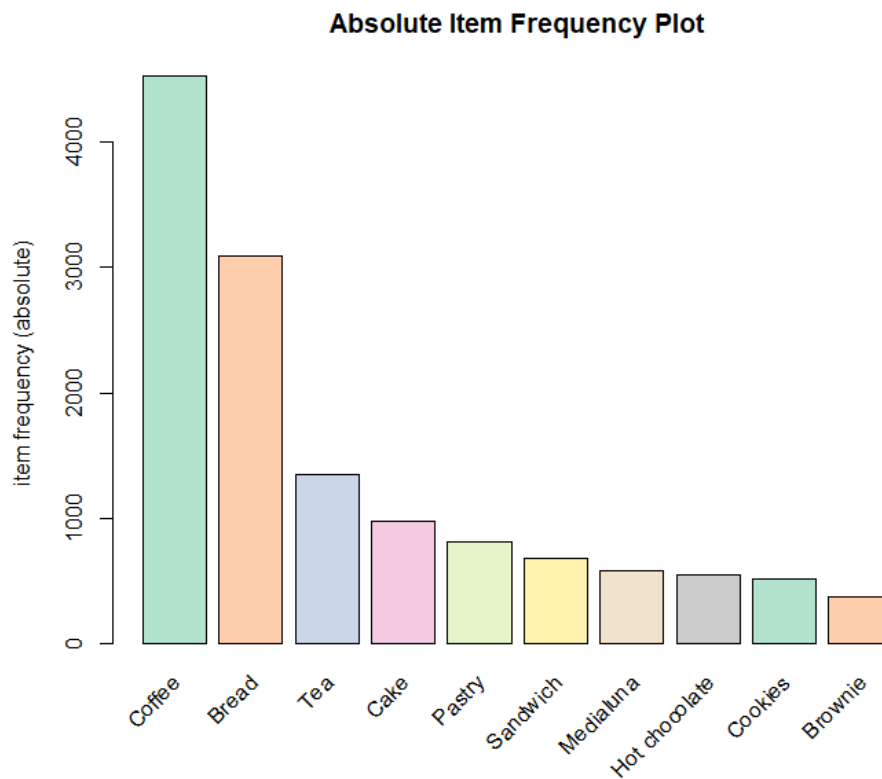


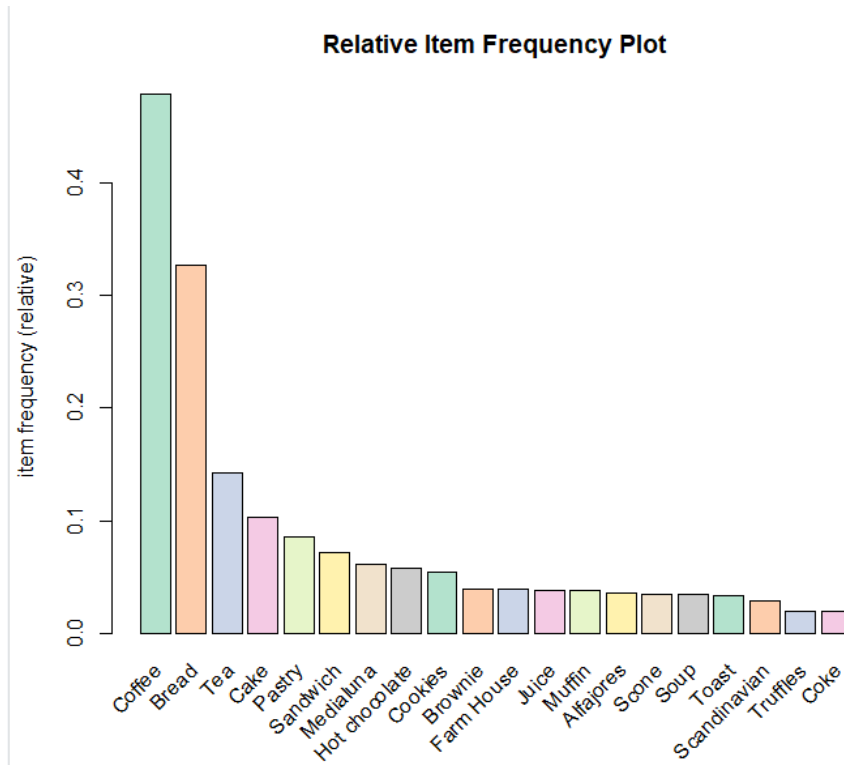
1. Combination of which 2 items will increase the sales on a regular basis?**Answer and results:**

