Minimum-cost and maximum-profit assignments

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Form the opportunity-loss matrix for the supplied profits using K=19. [3 marks]

Profit ($100 units) from assigning each team to one distinct contract.

Team	Contract 1	Contract 2	Contract 3
P	18	14	13
Q	15	17	12
R	16	11	19

Subtract each original profit from 19.

Answer: [1,5,6], [4,2,7], [3,8,0].

2. For a four-person problem with K=30, the minimum transformed total is 17. Find the maximum profit. [2 marks]

The complete transformed total is $4\times30-P$.

$P=120-17=103$.

Answer: 103 profit units.

3. Two workers have profits A:[12,8] and B:[10,11]. Find the best complete assignment. [2 marks]

The two feasible totals are 12+11=23 and 8+10=18.

Choose the larger.

Answer: A→1, B→2; total profit 23.

4. For costs A:[12,8] and B:[10,11], find the minimum assignment and compare it with the previous profit objective. [2 marks]

The same numbers give a different optimum when lower is better.

18<23.

Answer: A→2, B→1; total cost 18.

5. If 5 is added to every profit in a three-person square table, does the optimal pairing change? What happens to its total? [2 marks]

Each complete assignment selects exactly three entries.

The same constant shift preserves the ranking.

Answer: The optimal pairing does not change; every complete total rises by 15.

6. An assignment gives predicted profits \$700, \$900 and \$600, but the last two contracts compete for the same machine. Explain why adding them may overstate the achievable profit. [3 marks]

The nominal sum is \$2,200.

The machine conflict may prevent both contracts being completed as modelled; costs or scheduling need revision.

Answer: The independent-addition/resource assumption is violated.