Linear programming

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Maximise $P = 4x + 3y$ for $x, y \geq 0$, $x + y \leq 8$, $x \leq 5$. [2 marks]

The vertices are $(0, 0), (5, 0), (5, 3), (0, 8)$.

Their values are 0,20,29,24.

Answer: Maximum 29 at $(5, 3)$.

2. Maximise $P = 3x + 5y$ for $x, y \geq 0$, $x + y \leq 9$, $x + 2y \leq 14$. [2 marks]

Vertices are $(0, 0), (9, 0), (4, 5), (0, 7)$.

Values are 0,27,37,35.

Answer: Maximum 37 at $(4, 5)$.

3. Minimise $C = 2x + 5y$ for $x, y \geq 0$, $x + y \geq 6$. [2 marks]

Rewrite the objective as $C = 2(x + y) + 3y$.

Since $x + y \geq 6$ and $y \geq 0$, $C \geq 12$; $(6, 0)$ attains that bound.

Answer: Minimum 12 at $(6, 0)$.

4. Why has $P = x + y$ no finite maximum when only $x, y \geq 0$ is required? [2 marks]

Feasible points $(t, 0)$ have arbitrarily large objective t.

Answer: It is unbounded above.

5. A high-profit proposal uses 18 hours when at most 16 are available. Is it acceptable? [2 marks]

An infeasible decision is excluded regardless of its profit.

Answer: No.

6. The optimum for $P = 5x + 3y$ is $(4, 6)$. If P is in hundreds of dollars, interpret the result. [2 marks]

$P = 38$ hundreds, so multiply by 100.

Answer: AUD 3,800.