Lesson 47
Introduction to Statistics

NAME:

Start by navigating to the Online Lesson for instructions.

Objectives

- Identify a population and a sample in a scenario.
- Identify and categorize statistical variables.
- Name and/or explain the type of study being conducted.

Why?

Statistics is the field of mathematics in which mathematicians, statisticians, actuaries, and scientists formulate statistical questions, collect data, analyze data, and interpret the results. For others, statistics provide a way to interpret the data they encounter daily. Understanding statistical variability allows you to ask if the data is accurate, makes sense, and is useful in your situation.

Warm Up

Explain how the data would be skewed if the mean was used to represent the data.

1) The price of a home in the state of New York

2) The age at which people retire from the workforce

To continue, return to the Online Lesson.

Explore

Populations and Samples

Fill in the notes as you watch the video in the Online Lesson.

- Statistics is the art and science of:
  - _____
  - _____

- _____
- _____

- The study of statistics has its own _____.

Prior to this lesson, you may have used some of the vocabulary words in a different context. Be sure to pay attention to how these words are defined for use in the study of statistics.

Descriptive Statistics

- Descriptive statistics summarize a population through _____ _____. (i.e., Measures of center can be used to describe the entire group.)
- In descriptive statistics, you can only describe _____ _____.
- Common phrases include:
  - _____
  - _____
  - _____

Descriptive Statistics Vocabulary

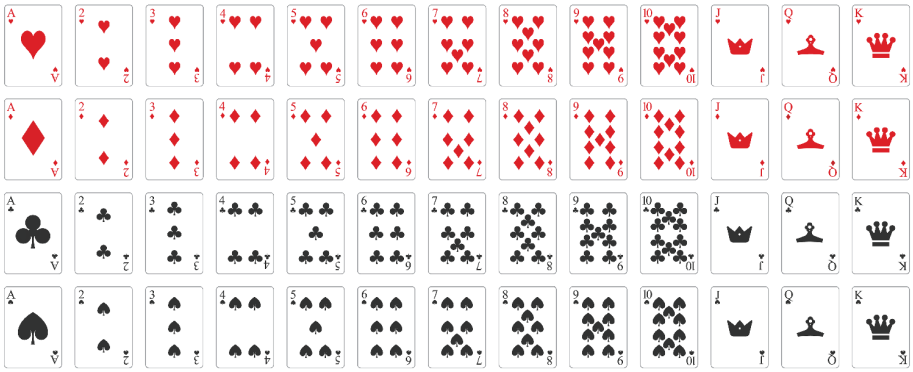
- A _____ is the entire group (every single person, thing, etc.) from which the data is gathered.
- A _____ is a survey or study that collects data from every individual in the population.
- A _____ is a characteristic or measure that describes the entire population. Parameters are determined from a census.
- _____ (or elements, or individuals) are the people or things that make up the population. A collection of individual data values is called a _____.

Inferential Statistics

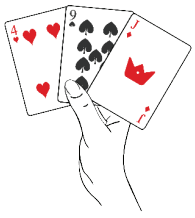
- Inferential statistics _____ what will likely happen within the population.
- In inferential statistics, probability is used to determine _____ _____ (or make a reasonable guess) for the population based on the sample.
- Common phrases include:
  - _____
  - _____
  - _____
  - _____

Inferential Statistics Vocabulary

- A _____ is a subset (or part) of a population from which data is collected.
  - Most often, samples are analyzed to draw conclusions (make inferences) about the population because conducting a census is not practical.



Population



Sample

- A _____, or statistic, is a calculation that is determined by using the data from the sample.
  - It is most often simply called a statistic because it is understood _____ _____ is rarely used.

- Statistical estimates about the population are made using _____ _____.
- The population's response is estimated using statistics that include _____ _____.

Example 1

Complete the example as you watch the video in the Online Lesson.

Identify the population and sample from the scenario.

A) One student from every math class at Greenville High School

Population: _____

Sample: _____

B) Five cards are drawn from a standard deck

Example 2

Complete the example as you watch the video in the Online Lesson.

Determine if the question will result in descriptive or inferential statistics. Then name the population.

A) What is the average miles per gallon for all trucks manufactured in 2019?

B) Are the variations in class test scores statistically significant?

C) Has the new attendance policy impacted student attendance at VHS?

☑ Checkpoint: Populations and Samples

Determine if the question will result in descriptive or inferential statistics. Then name the population.

How many people will complete the marathon in less than five hours?

