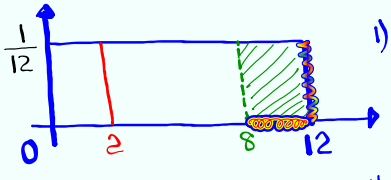
Statistics

Lecture 16

Feb 19-8:47 AM

Suppose the wait time to see a teller at a local bank is no more than 12 minutes and it has a uniform Prob. dist.



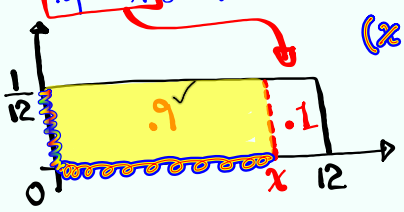
1) P(wait time is exacty 2 minutes)

$P(x=2) = 0$

2) P(wait time is more than 8 minutes)

$P(x>8) = (12-8)\cdot\frac{1}{12} = \frac{4}{12} = \frac{1}{3}$

3) Find the time that separates the top 10% from the rest. Round to whole #



$(x-0)\cdot\frac{1}{12} = .9$

$x - 0 = 12(.9)$

$x = 10.8$

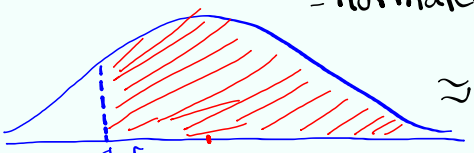
$x \approx 11$ minutes

Apr 29-1:46 PM

Find $P(Z > -1.5)$

$= \text{normalcdf}(-1.5, E99, 0, 1)$

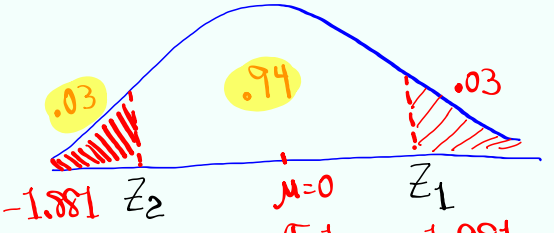
$\approx \boxed{.933} = 93.3\%$



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

$1 - .94 = .06$

$.06 \div 2 = .03$



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

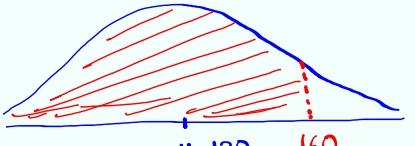
Apr 29-1:57 PM

Given $N(130, 15)$

Normal Prob. Dist.

μ σ

1) $P(x < 160)$



$= \text{normalcdf}(-E99, 160, 130, 15)$

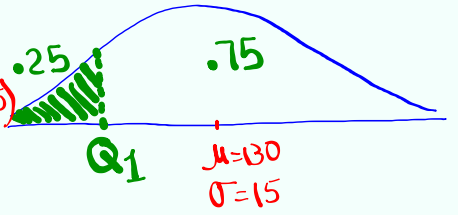
$\approx \boxed{.977}$

2) Find $x = Q1$, Round to whole #.

$x = Q1$

$= \text{invNorm}(.25, 130, 15)$

$\approx \boxed{120}$



Apr 29-2:04 PM

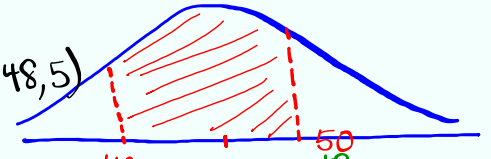
Ages of teachers in LAUSD has a normal dist with the mean of 48 yrs and Standard dev. of 10 yrs. $N(48, 10)$

If we randomly select $n = 4$ 4 teachers, find the Prob. that their mean age $\bar{x}$ is between 40 & 50 yrs.

