Proof that distance formula isn't admissible:

Distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

The most straightforward method to create a heuristic for this project is to

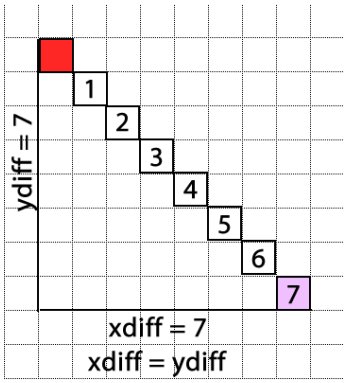
(1) create an admissible heuristic for 8-way movement

(2) create an admissible heuristic for the cost function

(3) multiply (1) and (2) to get your admissible heuristic for the program

Our group has talked with several people who are using the basic distance formula for (1). They assume that it is admissible because the shortest distance between two points is a straight line, but this is not the case for our discrete grid and 8-way movement.

Given this map for example:



the distance formula gives: $7\sqrt{2}$, whereas the true cost is 7. Therefore it is not admissible.

In order to create an admissible heuristic with the distance formula you must divide by at least $\sqrt{2}$. This comes from the fact that with 8-way movement you can move diagonally in 1 step.

Admissible Distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \div \sqrt{2}$

Conclusion:

The admissible distance above is a provable heuristic for (1). In order to get a heuristic for the program you must divide <u>further</u> by your solution to (2)! Giving something like this:

$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \div \sqrt{2} \div (\textit{solution to } (2))$

We are just bringing this up since the algorithm will find the optimal solution in all given test cases including the Mt. St. Helens part even if you leave out the $\sqrt{2}$. But it is not true for all possible cases. It is an overfitting.