The answer to the above question can be figured out if we can determine which products are more likely to be purchased with which products, implying that sale of one product will lead to sale of the other hence increasing the overall sales. Market basket analysis is a data mining technique used by retailers to increase sales by better understanding customer purchasing patterns. By determining the purchasing patterns of the customer, we can develop strategies to combine items to increase the sales on a regular basis.

On performing the basket analysis, we arrive at following results and conclusion:

Item Frequency Plots:

a. Absolute-**b. Relative-**



At this point, we can answer the question: Which item has more sales than the rest?

From the above given graphs, we can conclude that coffee is the highest selling item.

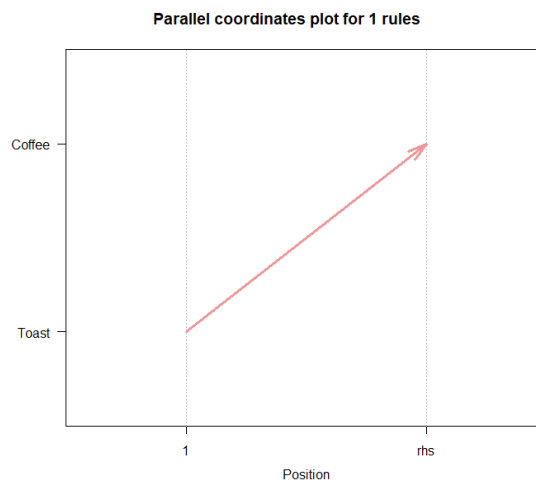
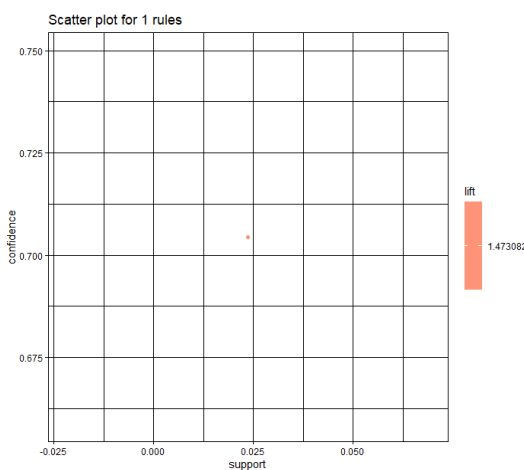
Exploring further, we are able to generate only one association rule with considerable lift(>1) for our requirement i.e. Toast => Coffee

```

> inspect(rules)
  lhs      rhs      support  confidence coverage  lift    count
[1] {Toast} => {Coffee} 0.02366614 0.7044025 0.03359746 1.473082 224

```

Visualizing the rule:



Toasts and Coffee are most likely to be purchased together. **When a client buys a toast, it is most probable that they will also buy a coffee afterwards.**

Conclusions:

