



QUESTION WORKBOOK

# Game theory: play safe and stable solutions

Decision Mathematics 2 · Year FM

6 questions · 24 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

- A1** A pay-off matrix has the entry 5 where the first row meets the second column. State what this means for each player. [2]

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- A2** A game has row minima 4 and 2, and column maxima 7, 4 and 9. State whether it is stable and give the value if it is. [2]

**SECTION B** · Standard

- B1** In a zero-sum game the row player's pay-offs are R1 (4, 2, 6), R2 (1, 5, 3) and R3 (3, 3, 2). Find both play-safe strategies and say whether the game is stable. [6]

- B2** In a zero-sum game the row player's pay-offs are  $R1 (5, 3, 7)$ ,  $R2 (6, 4, 8)$  and  $R3 (2, 1, 3)$ . Show that the game has a stable solution and give the value and the strategies. [4]

- B3** In a zero-sum game the row player's pay-offs are  $R1 (5, 3, 7)$ ,  $R2 (6, 4, 8)$  and  $R3 (2, 1, 3)$ . Reduce the matrix as far as possible using dominance, and comment on the result. [4]

### SECTION C · Stretch

- C1** In a zero-sum game the row player's pay-offs are  $R1 (6, 0, 7)$ ,  $R2 (4, k, 5)$  and  $R3 (3, 1, 8)$ , where  $k$  is an integer with  $1 \leq k \leq 9$ . Find all the values of  $k$  for which the game has a stable solution, and state the value of the game in each case. [6]