1993 Paper 2 Question 2

Two teams A and B play a match in which the winner is the first team to win n games. If A needs i games to win and B needs j games to win, denote by $\mathrm{P}(i, j)$ the probability that A will win. B is the better team, and in any particular game A's probability of winning is only $2/5$. Write down a relation between $\mathrm{P}(i, j)$, $\mathrm{P}(i-1, j)$ and $\mathrm{P}(i, j-1)$.

Of what order is the computation of $\mathrm{P}(k, k)$ for given k? Show how to lay out the results for maximum re-use of computed values, and work out $\mathrm{P}(2, 2)$.