

Summary Sheet of Instruction for Statistical Specimens

Things to instruct in this lesson plan to ensure alignment:

- Instruct on how to find the mean, median, and mode of a set of data (MAE13182).
- Instruct on how to determine appropriate measures of central tendency for a given situation or set of data (MAE13283).
- Instruct on how to identify different types of sampling techniques (for example, random, systematic, stratified) (MAE33283).

Things students need to practice:

- Determine appropriate measures of central tendency for a given situation or set of data (MAE13283).
- Know whether a sample is biased (MAE33284).
- Find the mean, median, and mode of a set of data (MAE13182).
- Determine appropriate measures of central tendency for a given situation or set of data (MAE13283).

Optional-Use MS Excel to organize the data collected; then create a circle, line, bar, and /or a histogram based on the information. Also, students can determine the mean, median, mode, and range of the data using MS Excel, a calculator, or some other form of technology (MAE13381).

Parts of the standard(s) that will not be covered in this lesson:

The student will not use the different sampling techniques. They will only identify the different kinds and decide when it would be appropriate to use each kind (MAE33283).

Optional standards that could be integrated into this activity:

- Determines the mean, median, and mode and range of a set of real-world data using appropriate technology (MAE13381).
- Organize, graphs, and analyzes a set of real-world data using appropriate technology (MAE13382).

Formative assessment for this lesson:

Students will know and be able to...

MAE13281 Finds the mean, median, and mode of a set of data.

MAE13283 Determines appropriate measures of central tendency for a given situation or set of data.

MAE33283 Identifies different types of sampling techniques (for example, random, systematic, stratified).

MAE33284 Knows whether a sample is biased.

Finding the Mean, Median, and Mode of a Set of Data

The following data set represents math scores from the first test in Ms. Rodriguez's 3rd period pre-algebra class:

55	98	70	95	94	64	92	91	70	89	82
88	85	83	82	96	81	80	78	75	75	65
74	73	93	87	68	99	90	62	59	100	

- Using the data set above, find the mean value.
- Find the median of the data set.
- Find the mode of the data.

(Cut on the dotted line)

Answer Key-Finding the Mean, Median, and Mode of a Set of Data

- How to find the mean:
 - Find the sum of the data. **The sum of the data in this table is 2593.**
 - Divide by the addends. [Addends are the number of numbers in the data set.] **The addend is 32.**
 - To find the mean divide 2593 by 32. **The mean of the data is 81.03125.**
- How to find the median:
 - Arrange the numbers from least to greatest in value.
 - Find the middle value in the range (if there are an even number of data in the set, take both values and average them).
 - The median of the data is 82.**
- How to find the mode:
 - The value or values that occur the most in a set of data.
 - It is possible to have several modes.
 - The mode(s) of the data are 70, 75, and 80.**

Determining Appropriate Measures of Central Tendency

Below you see Tonya's grades for the first nine weeks in math. Each grade is counted equally. Based on the data find the mean, median, and mode.

45	80	90	70	85	90	100	0	100	82
88	89	91	95	96	97	87	86	0	83

- 1a. The mean is _____.
- b. The median is _____.
- c. The mode is _____.

In order to decide which measure of central tendency is the *most appropriate for the situation*, it is important to look at the following information:

- the grading scale is based on 0-100
- an A is 90-100
- a B is 80-89
- a C is 70-79
- a D is 60-69
- an F is 0-59

2. Looking at the implications of the data, which measure (mean, median, or mode) best represents Tonya's grades for the first nine weeks in math? Explain why you chose the answer that you did.

<u>THINK</u>
<u>SOLVE</u>
<u>EXPLAIN</u>

Answer Key- Determining Appropriate Measures of Central Tendency

Below you see Tonya's grades for the first nine weeks in math. Each grade is counted equally. Based on the data find the mean, median, and mode.

45	80	90	70	85	90	100	0	100	82
88	89	91	95	96	97	87	86	0	83

- 1a. The mean is **77.7**
- b. The median is **87.5**
- c. The mode is **0, 90, and 100**

In order to decide which measure of central tendency is the most appropriate for the situation, it is important to look at the following information:

- the grading scale is based on 0-100
- an A is 90-100
- a B is 80-89
- a C is 70-79
- a D is 60-69
- an F is 0-59

2. Looking at the implications of the data, which measure (mean, median, or mode) best represents Tonya's grades for the first nine weeks in math? Explain why you chose the answer that you did.

