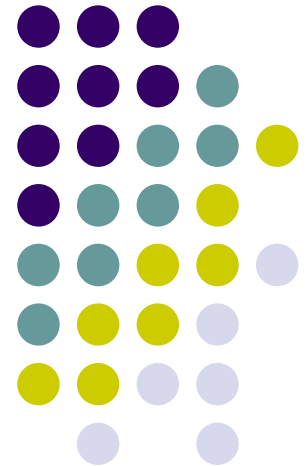


Econ 3790: Business and Economics Statistics

Instructor: Yogesh Uppal
Email: yuppal@ysu.edu

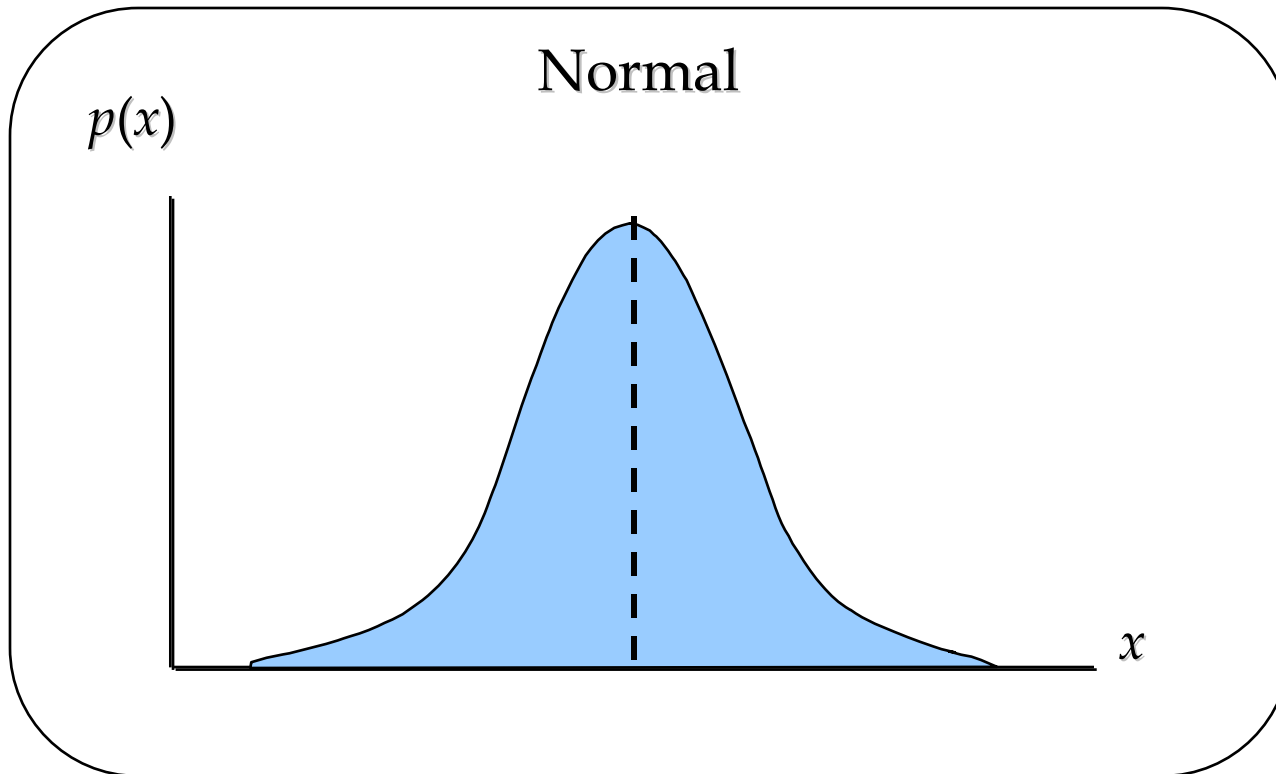


Chapter 6

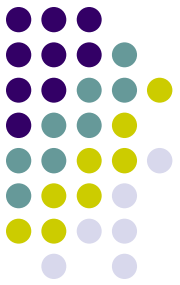
Continuous Probability Distributions



- Normal Probability Distribution

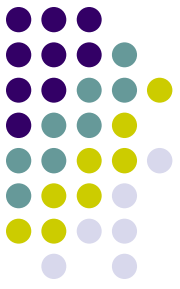


Normal Probability Distribution



- The normal probability distribution is the most important distribution for describing a continuous random variable.
- It is widely used in statistical inference.

