Simplex Method Practice Problems

Below are 14 problems designed for practicing the simplex method. Each problem includes an objective function and constraints. Solve each problem step by step to find the optimal solution.

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Problem 1

$$\begin{aligned} \text{Maximize: } & Z = 3x_1 + 5x_2 \\ & x_1 + 2x_2 \leq 6, \\ \text{Subject to: } & 3x_1 + 2x_2 \leq 12, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 2

$$\begin{aligned} \text{Minimize: } & Z = 2x_1 + 4x_2 \\ & x_1 + 3x_2 \geq 9, \\ \text{Subject to: } & 2x_1 + x_2 \geq 8, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 3

$$\begin{aligned} \text{Maximize: } & Z = 4x_1 + 6x_2 \\ & 2x_1 + 3x_2 \leq 12, \\ \text{Subject to: } & x_1 + x_2 \leq 5, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 4

$$\begin{aligned} \text{Minimize: } & Z = 5x_1 + 3x_2 \\ & 4x_1 + 2x_2 \geq 10, \\ \text{Subject to: } & x_1 + 3x_2 \geq 9, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 5

$$\begin{aligned} \text{Maximize: } & Z = 6x_1 + 8x_2 \\ & x_1 + x_2 \leq 7, \\ \text{Subject to: } & 2x_1 + 3x_2 \leq 15, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 6

$$\begin{aligned} \text{Maximize: } & Z = 5x_1 + 4x_2 \\ & x_1 + 2x_2 \leq 8, \\ \text{Subject to: } & 3x_1 + x_2 \leq 10, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 7

$$\begin{aligned} \text{Minimize: } & Z = 7x_1 + 9x_2 \\ & x_1 + x_2 \geq 6, \\ \text{Subject to: } & 2x_1 + 3x_2 \geq 12, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 8

$$\begin{aligned} \text{Maximize: } & Z = 3x_1 + 4x_2 \\ & 2x_1 + 3x_2 \leq 18, \\ \text{Subject to: } & x_1 + x_2 \leq 8, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 9

$$\begin{aligned} \text{Minimize: } & Z = 4x_1 + 2x_2 \\ & 2x_1 + 5x_2 \geq 20, \\ \text{Subject to: } & 3x_1 + x_2 \geq 9, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 10

$$\begin{aligned} \text{Maximize: } & Z = 10x_1 + 15x_2 \\ & 2x_1 + x_2 \leq 20, \\ \text{Subject to: } & x_1 + 2x_2 \leq 15, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 11

$$\begin{aligned} \text{Minimize: } & Z = 8x_1 + 5x_2 \\ & x_1 + 3x_2 \geq 12, \\ \text{Subject to: } & 4x_1 + x_2 \geq 10, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 12

$$\begin{aligned} \text{Maximize: } & Z = 12x_1 + 18x_2 \\ & x_1 + x_2 \leq 10, \\ \text{Subject to: } & 2x_1 + 3x_2 \leq 30, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 13

$$\begin{aligned} \text{Minimize: } & Z = 6x_1 + 4x_2 \\ & 3x_1 + x_2 \geq 9, \\ \text{Subject to: } & x_1 + 2x_2 \geq 10, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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Problem 14

$$\begin{aligned} \text{Maximize: } & Z = 5x_1 + 7x_2 \\ & x_1 + 2x_2 \leq 14, \\ \text{Subject to: } & 3x_1 + x_2 \leq 15, \\ & x_1 \geq 0, \\ & x_2 \geq 0. \end{aligned}$$

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