THINK
SOLVE
EXPLAIN

The median is the most appropriate measure of central tendency because if you arrange the data from least to greatest, you see that 16 out of the 20 grades are 80 or higher, which means that 80% of Tonya's grades are a B average or higher. The median of the data was 87.5 and that is in the B range. The mode was 90, and all grades that were 90 or higher only represent 35% of the data. The mean of the data was 77.7 and is not an appropriate measure of central tendency because Tonya would receive a grade of C for the nine weeks, and only 20% of Tonya's overall grades are anything less than a B.

Scenarios Using Different Sampling Techniques

DIRECTIONS for Part I:

Use the following problem: Students at Mystery Falls Middle School want to find out, “Approximately how many hours would a calculator save in work time per week for the average eighth grade student in math?” Identify the best choice for the sampling technique being demonstrated in each scenario as stratified, systematic, random, or biased in some way, and then explain **WHY** you believe that particular sampling technique is being used.

1. Students decide to survey the community to answer their question. Students randomly select one person from the phone book. They call and ask that person what they think, and then they continue to call every fifth person after that until they collect 100 responses.

Sampling technique being used _____

2. Students decide to survey all eighth grade students in their city to answer their question. Since there are so many students to survey, they decide to sample 25 students from each middle school in the city. Each student is hand picked by the eighth grade guidance counselor.

Sampling technique being used _____

3. Students decide to collect data from the students at their school. They use a complete alphabetized list of **all** the students in the school and from that list they select every third student to survey.

Sampling technique being used _____

4. Students decide to collect data from students across the country. Using a computer program to generate 100 random phone numbers, the students call each phone number and survey the person who answers the phone.

Sampling technique being used _____

5. Students decide to collect data from every student in their school.

Sampling technique being used _____

DIRECTIONS for Part II:

Identify the sampling technique being used stratified, systematic, random, or bias, then explain **WHY** you believe that particular sampling technique is being used.

6. Students decide to choose 100 telephone numbers at random from the entire telephone book in Panama City, FL.

Sampling technique being used _____

7. Students decide to choose every 100th listing in the telephone book in Panama City, FL.

Sampling technique being used _____

8. Each person in the population has an equal chance of being selected.

Sampling technique being used _____

9. People are chosen from a list using a fixed interval.

Sampling technique being used _____

10. The population is pre-sorted into relevant subgroups, and people are randomly selected from each subgroup.

Sampling technique being used _____

Answer Key- Scenarios Using Different Sampling Techniques
Student's answers may vary. The answers provided are the best choice for the sampling technique being demonstrated in each scenario. Assess student responses based on completeness using the criteria in the "Long-Answer Question Rubric" (found on page 21 of this Associated File).

1. Students decide to survey the community to answer their question. Students randomly select one person from the phone book. They call and ask that person what they think, and then they continue to call every fifth person after that until they collect 100 responses.

Sampling technique being used – **systematic sample (based on the definition).** One member of the population on a random basis is selected and each additional member is selected at evenly spaced intervals until the desired number for the sample space has been collected.

2. Students decide to survey all eighth grade students in their city to answer their question. Since there are so many students to survey, they decide to sample 25 students from each middle school in the city. Each student is hand picked by the eighth grade guidance counselor.

Sampling technique being used- **The sample is biased because each person selected is purposely chosen from the population.**

3. Students decide to collect data from the students at their school. They use a complete alphabetized list of **all** the students in the school and from that list they select every third student to survey.

Sampling technique being used- **A systematic sample because every third person is selected from the list of students OR this sample might be considered biased because the first person selected was not random enough.**

4. Students decide to collect data from students across the country. Using a computer program to generate 100 random phone numbers, the students call each phone number and survey the person who answers the phone.

Sampling technique being used- **random (by definition).** In random sampling each member of the population is selected entirely by chance and has an equal chance of being selected.

5. Students decide to collect data from every student in their school.

Sampling technique being used- **This is a somewhat biased sample because the results are from a single population only. The reason this is a biased sample is because the method used to acquire the data was systematically different from the population.**

6. Students decide to choose 100 telephone numbers at random from the entire telephone book in Panama City, FL.

Sampling technique being used- **Random sample** because each member of the population is selected entirely by chance. This could also be considered a biased sample because people without a phone do not have a chance of being selected; also the entire population being sampled is in one city-Panama City.

7. Students decide to choose every 100th listing in the telephone book in Panama City, FL.

Sampling technique being used- **systematic (by definition)**.

8. Each person in the population has an equal chance of being selected.

Sampling technique being used- **random (by definition)**.

9. The first person in a population is randomly selected and the other people are chosen from a list using a fixed interval.

Sampling technique being used- **systematic (by definition)**.

10. The population is pre-sorted into relevant subgroups, and people are randomly selected from each subgroup.

Sampling technique being used- **stratified (by definition)**. The entire population is divided into meaningful subgroups (strata) and *then* each group is **randomly** sampled (as described by the random sample above).