

# AI1103 Assignment-5

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Download all python codes from

<https://github.com/Srivatsan-T/AI1103/tree/main/Assignment-5/codes>

and latex-tikz codes from

<https://github.com/Srivatsan-T/AI1103/blob/main/Assignment-5/Assignment-5.tex>

Probability that the selected set contains 2 defective items =  $\Pr(M = 2)$

$$\Pr(M = 2) = \frac{{}^K C_2 \times {}^{N-K} C_{n-2}}{{}^N C_n} \quad (0.0.2)$$

$$= \frac{{}^{20} C_2 \times {}^{100-20} C_{2-2}}{{}^{100} C_2} \quad (0.0.3)$$

$$= \frac{{}^{20} C_2 \times {}^{80} C_0}}{{}^{100} C_2} \quad (0.0.4)$$

$$= \frac{20 \times 19}{100 \times 99} \quad (0.0.5)$$

$$= \frac{19}{495} \quad (0.0.6)$$

So the probability that the selected set of 2 items contain 2 defective items is  $\frac{19}{495}$ .

Correct Option : D

## QUESTION (GATE-ME-2006-Q4)

A box contains 20 defective items and 80 non-defective items. If two items are selected at random without replacement, what will be the probability that both items are defective?

- A.  $\frac{1}{5}$     B.  $\frac{1}{25}$     C.  $\frac{20}{99}$     D.  $\frac{19}{495}$

## SOLUTION

This problem involves Hyper-Geometric distribution

- Number of defective items = 20
- Number of non-defective items = 80

One can use Hyper-Geometric distribution to find out the probability that the selected set contains 2 defective items.

Let M be a variable representing the number of non-defective items in a selection of 2 items.

M has a probability distribution Function:

$$\Pr(M = k) = \frac{{}^K C_k \times {}^{N-K} C_{n-k}}{{}^N C_n} \quad (0.0.1)$$

Here Success refers to selecting a defective item,

|   |                               |               |
|---|-------------------------------|---------------|
| K | Total successes in population | 20            |
| N | Population size               | 80 + 20 = 100 |
| k | Total observed successes      | 2             |
| n | Number of draws               | 2             |