Normal Probability Distribution



- It has been used in a wide variety of applications:

Heights
of people



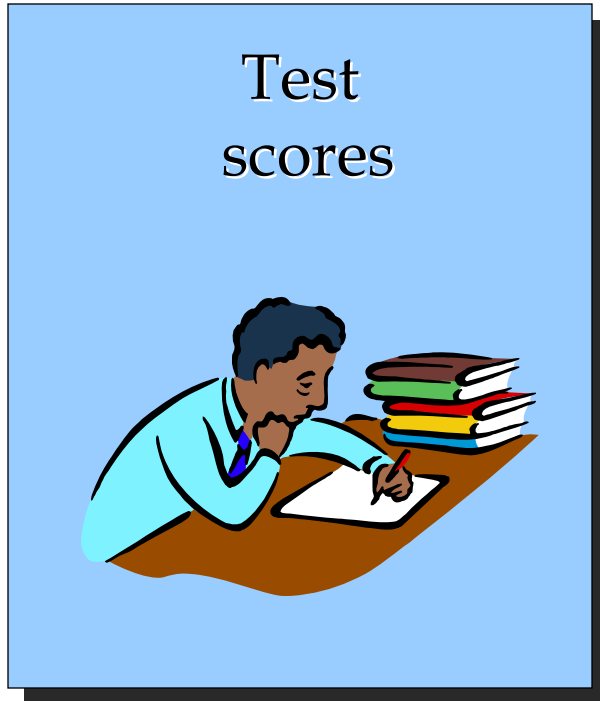
Scientific
measurements



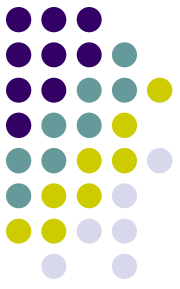
Normal Probability Distribution



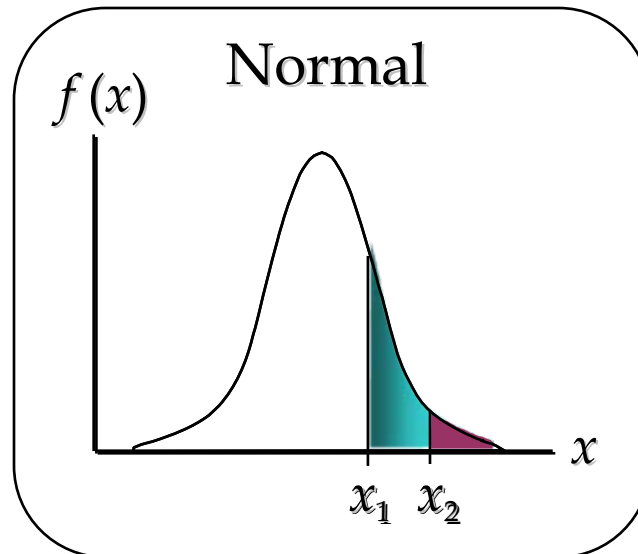
- It has been used in a wide variety of applications:



Normal Distributions



- The probability of the random variable assuming a value within some given interval from x_1 to x_2 is defined to be the area under the curve between x_1 and x_2 .

