Dual Simplex Method: Numerical Examples

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Dual Simplex Method:
Numerical Example:1

$$\min : Z = X_1 + 3X_2$$

Subject to

$$X_1 + X_2 \geq 10$$
$$X_1 + 2X_2 \geq 11$$
$$X_1 + 4X_2 \geq 16$$
$$X_1, X_2 \geq 0$$

Numerical Example:2

$$\min : Z = 2X_1 + 6X_2$$

Subject to

$$X_1 + X_2 \geq 10$$
$$X_1 + 2X_2 \geq 11$$
$$X_1 + 4X_2 \geq 16$$
$$X_1, X_2 \geq 0$$

Numerical Example:3

$$\min : Z = X_1 + 4X_2$$

Subject to

$$X_1 + X_2 \geq 10$$
$$X_1 + 2X_2 \geq 11$$
$$X_1 + 4X_2 \geq 16$$
$$X_1, X_2 \geq 0$$

Numerical Example:4

$$\min : Z = X_1 + 4X_2 + X_3$$

Subject to

$$X_1 + X_2 + X_3 \geq 10$$
$$X_1 + 4X_2 + X_3 \geq 16$$
$$X_1, X_2, X_3 \geq 0$$

Numerical Example: 5

$$\min : \boldsymbol{Z} = \boldsymbol{X}_1 + 8\boldsymbol{X}_2$$

Subject to

$$\boldsymbol{X}_1 + \boldsymbol{X}_2 \geq 10$$
$$\boldsymbol{X}_1 + 2\boldsymbol{X}_2 \geq 12$$
$$\boldsymbol{X}_1 + 4\boldsymbol{X}_2 \geq 16$$
$$\boldsymbol{X}_1 + 6\boldsymbol{X}_2 \geq 20$$
$$\boldsymbol{X}_1, \boldsymbol{X}_2 \geq 0$$

Numerical Example: 6

$$\min : Z = X_1 + 12X_2$$

Subject to

$$X_1 + X_2 \geq 10$$
$$X_1 + 2X_2 \geq 12$$
$$X_1 + 4X_2 \geq 16$$
$$X_1 + 6X_2 \geq 20$$
$$X_1, X_2 \geq 0$$

Numerical Example: 7

$$\min : Z = 20X_1 + 50X_2$$

Subject to

$$3X_1 + 2X_2 \geq 25$$
$$2X_1 + 5X_2 \geq 30$$
$$2X_1 + 3X_2 \geq 20$$
$$X_1, X_2 \geq 0$$

Problem with more then 3 Variables:

Numerical Example: 8

$$\min : \boldsymbol{Z} = 6\boldsymbol{X}_1 + 6\boldsymbol{X}_2 + 8\boldsymbol{X}_3$$

Subject to

$$\boldsymbol{X}_1 + \boldsymbol{X}_2 + \boldsymbol{X}_3 \geq 12$$
$$3\boldsymbol{X}_1 + 3\boldsymbol{X}_2 + 4\boldsymbol{X}_3 \geq 36$$
$$\boldsymbol{X}_1, \boldsymbol{X}_2, \boldsymbol{X}_3 \geq 0$$

Numerical Example: 9

$$\min : Z = 6X_1 + 6X_2 + 8X_3$$

Subject to

$$X_1 + X_2 + X_3 \geq 12$$
$$3X_1 + 2X_2 + 3X_3 \geq 30$$
$$X_1, X_2, X_3 \geq 0$$

Numerical Example: 10
Primal LPP:

$$\min : \boldsymbol{Z} = 8\boldsymbol{X}_1 + 8\boldsymbol{X}_2 + 6\boldsymbol{X}_3$$

Subject to

$$\boldsymbol{X}_1 + \boldsymbol{X}_2 + \boldsymbol{X}_3 \geq 18$$
$$4\boldsymbol{X}_1 + 4\boldsymbol{X}_2 + 3\boldsymbol{X}_3 \geq 60$$
$$\boldsymbol{X}_1, \boldsymbol{X}_2, \boldsymbol{X}_3 \geq 0$$

