AI1103 Assignment-1
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Download all python codes from
https://github.com/rajasekhar156/AI1103/blob/main/assignment–1.py
and latex-tikz codes from
https://github.com/rajasekhar156/AI1103/edit/main/assignment-1.tex

QUESTION:
A manufacturer has three machine operators A, B and C. The first operator A produces 1% defective items, where as the other two operators B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the time, B is on the job for 30% of the time and C is on the job for 20% of the time. A defective item is produced, what is the probability that it was produced by A?

ANSWER:
P(A) : be the probability that item is produced by operator A.
P(B) : be the probability that item is produced by operator B.
P(C) : be the probability that item is produced by operator C.
D be the event that item produced is defective.
So from question it is clear that
$P(A) = \frac{50}{100} = \frac{1}{2}$, $P(B) = \frac{30}{100} = \frac{3}{10}$, $P(C) = \frac{20}{100} = \frac{1}{5}$. And————(1)

$P(\frac{D}{A})$: is the probability of defective item produced by A.
$P(\frac{D}{B})$: is the probability of defective item produced by B.
$P(\frac{D}{C})$: is the probability of defective item produced by C.
From the question it is clear that
$P(\frac{D}{A}) = \frac{1}{100}$, $P(\frac{D}{B}) = \frac{5}{100}$, $P(\frac{D}{C}) = \frac{7}{100}$ ————(2)

$P(D) = P(A)P(\frac{D}{A}) + P(B)P(\frac{D}{B}) + P(C)P(\frac{D}{C})$ As the defective item can be produced from either operator A or B or C.
$P(D) = (\frac{1}{2})(\frac{1}{100}) + (\frac{3}{10})(\frac{5}{100}) + (\frac{1}{5})(\frac{7}{100}) = \frac{34}{1000}$

We need to find probability that item was produced by operator A given that item is defective $P(\frac{A}{D})$

From conditional probability,
$\mathrm{P}(\frac{A}{D}) = \frac{P(AD)}{P(D)} = \frac{\frac{P(AD)}{P(A)}}{\frac{P(D)}{P(A)}} = \frac{P(\frac{D}{A})}{\frac{P(D)}{P(A)}} = \frac{P(\frac{D}{A})P(A)}{P(D)}$

On substituting values from (1) and (2)
$\mathrm{P}(\frac{A}{D}) = \frac{(0.01)(0.5)}{(0.034)} = \frac{5}{34}$
Required probability is 0.147058