PUB – POS 316
Week 7

Normal Distribution, Central Limit Theorem

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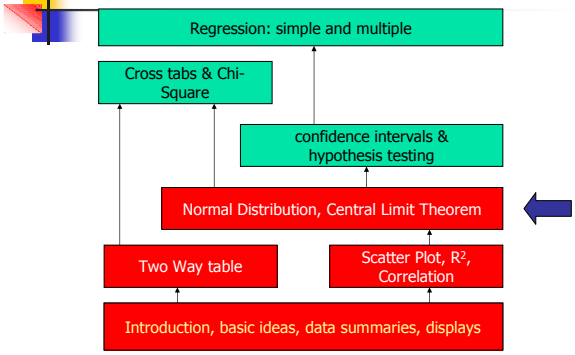
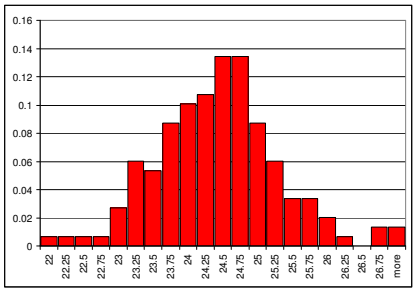
Course Road Map



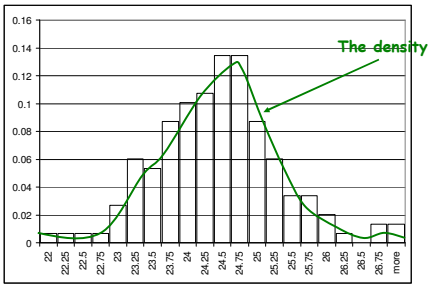
Review

- Example: Biological clocks



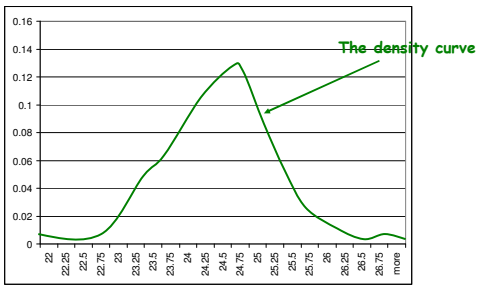
Review

- Example: Biological clocks



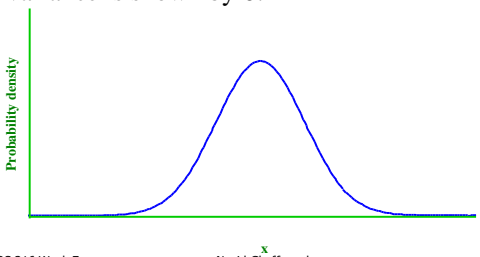
Review

- Example: Biological clocks



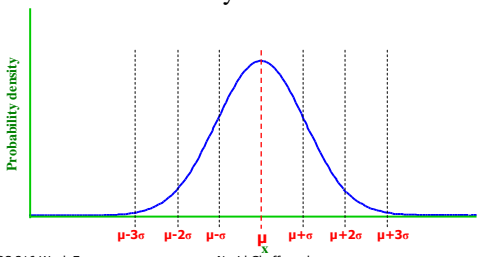
Review

- Normal distribution is a bell-shaped, symmetric density curve. Average is shown by μ and variance is shown by σ.



Review

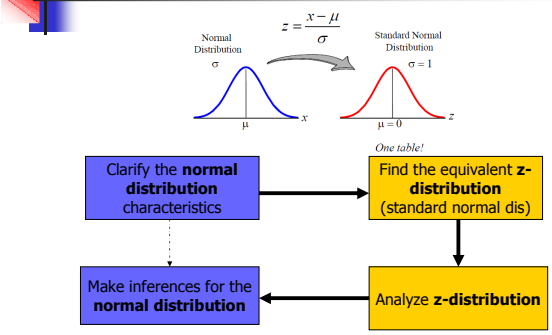
- Normal distribution is a bell-shaped, symmetric density curve. Average is shown by μ and variance is shown by σ.



Review

- Density curve
- Normal distribution is a bell-shaped, symmetric density curve. Average is shown by μ and variance is shown by σ.
- Standard normal distribution is a normal distribution with μ=0, σ=1. *N(0,1)*
- Many times we want to transform a normal distribution to a standard normal distribution in order to be able to say something about the distribution.
- Use: Z=(X- μ)/ σ

Review



Review

- Example:
- Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. What is the proportion of scores between 550 and 650?

The Main Procedure

- Samples (means).
  - **The central limit theorem**: when n is large, the sampling distribution of the sample mean is approximately normal with mean of μ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
  - Basically when *n* is very very very large, we get exactly μ!!

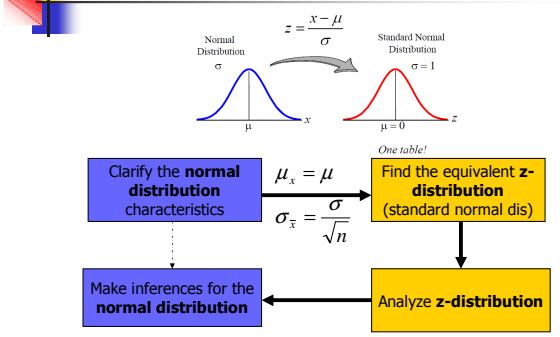
The Main Procedure

- Samples (means).
  - **The central limit theorem**: when n is large, the sampling distribution of the sample mean is approximately normal with mean of μ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
  - Example: You take a sample of 36 from a population with the mean of 100, and standard deviation of 10. Find the mean and standard deviation of the sampling dis. of your sample mean.

The Main Procedure

- samples (mean)
  - Example D: Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. We take a sample of 100 people. What is the probability that the mean sample becomes less than 480 about this?

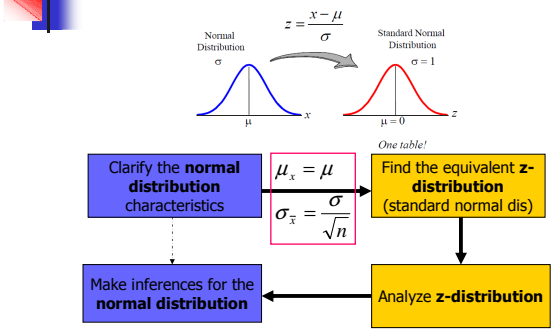
The Main Procedure



The Main Procedure

- samples (mean)
  - Example D: Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. We take a sample of 10,000 people. What is the probability that the mean sample becomes less than 480?

The Main Procedure



The Main Procedure

- samples (mean)
  - Example D: Scores on SAT tests are approximately normally distributed with the mean of 500 and the standard deviation of 100. We take a sample of 10,000 people. What is the probability that the mean sample becomes less than 480?
  - Let's discuss.. What if I get a sample of 16 people?
  - What is the proper sample size?

The Main Procedure

- samples (mean)
  - Example E: Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. We take a sample of 100 people. What is the probability that we get more than 4% error?

The Main Procedure

- Applications of standard normal distribution to the study of
  - 1) population (mean)
  - 2) samples (mean)
  - 3) samples (proportion)
    - *Next class*