2.Exercise

(i)

The sentence is wrong because it can happen that
$D[X_1] \subseteq D[X_2]$ but $q(X_1) \geq q(X_2)$
Let D be the following database
1. abc
2. ac
3. bc
4. cd
5. acd
6. ac

Let 1,3,4,5 be the transactions marked with positive sign
Let $X_1 = ab, X_2 = ac$
So $|D[X_1]| = 1, |D^+[X_1]| = 1, |D[X_2]| = 4, |D^+[X_2]| = 2, |D^+| = 4, |D| = 6$
$q(X_1) = \sqrt{1}.|\frac{|1|}{|1|} - \frac{|4|}{|6|}| = 1.(1 - \frac{4}{6}) \approx 0.33333$
$q(X_2) = \sqrt{3}.|\frac{|2|}{|4|} - \frac{|4|}{|6|}| \approx \sqrt{3}.(0.166666) \approx 0.28867$
$q(X_2) < q(X_1)$ even $D[X_1] \subset D[X_2]$
So the statement isn't true

(ii)

The function separates the transactions in the database into two types (interesting, not interesting).
The function calculates the quality by finding the difference between the fraction $\frac{D^+[X]}{D[X]}$ and the fraction $\frac{D^+}{D}$, and multiplying the result with a number representing how many transactions contain it.
So we can say that it tries to find the proportion of the interesting transactions containing X over the total number of occurrences of X in D.
The output can get bigger if $D[X]$ is big which means that many transactions contain X, or if $D^+[X]$ is close to $D[X]$ because the fraction $\frac{D^+[X]}{D[X]}$ would closer to 1 and so the difference would be bigger, which means that many of X occurrences are interesting.