Q2. One of the four persons John, Rita, Aslam or Gurpreet will be promoted next month. Consequently the sample space consists of four elementary outcomes S = {John promoted, Rita promoted, Aslam promoted, Gurpreet promoted}. You are told that the chances of John's promotion is same as that of Gurpreet, Rita's chances of promotion are twice as likely as Johns. Aslam's chances are four times that of John.
(a) Determine
P(John promoted)
P(Rita promoted)
P(Aslam promoted)
P(Gurpreet promoted)
(b) If A = {John promoted or Gurpreet promoted}, find P(A).
Sol: Let Event: J = John promoted
R = Rita promoted
A = Aslam promoted
G = Gurpreet promoted
Given sample space, S = {John promoted, Rita promoted, Aslam promoted, Gurpreet promoted}
i.e. S={J,R,A,G)
It is given that, chances of John's promotion is same as that of Gurpreet.
P(J) = P(G)
Rita's chances of promotion are twice as likely as John.
P(R) = 2P(J)
And Aslam's chances of promotion are four times that of John.
P(A) = 4P(J)
Now, P(J) + P(R) + P(A) + P(G) = 1 => P(J) + 2P(J) + 4P(J) + P(J) = 1
=> 8P(J) = 1
P(J) = 1/8

(a) $P(\text{John promoted}) = P(J) = \dfrac{1}{8}$

$P(\text{Rita promoted}) = P(R) = 2P(J) = 2 \times \dfrac{1}{8} = \dfrac{1}{4}$

$P(\text{Aslam promoted}) = P(A) = 4P(J) = 4 \times \dfrac{1}{8} = \dfrac{1}{2}$

$P(\text{Gurpreet promoted}) = P(G) = P(J) = \dfrac{1}{8}$

(b) $A = \text{John promoted or Gurpreet promoted}$

$\therefore \quad A = J \cup G$

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\begin{aligned}
P(A) &= P(J \cup G) \\
&= P(J) + P(G) - P(J \cap G) \\
&= \frac{1}{8} + \frac{1}{8} - 0 \qquad\qquad [\because P(J \cap G) = 0] \\
&= \frac{1}{4}
\end{aligned}
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