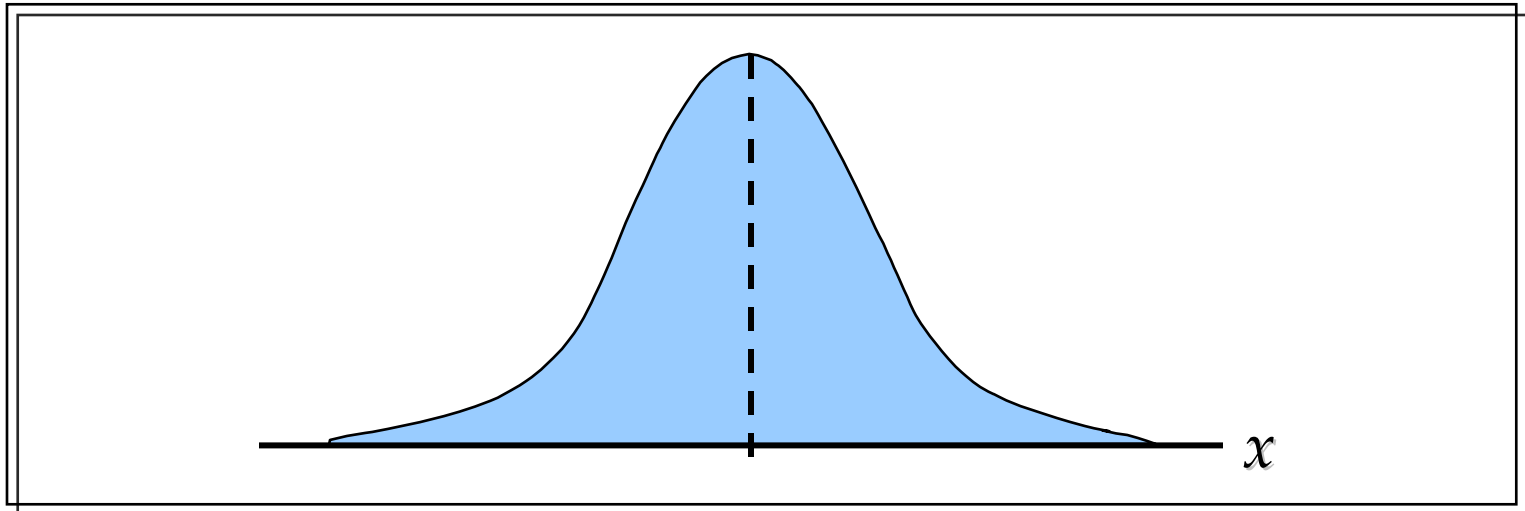


Normal Probability Distribution

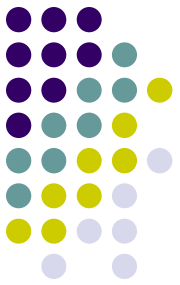


■ Characteristics

- ▶ The distribution is symmetric; its skewness measure is zero.

