



# LESSON PLAN

**Subject:** Grade 8 Math

**Lesson:** Baking Statistics

**Standard Addressed:**

- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (NC.8.SP.1)

**Objectives:**

- Students will be able to identify and describe bivariate measurement data.
- Students will be able to use bivariate measurement data to construct a scatter plot.
- Students will be able to analyze the scatter plot to determine associations, clustering, and outliers.

**Materials Needed:**

- Device for showing *Baking Statistics* video
- “A Bake Day Scatter Plot” activity

**Outline:**

- Prior to this lesson, students should have some understanding of how bivariate measurement data is used in making scatter plots.
- Show the video.
- 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.





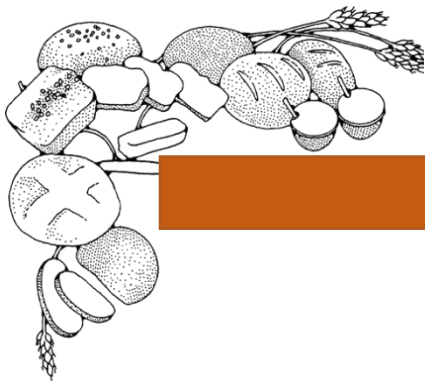
A Receipt for Making Bread without Barm by the Help of a Leaven

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.

Lined writing area consisting of 20 horizontal lines.





# A BAKE DAY SCATTER PLOT

Grade 8 Math

## Answer Key

In the video, you saw how the Miksch family's oven was used to produce baked goods. You learned about the use of statistics in understanding baking for the community of Salem during the 18<sup>th</sup> century.

Using what you learned, as well as what you know about statistics, complete the tasks below.

### Task 1: Identifying Variables with Positive and Negative Associations

Henrietta Miksch needs to produce loaves of bread quickly, having just learned that many visitors are coming to Salem today.

1. From the list of variables below, circle the ones that have a **positive association** with the rate at which bread can be produced.

The number of visitors arriving

The temperature of the air

The cost of wheat

The amount of yeast in the dough

2. From the list of variables below, circle the ones that have a **negative association** with the rate at which bread can be produced.

The percent of humidity in the air

The temperature of the air

The amount of liquid in the dough

The amount of yeast in the dough

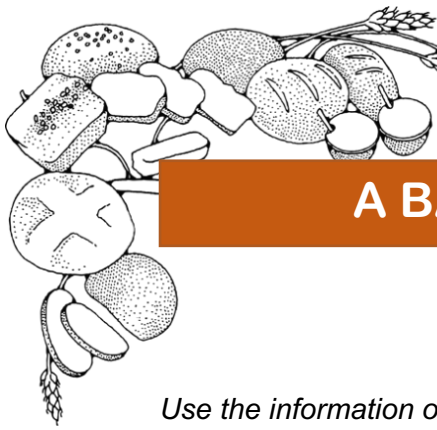
### Task 2: Ordering and Calculating Data Sets

The time it takes for a bake oven to heat up depends on the type of wood used to fire the oven. The table below is actual data about heat and wood type.

(See <https://forestry.usu.edu/forest-products/wood-heating> for more details.)

Species	Green Weight (lbs./Cord)	Dry Weight (lbs./Cord)	Heat per Cord (Million BTUs)
Apple	4850	3888	27.0
Birch	4312	2992	20.8
Cherry	3696	2928	20.4
Douglas-fir	3319	2970	20.7
Maple, Silver	3904	2752	19.0
Oak, White	5573	4200	29.1
Osage-orange	5120	4728	32.9
Pine, Ponderosa	3600	2336	16.2
Spruce	2800	2240	15.5
Sycamore	5096	2808	19.5
Walnut, Black	4584	3192	22.2
Willow	4320	2540	17.6





## A BAKE DAY SCATTER PLOT, page 2

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### Answer Key

Use the information on the previous page to order each species of tree from least to greatest heat per cord in the table below.

Fill in the number of BTUs for each of the tree species.

Find the ratio of green weight to dry weight for each species and record it (to the nearest hundredth) in the third column.

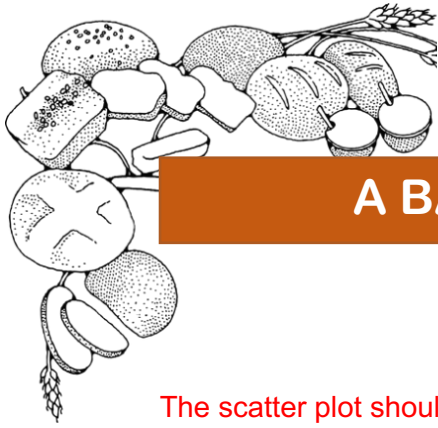
SPECIES OF TREE	HEAT PER CORD (MILLIONS OF BTUs)	RATIO OF GREEN WEIGHT : DRY WEIGHT
Spruce	15.5	1.25
Pine, Ponderosa	16.2	1.54
Willow	17.6	1.70
Maple, Silver	19.0	1.42
Sycamore	19.5	1.81
Cherry	20.4	1.26
Douglas-fir	20.7	1.12
Birch	20.8	1.44
Walnut, Black	22.2	1.44
Apple	27.0	1.25
Oak, White	29.1	1.33
Osage-orange	32.9	1.08

### Task 3: Construct a Scatter Plot

The town of Salem has access to many of the species of trees listed above but does not want to use lots of labor to move the heavy loads of wood. Before chopping down trees to use in firing the bake oven, the town leaders want to determine if there is a relationship between the weight of newly chopped trees (green wood), the weight of that same wood dried, and the amount of heat produced. You are asked to investigate possible associations.

