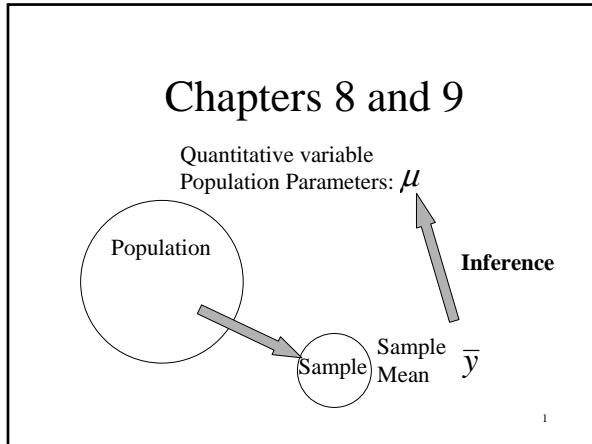


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Example

- What is the mean alcohol content of beer?
- A random sample of 10 beers is taken and the alcohol content (%) is measured.

2

- Population – all beers.
- Variable – alcohol content, %.
- Parameter – mean alcohol content of beer.

3

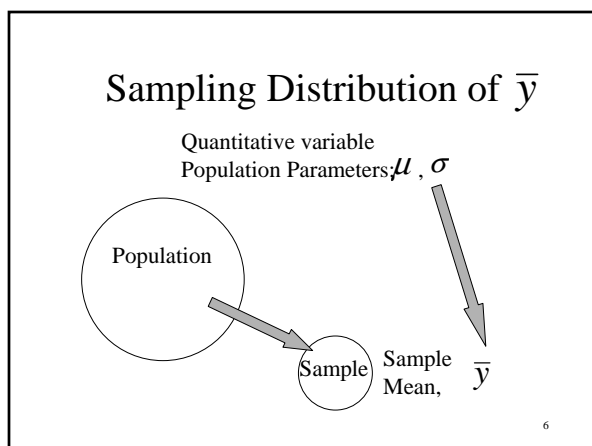
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Sample Data – Alcohol (%)

Molson Canadian	5.19	Heineken Dark	5.17
Michelob Dark	4.76	O'Keefe Canadian	4.96
Big Barrel Lager	4.32	Olympia Lager	4.78
Hamm's	4.53	Miller Draft	4.85
Tsingtao	4.79	Guinness Stout	4.27

Sample Summary

- Sample size:
 - $n = 10$
- Sample mean:
 - $\bar{y} = 4.762$
- Sample standard deviation:
 - $s = 0.314$



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Summary

- Sampling from a population that follows a Normal Model.
- Distribution of the sample mean, \bar{y}
 - Shape: Normal model
 - Center: μ
 - Spread: $SD(\bar{y}) = \frac{\sigma}{\sqrt{n}}$

7

Unknown, σ

- If we do not know the value of the population standard deviation we cannot standardize and cannot use table Z.

8

Unknown, σ

- We can use the sample standard deviation, s , as an estimate of the population standard deviation, σ .

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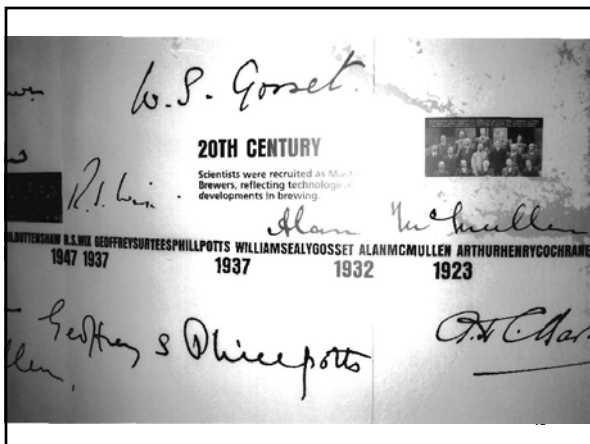
Unknown, σ

- We can **NOT** continue to use the standard normal distribution or Table Z.
- Why?

10



11



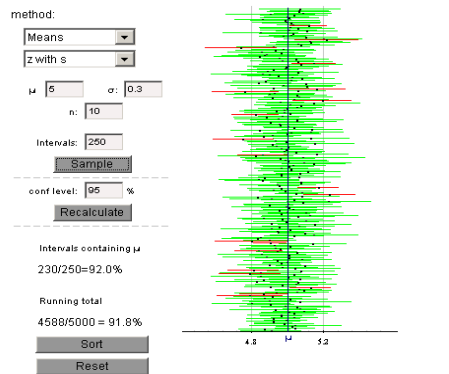
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95% Confidence?

- Simulation illustrating repeating the procedure.
- <http://statweb.calpoly.edu/chance/applets/ConfSim/ConfSim.html>

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Simulating Confidence Intervals



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Quantitative Variable

- Confidence Interval for μ .

$$\bar{y} - t^* \left(\frac{s}{\sqrt{n}} \right) \text{ to } \bar{y} + t^* \left(\frac{s}{\sqrt{n}} \right)$$

- t^* found in Table T, $df = n - 1$

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Quantitative variable

- Test statistic.

$$t = \frac{\bar{y} - \mu}{\left(\frac{s}{\sqrt{n}}\right)}, \text{ Table T} \Rightarrow \text{P - value}$$

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Confidence Interval for μ

$$\bar{y} - t^* \left(\frac{s}{\sqrt{n}}\right) \text{ to } \bar{y} + t^* \left(\frac{s}{\sqrt{n}}\right)$$
$$df = n - 1$$

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Inference for μ

- Do NOT use Table Z!



- Use Table T instead!

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