LESSON PLAN

Subject: Grade 7 Math

Lesson: Baking Statistics

Standards Addressed:

- Understand that statistics can be used to gain information about a population. (NC.7.SP.1)
- Generate multiple random samples of the same size to gauge the variation in estimates or predictions, and use this data to draw inferences about a population with an unknown characteristic of interest. (NC.7.SP.2)

Objectives:
- Students will be able to recognize that generalizations about a population from a sample are valid only if the sample is representative of that population.
- Students will be able to use random sampling to produce representative samples to support valid inferences.
- Students will be able to collect and use multiple samples of data to make generalizations about a population.

Materials Needed:
- Device for showing *Baking Statistics* video
- "Baking Statistics" activity sheet
- Attached recipe

Outline:
- Prior to this lesson, students should know the difference between a population and a sample, how and why randomization is used in studying a population, and ways to reduce bias.
- Show the 9 ½ minute video, *Baking Statistics* (https://youtu.be/oNMtqqp1psU).
- Discuss the activity prompt.
- Students finish the activity independently or with a partner.

Take It Further: Students use the information they discovered in Scenario 3 to explain why the townspeople in Salem may have complained about Henrietta's bread.

Cross-Curriculum Connection: The following recipe is from *The Art of Cookery Made Plain and Easy*, written by Hannah Glasse in 1747. Have students work in groups to research various terms stated by Glasse and then rewrite this recipe in modern language.

A Receipt for Making Bread without Barm by the Help of a Leaven

Taken from *The Art of Cookery Made Plain and Easy*, by Hannah Glasse, 1747

Take a lump of dough, about two pounds of your last making, which has been raised by barm, keep it by you in a wood vessel, and cover it well with flour; (this is your leaven); then the night before you intend to bake, put the said leaven to a peck of flour, and work them well together with warm water; let it lie in a dry wooden vessel, well covered with a linen cloth and a blanket, and keep it in a warm place: this dough kept warm will rise again next morning, and will be sufficient to mix with two or three bushels of flour, being worked up with warm water and a little salt; when it is well worked up, and thoroughly mixed with all the flour, let it be well covered with the linen and blanket until you find it rise; then knead it well and work it up into bricks or loaves, making the loaves broad, and not so thick and high as is frequently done, by which means the bread will be better baked; then bake your bread.

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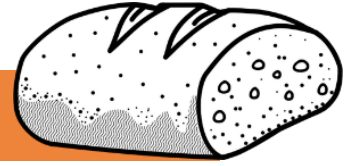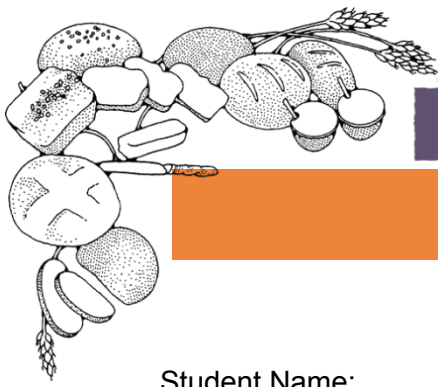
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Student Name: _____Date: _____

In the video, you saw how the Miksch family's oven was used to provide baked goods to the townspeople of Salem prior to the arrival of the bakery. The Moravian church regulated the sale of all items in Salem at this time, including baked goods. The church used statistical information to help decide what was sold, the price of items, and how many items were to be produced.

Imagine that you are part of the governing body of the Moravian church in Salem. Determine your response to the following scenarios.

Scenario 1:

Henrietta Miksch needs to increase the number of ginger cakes she sells. She is planning to conduct a survey to determine the townspeople's preferences for various ginger cake recipes. The three survey methods Henrietta is considering are listed below.
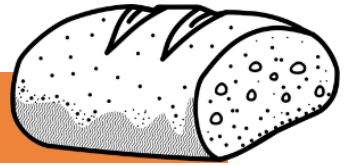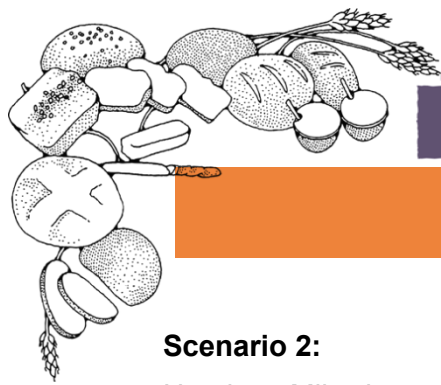
Determine if each survey option would produce a random sample. If so, how do you know? If not, what conditions have been violated? Explain your answers in the table.

Survey Method #1: Henrietta writes all the townspeople's names on cards. She pulls 20 of the cards out in a draw to determine who will complete the survey.

Survey Method #2: Henrietta surveys the first 20 townspeople who come to buy ginger cakes.

Survey Method #3: Henrietta surveys every third townsperson who walks by her home on Tuesday afternoon until she reaches 20 people.