To continue, return to the Online Lesson.

Studies and Variables

Fill in the notes as you watch the video in the Online Lesson.

Studies

- The researcher determines the type of study by defining:
  - _____
  - _____
- _____: through observation only, conclusions are drawn by a researcher, with no attempt to influence the responses of individuals
- _____: through researcher questionnaires or interviews, conclusions are drawn about the population using the sample
- _____: through researcher-designed treatment plans, conclusions are drawn by comparing the experimental and control groups

Variables

- Variables are _____ and are either:
  - _____: numerical values that include counts and measures (height, arm span) upon which calculations can be performed.
  - _____: characteristics or categories (eye color, birth month), and may also be referred to as “Qualitative.”

Example 3

Complete the example as you watch the video in the Online Lesson.

Name the type of study conducted and if the variables are quantitative (Q) or categorical (C).

Researcher A recorded the precise arrival time of each bus entering the school parking lot and the corresponding number of students disembarking.

Researcher B documented the number of students exiting the bus with sports equipment and the brand of shoes they were wearing.

Example 4

Complete the example as you watch the video in the Online Lesson.

Name the type of study and classify the variable(s).

To assess the impact of a new fertilizer, a study was conducted on two apple orchards. Orchard A received the new fertilizer. Orchard B was treated with the standard fertilizer. The aim was to determine if a significant difference in fruit production existed between the apple trees in Orchard A and Orchard B.

Example 5

Complete the example as you watch the video in the Online Lesson.

Name the population and type of study. Then classify the variable(s).

The Madison High student council needs help selecting the theme for the upcoming school dance. At every lunch period, 45 students were asked to vote on the theme. The results were tabulated, and the theme with the most votes was declared the winner.

☑ Checkpoint: Studies and Variables

Name the population and type of study. Then classify the variable(s).

While her English class highlighted the vocabulary in a reading passage, Ms. Booker watched the class and noted the color highlighters they used, and whether each student worked forward or backward through the passage.

To continue, return to the Online Lesson.

Practice 1

Complete problems on a separate sheet of paper.

Identify the population and sample from the scenario.

1) Two hundred residents of Baytown were surveyed about the proposal for a new park.

2) Lights Unlimited tests fifty lightbulbs from a batch of 10,000 bulbs.

Determine if the question will result in descriptive or inferential statistics. Then name the population.

3) What is the most common eye color among all students at Adams Elementary School?

4) How did the teachers at Whittier Middle School describe the relationship between the new math curriculum and student learning?

5) Which fish species has the largest population in the lake, based on the sample taken?

6) What are the age ranges of participants in The Novel Ideas book club?

Explain the study and type of variable.

7) A researcher wants to know when people start wearing jackets this fall, so they record the number of people wearing jackets in a park in September.

8) To prepare for a test, a researcher separated students into two groups. The control group used the standard text-based study guide. The treatment group used a visual study guide. The test scores were compared to determine the effectiveness of each study guide.

Name the type of study conducted, the population, and name and classify the variables as quantitative (Q) or categorical (C).

9) To compare their town's rainfall to the state average, Alcott Elementary students measured rainfall over a one month period.

10) A botanist classified a sample of trees by species in Dale City Park.

11) A customer satisfaction survey was sent to all customers of Neal's Knick-Knacks to rate their experience as "good," "fair," or "poor."

12) To determine if any machines produce a higher number of product defects than others in Fran's Factory, quality control wants to analyze the hourly defect rates of each machine.

To continue, return to the Online Lesson.

Mastery Check

Show What You Know

Two research teams are studying the habits of patrons at the Manheim Library on a selected Saturday in March.

Team X recorded the length of time each person spent at the library, the number of books they checked out, and whether each person was wearing glasses.

Team Z asked each person to name their favorite genre of books and share what they think is a reasonable fine for an overdue book per day.

A) Name the population and sample.

B) For Team X, name the type of study and whether the variables are categorical or quantitative.

C) For Team Z, name the type of study and whether the variables are categorical or quantitative.

D) Using the given information, create a study that a third research team, Team Y, could conduct at the Manheim library about judging a book by its cover.

Say What You Know

In your own words, talk about what you have learned using the objectives for this lesson and your work on this page.

To continue, return to the Online Lesson.

Practice 2

Complete problems on a separate sheet of paper.

Identify the population and sample from the scenario.

1) A university sends an email questionnaire to 500 alumni from the past five years.

2) A team surveys five players from the Lawrence High School basketball team.

