Gas Station Write – Up

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Problem Statement

There are two gas stations that you are considering going to. First find out which would be a better deal. Then apply this to multiple gas stations.

Process

We attempted to make the simplest possible scenario. We researched cars, mileage, tank capacity, and different gas station prices and proximity. Next, we made assumptions and developed an equation to provide a simple solution to the problem. Finally, we made a generic case that takes any values into account.

Solution

We are first optimizing for only cost, then we are creating a composite score of cost and time spent driving to the gas station. We are also considering the amount of gas the car starts with in our more general model.

P: Price in dollars per gallon
D: Distance to gas station on roads in miles
E: Fuel efficiency in miles per gallon
V: Volume of gas we want to buy, in gallons
S: Speed of vehicle, in mph
C: Dollar value user places on their time in hours
G: Gas vehicle has in tank at start, in gallons

Basic Case

```
p1 = 2;

p2 = 2.5;

d1 = 5;

d2 = 10;

e = 15;

v = 15;
```

```
cost1 = N[p1 d1 / e + v p1]
```

30.2857

```
cost2 = N[p2 d2 / e + v p2]
```

38.2143

```
best = Min[cost1, cost2]
```

30.2857

Generic Case

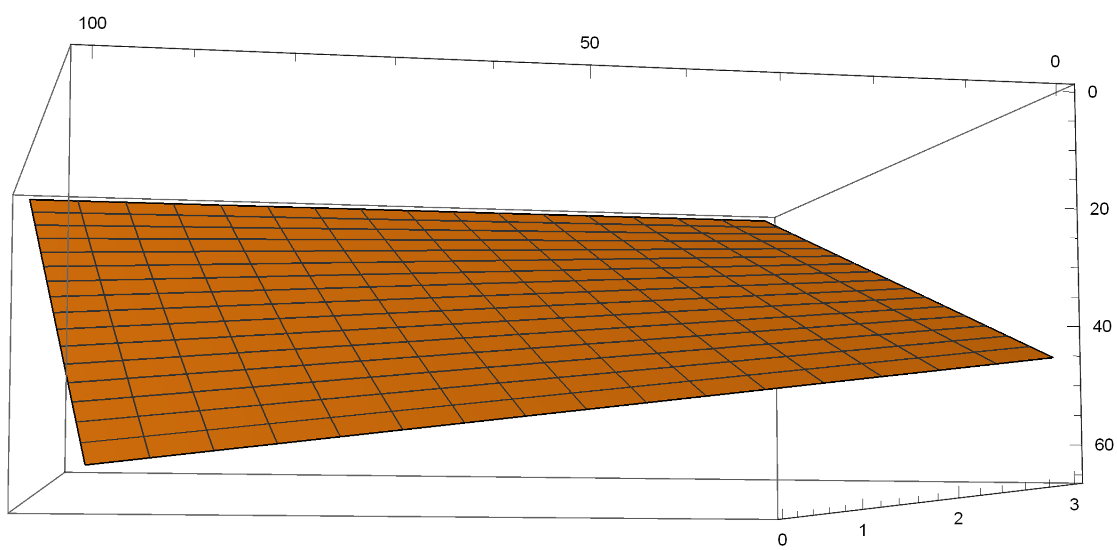
This case took the lists of p and d to compute the best price possible for the given values. We then put those values into a table and then we plotted it in a 3D graph. This case also had three gas stations. The slope can be seen in the model below.

```
p = {2, 2.5, 4};
```

```
d = {5, 10, 0.5};
Grid[Prepend[Table[Transpose[{p, d}]], {"price", "distance"}],
 Alignment → Center, Dividers → {2 → True, 2 → True}, Spacings → {1, 1}]
```

price	distance
2	5
2.5	10
4	0.5

```
Plot3D[x * v + x * y / e, {x, 0, 3}, {y, 0, 100}, ImageSize → Large]
```




```
s = 40;
```

```
c = 15;
```

```
bestprice = N[Min[
   Table[Take[p, {i, i}] (v + Take[d, {i, i}] / e) + Take[d, {i, i}] c / s, {i, 1, Length[p]}]]]
```

```
32.5417

Table[{i, N[Take[p, {i, i}] (v + Take[d, {i, i}] / e) + Take[d, {i, i}] c / s]},
  {i, 1, Length[p]}]

{{1, {32.5417}}, {2, {42.9167}}, {3, {60.3208}}}
```

Generalizations

– Fuel efficieny is constant
– You have enough gas to get to the gas station
– The generic case can be generalized to any scenario

Self – Assement

We tried many different methods starting from simple to complex. During that process, we were experimenting with various values for the distances. We originally chose 25 and 50 miles, but people would not realistically go that far to get gas. We made sure that the simplest case functioned properly, then we made it more complicated by adding a 3 D model and a generic case. Our team worked diligently together by considering various possibilities before we complicated the scenario. We had assistance from the Mathemtica documentation guide. It helped us by clarifying certain syntax and parameters.