Wind Chill *The formula that gives the wind chill factor for a 60°F temperature and a wind with velocity V in miles per hour is*[1]

$$W = \begin{cases} 60 & \text{if } 0 \le V < 4 \\ 0.644V - 9.518\sqrt{V} + 76.495 & \text{if } 4 \le V \le 55.9 \\ 41 & \text{if } V > 55.9 \end{cases}$$

Before we get started answering the questions, let's notice how the wind chill function W is defined on three intervals. The part of the function that you use will depend on the velocity of the wind, V.

For example, if the wind speed is at least 0 and less than 4, we'll use the first piece of the function:

$$W = \begin{cases} 60 & \text{if } 0 \le V < 4 \\ 0.644V - 9.518\sqrt{V} + 76.495 & \text{if } 4 \le V \le 55.9 \\ 41 & \text{if } V > 55.9 \end{cases}$$

Likewise, if the wind speed is at least 4 and at most 55.9, we'll use the second piece of the function:

$$W = \begin{cases} 60 & \text{if } 0 \le V < 4 \\ 0.644V - 9.518\sqrt{V} + 76.495 & \text{if } 4 \le V \le 55.9 \\ 41 & \text{if } V > 55.9 \end{cases}$$

And last, if the wind speed is greater then 55.9, we'll use the third piece of the function:

$$W = \begin{cases} 60 & \text{if } 0 \le V < 4 \\ 0.644V - 9.518\sqrt{V} + 76.495 & \text{if } 4 \le V \le 55.9 \\ 41 & \text{if } V > 55.9 \end{cases}$$

a. *Find the wind chill factor for the 60° temperature if the wind is 20 mph.*

We're asked about the value of W when $V = 20$ so our first step is to find the piece of W that corresponds to 20. Since 20 falls between 4 and 55.9 we'll use the function $W = 0.644V - 9.518\sqrt{V} + 76.495$ and substitute $V = 20$ to find W.

$$\begin{aligned} W &= 0.644V - 9.518\sqrt{V} + 76.495 \\ &= 0.644(20) - 9.518\sqrt{20} + 76.495 \\ &= 46.81 \end{aligned}$$

The wind chill factor for a 60°temperature when the wind is blowing 20 mph is 47°.

b. *Find the wind chill factor for the 60° temperature if the wind is 65 mph.*

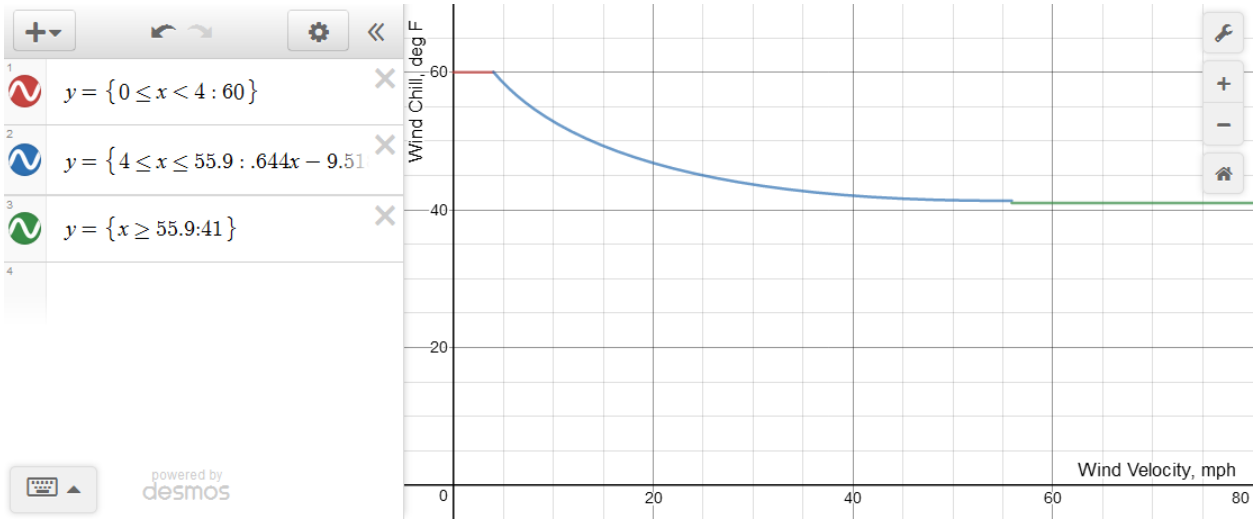
In this question we're asked about the value of W when $V = 65$. The third piece of the function is defined for all values of V that are greater than 55.9. Since $65 > 59.9$, we see that $W = 41$.

The wind chill factor for a 60°temperature when the wind is blowing 65 mph is 41°.

[1] Harshbarger/Yocco, *College Algebra In Context, 5e*, p. 210, #48.

c. *Graph the function for* $0 \leq V \leq 80$.

I graphed W in three pieces so you can clearly see how the function is defined in the given intervals.



d. *What are the domain and range of the function graphed in part (c)?*

The domain is all values of V that are defined. In this example, it doesn't make sense for the wind to blow in negative miles per hour and part (c) limits us to a wind velocity of 80. This gives us a domain of $0 \leq V \leq 80$.

The range are the values of W that are generated by the values of the domain. The range is $41 \leq W \leq 60$.