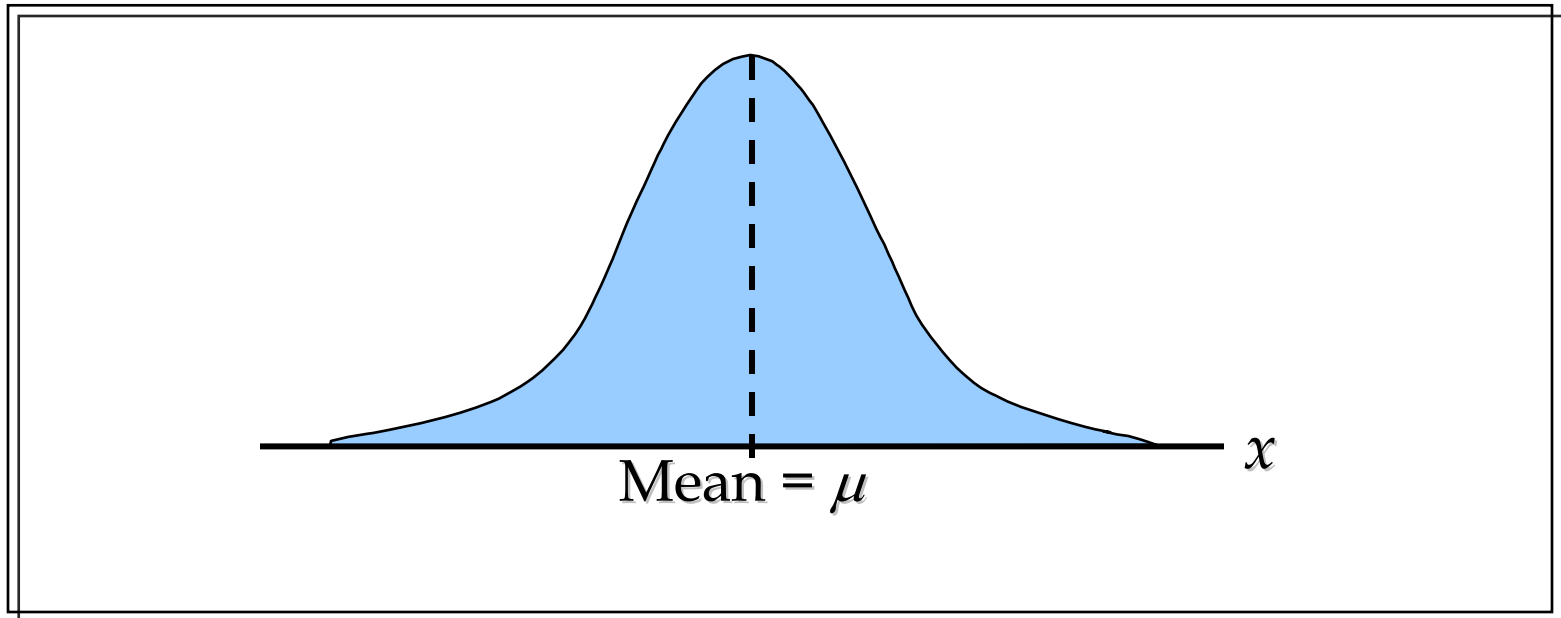


Normal Probability Distribution

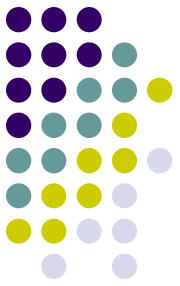


■ Characteristics

- ▶ The highest point on the normal curve is at the mean, which is also the median and mode.

