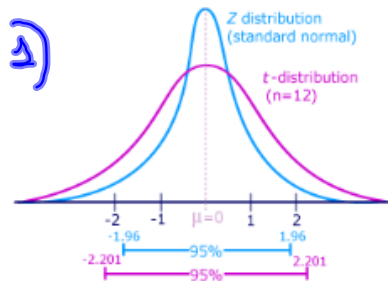


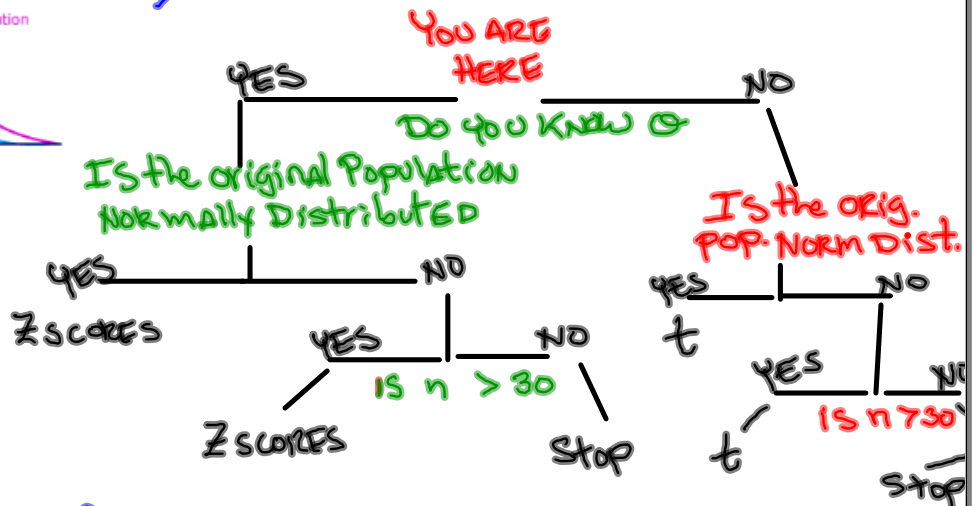
Lesson #16

Aim: How do we estimate a population mean when σ is unknown?

I- Z scores vs. t scores.



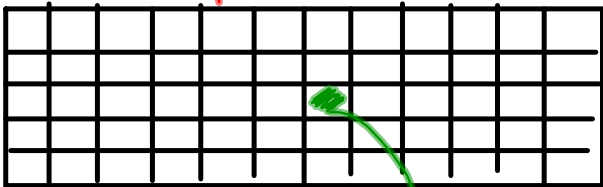
2) Selecting Z or t



3) Decide t or Z

- t ① $n=50, \bar{x}=100, s=15$ pop. HAS a SKEWED DIST.
- t ② $n=8, \bar{x}=100, s=15$ POP IS NORMALLY DIST.
- stop ③ $n=8, \bar{x}=100, s=19$ pop is VERY SKewed.
↳ STANDARD DEVIATION FOR THE SAMPLE.

Population μ, σ



$n = \left[\frac{z_{\alpha/2} \cdot \sigma}{\text{error}} \right]^2$

$n > 30$

\bar{x} } will try to μ, σ
 S } Approximate

4) Formulas

$$Z = \frac{\bar{x} - \mu}{\sigma} \quad (\text{Individuals})$$

$$t = \frac{\bar{x} - \mu}{s}$$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} \quad (\text{Groups})$$

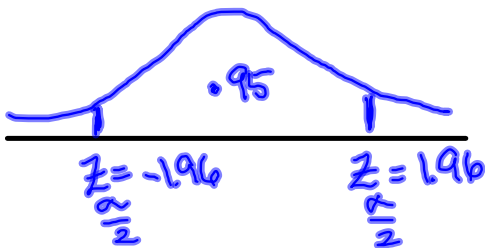
$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

~~I~~ t-tables

1) DF ($n-1$) - Degree of Freedom.

