1. K-Nearest-Neighbors models follow the intuition that if two observations have similar characteristics, they will have the same outcome. They predict an outcome for an unknown observation by taking into account known outcomes that are closest to it along certain dimensions.

2.

x	Target	Manhattan Distance From (4,2)
(1,6)	7	7
(2,4)	8	4
(3,7)	16	6
(6,8)	44	8
(7,4)	50	5
(8,5)	68	7

1 nearest neighbor: prediction for (4,2) is 8
3 nearest neighbors: prediction for (4,2) is (8+50+16)/3 = 24.67

$\mathbf{XX^T}$ = (1 1 0 0 0 0
1 1 0 0 0 0
0 0 1 1 0 0
0 0 1 1 0 0
0 0 0 0 1 1
0 0 0 0 1 1)

When 2 observations have the same value for this variable, the matrix will have a value of 1 at their intersection, and when they have different values, it will have a 0 at their intersection. If we subtract this from a matrix of all 1s, we'll obtain a distance matrix where the value is 0 if they match, 1 otherwise.

3. Advantages:
   - understandable and easy to explain
   - applicable to any type of data
   - makes no mathematical or statistical assumptions etc.

   Disadvantages:
   - computationally expensive in the classification phase
   - requires storage for the training set
   - results depend on choice of distance function/combination function/k etc.