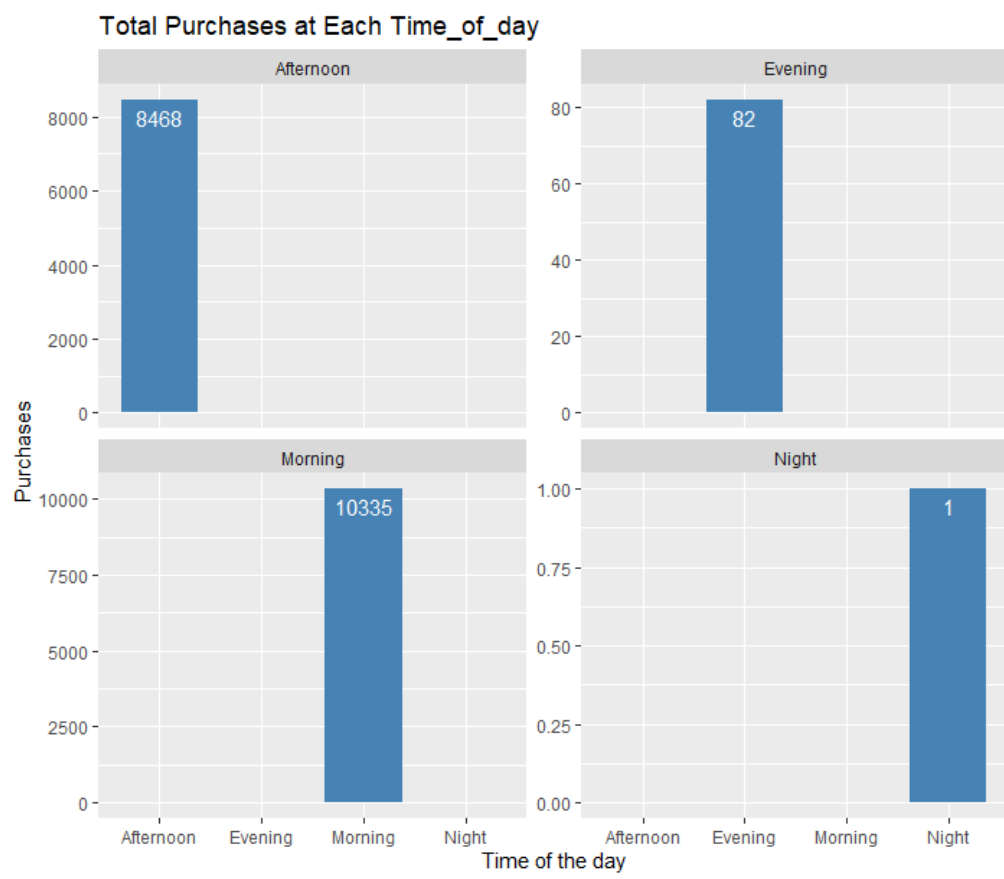
- In around 2% of all the transactions, Toast and Coffee are bought together.
- When Toast is bought, the likelihood that Coffee is then bought is 70%.

So, combination of toast and coffee will increase the sales on a regular basis.

2. At what time of the day are the sales most influential?

Answer and results:

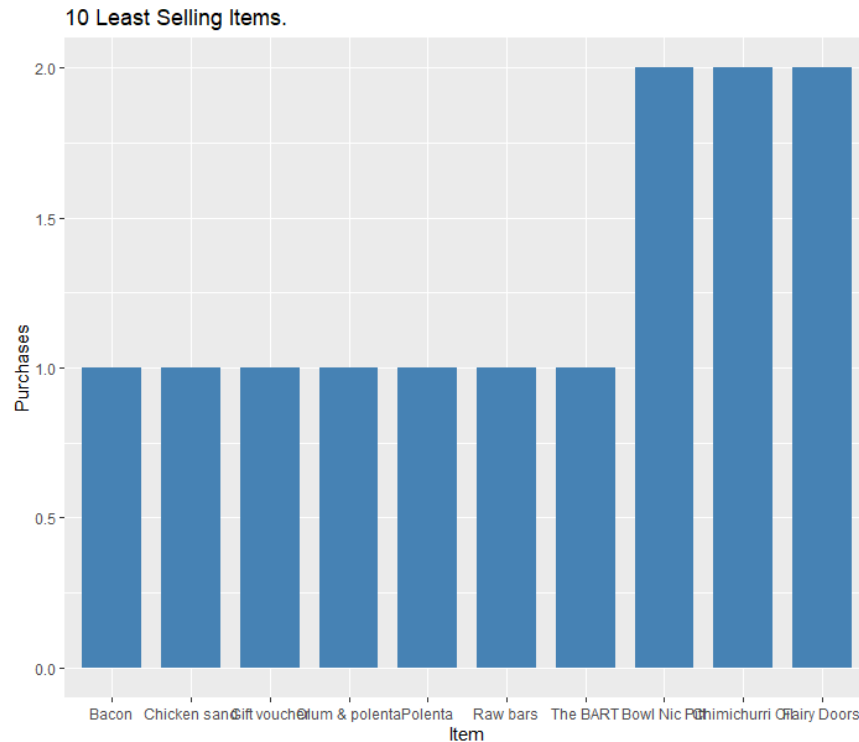
The time of the day the sales are influential can be determined by finding out total item sold during each time of the day (Session: Morning, Afternoon, Evening, Night).



