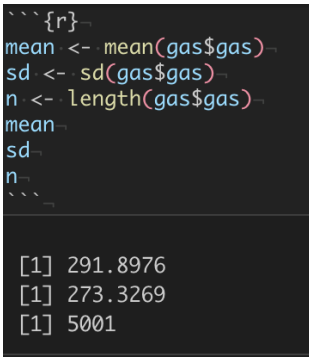
Authors - Sargam Gupta, Grace Jiang, Dylan Kahn, Xiangjing Lai, Jiaqi Zhao

After analyzing the client data we found that, with 95% confidence, the average gasoline consumption of a household is between a lower bound of **284.1675** liters per month and an upper bound of **299.6276** liters per month.



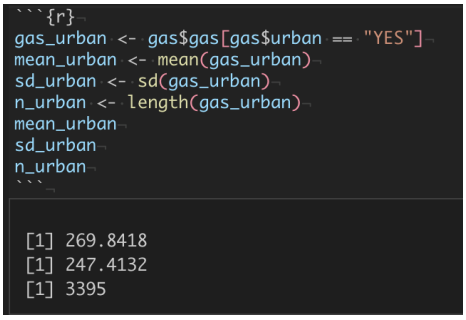
```{r}
mean <- mean(gas$gas)
sd <- sd(gas$gas)
n <- length(gas$gas)
mean
sd
n
```

```
[1] 291.8976
[1] 273.3269
[1] 5001
```

```{r}
se <- sd/sqrt(n)
lower.end <- mean - 2*se
upper.end <- mean + 2*se
se
lower.end
upper.end
```

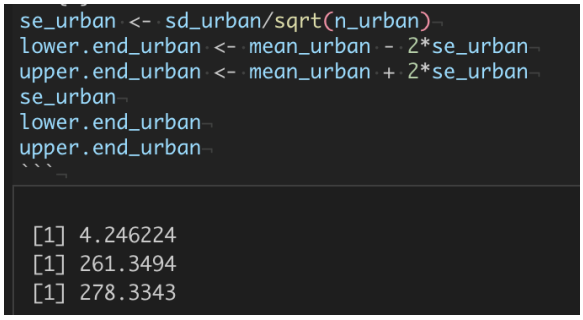
```
[1] 3.86504
[1] 284.1675
[1] 299.6276
```

In urban households, we can say with 95% confidence that the average gas consumption is between a lower bound of **261.3494** liters per month and an upper bound of **278.3343** liters per month.



```{r}
gas_urban <- gas$gas[gas$urban == "YES"]
mean_urban <- mean(gas_urban)
sd_urban <- sd(gas_urban)
n_urban <- length(gas_urban)
mean_urban
sd_urban
n_urban
```

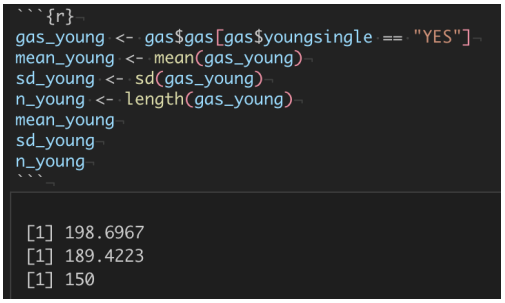
```
[1] 269.8418
[1] 247.4132
[1] 3395
```



```
se_urban <- sd_urban/sqrt(n_urban)
lower.end_urban <- mean_urban - 2*se_urban
upper.end_urban <- mean_urban + 2*se_urban
se_urban
lower.end_urban
upper.end_urban
```

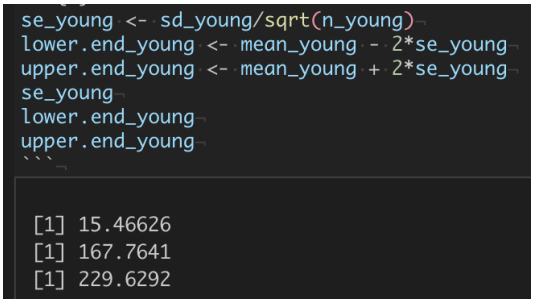
```
[1] 4.246224
[1] 261.3494
[1] 278.3343
```

In households consisting of those who are young and single, we found a 95% confidence interval of the average gas consumption between a lower bound of **167.7641** liters per month and an upper bound of **229.6292** liters per month.



```{r}
gas_young <- gas$gas[gas$youngsingle == "YES"]
mean_young <- mean(gas_young)
sd_young <- sd(gas_young)
n_young <- length(gas_young)
mean_young
sd_young
n_young
```

```
[1] 198.6967
[1] 189.4223
[1] 150
```

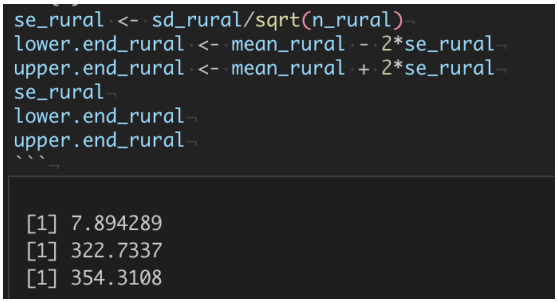


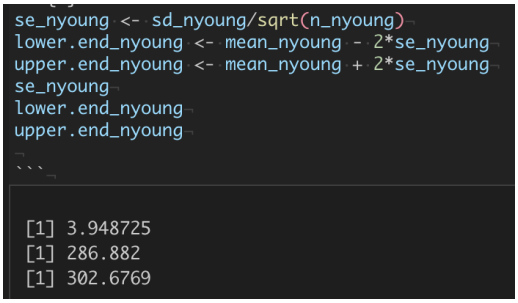
```
se_young <- sd_young/sqrt(n_young)
lower.end_young <- mean_young - 2*se_young
upper.end_young <- mean_young + 2*se_young
se_young
lower.end_young
upper.end_young
```

```
[1] 15.46626
[1] 167.7641
[1] 229.6292
```

Yes, we agree with the client executives' claims that the urban households & young and single households both represent lower proprietary sales of gas consumption than their respective

counterparts. In terms of the urban counterpart, we found with 95% confidence that the average **rural** household gas consumption is between **322.7337** and **354.3108** liters per month. Households that are represented as **not** young and single consume between **286.882** and **302.6769** liters per month on average, based on a 95% confidence interval.





If one of the two campaigns is to be chosen, we would choose to target urban households. Based on the large sample size, the number of consumers of urban households is significantly larger than that of young and single households (3395 > 150), the mean of the consumption of urban is larger than that of young and single (269 > 198), and the lower and higher ends of 95% confidence intervals are larger as well (261.3494 ~ 278.3343, compared to 167.7641 ~ 229.6292). If the campaign costs are the same, investing in targets with higher returns, which in this case is the urban households, is indubitable.

We recommend that the client does not launch both campaigns simultaneously, but to only launch the campaign for urban households for two reasons. First, out of the 5001 household sample size, only 3% of households are young and single. Therefore, a campaign targeting this group may not bring out significant profit to the company due to the low percentage of young and single households expected among the larger population. In addition, 83% of young and single households are also categorized as urban. The large overlap makes it inefficient to launch both campaigns at the same time, which may generate a waste of investment in the campaign that could be hard to offset by the 20% discount of doing both campaigns simultaneously.

Missing a very few people (26%) of rural young and single by not running campaign 2