# Question 1

* To prove the set is universal, have to show it in general, i.e., for any finite
* The particular case of is already fleshed out as part of the problem statement, as an example
* Property: Given a bucket, say , and given a key , the number of functions in such that is . Must prove this to use
* Not proving Claim 1 from lecture notes 3a, but rather that the number of hash functions in the set has a certain property

Alternate wording: We are given a set of hash functions all of whose domains are and co-domains are . Need to prove that this set is indeed universal, where universal means: given any two distinct , the number of functions in that set of functions given for which is at most the cardinality of the set divided by .

* So, given a universal set, there is only one way to choose from it, which is uniformly at random
* This question addresses generation or creation of the universal set, not the way we pick a function given such a set
* The way we generate a universal set, given is to simply adopt the set of all functions with domain and co-domain
* This question is asking about the practicality of adopting that set as our universal set

# Question 2

Example:

The items are but not necessarily sorted.

When we break up the array into pieces of , we get:

The median of the first piece of size is , the second is , and the third is .

The median of is . So, on this input array would return .

Another example:

Subsequences:

The medians are:

If (to find the smallest number), then the array would be split around and the algorithm recurses on the left portion. This portion is of size .

Clearly, , so the claim holds for this case.

# Question 3

# Question 4

# Question 5

# References

**There are no sources in the current document.**