ASSOCIATION RULE MINING

The Bread_basket dataset consists of 20507 observations and 5 features including both numerical and categorical. For this study, only essential features, namely the item and transaction number, were kept, discarding date_time, period_of_day, and weekday_or_weekend.
To use the “arules” library, the data was transformed into a transaction format. This involved removing 1,620 duplicated rows and ensuring no missing values.
To get a broad overview, the number of items in each basket was analyzed in terms of both raw count and percentage of total items. The data indicates that coffee, for instance, was purchased 4,528 times, making up 47.84% of all transactions, highlighting its popularity.

Subsequently, a set of rules was generated using the apriori algorithm with a support level of 0.04. From these, only rules with a lift value above 1.0 were selected retained.
The resulting rules were:

```
> inspect(rules)
    lhs         rhs      support    confidence coverage   lift     count
[1] {Pastry} => {Coffee} 0.04754358 0.55214724 0.08610671 1.154168 450
[2] {Coffee} => {Pastry} 0.04754358 0.09938163 0.47839408 1.154168 450
[3] {Cake}   => {Coffee} 0.05472795 0.52695829 0.10385631 1.101515 518
[4] {Coffee} => {Cake}   0.05472795 0.11439929 0.47839408 1.101515 518
>
```

A ‘lift’ value greater than 1 indicates a positive relationship between items. For instance, the first rule implies that buying pastry increases the likelihood of buying coffee. This trend is consistent across all four rules. The 'Count' showcases how often items are purchased together. As an example, cake and coffee were bought together in 518 transactions.
'Support' indicates the proportion of combined product transactions. For instance, a support of 0.04754358 in the second rule means that pastry and coffee appear together in 4.75% of all transactions.
'Confidence' reveals the probability of one product being bought when another is. Using the first rule's confidence level of 0.55214724 as an example, it shows a 55.21% chance that when a pastry is purchased, coffee will also be.
Finally, 'Coverage' reflects how often rule items appear in all transactions. For instance, the 0.47839408 coverage of the fourth rule indicates that coffee features in 47.84% of transactions.