Gas prices fluctuate regularly, and often times the prices differ from station to station. The dilemma arises when a gas station that is farther away offers a lower gas price. It becomes difficult to choose whether to drive the longer distance for a cheaper price, or to drive less but pay a higher gas price.

We approached this problem by making an excel file that would calculate the price needed to fill up at each gas station, given our arbitrary example values. We chose distances and prices for fifteen gas stations, as well as mileage, tank size, initial amount of gas in the tank, and the percent of the tank to fill up.

Distance	Price	Can you make	Cost	Gas Left at Home	Per Mile Cost	Best one
0	2.4	Yes	24	14	0.12	
5	2.3	Yes	23.575	13.75	0.115	
10	2.2	Yes	23.1	13.5	0.11	
15	2.1	Yes	22.575	13.25	0.105	
20	2	Yes	22	13	0.1	
25	1.9	Yes	21.375	12.75	0.095	
30	1.8	Yes	20.7	12.5	0.09	
35	1.7	Yes	19.975	12.25	0.085	
40	1.6	Yes	19.2	12	0.08	
45	1.5	Yes	18.375	11.75	0.075	
50	1.4	Yes	17.5	11.5	0.07	
55	1.3	Yes	16.575	11.25	0.065	
60	1.2	Yes	15.6	11	0.06	
65	1.1	Yes	14.575	10.75	0.055	Cheapest

MPG	20.00
Tank Size	14
Current Tank	4
Gas to get	10

Formula for Cost

$$cost = \left(gas\ to\ get + \left(\frac{distance}{mpg}\right)\right) * price$$

Can You Make it

$$if\ mpg \times current\ gas\ left\ in\ tank > distance,$$
$$then\ return\ Yes, else\ return\ No$$

Gas Left at Home

$$gas\ left\ at\ home = \ tank\ size - \left(\frac{distance}{mpg}\right)$$

We inputted sample data for the gas station distances and prices, as well as the car's mileage. Our next step was to generate a function for the cost to fill up at each station, to see which choice would be the cheapest. Our formula was cost=(gas to get +(distance)/milage)*price. "Gas to get" represents the amount of gas a person fills up, "distance" represents the distance to the gas station, the milage is based on the car's miles per gallon rating, and the price represents the price that the particular gas station offers.

The columns distance and price indicate the gas stations, and can be manipulated for any situation. The orange boxes on the right are the constants that were used. We generated the total cost formula which is explained above, and two other formulas for the amount of gas left at home, and if the car can drive to the given distance without running out of gas. The formula we used to figure out if the person can make it to the distance desired was, mpg*current amount of gas> distance. We used this inequality to see whether our solution was reasonable because the goal is to not run out of gas. We also calculated the amount left after the trip to make sure that there was enough gas to start driving in an upcoming trip. This is also a factor in choosing an optimal solution.

Using these formulas, we calculated the optimal solution using our particular values. We found that driving 65 mi would be the best decision because that gas station offers the lowest price and when we entered the values in our equation, it was still worth it to drive the distance because the low gas price outweighed the cost of the gas needed to drive to the farther distance. However, this solution leaves the person with the least amount of gas once they get home compared to other solutions.

To develop this solution further, we could come up with a model that eliminates our assumption that we start at the same point every single time.