Tuesday
August 23,2016

Notes –Binder Check - 08/14, every
work should be completed.

GPS – SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.

Catalyst:

Explain why sample size is important in determining probability? (pg-42)

Topic: **Tools of Environmental science**

Essential question: Why a hypothesis is not just a guess?

Learning targets,

1) List and describe the steps of experimental method
2) Describe how scientists study subjects in which experiments are not possible.

And answer a question like this:

Why should the results of an experiment should be repeatable?

Ecolog

Section: Statistics and Models

What is the difference between the responsible use of statistics and misleading uses of statistics? Give examples.

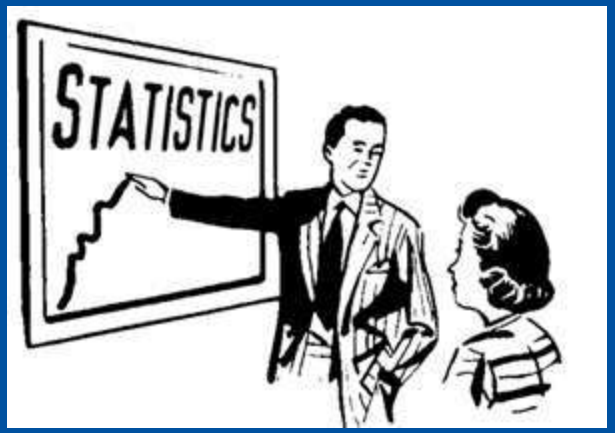
Write your responses in your ***EcoLog***.

Chapter 2
Tools of Environmental Science
Section 2: Statistics and Models

DAY 1

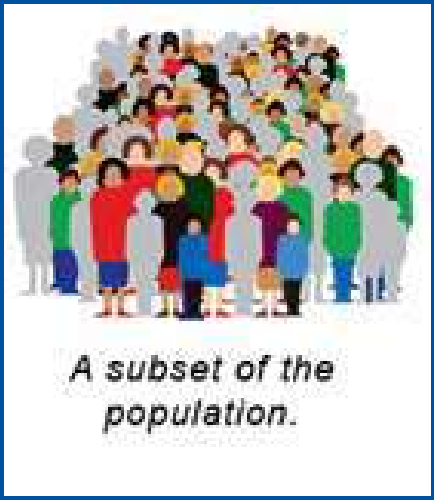
How Scientists use Statistics

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



Statistics Works with Populations

- Scientists use statistics to describe statistical populations.
- A statistical population is a group of similar things that a scientist is interested in learning about.

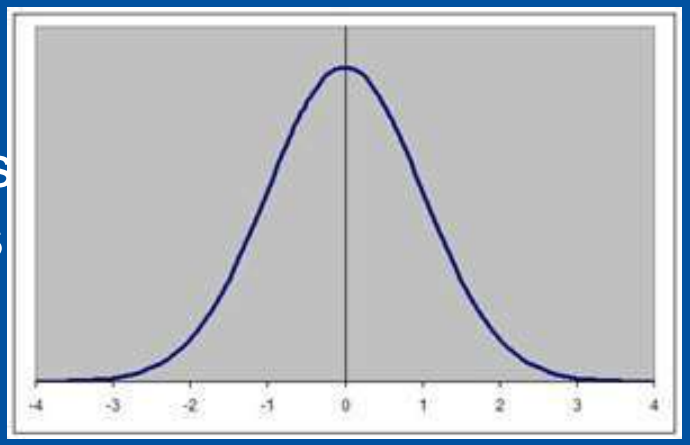


What is the Average?

