 99% Conf. interval for the mean Score of all exams.

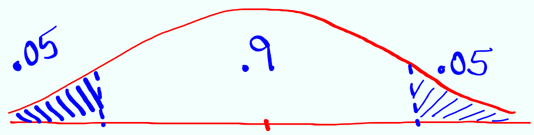
$\boxed{67.4 < \mu < 93.6}$

σ Unknown $\rightarrow$ TInterval

$E = \frac{93.6 - 67.4}{2} = \boxed{13.1}$

Apr 15-7:57 PM

Find $\pm t_{\alpha/2}$ for 90% C-level with $df = 9$



$\mu = 0$
σ unknown
$df = 9$

$t_{\alpha/2} = \text{invT}(.95, 9) \approx 1.833$

do it with $df = 99$ $\quad t_{\alpha/2} = \text{invT}(.95, 99) \approx 1.660$

do it with $df = 999$ $\quad t_{\alpha/2} = \text{invT}(.95, 999) \approx 1.646$

$z_{\alpha/2} = \text{invNorm}(.95, 0, 1) \approx 1.645$

As df increases $t_{\alpha/2} \approx z_{\alpha/2}$

Apr 15-8:05 PM

Min. Sample Size for pop. mean:

$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

if we Solve for n

$$n = \left(\frac{z_{\alpha/2} \cdot \sigma}{E} \right)^2$$

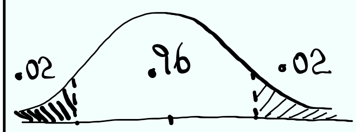
Always round-up to a whole #.

If σ is unknown $\rightarrow$ use S

$$n = \left(\frac{z_{\alpha/2} \cdot S}{E} \right)^2$$

Apr 15-8:13 PM

Find min. Sample Size needed to Construct 96% Conf. interval for pop. mean with $\sigma = 25$ and $E = 8$.



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

$Z_{.02} = \text{invNorm}(.98, 0, 1) = 2.054$

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{2.054 \cdot 25}{8}\right)^2 = 41.200\ldots \approx \boxed{42}$$

Redo with $E = 4$

$$n = \left(\frac{2.054 \cdot 25}{E}\right)^2 = 164.8\ldots \quad \boxed{n \approx 165}$$

Apr 15-8:16 PM

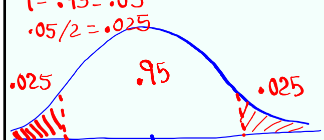
Standard deviation of Salaries of all nurses is known to be \$400. $\boxed{\sigma = 400}$

$n = ?$

Find min. Sample Size needed to Construct Confidence interval for mean Salaries of all nurses and error not to exceed \$50. $E = 50$

NO C-level
.95

$1 - .95 = .05$
$.05/2 = .025$



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

$Z_{.025} = \text{invNorm}(.975, 0, 1)$

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2 = \left(\frac{1.960 \cdot 400}{50}\right)^2 \approx \boxed{246}$$

Redo with $E = 100$

$$n = \left(\frac{1.960 \cdot 400}{100}\right)^2 \approx \boxed{62}$$

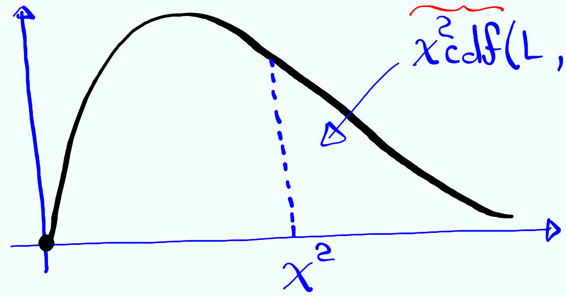
SG 21 & 22

Apr 15-8:23 PM

Chi-Sqr dist.