Using the ratio of green weight to dry weight and heat per cord, construct a scatter plot on the next page. Be sure to label each axis, listing the units of measure. Also remember to give your scatter plot a title. Do not connect the dots – just plot them.





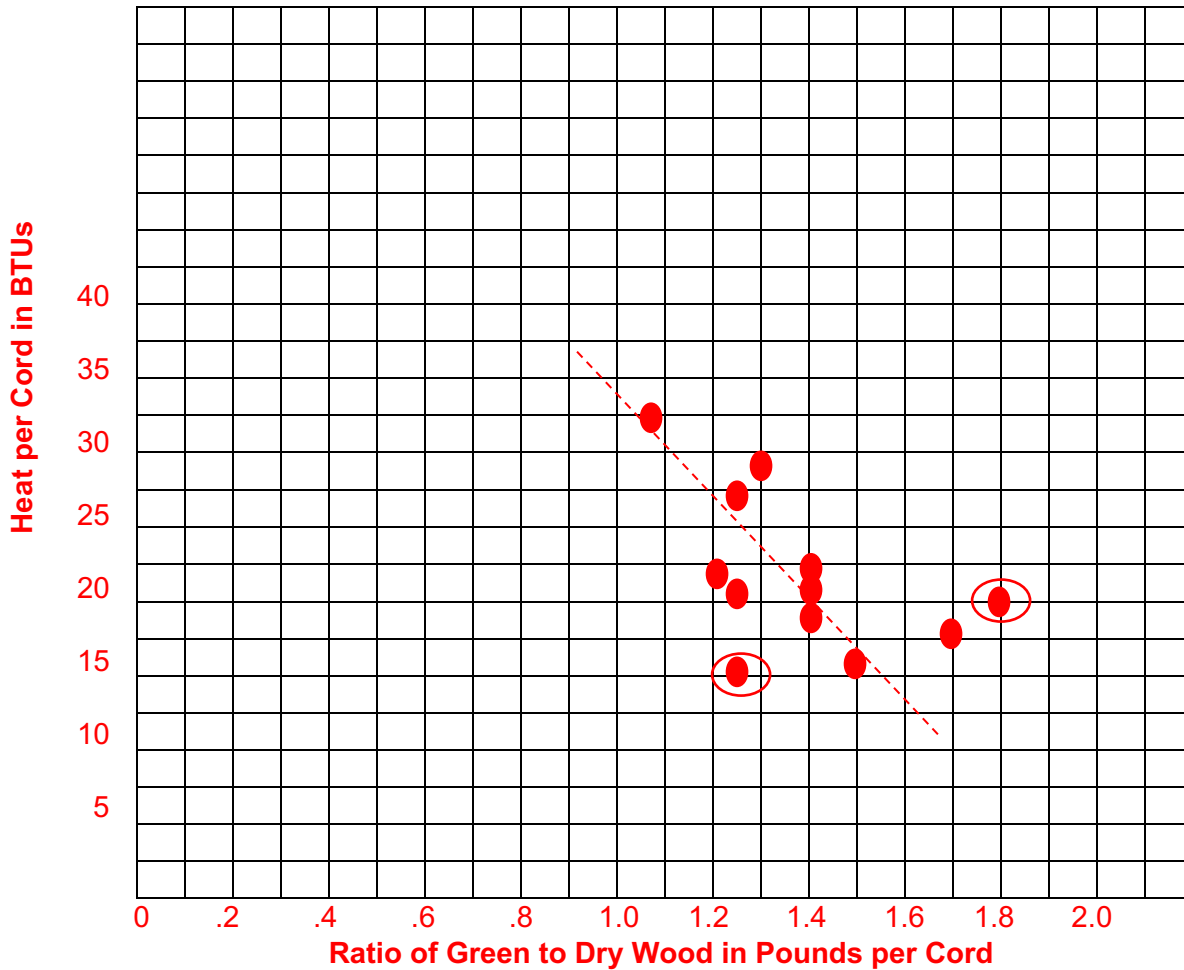
# A BAKE DAY SCATTER PLOT, page 3

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Answer Key

The scatter plot should resemble the following:

The Dependence of Heat on the Ratio of Green to Dry Wood



After constructing the scatter plot, answer these questions:

1. Does there appear to be an association between the ratio of green to dry wood and heat per cord? If so, is it positive or negative? **There appears to be a negative association.**
2. Do you see evidence of a linear association? **yes** If so, draw a trend line that passes through or near as many data points as possible.
3. Circle any outliers.

