Fundamentals of Operational Research
Tutorial 3
School of Mathematics
The University of Edinburgh
Year 2022/2023

1. A government agency is conducting research on a certain engineering project that must be solved before university lecturers can be replaced by teaching robots. Three research teams are currently trying three different approaches for solving this problem doing independent work. It is estimated that the probability that each team does not succeed is 0.4, 0.6, and 0.8, respectively. Thus, the probability that all three teams will fail is $0.4 \times 0.6 \times 0.8 = 0.192$.

With the objective of minimizing the probability of failure as much as possible, two more scientists join the project. The table below gives the new probability of failure when new scientists join. How should the two scientists be allocated to minimize the probability that all three teams fail? Use dynamic programming to solve this problem.

	Team		
New Scientists	1	2	3
0	0.40	0.60	0.80
1	0.20	0.40	0.50
2	0.15	0.20	0.30

2. A gambler believes that he has found a system to win a popular game in a casino in North Berwick. He starts with 3 chips and he must end with at least 5 chips after 3 plays of the game in order to win. Each play of the game involves betting any desired number of available chips and then winning than number with probability $\frac{2}{3}$ or losing it with probability $\frac{1}{3}$. What is the maximum probability of winning? Can you describe an optimal policy for the three plays?