From the graph, it can be inferred that the mornings are the busiest. Morning timings 7:00 am till noon are the most influential for sales.

3. If you had to replace an item from the servings, which would it be and why?

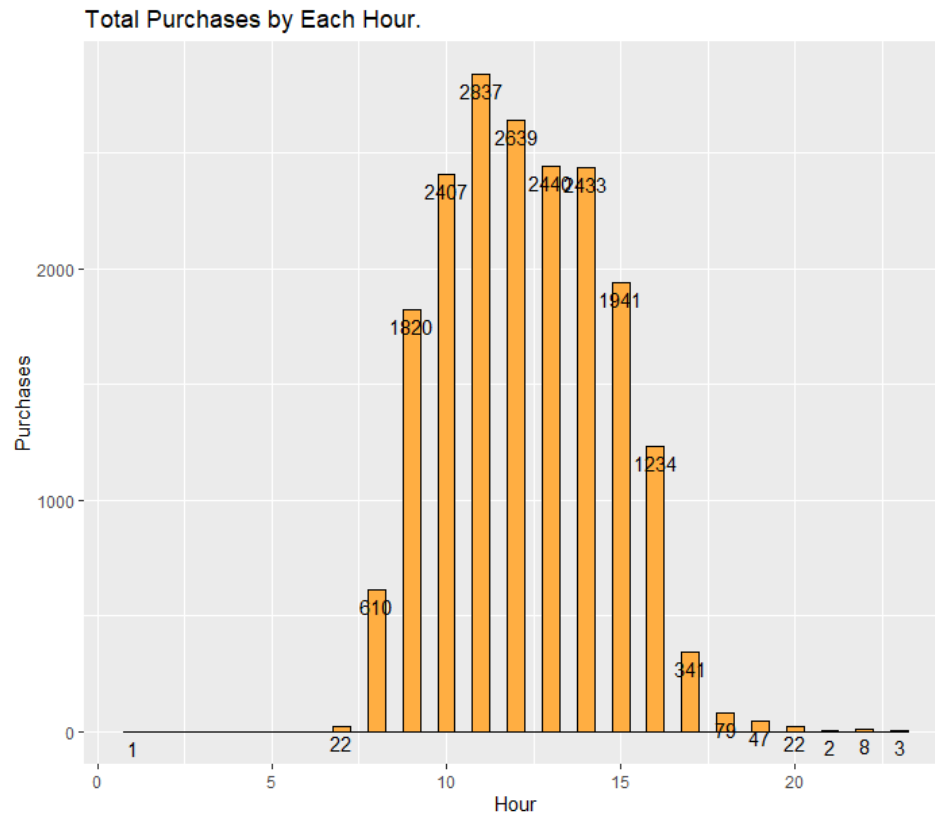
Answer and results:



While plotting the graph for 10 least selling items, we observe that there are only one or two servings of few items such as Bacon, Chicken Sand etc out of 18,886 unique transactions. Keeping such items for sale is certainly not of use. Instead, if resources spent of such stock can be instead spent on the top selling items such as coffee or bread which in turn would be profitable.

4. If you had to add wine to one particular hour of the day, at what time would it be?

Answer and results:



It can be observed that the busiest hours of the sales are in the morning from the above graph implying that customers consistently buy items during the morning hours. If wine had to be added to an hour, it should be added to the time where the bakery gets in decent amount of customers. Infact, adding the wine should be at the hour in such a way that it increases the sales in that hour (due to addition of wine) thus increasing overall sales.

As observed the morning till afternoon hours are busy enough so the viable option that suits our needs are the evening hours. Wine can be added at 4:00pm slot and hence forth(till 6:00pm if possible) so that proper sales are ensured.