Summer 2016

UTM Middle School STEM Workshop

**Workshop Facilitator**: Dr. Louis Kolitsch

**Subject/Grade**: Fahrenheit and Celsius temperature scales. (Grades 7 and 8)

**Estimated time**: 1 hour

**Standard(s)**: TN Mathematics Standards

Grade 7: **7.RP.A.2** Recognize and represent proportional relationships between quantities.

 **a**. Decide whether two quantities are in a proportional relationship (e.g., by

 testing for equivalent ratios in a table or graphing on a coordinate plane

 and observing whether the graph is a straight line through the origin).

Grade 8: **8.F.B.4** Construct a function to model a linear relationship between two quantities.

 Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

**Objective**: Determine the linear functions that can be used to convert from Fahrenheit to Celsius and from Celsius to Fahrenheit.

* I can express Fahrenheit temperature as a function of Celsius temperature
* I can express Celsius temperature as a function of Fahrenheit temperature
* I can use a linear function to convert a Fahrenheit temperature to a Celsius temperature
* I can use a linear function to convert a Fahrenheit temperature to a Celsius temperature

**Materials and Resources**: Sheet on comparison of Fahrenheit and Celsius temperatures.

**Motivating Students/Anticipatory SET:**

This lesson involves constructing a function to demonstrate the relationship between two real-world quantities. Motivate your students by discussing a trip to Canada, where temperatures are given in Celsius. How would you know whether you need to wear shorts or a coat on a trip to Canada?

**Instructional procedures**:

* Give each student the sheet on showing a comparison between Fahrenheit and Celsius temperatures.
* Have students explain why the relationship between the two temperature scales is not a proportion.
* Have the students construct a linear function that will determine the Celsius temperature that corresponds to a given Fahrenheit temperature using the four highlighted pairs of temperatures.
* Have the students construct a linear function that will determine the Fahrenheit temperature that corresponds to a given Celsius temperature using the four highlighted pairs of temperatures.
* Have students graph their two functions and describe the geometric relationship between them.

**Questioning/Thinking/Problem Solving:**

1. What makes a relationship proportional?

2. What do you need to construct a linear function?

3. How can you use the quantities you are given to construct your linear function? How can you use other quantities to “check” your answer?

4. How is the temperature of 80 degrees Celsius related to the temperature of 80 degrees Fahrenheit? Which is hotter?

**Follow-up Activities/Extensions**:

1. Ask the students to explain why you had them use the four highlighted pairs of temperatures.

2. Ask the students to graph the four highlighted pairs of temperatures and explain how the graph illustrates that the temperatures are not proportional. Does swapping Fahrenheit values and Celsius values on the axes make a difference in their explanation?

2. Do a similar exercise using Kelvin temperatures.

**Accommodations/Adaptations:**

For students needing additional guidance, add questions to the activity to lead students through the process. Provide a pre-drawn graph of the temperatures.

**Closure:**

1. Ask students to give you both functions (converting Fahrenheit to Celsius and converting Celsius to Fahrenheit). If students give more than one function for one of the conversions, ask them to explain whether the functions are equivalent.

2. Are there other equivalent ways to write the functions? (Students may provide fractions or decimals as coefficients or may provide a function that results from obtaining a common denominator.)

**Assessment:**

Ask students to convert from one temperature to the other. Tie your questions back to the motivating question: If the temperature in Canada is X degrees Celsius, do I need to wear shorts or a coat? Why?

**Teacher Reflection:**

To be completed once the activity has been conducted.

