

Katherine Aho
NSF GK-12 Vibes and Waves in Action
CP Physics
Lesson 12: Conversion Between Fahrenheit and Celsius

Summary of the Lesson

This lesson was another practice lesson for the CP class. This gave them another opportunity to practice variable assignment, prompts and plotting. There were two tasks to the programming assignment: 1.) convert from a given Fahrenheit value to Celsius and display the output. 2.) Convert a given Celsius value to Fahrenheit and plot Celsius temperature vs Fahrenheit temperature. The two parts were done separately, making sure the entire class was done with the first part before moving onto the second. A worksheet was given for the first part of the program where they were asked to fill in the blanks of the skeleton code and then type the lines of code into Rstudio and test if the program worked correctly. A simulation of the program was shown and explained before moving onto the second part. In the second part, a similar worksheet was given. The students filled in the blanks of the skeleton code and typed the code into Rstudio. The second part was also explained and demonstrated at the end of class.

CP Physics Lesson Plan

Text: Conceptual Physics, Paul G. Hewitt

Chapter: Ch 21- Temperature (Section 21.1)

Objectives: Write a program in R to convert between Fahrenheit and Celsius

Essential Question: How would you write a program to perform a simple conversion?

Frameworks: Heat and Heat Transfer; SIS1, SIS2, SIS3, SIS4

L-Side Activities: Teacher	R-Side Notes: Students
<p>At the Bell: Complete the worksheet for Part 1.</p> <p>Agenda: 1. Review the skeleton code worksheet for Part 1. 2. Write the Part 1 of the program 3. Review/Demonstrate Part 1 of the program 4. Complete the skeleton code worksheet for Part 2 5. Write the program for Part 2 6. Review/demonstrate Part 2 of the program</p> <p>Working It Out: 1. What are some examples of comments that you could write that describe the objective of the program? 2. What three tasks does the <code>readline(prompt="")</code> command perform? 3. What is the purpose of the <code>as.numeric()</code> command? 4. How do you convert a Fahrenheit value to a Celsius value? 5. What two commands could you use to display an output on the screen? What is the difference between those commands? 6. How do you create an array in R? Why would you need to use an array? 7. What do the arguments of the <code>plot</code> command do?</p> <p>Class Activity: Write a program that will prompt the user to enter a temperature in Fahrenheit, calculate the equivalent temperature in Celsius and display a message with the answer, convert five (5) given temperatures to Celsius and make a graph of Celsius (y-axis) vs. Fahrenheit (x-axis).</p> <p>Homework: None</p>	<p>See notes from Lesson 6</p>

R Activity

Name: _____

Convert Fahrenheit to Celsius

Part 1 Objectives: Your program will (1) prompt the user to enter a temperature in Fahrenheit, (2) calculate the equivalent temperature in Celsius and (3) display a message with the answer.

1) Create a comment that explains the purpose of the program.

```
# _____
```

2) Complete the code that you would use to have the program ask the user to input a temperature in Fahrenheit.

```
_____ <- _____(prompt="Enter a temperature value in Farenheit: ")  
  
FTemp <- as.numeric(_____)
```

3) The equation to convert from Fahrenheit to Celsius is: $C = \frac{5}{9}(F - 32)$. Write the code that R will use to convert the number you input. You will need to (1) decide on a variable name for the new temperature in Celsius and (2) use the proper symbols and grouping to make the calculation is correct.

```
_____ = _____
```

4) Complete the code below that will be used to display a message and an answer showing the converted temperature.

```
_____("The temperature in Celsius is: ")  
_____ ( _____ )
```

5) What command could you use to display the message and answer using one line of code?

```
_____("The temperature in Celsius is: ", _____ , "degrees", "\n")
```

Part 2 Objectives: Your program will convert five (5) given temperatures to Celsius and make a graph of Celsius (y-axis) vs. Fahrenheit (x-axis).

1) Complete the code that you will use to assign five values to a variable called TempF. The five values are -10, 0, +10, +65, +100.

```
_____ <- c(-10, _____ ,10, _____ ,100)
```

2) You will need to re-type the conversion formula for this section. Write it in the space below. Be careful to use the new variable names or create news ones if needed.

```
_____
```

3) Complete the code you will use to create a graph (points, not a line) of the Celsius temperature vs. the Fahrenheit temperature.

```
plot(_____, _____ , type=" _____" )
```

Part 3 Objectives: Students will create the program in R and troubleshoot until it works correctly.

Create the entire program in R. Type in all the indented lines from both sides. Try running the program and fix any errors.