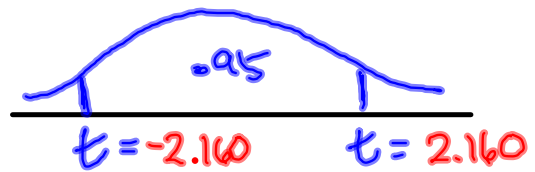
2) $\frac{\text{Exam}_1 + \text{Exam}_2 + \text{Exam}_3 + E_4 + E_5}{\text{Degree of freedom}} = \text{Mean}$

3) Let's use Z (values)⁵



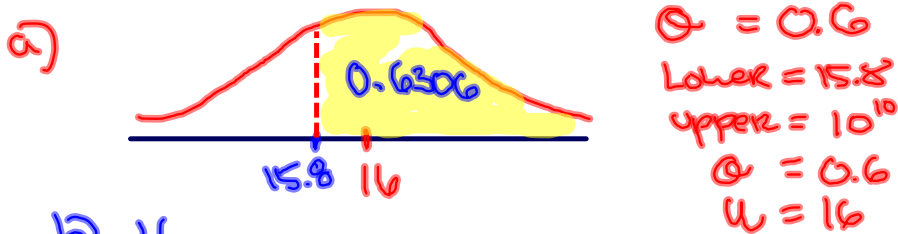
4) Let's use t (values)

$n=14$ $DF=13$



25. The volume of soft drink in plastic bottles is a normal random variable with mean 16 ounces and standard deviation 0.6 ounces.

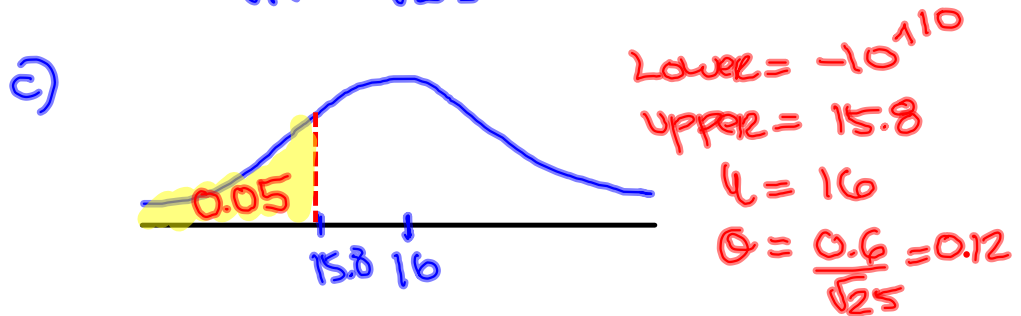
- If a bottle is selected at random, find the probability that it contains more than 15.8 ounces of soft drink.
- A random sample of 25 bottles is selected from a large quantity of filled bottles. Write down the sampling distribution of sample means. Give the mean and standard deviation of the sampling distribution, and compare the shape of the sampling distribution to the shape of the original distribution of soft drink volumes.
- Find the probability that the mean volume of soft drink in the 25 sampled bottles is less than 15.8 ounces.



b)

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

$$\sigma = \frac{\sigma}{\sqrt{n}} = \frac{0.6}{\sqrt{25}} = \frac{0.6}{5} = 0.12$$



25

a. $P(x > 15.8) = P(z > -0.33) = 0.6293$

b. The sample means are normally distributed with mean = 16, and standard deviation = 0.12

c. $P(\bar{x} < 15.8) = P(z < -1.67) = 0.0475$

df/p	0.40	0.25	0.10	0.05	0.025
1	0.324920	1.000000	3.077684	6.313752	12.70620
2	0.288675	0.816497	1.885618	2.919986	4.30265
3	0.276671	0.764892	1.637744	2.353363	3.18245
4	0.270722	0.740697	1.533206	2.131847	2.77645
5	0.267181	0.726687	1.475884	2.015048	2.57058
6	0.264835	0.717558	1.439756	1.943180	2.44691
7	0.263167	0.711142	1.414924	1.894579	2.36462
8	0.261921	0.706387	1.396815	1.859548	2.30600
9	0.260955	0.702722	1.383029	1.833113	2.26216
10	0.260185	0.699812	1.372184	1.812461	2.22814
11	0.259556	0.697445	1.363430	1.795885	2.20099
12	0.259033	0.695483	1.356217	1.782288	2.17881
13	0.258591	0.693829	1.350171	1.770933	2.16037

