



Out of the Furnace

Mathematics K -3rd Grade

Goals: Students will determine the best place to spend a hot day using thermometers to collect temperature data and interpreting graphs of the collected data.

Objectives: Students will predict, read thermometers (Fahrenheit and Celsius) to the nearest degree, collect data, create graphs and interpret data drawing conclusions based on the data.

Standards Addressed:

Virginia Math SOLs

- 3.8 The student will solve problems involving the sum or difference of two whole numbers, each 9,999 or less, with or without regrouping, using various computational methods, including calculators, paper and pencil, mental computation and estimation.
- 3.17 The student will read temperature to the nearest degree from a Celsius thermometer and a Fahrenheit thermometer. Real thermometers and physical models of thermometers will be used.
- 3.21 The student, given grid paper, will
- collect and organize data on a given topic of his/her choice, using observations, measurements, surveys, or experiments; and
 - construct a line plot, a picture graph, or a bar graph to represent the results. Each graph will include an appropriate title and key.
- 3.22 The student will read and interpret data represented in line plots, bar graphs, and picture graphs and write a sentence analyzing the data.

ISTE Standards

- Students use technology resources for solving problems and making informed decisions.
- Students use technology tools to process data and report results.
- Students employ technology in the development of strategies for solving problems in the real world.
- Students use technology tools to enhance learning, increase productivity, and promote creativity.

NCTM Standards

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving.

Prior Knowledge: How to use internet learning sites, how to put data on a graph, how to read a thermometer and how to use a four function calculator.

Materials: Enough identical thermometers (with Celsius and Fahrenheit scales) for the different locations to be measured, notebook or teacher created data recording sheet (one per student), computers with Internet access, calculators, pencils, field trip location that will have differing temperatures.

Lesson Overview: On a walking field trip outside (around school, a local park, etc), students will read thermometers to collection information on temperature, display collected data in graphs, and use calculators to determine the coolest location to spend hot days. They will tie this in with the Biblical account of the Fiery Furnace found in Daniel 3.

Lesson Procedures:

- **Introduction**—Teachers and students will participate in a discussion about temperature (i.e. what temperatures are hot? What temperatures are cold?). What’s the hottest place you have ever been? The coldest? What they would do if the air conditioning was broken? How will you keep cool? Where can you go to cool off?

The teacher explains students will be going on a walking field trip to find the coolest place to spend a hot day by using their measurement skills.

- **Main activity**— After arrival at the destination, thermometers are placed in varied locations such as: direct sunlight, in the shade of a man made structure and/or tree, underground (This can simulate a cave if one is not available), in water in both shade and sun, etc. Allow plenty of time so the thermometers can adjust to the temperature of the location.

Have students write down their predictions of which location will be the hottest and the coolest.

Read Daniel 3: 13-30. (May read the entire chapter). Discuss how hot the furnace would have been to kill the soldiers, what “seven times hotter” must have been like. What uses did a furnace have in the days of Nebuchadnezzar? (melting ore for metal)

Review (if you have not) how to read the scale on a thermometer, how to round to the nearest degree, and the difference between Celsius and Fahrenheit. Assist students in how to collect their data either supplying a sheet to do so or showing a template for them to copy and use in their notebooks.

Students may work individually or in groups of 3-4 to complete this activity. Each group checks the 4-5 locations of the thermometers, records the location and temperature on data collection sheets. The teacher/helpers will be available to answer questions about reading particular thermometers.

Back in class

Discuss their predictions and actual findings. Did all the readings agree? What might have caused slight differences in temperatures? (Clouds). Predict if temperatures would be greater than or less than those read at different times of the day or seasons in the year. Encourage students to “think aloud” when discussing their answers to get an inside look at their reasoning skills for informal assessment.

Students log into (<http://nces.ed.gov/nceskids/CreateAGraph/>) to create a graph to display the data collected. The teacher may need to demonstrate how to enter data, modify labels, etc. Students choose the best graph (bar graph, line graph) to display collected information and formulate own titles/labels.

Students complete the mandatory and one or more optional journaling assignments in their notebooks. For younger students teacher has group suggest what should be written and teacher writes in the classroom

journal (Usually a large pad of paper on easel). Students can draw pictures to represent what happened and was discussed in their personal journals.

• **Conclusion**— What outside factors influence temperature? Why is accurate measurement and data collection needed?

• **Extension**—

- This lesson can be extended by having students measure temperatures in different locations around their homes (attic, basement, inside room, pantry) and determining the coolest locations available to them during the summer. Students could compare the temperatures they collect to the temperatures other students collect verbally or a class graph could be created.
- Students may measure temperatures of different things such as meat as it is cooked with the help of their parents.
- Students may investigate using digital thermometers to measure items that have been heated in the microwave or cooled in a refrigerator at school.
- Students can take their own body temperatures and graph class results. Students can also record their temperatures over a period of time and graph the results using a line graph. Research can be done on what “normal” temperatures are and what “abnormal” temperatures are. This data can be used to determine if a person is sick or hypothermic.
- Students may contact local weathermen to learn how temperatures are collected and reported on the news. Where are the local temperature collection locations?
- To connect with social studies discuss why pioneers chose to store perishable items in basements or root cellars.

