Pre-Unit: Introduction to Statistics, Sampling and Simulation

Content Area: **Mathematics**
Course(s): **Statistics**
Time Period: **September**
Length: **3 weeks**
Status: **Published**

Unit Overview

Students will be introduced to statistics, types of data and the two branches of statistics. The students will become aware of the different elements involved in statistical sampling and simulation. Students will also be exposed to uses and misuses of statistics. They will analyze a statistical survey, graph, or report and derive conclusions about the sampling method.

Transfer

Students will be able to independently use their learning to...

- **Relate statistics terminology to real life problems/applications**
- **Apply the concepts to complete real world problems**

What kinds of long term, independent accomplishments are desired?

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- There are different reasons for studying statistics.
- There are different ways to classify data and that data are measured by various scales.
- There are advantages and disadvantages of observational and experimental studies.
- There are uses and misuses of statistics.
- There are different methods to obtaining samples and different techniques used in simulations.

Essential Questions

Students will keep considering...

- What are the branches of statistics?
- What are data and how are they measured?
- How are samples selected?
- Can bad data be corrected with good statistical analysis?
- What is the difference between preventing variability and preventing bias in a statistical study?
- Why are experiments considered more convincing than observational studies?
- Which is worse, variability or bias?

Application of Knowledge and Skill

Students will know...

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- The two major areas of statistics are descriptive and inferential and what is included in each area.
- Data can be classified as qualitative or quantitative.
- The four basic methods to obtaining samples: random, systematic, stratified, and cluster.
- The two types of statistical studies: observational and experimental studies.
- To question or examine the results of research studies and surveys for misuse or misrepresentation.

Students will be skilled at...

Students will be skilled at...

- Selecting samples and comparing them with the population mean.
- Determining if a variable is qualitative or quantitative.

- Determining if a sample is random, systematic, stratified, or cluster.
- Concluding if a study is observational or experimental

Academic Vocabulary

Cluster sample

Continuous variables

Control group

Convenience sample

Dependent variable

Discrete variables

Experimental study

Explanatory variable

Independent variable

Outcome variable

Population

Qualitative variable

Quantitative variable

Quasi-experimental study

Random sample

Random variable

Sample

Stratified sample

Systematic sample

Treatment Group

Variable

Biased sample

Double sampling

Sequence sampling

Simulation technique

Unbiased sample

Learning Goal P.1

To define key terms used in statistics, understand and explain the different sampling methods, and recognize the two types of statistical studies

Target P.1.1--(Level of Difficulty: 3 Analysis)

SWBAT:

- Define and use in context statistical terms
- Differentiate between the two branches of statistics: descriptive vs. inferential
- Identify types of data
- Identify the measurement level for each variable

MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Target P.1.2--(Level of Difficulty: 3 Analysis)

SWBAT:

- Classify samples using the four basic sampling techniques: random, systematic, stratified, or cluster
- Demonstrate the knowledge of the four basic sampling methods

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MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Target P.1.3--(Level of Difficulty: 2 Comprehension)

SWBAT:

- Identify a study as being either observational or experimental
- Explain the difference between an observational and experimental study

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MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

Target P.1.4--(Level of Difficulty: 2 Comprehension)

SWBAT:

- Explain how statistics can be used and misused
- Recognize faulty questions on a survey and other factors that can bias responses

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MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.S-IC.A.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

Summative Assessment

- Quizzes
- Unit Test #1

21st Century Life and Careers

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

Technology

TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

Formative Assessment and Performance Opportunities

- Application
- Classwork
- Closures/exit tickets
- cooperative groups (stations, jigsaw activities)
- Do nows
- EXCEL
- graphing calculators
- Homework
- Participation/Discussion
- Problem Based Learning
- Reading
- Teacher directed Q & A
- Teacher observations
- whiteboard/communicator responses

Differentiation / Enrichment

- 504 accommodations
- Challenge problems
- Extend the concept/Critical thinking problems
- heterogeneous grouping
- IEP's
- scaffolding questions
- small group instruction
- use of technology

Unit Resources

- • Textbook: Elementary Statistics: A Step by Step Approach by Bluman, 8th Edition, Publisher McGraw- Hill, Copyright 2012
- EXCEL
- NCTM website

- TI 83/84 Graphing calculator