

ASSIGNMENT 2

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Download all python codes from

<https://github.com/harithar1234/ai1103/blob/main/ASSIGNMENT2/assignment2.py>

1 PROBLEM(GATE EC, Q. 10)

Let X and Y denote the sets containing 2 and 20 distinct objects respectively and F denote the set of all possible functions defined from X and Y. Let f be randomly chosen from F. The probability of f being one-to-one.....

2 SOLUTION

Number of elements of set X = $|X|=2$

Number of elements of set Y = $|Y|=20$

Total number of possible functions defined X to Y=Number of elements of set F= $|F|$.

The total number of mappings from a set with m elements to a set with n elements, is n^m .

Hence by definition,

$$|F| = |Y|^{|X|} = 20^2 = 400 \quad (2.0.1)$$

Let O be the set of all possible one-to-one functions defined from set X to Y.

Let $|O|$ be number of one-to-one functions from X to Y. Clearly $|X| < |Y|$.

The total number of one-to-one mappings from a set with m elements to a set with n elements, $m < n$, is $\frac{n!}{n-m!}$.

Hence by definition,

$$|O| = \frac{|Y|!}{(|Y| - |X|)!} = \frac{20!}{(20-2)!} = 20 \times 19 = 380 \quad (2.0.2)$$

Hence, by definition the probability of randomly chosen function f from F being one to one is $\Pr(f)$ given by,

$$\Pr(f) = \frac{|O|}{|F|} = \frac{380}{400} = \frac{19}{20} = 0.95 \quad (2.0.3)$$