Problem 1:

1. attributes:

F : {poor, average, good}

A : {inferior, normal, superior}

S : {bad, fair}

output classifications:

L : {yes , no}

There are 3\*3\*2 = 18 possible instances

1. Hypothesis space size is 2^18 = 262,144
2. Not consistent. According to the data, Alice can like restaurants that do not have good food and also cannot like restaurants that do have good food.
3. Version space includes instances with 2 yes's and 3 no's. This leaves 13 other instances that could be anything. Thus, the version space size is 2^13 = 8,192
4. By introducing the sum, the attributes of an instance now deterministically determine that instance's classification. Thus, there is only one hypothesis in the hypothesis space - the one that assigns "yes" to instances that have a positive sum and "no" to instances that do not. The following is the single hypothesis function:

|  |  |  |
| --- | --- | --- |
| **Instance** | **Values** | **Classification** |
| Poor, inferior, bad | -1 , -1 , -1 | No |
| Poor, inferior, fair | -1 , -1 , 1 | No |
| Poor, normal, bad | -1 , 0 , -1 | No |
| Poor, normal, fair | -1 , 0 , 1 | Yes |
| Poor, superior, bad | -1 , 1 , -1 | No |
| Poor, superior, fair | -1 , 1 , 1 | Yes |
| Average, inferior, bad | 0 , -1 , -1 | No |
| Average, inferior, fair | 0 , -1 , 1 | Yes |
| Average, normal, bad | 0 , 0 , -1 | No |
| Average, normal, fair | 0 , 0 , 1 | Yes |
| Average, superior, bad | 0 , 1 , -1 | Yes |
| Average, superior, fair | 0 , 1 , 1 | Yes |
| Good, inferior, bad | 1 , -1 , -1 | No |
| Good, inferior, fair | 1 , -1 , 1 | Yes |
| Good, normal, bad | 1 , 0 , -1 | Yes |
| Good, normal, fair | 1 , 0 , 1 | Yes |
| Good, superior, bad | 1 , 1 , -1 | Yes |
| Good, superior, fair | 1 , 1 , 1 | Yes |

1. Since the hypothesis set only contains one function, and since the training set is not consistent with that one hypothesis function, then the size of the version space is 0.

Problem 3:

nd + nlogn + klogn + kd + dlogd + 10logd

nd + nlogn + dlogd

ns + nlogn + klogn + kd + dlogd + 10logd