Determine if the question will result in descriptive or inferential statistics. Then name the population.

3) What percentage of customers who visited Love Ya Latte ordered the latte of the month?

4) What is the most popular genre of books among Ms. Henson's ninth-grade English class?

5) Is there a relationship between the amount of sleep a person gets and their reaction time?

6) Do students at Washington High School who use a new online learning platform achieve higher test scores than those who use traditional methods?

Explain the study and type of variable(s).

7) To gauge satisfaction with public transportation, the local government surveyed 1,000 randomly chosen New Town citizens, inquiring if they were satisfied, neutral, or dissatisfied.

8) Over a ten-year period, a meteorologist observed hurricane activity in the Atlantic Ocean, documenting the number of named hurricanes and classifying them by category (1, 2, 3, 4, or 5).

Name the type of study conducted, the population, and name and classify the variables as quantitative (Q) or categorical (C).

9) A marketing team surveys 500 randomly selected residents of Shawnee, Oklahoma, to determine their preferred coffee shop.

10) A medical research group conducted a three-month study on 100 men, aged 50–60, to measure their blood pressure and heart rate. The participants were divided into two groups: one maintained their existing exercise routines, while the other increased their daily exercise by 20 minutes.

11) A wildlife biologist tracks the migration patterns of Monarch butterflies, noting the start and end dates of their migration.

12) The principals at Seymour High School want to know the average number of hours students spend on homework per night. They ask randomly selected students to report their homework time.

To continue, return to the Online Lesson.

Targeted Review

Complete items on a separate sheet of paper.

1) Group the words below by measure of center and measure of spread.

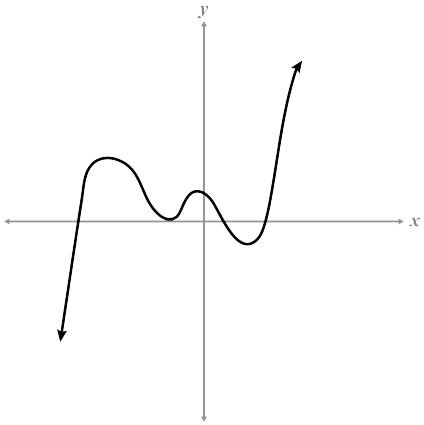
mode, range, mean, standard deviation, median

2) Calculate the measures of center for: $\{15, 20, 25, 25, 30, 35, 40, 50, 75, 90\}$. Identify the distribution.

3) Calculate the standard deviation. Show your work.
$\{2, 3, 4, 4, 5, 5, 6, 7\}$

4) Determine the approximate z-value for 37% of a standard normal distribution.

For problems 5–6, use the graph.



5) Explain why the graph is a polynomial function. Then state the end behavior.

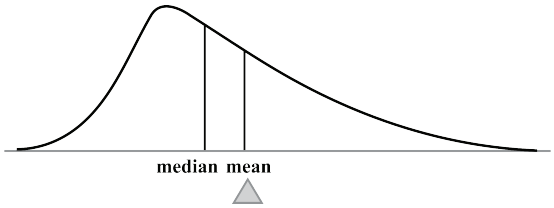
6) Given the graph, name the possible number of real roots.

7) Solve with common logs. Round to the ten-thousandth.
$12^{(3x-2)} = 4$

8) Solve with natural logs.
$(e^x - 1)(e^x - 3) = 0$

Multiple Choice

____ 9) Identify the type of distribution shown in the sketch.



A) Left-skewed

B) Right-skewed

C) Symmetric

D) Cannot be determined

____ 10) Which equation is equivalent to $\ln 9 + 5\ln x = 3\ln 7$?

A) $\ln 9x^5 = \ln 21$

B) $\ln 9x^5 = \ln 343$

C) $\ln 45x = \ln 343$

D) $\ln 14x = \ln 10$

____ 11) If $y = 15(0.5)^x$, what is the approximate value of x when $y = 3$?

A) -2.32

B) 0.55

C) 0.43

D) 2.32

____ 12) Determine the raw data value when the proportion of area for a standard normal distribution is 97% with a mean of 5 and a standard deviation of 2.1.

A) 6.95

B) 8.95

C) 7.04

D) 11.50

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Origin	L45	L45	L45	L46	L33	L35	L41	L42	L45	L41	L38	L46

L = Lesson in this level, A1 = Algebra 1: Principles of Secondary Mathematics, FD = Foundational Knowledge

To continue, return to the Online Lesson.