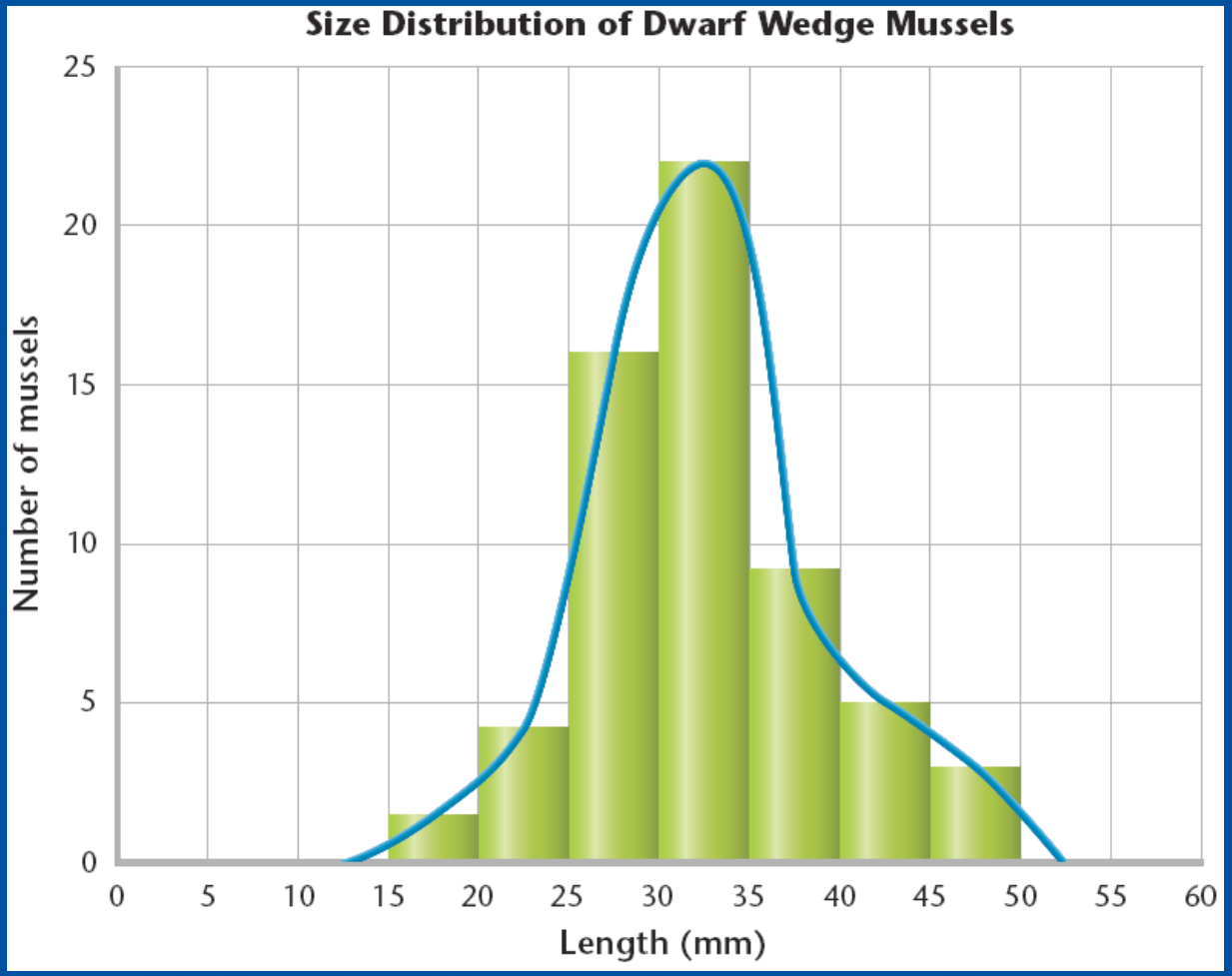
- Statistical populations are composed of similar individuals, but these individuals often have different characteristics.
- A mean is the number obtained by adding up the data for a given characteristic and dividing this sum by the number of individuals.
- The mean provides a single numerical measure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

Distribution

- 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 bell-shaped curves.
- A bell shaped curve indicates a normal distribution where the data is grouped symmetrically around the mean.



Distribution



What is the Probability?

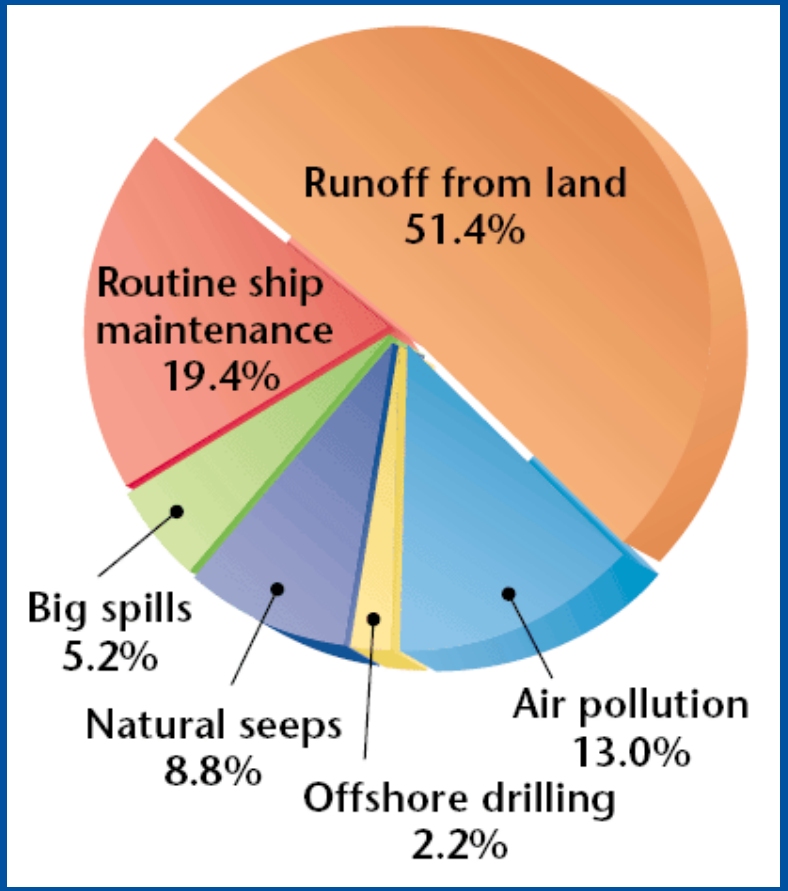
- Probability is the likelihood that a possible future event will occur in any given instance of the event.
- Probability is usually expressed as a number between 0 and 1 and written as a decimal rather than as a fraction.
- However, there must be a large enough sample size in order to obtain accurate results.