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

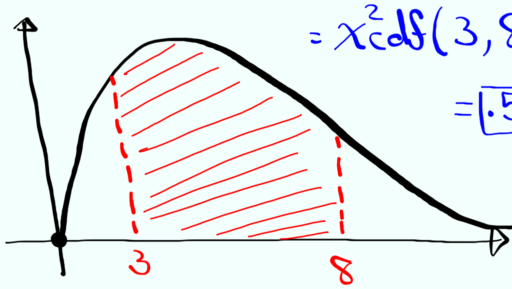
$\chi^2cdf(L, U, df)$



Find $P(3 < \chi^2 < 8)$ with $df = 5$.

$= \chi^2cdf(3, 8, 5)$

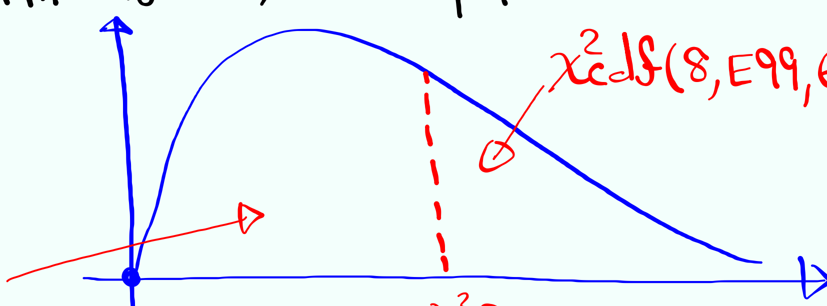
$= \boxed{.544}$



Apr 15-8:33 PM

Find the area on each side of $\chi^2 = 8$ with $df = 6$, multiply Small area by 2.

$\chi^2cdf(8, E99, 6) = \boxed{.238}$



$\chi^2cdf(0, 8, 6) = \boxed{.762}$

2 · Smaller area

$= 2(.238) = \boxed{.476}$

Apr 15-8:37 PM

F - Dist.

Graph is similar to χ^2-dist. graph

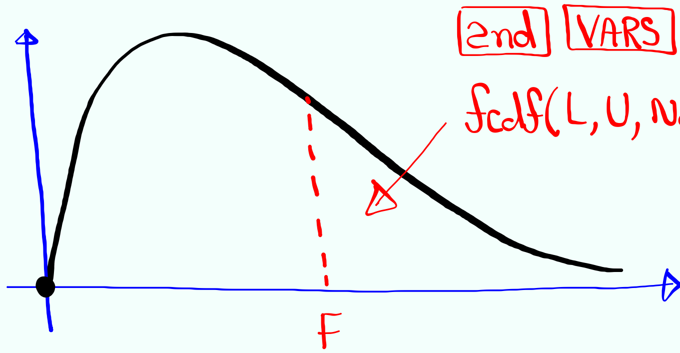
It comes with two degrees of freedom

Ndf Numerator df

Ddf Denominator df

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

fcdf(L, U, Ndf, Ddf)



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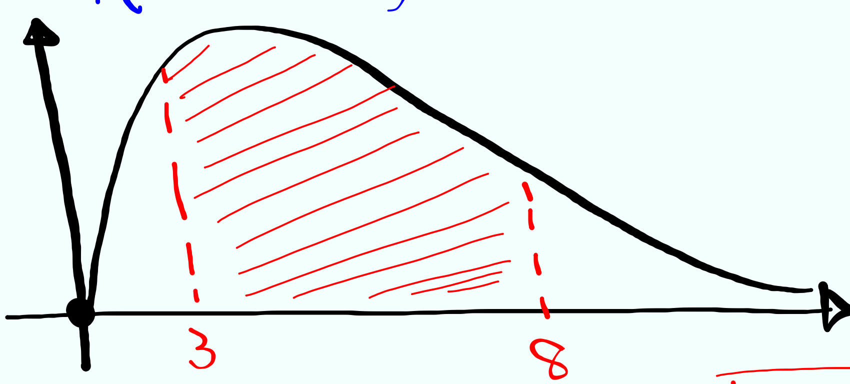
find $P(3 < F < 8)$ with Ndf = 4 & Ddf = 10.



fcdf(3, 8, 4, 10) = $\boxed{.069}$

Apr 15-8:44 PM