

# A Few Good Examples: For Introductory Statistics

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## A Few Good Examples: For Introductory Statistics

This session will demonstrate and share several examples you can incorporate into your teaching that students find interesting and engaging.

These examples actively involve the students in the learning process and are designed to promote student understanding of important concepts covered in an Introductory Statistics course.

## Standard Score

The standard score measures the position of a particular data value relative to all the other data by calculating the number of standard deviations a particular data value is from the mean.

$$z = \frac{(X_i - \mu_X)}{\sigma_X} \quad t = \frac{(x_i - \bar{x})}{s_x}$$

## Standard Score

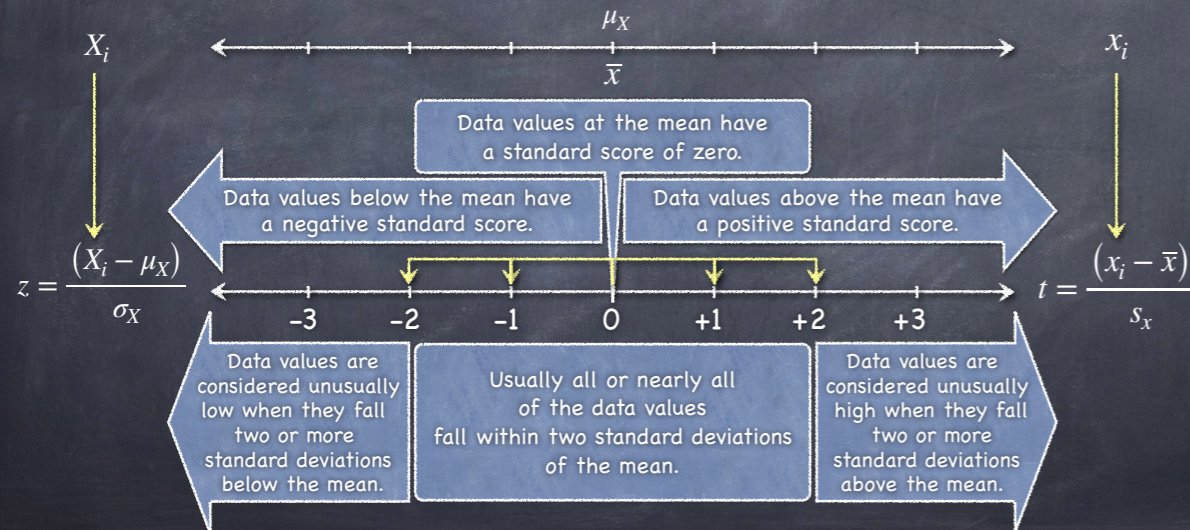
The standard score is a dimensionless quantity. (That is, it has no units.)

This property of the standard score permits the comparison of the relative position of data values from different sources or with different units on the same standardized scale.



## Standard Score

The standard score scale is a linear transformation of the data value scale.



## Standard Score

One good example that illustrates the concept that "Usually all or nearly all of the data values fall within two standard deviations of the mean" and that "It is considered unusual when data values fall two or more standard deviations from the mean" is **Bollinger Bands**.

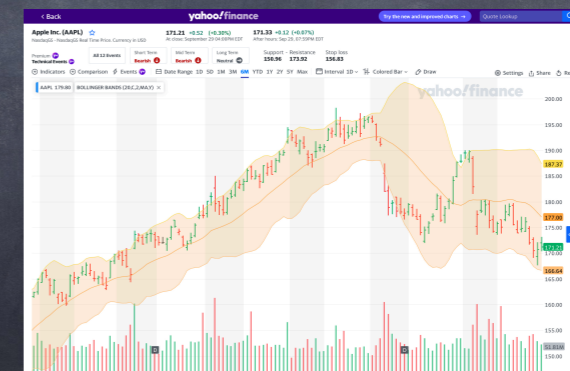
## Standard Score

Bollinger Bands display intervals that extend two standard deviations from the mean trading price of a company's stock.

Most stock price charting tools provide Bollinger Bands as a technical indicator.

## Standard Score

The Yahoo! Finance website is a fast, free, and easy to use option to display Bollinger Bands.





## Binomial Probability Distribution

The binomial probability distribution calculates the probability of getting a certain amount ( $x$ ) of one possible outcome out of a total number ( $n$ ) of attempts when each independent attempt can result in only one (with probability  $p$ ) of two possible outcomes.

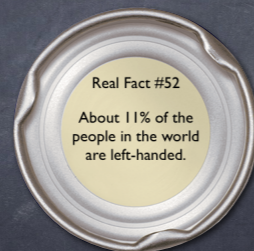
## Binomial Probability Distribution

A good binomial probability distribution example not only requires students to calculate various binomial probabilities, but it also provides a fundamental foundation that will support the teaching and learning of later course topics, such as hypothesis testing procedures and confidence interval estimation techniques.