Understanding the News

- The news contains statistics everyday.
- For example, a reporter might say, “A study shows that forest fires increased air pollution in the city last year.”
- This could lead you to gather and then graph data on the pollution levels for last 20 years, and looking to see if this years seem unusually high.
- Paying attention to statistics will make you a better consumer of information.

Thinking About Risk

- 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.

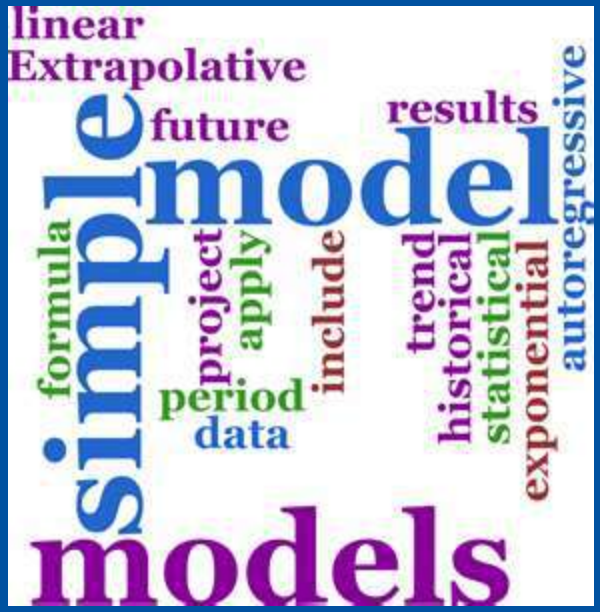
Thinking About Risk

Perceptions of Risk by Experts and Ordinary Citizens

	High risk	Low risk
Experts	ozone depletion; global climate change	oil spills; radioactive materials; water pollution
Citizens	ozone depletion; radioactive waste; oil spills	global climate change; water pollution

Models

- 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.

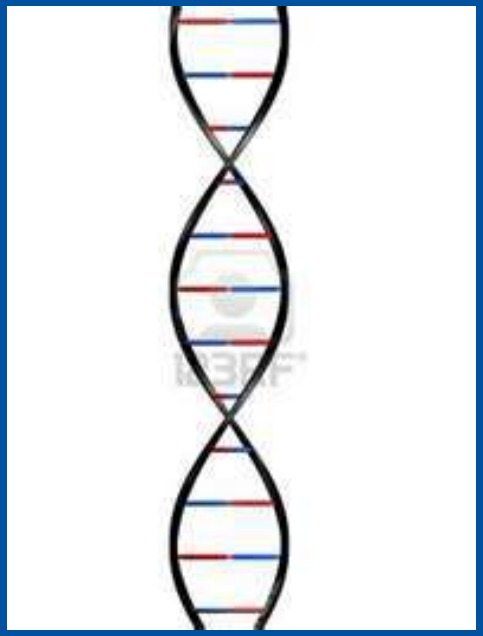


Physical Models

- Physical models are three-dimensional models you can touch.
- Their most important feature is that they closely resemble 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.

Physical Models

- One of the most famous physical models was used to discover the structure of DNA.
- The structural model was built based on the size, shape, and bonding qualities of DNA.
- The pieces of the model put together helped the scientist figure out the potential structure of DNA.
- Discovering the structure led the understanding of DNA replication.