Numerical Example: 11

$$\min : Z = X_1 + 3X_2 + 4X_3$$

Subject to

$$2X_1 + X_2 + X_3 \geq 63$$
$$X_1 + 4X_2 + 3X_3 \geq 84$$
$$X_1, X_2, X_3 \geq 0$$

Numerical Example: 12

$$\min : Z = 2X_1 + 3X_2 + 2X_3 + X_4 + X_5$$

Subject to

$$3X_1 - 3X_2 + 4X_3 + 2X_4 - X_5 \geq 10$$
$$X_1 + X_2 + X_3 + X_4 + X_5 \geq 20$$
$$X_1, X_2, X_3, X_4, X_5 \geq 0$$

Numerical Example: 13
Primal LPP:

$$\min : Z = 2X_1 + 3X_2 + 2X_3 + X_4 + X_5$$

Subject to

$$3X_1 + 3X_2 + 4X_3 + 2X_4 + X_5 \geq 60$$
$$X_1 + X_2 + X_3 + X_4 + X_5 \geq 20$$
$$X_1, X_2, X_3, X_4, X_5 \geq 0$$

Numerical Example: 14

$$\min : Z = X_1 + 2X_2 + 3X_3 + 4X_4$$

Subject to

$$20X_1 + 9X_2 + 6X_3 + X_4 \geq 20$$
$$10X_1 + 4X_2 + 2X_3 + X_4 \geq 10$$
$$X_1, X_2, X_3, X_4 \geq 0$$

Numerical Example: 15

$$\min : \boldsymbol{Z} = 9\boldsymbol{X}_1 + 8\boldsymbol{X}_2 + 6\boldsymbol{X}_3 + 5\boldsymbol{X}_4$$

Subject to

$$7\boldsymbol{X}_1 + 10\boldsymbol{X}_2 + 4\boldsymbol{X}_3 + 9\boldsymbol{X}_4 \geq 120$$
$$3\boldsymbol{X}_1 + 4\boldsymbol{X}_2 + \boldsymbol{X}_3 + \boldsymbol{X}_4 \geq 35$$
$$\boldsymbol{X}_1, \boldsymbol{X}_2, \boldsymbol{X}_3, \boldsymbol{X}_4 \geq 0$$

Numerical Example: 16

$$\min : Z = 5X_1 + 6X_2 + 4X_3 + 2X_4$$

Subject to

$$10X_1 + 5X_2 + 5X_3 + 3X_4 \geq 50$$
$$12X_1 + 4X_2 + 6X_3 + X_4 \geq 48$$
$$X_1, X_2, X_3, X_4 \geq 0$$

Numerical Example: 17

$$\min : Z = 3X_1 + X_2 + 2X_3 + X_4$$

Subject to

$$X_1 + X_2 - X_3 + X_4 \geq 6$$
$$X_1 - X_2 + X_3 + X_4 \geq 4$$
$$X_1, X_2, X_3, X_4 \geq 0$$

Numerical Example: 18

$$\min : Z = 8X_1 + 3X_2 + 8X_3 + 6X_4$$

Subject to

$$4X_1 + 3X_2 - X_3 + 3X_4 \geq 10$$
$$X_1 - X_2 + X_3 + X_4 \geq 15$$
$$X_1, X_2, X_3, X_4 \geq 0$$

Numerical Example: 19

$$\min : Z = X_1 + 2X_2 + X_3$$

Subject to

$$2X_1 + X_2 - X_3 \geq 6$$
$$X_1 + 4X_2 + 5X_3 \geq 18$$
$$X_1, X_2, X_3 \geq 0$$

Numerical Example: 20

$$\min : Z = X_1 + 2X_2 + X_3$$

Subject to

$$2X_1 + X_2 + X_3 \geq 2$$
$$X_1 + 4X_2 + 5X_3 \geq 6$$
$$X_1, X_2, X_3 \geq 0$$