Math 320 Section 2
Handout 1 Winter 2014

Celsius vs. Fahrenheit

Last class I was not very clear in how to transform from the Fahrenheit scale to Celsius and viceversa.

First of all, recall that in the equation $y = f(x)$, x is the input and y is the output. For example, for a European or Latin-American in the US, the x would be Fahrenheit degrees as she wants to know the temperature y in Celsius. For an American in Paris, he will hear in the radio the temperature x in Celsius and would like to know then the temperature y in Fahrenheit degrees.

Thus, let's deal first with Elke from Germany. She knows that $0°$ Celsius equal $32°$ Fahrenheit, and $10°$ Celsius equal $50°$ Fahrenheit. Thus she has the points $(32, 0)$ and $(50, 10)$, because in her case, Fahrenheit is the input. We know that the slope-point equation of a line is given by

$$y - c = m(x - a),$$

where m is the slope and (a, c) is *any* point. So, we need the slope:

$$m = \frac{10 - 0}{50 - 32} = \frac{10}{18} = \frac{5}{9}.$$

And with $(32, 0)$, we get

$$y - 0 = \frac{5}{9}(x - 32)$$

Thus, for example, if the forecast for that day is $86°$ Fahrenheit, Elke substitutes $x = 86$ to get

$$y = \frac{5}{9}(86 - 32) = \frac{5}{9}(54) = \frac{5 * 54}{9} = \frac{5 * 6 * 9}{9} = 30,$$

or 30 Celsius.

Let's now deal with Bruce, your non-so typical Bakersfieldean, walking by Les Champs Ellysées. Like Elke, he knows that $0°$ Celsius equal $32°$ Fahrenheit, and $10°$ Celsius equal $50°$ Fahrenheit. But for him, the input is in Celsius, so he has instead the points $(0, 32)$ and $(10, 50)$. Again, we know that the slope-point equation of a line is given by

$$y - c = m(x - a),$$

where m is the slope and (a, c) is *any* point. So, we need the slope:

$$m = \frac{50 - 32}{10 - 0} = \frac{18}{10} = \frac{9}{5}.$$

And with $(10, 50)$, we get

$$y - 50 = \frac{9}{5}(x - 10)$$

Bruce hears that the temperature for that day is 5 Celsius (it's Winter). But he wants to know exactly how cold it really is. Thus, he substitutes $x = 5$ to get

$$y = 50 + \frac{9}{5}(5 - 10) = 50 + \frac{9}{5}(-5) = 50 + \frac{-9 * 5}{5} = 50 - 9 = 41.$$

or 41 Fahrenheit.