Survey Method	Does this produce a random sample?	Explain why or why not.
#1		
#2		
#3		

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Scenario 2:

Henrietta Miksch wants to make sure she is putting similar amounts of candied orange peel and almonds in her sugar biscuits. She selects a random sample of 25 sugar biscuits from batches she baked over the course of a week. She determines the proportion of candied orange peel to almonds ranges from 0.57 – 0.61. She is satisfied with this variation.

1. Of the following reasons, which one gives the best explanation for the differences Henrietta found in the sample proportions. Circle your answer.

> a. Henrietta doesn't always count the amount of candied orange peel and almonds correctly.

> b. There are too many sugar biscuits in the sample size for the proportions to be the same.

> c. Sample proportions differ from one random sample to another.

> d. Henrietta miscalculates the proportions of candied orange peel to almonds in some of the sugar biscuits.

2. If Henrietta repeats this statistical study next week, which of the following proportions would most likely cause her to be unsatisfied with the results? Circle your answer.

> a. 0.59

> b. 0.49

> c. 0.60

> d. 0.57

Scenario 3:

Salem has heard some complaints about Henrietta's bread not being consistently the same size but costing the same price. You are to find out if this claim is true. You have weighed a random sample of 15 loaves of bread each week over the course of 2 weeks. Here are the weights of the bread loaves in grams:

> WEEK 1: 502, 510, 498, 495, 501, 494, 499, 505, 502, 507, 497, 500, 499, 496, 503

> WEEK 2: 500, 496, 499, 502, 505, 500, 498, 502, 497, 499, 502, 498, 496, 503, 504

1. What is the range of weights of Henrietta's bread? _____

2. What is the median weight of Henrietta's bread? _____

3. What is the mean weight of Henrietta's bread? _____

4. If the cost of bread is 3 pence per 500-gram loaf, is Henrietta's bread, on average, fairly priced? _____

5. What weight of bread loaf was most common during this 2-week sample? _____

6. Based on this 2-week sample, would a customer more likely receive a loaf of bread <u>over</u> 500 grams or <u>under</u> 500 grams? _____
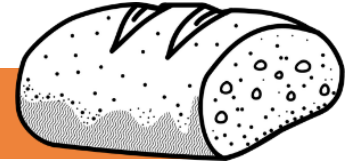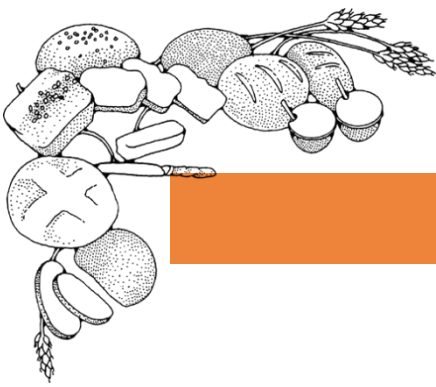
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Answer Key

In the video, you saw how the Miksch family's oven was used to provide baked goods to the townspeople of Salem prior to the arrival of the bakery. The Moravian church regulated the sale of all items in Salem at this time, including baked goods. The church used statistical information to help decide what was sold, the price of items, and how many items were to be produced.

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Survey Method #2: Henrietta surveys the first 20 townspeople who come to buy ginger cakes.

Survey Method #3: Henrietta surveys every third townsperson who walks by her home on Tuesday afternoon until she reaches 20 people.

Survey Method	Does this produce a random sample?	Explain why or why not.
#1	Yes	Responses may be similar to: This method produces a random sample because it takes into consideration the entire population of Salem. Each person has the same chance at having his/her card drawn as any other person.
#2	No	Responses may be similar to: This method does not produce a random sample because it only considers people within the population who already buy ginger cakes, and not those who do not buy them.
#3	No	Responses may be similar to: This method does not produce a random sample because it only considers people within the population who walk by Henrietta's home on Tuesday afternoons. Other people having different schedules are not part of the sample.
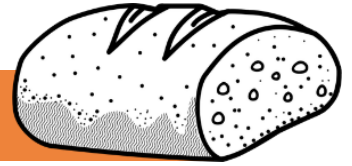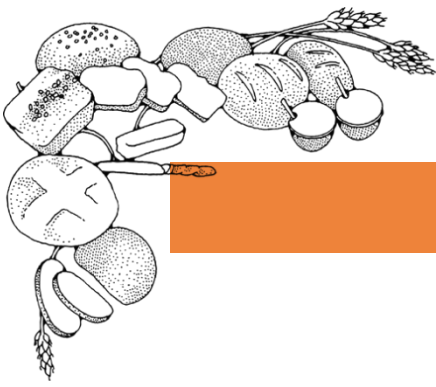
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Answer Key

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WEEK 2: 500, 496, 499, 502, 505, 500, 498, 502, 497, 499, 502, 498, 496, 503, 504

1. What is the range of weights of Henrietta's bread? 494 grams – 510 grams

2. What is the median weight of Henrietta's bread? 500 grams

3. What is the mean weight of Henrietta's bread? 500.3 grams

4. If the cost of bread is 3 pence per 500-gram loaf, is Henrietta's bread, on average, fairly priced? Yes

5. What weight of bread loaf was most common during this 2-week sample? 502 grams

6. Based on this 2-week sample, would a customer more likely receive a loaf of bread over 500 grams or under 500 grams? Under 500 grams