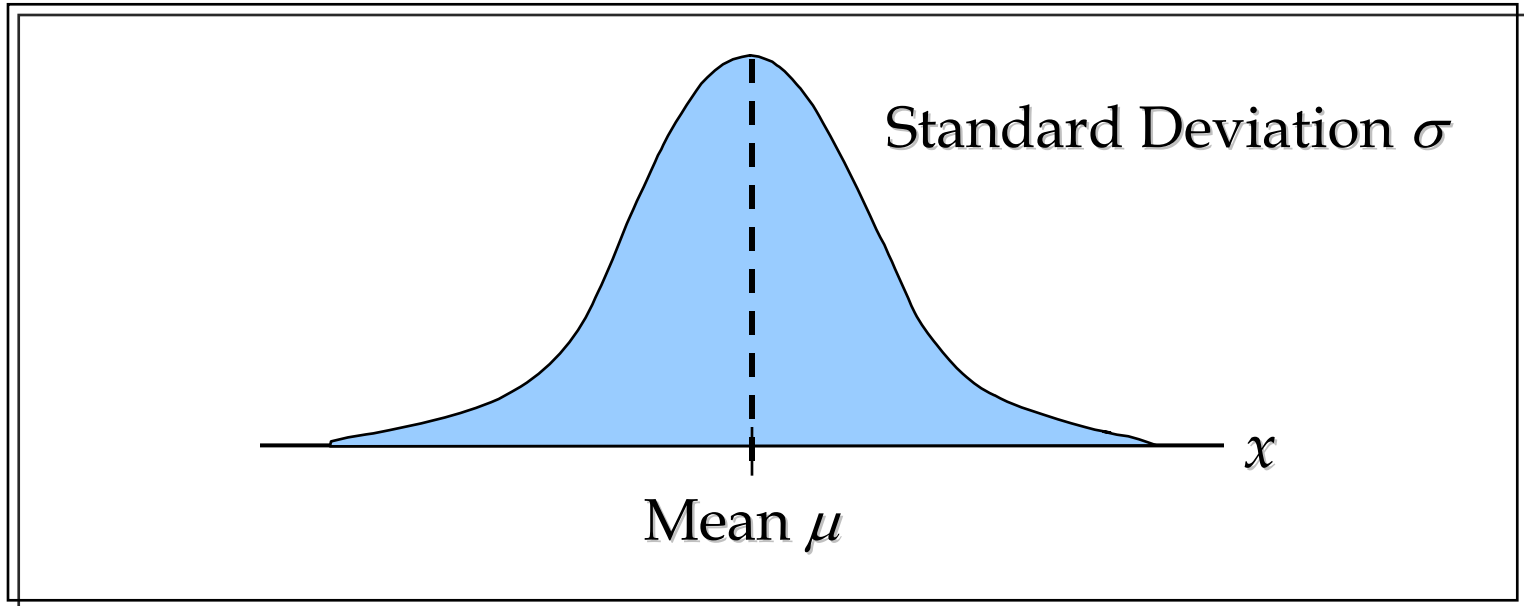


Normal Probability Distribution



■ Characteristics

- ▶ The entire family of normal probability distributions is defined by its mean μ and its standard deviation σ .

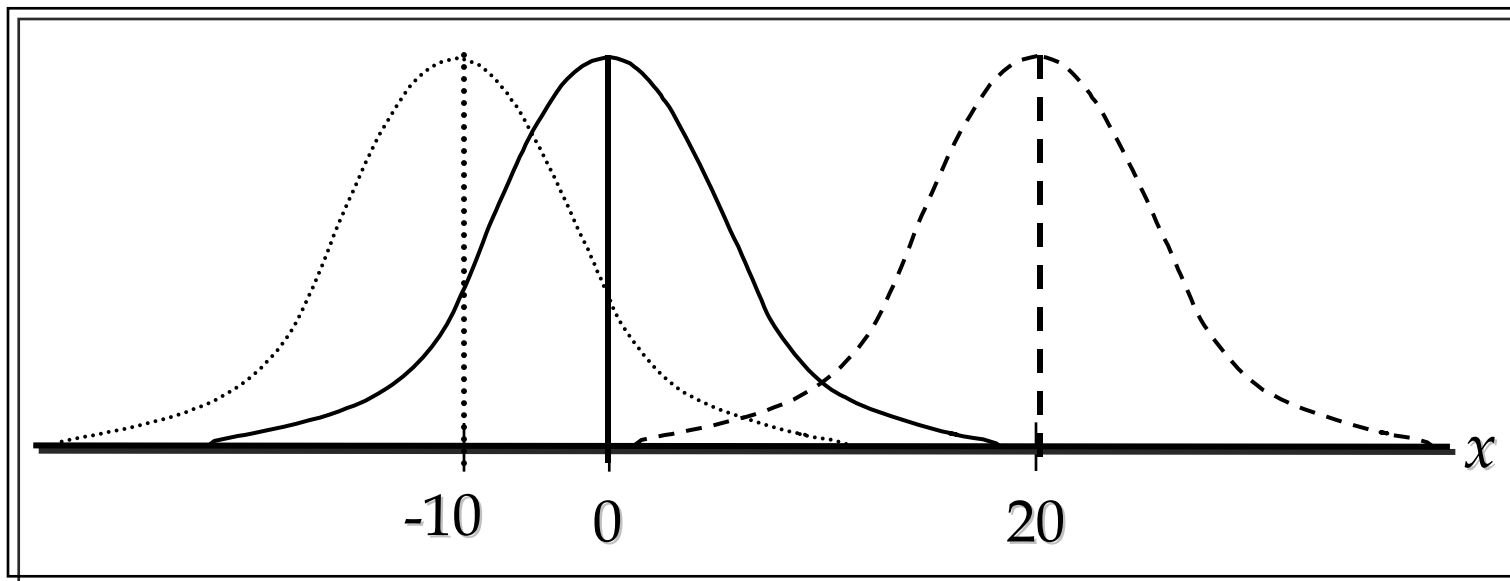


Normal Probability Distribution



■ Characteristics

- ▶ The mean can be any numerical value: negative, zero, or positive. The following shows different normal distributions with different means.

