How Scientists use Statistics

- _____ is the collection and classification of data that are in the form of numbers.
- Scientists rely on and use statistics to
_____.
- Statistics is actually a branch of _____ that provides scientists with important tools for analyzing and understanding their data.

Statistics Works with Populations

- Scientists use statistics to describe _____.
- A statistical population is a _____ that a scientist is interested in learning about.

What is the Average?

- Statistical populations are composed of _____, but these individuals often have _____ characteristics.
- A _____ is the number obtained by adding up the data for a given characteristic and dividing this sum by the number of individuals.
- The mean provides a single _____ for a population and allows for easy comparison.

Distribution

- _____ is the relative arrangement of the members of a statistical population, and is usually shown in a graph.
- The graphs of many characteristics of populations, such as the heights of people, form
_____.
- A bell shaped curve indicates a _____ where the data is grouped symmetrically around the mean.

What is the Probability?

- _____ is the likelihood that a possible future event will occur in any given instance of the event.
- Probability is usually expressed as a number between _____ and written as a decimal rather than as a fraction.
- However, there must be a large enough sample size in order to obtain accurate results.

Thinking About Risk

- _____ is the probability of an unwanted outcome.
- People often worry about big oil spills, but as the pie chart shows, there is a much greater risk of oil pollution from everyday sources.

Thinking About Risk

- The most important risk we consider is the risk of death.
- Most people overestimate the risk of dying from sensational causes, such as plane crashes, but underestimate the risk from common causes, such as smoking.
- Likewise, most citizens overestimate the risk of sensational environmental problems and underestimate the risk of ordinary ones.

Models

- _____ are patterns, plans, representations, or descriptions designed to show the structure or workings of an object, system, or concept.
- Scientists use several different types of models to help them learn about our environment.

Physical Models

- Physical models are _____ models you can touch.
- Their most important feature is that they _____ the object or system they represent, although they may be larger or smaller.
- The most useful models teach scientists something new and help to further other discoveries.

Graphical Models

- _____ are the most common examples of graphical models.

- Scientists use graphical models to show things such as the position of the stars, the amount of forest cover in a given area, and the depth of the water in a river or along a coast.

Conceptual Models

- _____ are verbal or graphical explanations for how a system works or is organized.
- A _____ is an example of a conceptual model.
- A flow-chart uses

_____

_____.

Conceptual Models

- Conceptual models can also be _____.
- For example, one conceptual model of the structure of an atom describes the atom as one large ball being circled by several smaller balls.
- This illustrates another point, that a model can be more than one type.
- An atomic model made using plastic balls is both a conceptual and physical model.

Mathematical Models

- _____ are one or more equations that represent the way system or process works.
- Mathematical models are especially useful in cases with many variables, such as the many things that affect the weather.

Mathematical Models

- Although mathematical models use number and equations, they are not always right.
- People are the ones who interpret the data and write the equations.
- Therefore, if the data or the equations are wrong, the model will not be realistic and will provide incorrect information.
- Like all models, mathematical models are only as good as the data that went into building them.

Mathematical Models

- Scientists use mathematical models to create amazing, as well as useful images.
- _____ are created using mathematical models.
- Scientists use the models to relate the amount of energy reflected from objects to the objects' physical condition.