

**Fundamentals of Operational Research**  
**Tutorial 5**  
**School of Mathematics**  
**The University of Edinburgh**  
**Year 2022/2023**

1. Use branch-and-bound to solve the following problem:

$$\begin{array}{ll}\text{Max.} & 5x_1 + 2x_2 \\ \text{s.t.} & 3x_1 + x_2 \leq 12, \\ & x_1 + x_2 \leq 5, \\ & x_1, x_2 \in \mathbb{Z}^+.\end{array}$$

2. Consider the problem

$$\begin{array}{ll}\text{Max.} & 3x_1 + 2x_2 \\ \text{s.t.} & x_1 + 2x_2 \leq 7, \\ & 5x_1 + 2x_2 \leq 10, \\ & x_1, x_2 \in \mathbb{Z}^+.\end{array}$$

The optimal solution to the linear relaxation is  $\tilde{x} = (\frac{3}{4}, \frac{25}{8})$ . Find Gomory cuts that cut off this point.

3. For the game having the following payoff table, determine the optimal strategy for each player.

Strategy		Player 2		
		1	2	3
Player 1	1	-3	1	2
	2	1	2	1
	3	1	0	-2

4. Find a saddle point for the following game using the minimax criterion to find the best strategy for each player.

Strategy		Player 2		
		1	2	3
Player 1	1	1	-1	1
	2	-2	0	3
	3	3	1	2

5. For the game having the following payoff table, use the graphical solution method to determine the value of the game and the optimal mixed strategies.

Strategy		Player 2		
		1	2	3
Player 1	1	4	3	1
	2	0	1	2