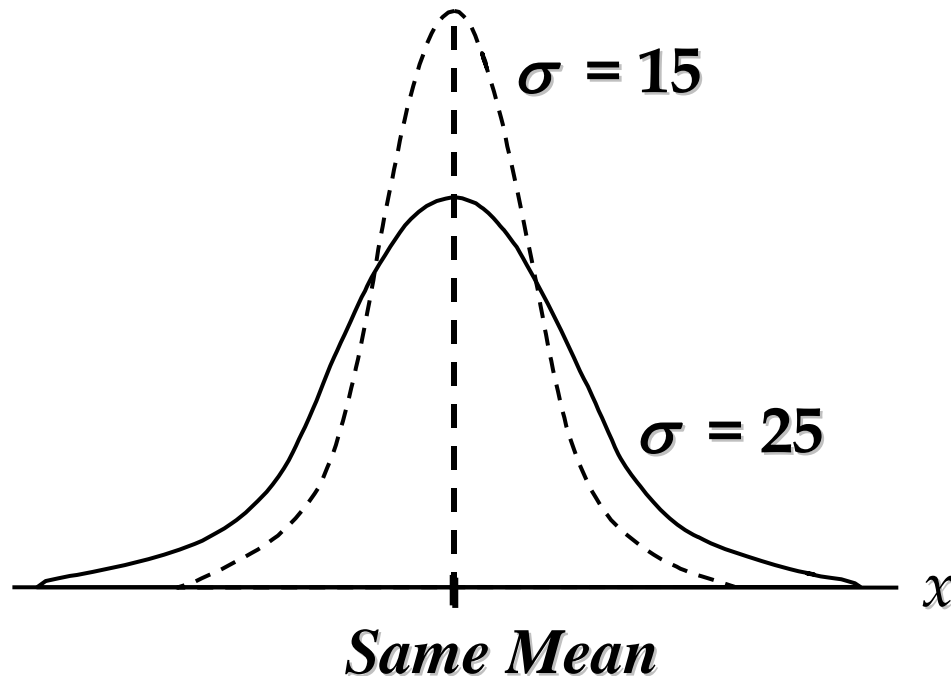


Normal Probability Distribution

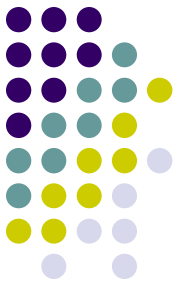


- Characteristics

- The standard deviation determines the width of the curve: larger values result in wider, flatter curves.

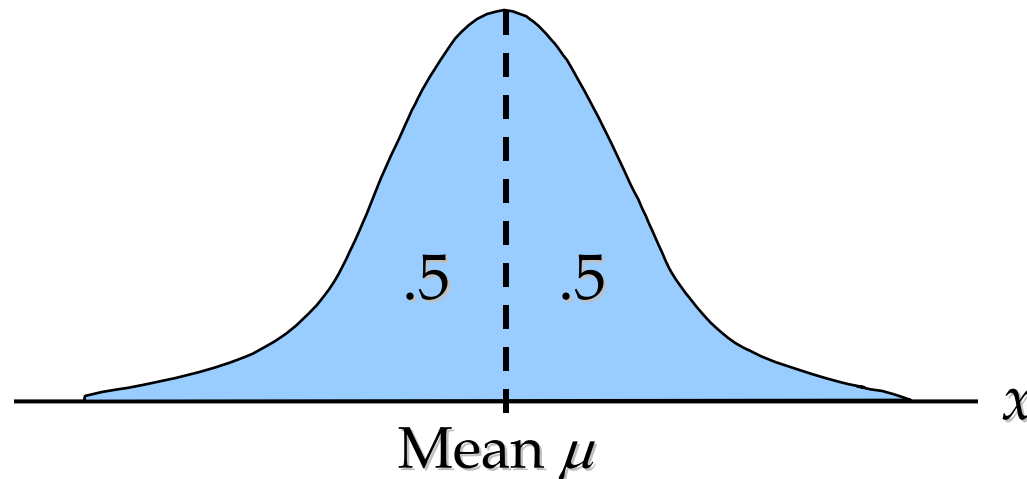


Normal Probability Distribution

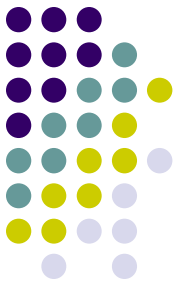


■ Characteristics

Probabilities for the normal random variable are given by areas under the curve. The total area under the curve is 1 (.5 to the left of the mean and .5 to the right).