$P(40 < \bar{x} < 50)$

=normalcdf(40,50,48,5)

$\approx$ .601

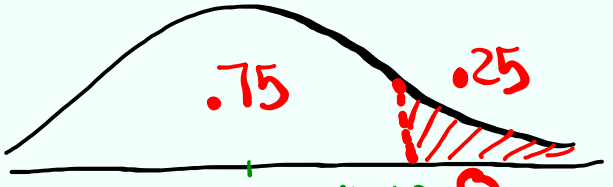


CLT $\mu_{\bar{x}} = \mu = 48$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{4}} = 5$

Apr 29-2:11 PM

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



CLT $\mu_{\bar{x}} = \mu = 48$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{5}}$

$\bar{x}$ = invNorm(.75, 48, 10/$\sqrt{5}$)

$\approx 51.016 \approx$ 51

SG 17-20

Apr 29-2:18 PM

Find $z_{.03}$ → Right-Tail Area

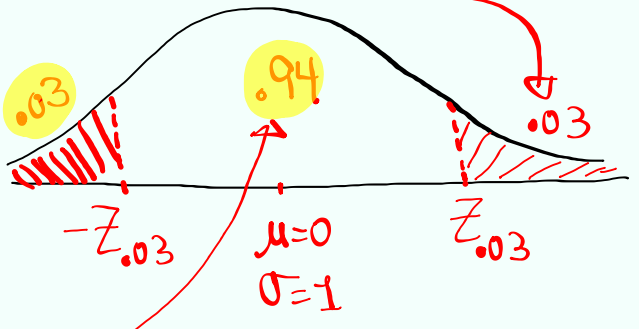
$\alpha/2 = .03$

$\alpha = .06$

$1 - \alpha = .94$

Middle Area

Confidence level



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

$\approx \boxed{1.881}$

Apr 29-2:24 PM

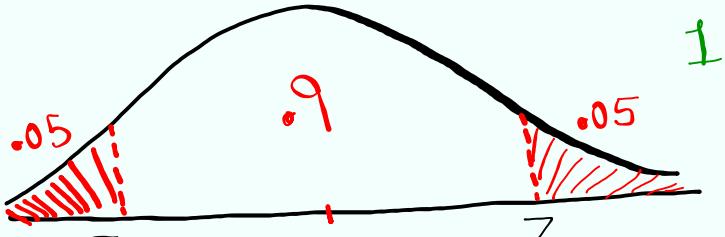
Find $\pm z_{\alpha/2}$ for 90% Conf. level.

Middle Area .9

$1 - \alpha = .9$

$\alpha = .1$

$\alpha/2 = .05$



-1.645

1.645

$z_{.05} = \text{invNorm}(.95, 0, 1)$

$\approx \boxed{1.645}$

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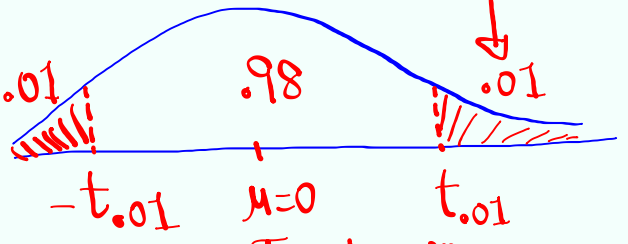
Find $t_{.01}$ with $df = 29$.

$\alpha/2$



σ unknown

$df = 29$

$t_{.01} = invT(.99, 29)$

$\approx \boxed{2.462}$

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Find $\pm t_{\alpha/2}$ for 99% Conf. level with $df = 99$

Middle Area .99

$1 - \alpha = .99$

$\alpha = .01$

$\alpha/2 = .005$

σ unknown

$df = 99$

-2.626

$= invT(.995, 99)$

2.626

$\approx \boxed{2.626}$

Apr 29-2:36 PM

SG 21

Estimating Parameters:

Parameter ⟷ Population

Statistic ⟷ Sample

we use Statistic to estimate parameter.

