the CEED

THE CENTER FOR ENERGY EFFICIENT DESIGN

Temperature Conversions

Grade Level	Upper elementary and middle school	**Subject**	Math and Science

| Objective(s):	SOL Addressed:
Practice converting Fahrenheit temperatures to Celsius and Celsius temperatures to Fahrenheit. Graph comparisons and also practice converting to decimals.	Math: 5.4, 5.5, 5.6, 5.15, 6.6, Science: 4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which i) data are collected, recorded, analyzed, and displayed using bar and basic line graphs; j) numerical data that are contradictory or unusual in experimental results are recognized; k) data are communicated with simple graphs, pictures, written statements, and numbers 5.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which g) data are collected, recorded, analyzed, and communicated using proper graphical representations and metric measurements; i) inferences are made and conclusions are drawn. 6.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which h) data are analyzed and communicated through graphical representation; LS.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which h) data are organized, communicated through graphical representation, interpreted, and used to make predictions; i) patterns are identified in data and are interpreted and evaluated. PS.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which c) conversions are made among metric units, applying appropriate prefixes; l) experimental results are presented in appropriate written form.

		Next Generation Science Standards:
		5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
Materials Needed Per Class of 30 **and** **Prior Knowledge**	Calculators (optional) Access to CEED dashboard or data tables. Formulas Fahrenheit to Celsius: (F – 32)(5/9) = C Celsius to Fahrenheit: (C) (9/5) + 32 = F	
Ways to differentiate this lesson plan	**EXTENSION** : Convert the fractions to decimals and work the problems. Graph comparisons or results of conversions. - Instead of using formulas, measure the temperature of water (over intervals) with both scales (F and C) while water is heated or cooled. This can be graphed (F on y-axis and C on x-axis) and students can find the slope, which is the formula. See attached example. **MODIFICATIONS** : Use a conversion chart instead of working the problems. http://www.albireo.ch/temperatureconverter/table.htm - http://www.hardbandingsolutions.com/postle/temperature.php	
Introduction/ Anticipatory Set	**Anticipatory Set:** Temperatures are measured in more than one scale. Discuss the different ones used and how/when used. **Questions to ask students:** * What are the different temperature scales? * Which is most commonly used in Science? * What is used at CEED? * Why might we want to change data from one scale to another?	**Introduction:** **Using the CEED data, find examples of temperatures given in Fahrenheit.** **Practice problems** **(75 F -32)(5/9) = C** **(43)(5) = 215 = 24 C** ** 9 9** **(10 C)(9/5) + 32 = F** **(10)(9) = 90 = 18 + 32 = 50 F** ** 5 5** **Using decimals instead of fractions.** **5/9 = 0.56** **9/5 = 1.8** **(60 F -32)(0.56) = C** **(28)(.56) = 16 C** **(18 C)(1.8) + 32 = F** **32.4 + 32 = 64 F**

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Instructional Activities

Guided Practice	Research Shows that students learn best when they are • actively engaged and thinking in the classroom • drawing conclusions by analyzing data, models or examples and by discussing ideas • working together in self-managed teams to understand concepts and to solve problems • reflecting on what they have learned and on improving their performance • interacting with an instructor as a facilitator of learning **Sample Facilitator Questions for the Activity:** What question(s) will students be investigating? What process will students follow to collect information that can be used to answer the question(s)? Debate, cross-examine, rebuttal, devil's advocate
Independent Practice	After guided practice, students should look up data on the CEED dashboard that can be used for conversions, especially trends over time. This allows students to graph the trend and compare their conversions with Fahrenheit (if it gets warmer, their conversions should get warmer, for example). Let students choose their own data and analyze it, writing statements that explain the trends.
Closure (Summary of Lesson)	Emphasize that if Fahrenheit temperatures rose, their Celsius conversions should also, and vice versa if the temperatures dropped or remained steady. Graphing will help students check their answers. Students can also use conversion charts (referenced above) to check mathematical calculations.
CEED Building Application/ Sensor Data	Use any part of the CEED dashboard that has temperature data (which is in F) and convert to Celsius for this activity.
Assessment	Discussion of what was graphed and students share the trends they observed/graphed. Students can create graphs on ActivBoards or posters, if sharing. Or complete a report of some kind that is given to the teacher/facilitator.

Temperature comparison

$y = 1.8x + 32$
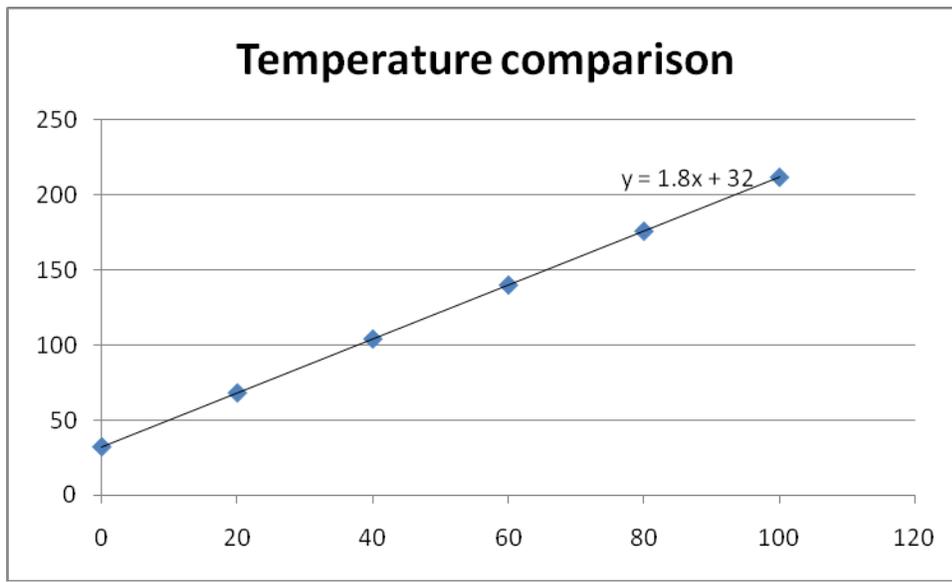
Extension Information

1. What is the relationship between the Fahrenheit and Celsius temperature scales? Justify your answer.

  The relationship is linear. The characteristic plot is a straight line.

2. What does the *y*-intercept of the graph represent?

  The y-intercept represents the difference in the freezing points between the Fahrenheit and Celsius temperature scales.