Assessment: Students will be assessed using a 4 point rubric (below) and teacher observation.

Activity	1	2	3	4
Data Collection	Student did not collect data.	Student collected some data. Thermometer read incorrectly.	Student collected most needed data. Thermometer read correctly to a close degree.	Student collected all needed data. Thermometer read correctly to nearest degree.
Graph Creation	Student did not create a graph.	Student attempted a graph that is largely incomplete	Student created a graph that contains some errors.	Student created a graph to accurately represent collected data.
Calculations	Student did not perform calculations.	Student performed some calculations.	Student performed most calculations.	Student performed all calculations.
Discussion	Student did not participate	Student participated but made erroneous statements	Student had correct information but failed to draw correct conclusions.	Student had correct information, conclusions and could explain his/her reasoning in detail.

DATA COLLECTION (LOCATION TEMPERATURES)

Location (Describe the location of the thermometer in your own words)	Temperature in °F	Temperature in °C

Journaling prompts

REQUIRED: The highest temperature (warmest place) was ____ degrees. I recorded this temperature at _____. The lowest temperature (coolest place) was ____ degrees. I recorded this temperature at _____.
 The difference in temperature between the warmest and coolest places was ____ degrees.
 The average temperature of the all the locations I recorded was _____ degrees.

OPTION 1: Were any of the temperatures you recorded very similar? If so, why do you think they were similar? _____

OPTION 2: If I were Abednego and I wanted to find the coolest place to spend a hot day, I would go to _____ because _____

OPTION 3: Imagine you were thrown into a furnace. What would you be thinking just before you were thrown in? While you were inside and another person appeared? After when people asked you why the fire had not harmed your body including your hair or clothes?

OPTION 4: Vocabulary

Make a word web or other graphic organizer using the following words from Daniel 3. Show how they are similar and how they are different. List some additional words from the same root word as each of these. Add a couple of interesting related words not in the chapter: blazing, heated, hot, flames, singed, scorched.

OPTION 5: Use the following words: blazing, heated, hot, flames, singed, scorched. In several sentences or in a poem to express their meaning. You may use the following websites to help you:

<http://www.readwritethink.org/materials/acrostic/>.

<http://www.readwritethink.org/materials/diamante/>.

<http://www.readwritethink.org/materials/shape/>.

OPTION 6: Younger/non writers/differentiated instruction

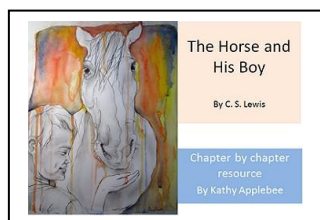
Students draw pictures of thermometers in two different locations showing which was the hottest location and which was the coolest. Teacher looks for correspondence of the mercury level and the picture. Students draw a picture of the Fiery Furnace story.

OPTION 7: (using the scripture .JPEGs) Choose a verse and write or draw what comes to mind.

ADDITIONAL PRODUCTS

Three card games in one! Players learn how plants grow, develop and how parts function in the PLANT PART game. The PHOTOSYNTHESIS game lets students collect water, carbon dioxide and sunlight cards to be synthesized into glucose. The POLLINATION game teaches how the parts of a flower function and how pollinators assist in the process. All three games also incorporate weather and other events as well as plant adaptations making these games valuable resources for teaching the big picture. <http://www.teacherspayteachers.com/Product/Game-3-in-1-plant-parts-photosynthesis-pollination-1229299>

FREEBIES: Novel study Power Points for The Lion, Witch and Wardrobe, Magician's Nephew and The Horse and His Boy. <http://www.foolsforchrist.net/novel-studies.html>



Daniel choral reading script – FREE at <http://www.foolsforchrist.net/old-testament.html>

DIGESTION card game – players try to be the first to construct a digestion system and move food token through it while opponents play cards like choking, colon cancer and diabetes that hinder them. Other cards help fix the damage cards played teaching healthy living.

<http://www.teacherspayteachers.com/Product/Game-The-Digestive-System-card-game-998930>

FREE <http://www.teacherspayteachers.com/Product/Power-point-Patriotic-choral-reading-from-scripture>

Choral reading provides an authentic reason to get reluctant readers to read and reread aloud, improving their fluency and comprehension. This 14 slide power point has a **patriotic** flavor with fireworks and scriptures relating to God and the nations.

Mystery of the Underground Railroad Conductor - Slave Ann Clark escaped from her owner in South Carolina and made her way to Canada via the URR (Underground Railroad) Who helped her in this illegal endeavor? Experience life in pre-Civil War America by researching and taking on the persona of a historical figure while trying to solve the mystery. <http://www.teacherspayteachers.com/Product/Game-Mystery-of-the-Underground-Railroad-Conductor-84292>

FREE LESSON PLANS: <http://www.foolsforchrist.net/lesson-plans.html> **Noah Subtraction, Build a Tower, Build a Budget** (Math), **Measuring at the Wedding** (science) and **Out of the Furnace** (Science) Take a walking field trip to find a good place to cool off. This lesson combines math (Basic operations and graphing), science (temperature and data collection) and the Fiery Furnace from Daniel 3. Extensions to the lesson bring in vocabulary and journaling. This lesson has adaptations to use with a mixed grade level class/differentiated learning

