Minimum support is given at 40%. In other words, at least 2 out of 5 transactions must include the associated items. We can calculate the support for each purchased food item as below:

|  |  |  |
| --- | --- | --- |
| Items | Support | Support (%) = (Support \* 100) / Number of transactions |
| Salad | 2 | (2 \* 100) / 5 = 40% |
| Hamburger | 3 | (3 \* 100) / 5 = 60% |
| Taco | 2 | (2 \* 100) / 5 = 40% |
| Pasta | 4 | (4 \* 100) / 5 = 80% |
| Soup | 4 | (4 \* 100) / 5 = 80% |

**Table 1: Support of all food items**

As the support of all food items is equal or greater than 2, we select all food items for next step, which is to create combinations of two food items with their support:

|  |  |  |
| --- | --- | --- |
| Items | Support | Support (%) = (Support \* 100) / Number of transactions |
| {Salad, Hamburger} | 2 | (2 \* 100) / 5 = 40% |
| {Salad, Taco} | 1 | (1 \* 100) / 5 = 20% |
| {Salad, Pasta} | 1 | (1 \* 100) / 5 = 20% |
| {Salad, Soup} | 1 | (1 \* 100) / 5 = 20% |
| {Hamburger, Taco} | 1 | (1 \* 100) / 5 = 20% |
| {Hamburger, Pasta} | 2 | (2 \* 100) / 5 = 40% |
| {Hamburger, Soup} | 2 | (2 \* 100) / 5 = 40% |
| {Taco, Pasta} | 1 | (1 \* 100) / 5 = 20% |
| {Taco, Soup} | 1 | (1 \* 100) / 5 = 20% |
| {Pasta, Soup} | 3 | (3 \* 100) / 5 = 60% |

**Table 2: Support of combinations of two food items**

From table 2, we can find combinations of 3 or 4 food items with their support:

|  |  |  |
| --- | --- | --- |
| Items | Support | Support (%) = (Support \* 100) / Number of transactions |
| {Salad, Hamburger, Taco} | 1 | (1 \* 100) / 5 = 20% |
| {Soup, Hamburger, Pasta} | 2 | (2 \* 100) / 5 = 40% |
| {Salad, Soup, Hamburger, Pasta} | 1 | (1 \* 100) / 5 = 20% |

**Table 3: Combinations of three or more food items**

From table 1, 2, and 3, we get the frequent food items and their support as below:

|  |  |  |
| --- | --- | --- |
| Items | Support | Support (%) = (Support \* 100) / Number of transactions |
| Salad | 2 | (2 \* 100) / 5 = 40% |
| Hamburger | 3 | (3 \* 100) / 5 = 60% |
| Taco | 2 | (2 \* 100) / 5 = 40% |
| Pasta | 4 | (4 \* 100) / 5 = 80% |
| Soup | 4 | (4 \* 100) / 5 = 80% |
| {Salad, Hamburger} | 2 | (2 \* 100) / 5 = 40% |
| {Hamburger, Pasta} | 2 | (2 \* 100) / 5 = 40% |
| {Hamburger, Soup} | 2 | (2 \* 100) / 5 = 40% |
| {Pasta, Soup} | 3 | (3 \* 100) / 5 = 60% |
| {Soup, Hamburger, Pasta} | 2 | (2 \* 100) / 5 = 40% |

Next, we will calculate the confidence for the pairings:

|  |  |  |
| --- | --- | --- |
| Items | Association rule | Confidence = Support (X, Y) / Support(X) |
| {Salad, Hamburger} | Salad -> Hamburger | 40% / 40% = **100%** |
|  | Hamburger -> Salad | 40% / 60% = 66.67% |
| {Hamburger, Pasta} | Hamburger -> Pasta | 40% / 60% = 66.67% |
|  | Pasta -> Hamburger | 40% / 80% = 50% |
| {Hamburger, Soup} | Hamburger -> Soup | 40% / 60% = 66.67% |
|  | Soup -> Hamburger | 40% / 80% = 50% |
| {Pasta, Soup} | Pasta -> Soup | 60% / 80% = 75% |
|  | Soup -> Pasta | 60% / 80% = 75% |
| {Soup, Hamburger, Pasta} | Soup, Hamburger -> Pasta | 40% / 40% = **100%** |
|  | Soup, Pasta -> Hamburger | 40% / 60% = 66.67% |
|  | Pasta, Hamburger -> Soup | 40% / 40% = **100%** |

Since the minimum confidence level is 80%, we generate three valid rules

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Association rule | Support | Support (%) | Confidence | Lift = Confidence / Support |
| Salad -> Hamburger | 2 | 40% | 100% | 2.5 |
| Soup, Hamburger -> Pasta | 2 | 40% | 100% | 2.5 |
| Pasta, Hamburger -> Soup | 2 | 40% | 100% | 2.5 |

In summary, support for {salad} -> {hamburger} is 2/5, meaning that 40% of the transactions include this pair of items. Confidence for {salad} -> {hamburger} is 100%. In other words, on the condition that someone purchases a salad, there is probability 1/1 that the same purchase includes a hamburger. The lift is 2.5, meaning that if a customer buys a salad, he/she is 2.5 times more likely to also buy a hamburger (than her/his chance of buying a hamburger if we know nothing about him/her). The same applies to the other two pairings since they all have the same information.