## Binomial Probability Distribution

According to Snapple Real Fact #52, 11% of the people in the world are left-handed.

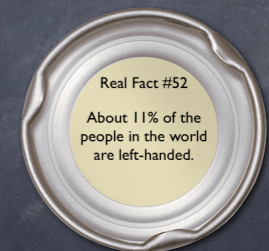
Find the probability that only one of the people in this room is left-handed.



## Binomial Probability Distribution

According to Snapple Real Fact #52, 11% of the people in the world are left-handed.

Find the probability that less than three of the people in this room are left-handed.





## Binomial Probability Distribution

According to Snapple Real Fact #52, 11% of the people in the world are left-handed.

Find the probability that anywhere from two to four of the people in this room are left-handed.



## Binomial Probability Distribution

According to Snapple Real Fact #52, 11% of the people in the world are left-handed.

Find the probability that the number of left-handed people in this room falls within two standard deviations of the mean.



## Inferential Statistics

Inferential Statistics refers to a collection of statistical methods in which random sample results are used to draw an inference, make a statement, or reach a conclusion about an entire population.

## Inferential Statistics

In general, there are two basic types of inferential statistics methods.

Confidence Interval Estimation

and

Hypothesis Testing Procedures



## Inferential Statistics

Confidence Interval estimation is used when the issue under investigation involves learning the value of an unknown population parameter.

Hypothesis Testing procedures are used when the issue under investigation involves assessing the validity of an assumed known value of a particular population parameter.

## Inferential Statistics

A good inferential statistics example involves students in more aspects, from conception to conclusion, of the statistical problem solving process. This could include selecting the issue to investigate, collecting the data, deciding which method to analyze the data, carrying out the data analysis, reaching the conclusion, and communicating the results.

## Inferential Statistics

A reaction time is the total amount of time that transpires between some stimulus and a response to that stimulus.

Propose a statistical study that you would be interested in investigating that involves reaction times and explain the method you would use to measure the reaction time.

## Inferential Statistics

A convenient way to measure a person's reaction time is the reaction time test on the Human Benchmark website (<https://humanbenchmark.com/tests/reactiontime>).

This test can be conducted on a desktop computer, laptop computer, tablet, or smartphone.



## Inferential Statistics

Is there a difference in reaction time between men and women?

Let's answer this question by measuring the reaction time for a sample of students in our class and conducting a statistical analysis.

## Inferential Statistics

Does a person's dominant hand react quicker than their non-dominant hand?

Let's answer this question by measuring the reaction time for a sample of students in our class and conducting a statistical analysis.

## Linear Regression

In a Regression Analysis data from the past (existing data) is used to observe a pattern that can be modeled mathematically which, when appropriate, can be used to predict the future (as of yet unknown data values).

## Linear Regression

A good Regression Analysis example gets students to collect the sample data in class, results in a reasonably strong correlation, and allows the students to make a prediction using the regression model that can be easily confirmed.

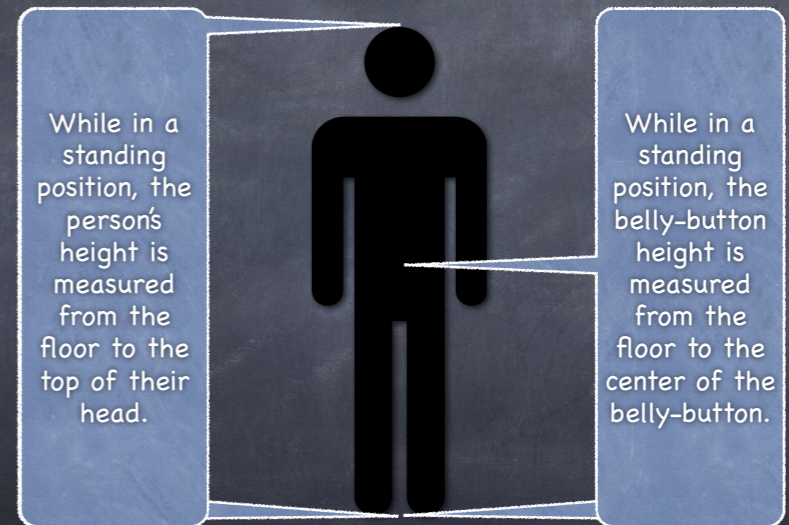


## Linear Regression

Can the location of a person's belly-button be accurately predicted based solely on their height?

In order for us to address this question, we will collect data from a sample of students in this class and conduct a regression analysis.

## Linear Regression



## Linear Regression

predictor ( $x_i$ )	predicted ( $y_i$ )
Person's Height	Belly-Button Height

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