

## Practice Worksheet: Binary Integer Programming Problems

Solve the following Binary Integer Programming problems. Ensure all variables  $x_i$  are binary, i.e.,  $x_i \in \{0, 1\}$ .

1. Maximize:

$$Z = -5x_1 + 25x_2$$

Subject to:

$$-3x_1 + 30x_2 \leq 27$$

$$3x_1 + x_2 \leq 4$$

$$x_1, x_2 \in \{0, 1\}$$

2. Maximize:

$$Z = 3x_1 + 8x_2 + 5x_3$$

Subject to:

$$2x_1 + x_2 + x_3 \leq 4$$

$$x_1 + 3x_2 + 2x_3 \geq 3$$

$$x_1, x_2, x_3 \in \{0, 1\}$$

3. Maximize:

$$Z = 6x_1 + 9x_2 + 4x_3 + 7x_4$$

Subject to:

$$3x_1 + 2x_2 + 4x_3 + x_4 \leq 6$$

$$x_1 + 2x_2 + x_3 + 2x_4 \geq 4$$

$$x_1, x_2, x_3, x_4 \in \{0, 1\}$$

4. Minimize:

$$Z = 5x_1 + 10x_2 + 3x_3 + 8x_4$$

Subject to:

$$2x_1 + 3x_2 + 4x_3 + x_4 \leq 7$$

$$x_1 + x_2 + 2x_3 + 2x_4 \geq 4$$

$$x_1, x_2, x_3, x_4 \in \{0, 1\}$$

5. Maximize:

$$Z = 3x_1 + 4x_2 + 2x_3 + x_4 + 2x_5$$

Subject to:

$$2x_1 - x_2 + x_3 + x_4 + x_5 \leq 3$$

$$-x_1 + 3x_2 + x_3 - x_4 - 2x_5 \leq 2$$

$$2x_1 + x_2 - x_3 + x_4 + 3x_5 \leq 1$$

$$x_1, x_2, x_3, x_4, x_5 \in \{0, 1\}$$