Standardizing the Normal Values or the Z-scores



- Z-scores can be calculated as follows:

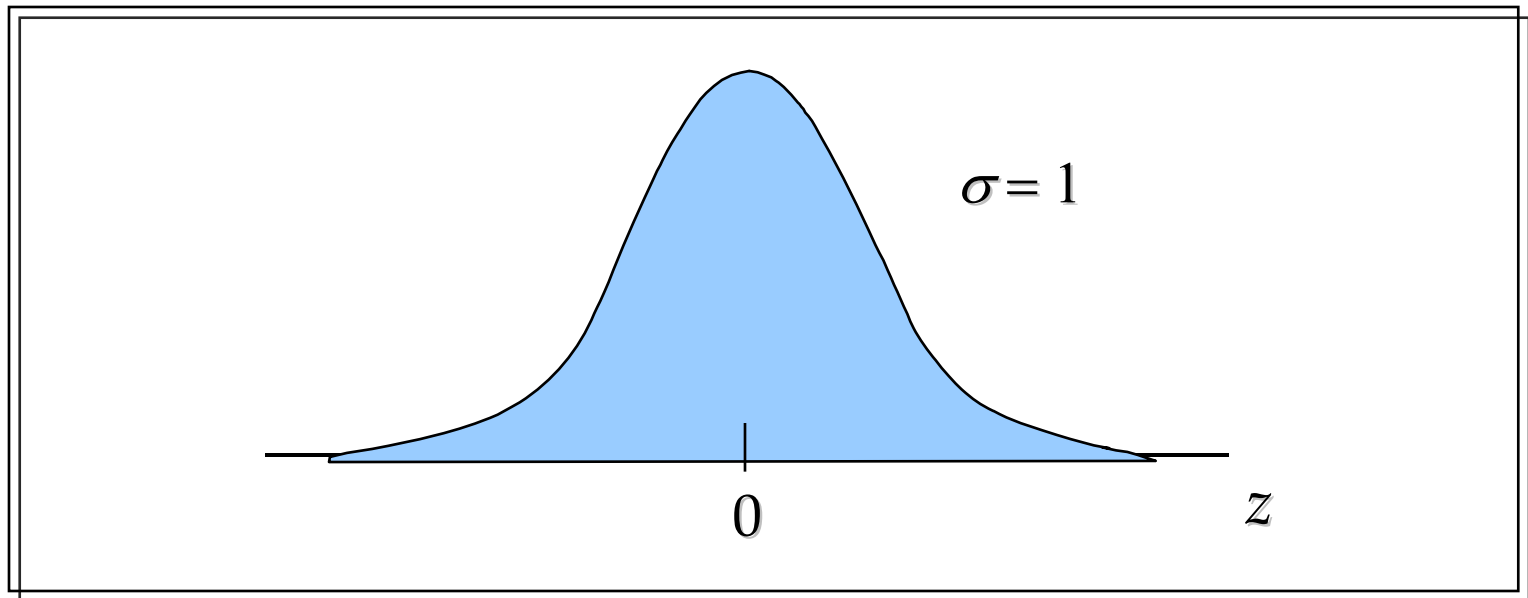
$$z \equiv \frac{x - \mu}{\sigma}$$

- We can think of z as a measure of the number of standard deviations x is from μ .

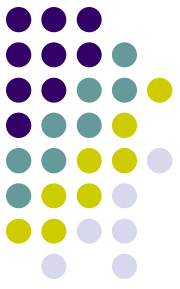
Standard Normal Probability Distribution



A standard normal distribution is a normal distribution with mean of 0 and variance of 1. If x has a normal distribution with mean (μ) and Variance (σ), then z is said to have a standard normal distribution.

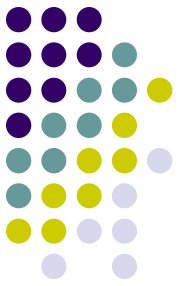


Example: Air Quality



- I collected this data on the air quality of various cities as measured by particulate matter index (PMI). A PMI of less than 50 is said to represent good air quality.
- The data is available on the class website.
- Suppose the distribution of PMI is approximately normal.

Example: Air Quality



- The mean PMI is 41 and the standard deviation is 20.5.
- Suppose I want to find out the probability that air quality is good or what is the probability that PMI is greater than 50.