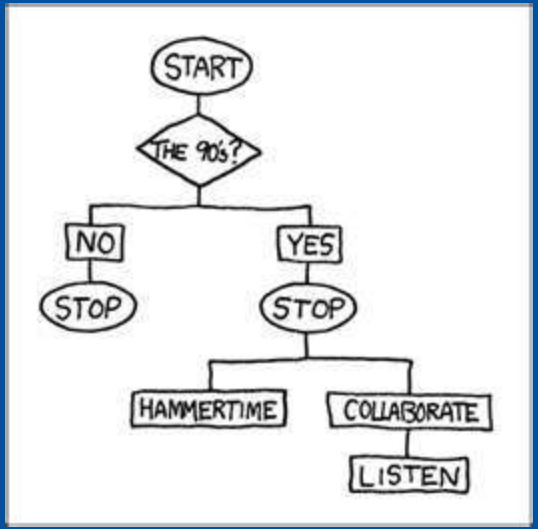


Graphical Models

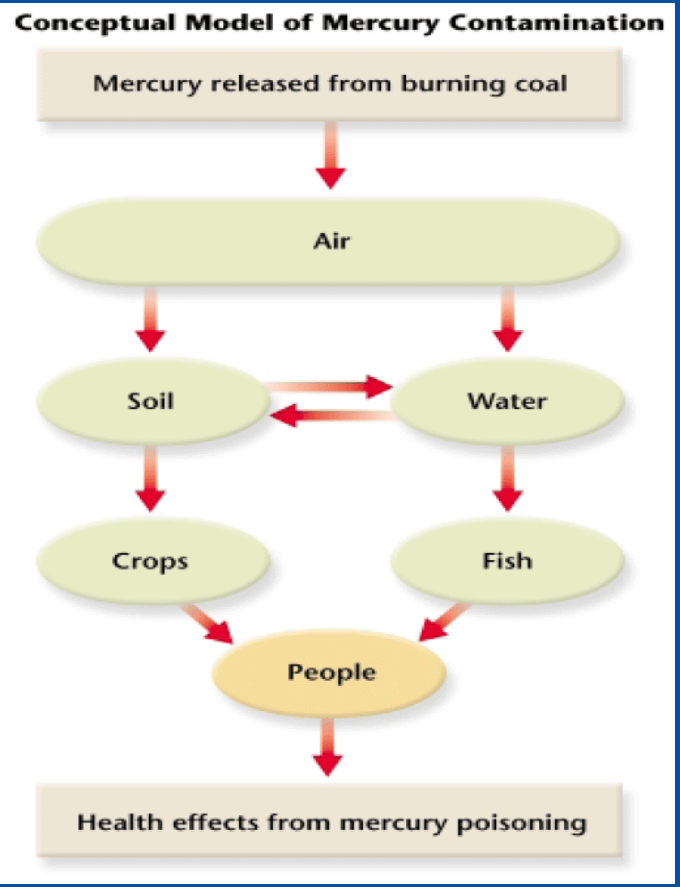
- Maps and charts are the most common examples of graphical models.
- Scientists use graphical models to show things such as the position of the stars, the amount of forest cover in a given area, and the depth of the water in a river or along a coast.

Conceptual Models

- Conceptual models are verbal or graphical explanations for how a system works or is organized.
- A flow-chart diagram is an example of a conceptual model.
- A flow-chart uses boxes linked by arrows to illustrate what a system contains, how those contents are organized, and how they affect one another.



Conceptual Model

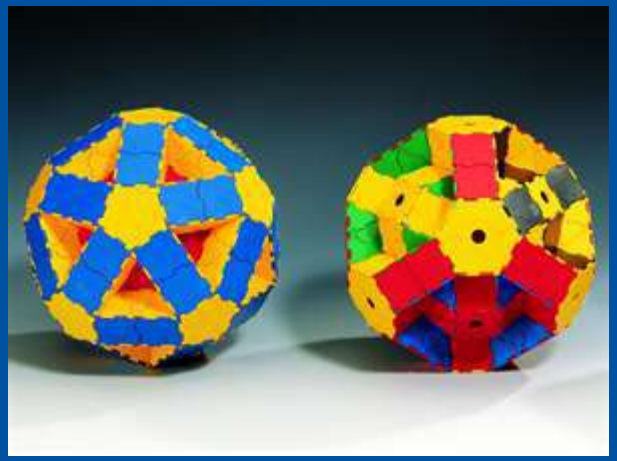


Conceptual Models

- Conceptual models can also be verbal descriptions or even drawings.
- 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

- 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.
- "False color" satellite images are created using mathematical models.
- Scientists use the models to relate the amount of energy reflected from objects to the objects' physical condition.