Point-estimate

we use		To estimate
Sample Proportion $\hat{p}$	→	Population Prop. p
" Mean $\bar{x}$	→	" Mean μ
" Standard deviation s	→	Pop. Stand. deviation σ

Point-estimate is our best guess.

Apr 29-2:51 PM

our estimation of a parameter is a range of values.

Confidence Interval

Every Conf. interval comes with Conf. level $(1-\alpha)\cdot 100\%$.

Middle Area.

$\alpha \rightarrow$ Significance level

$(1-\alpha)100\% \rightarrow$ Confidence level

If C-level not given → use 95%.

If α not given → use .05

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Estimating Population Proportion:

$$< p <$$

$$\hat{p} - E < p < \hat{p} + E$$

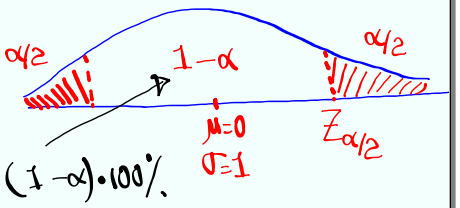
$\hat{p}$: Sample Proportion, Point-estimate

E: Margin of Error

$\hat{p} = \frac{x}{n}$ ← x = # Favorable responses, n ← Sample Size

$\hat{q} = 1 - \hat{p}$

$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$



C-level: $(1-\alpha)\cdot 100\%$

Apr 29-3:03 PM

I Surveyed 25 students, 20 had iPhone.

$n = 25$, $x = 20$

$\hat{p} = \frac{x}{n} = \frac{20}{25} = .8$

$\hat{q} = 1 - \hat{p} = .2$

C-level: .9

Construct 90% Conf. interval for the prop. of all Students that have iPhone.

$$\hat{p} - E < p < \hat{p} + E$$

$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$

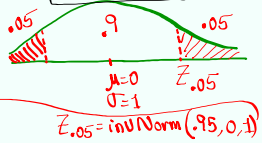
$= 1.645 \cdot \sqrt{\frac{(.8)(.2)}{25}}$

$\approx .13$

$z_{.05} = \text{invNorm}(.95, 0, 1)$

$.8 - .13 < p < .8 + .13$

$.67 < p < .93$



we are 90% Confident that between 67% & 93% of all Students have iPhone.

Using TI:

STAT → TESTS ↓ 1-PropZInt

$x = 20$

$n = 25$

C-level: .9

Calculate

$.67 < p < .93$

$E = \frac{.93 - .67}{2} = .13$

$\hat{p} = \frac{.93 + .67}{2} = .8$

Apr 29-3:10 PM

Students : 120

25 were Smokers

C-level : 99%

1-PropZInt

$x = 25$

$n = 120$

C-level: .99

Calculate

$.11 < p < .30$

$E = \frac{.30 - .11}{2} = .095$ $\quad \hat{p} = \frac{.30 + .11}{2} = .205$

Apr 29-3:35 PM

I Surveyed 250 students and 42% of them were in favor of online classes.

$n = 250$ $\quad x = n\hat{p} = 250(.42) = 105$

$\hat{p} = .42$ $\quad$ if decimal → Round-up

Find Conf. interval for the prop. of all students in favor of online classes.

↳ no C-level → use 95%

1-PropZInt

$x = 105$

$n = 250$

C-level: .95

$.36 < p < .48$

$E = \frac{.48 - .36}{2} = .06$

$\hat{p} = \frac{.48 + .36}{2} = .42$

Apr 29-3:43 PM

In a survey of 175 voters, 62.5% of them were females. $n=175$ $\hat{p}=.625$ $x=n\hat{p}$ $=175(.625)=109.375$ Round-up $x=110$

Find 98% conf. interval for the prop. of all voters that are females. C-level: .98

1-PropZInt

$.54 < p < .71$

$E=\frac{.71-.54}{2}=.085$

$\hat{p}=\frac{.71+.54}{2}=.625$

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