PROBLEM 1

(C) Consider the instance space $X = \{1, 2, ..., 999\}$. Let $\mathcal{C}$ be a concept class consisting of 10 concepts, c_0 through c_9. A number $n \in X$ is an element of c_i if the normal decimal representation of n contains the digit i. So, for example, the number "778" is an element of c_7 and c_8. What is the VC dimension of $\mathcal{C}$? Justify your answer.
(Hint: To prove the VC dimension of $\mathcal{C}$ is k, you should justify the following claims. 1. There exist k elements in X that $\mathcal{C}$ can shatter. 2. No $k+1$ or more elements in X that $\mathcal{C}$ can shatter.)