

## DUAL SIMPLEX

[TYPE - IV]

⑥ MIN,  $Z = 2x_1 + 2x_2 + 4x_3$

SUB,  $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

WHERE,  $x_1, x_2, x_3 \geq 0$

$-2x_1 - 3x_2 - 5x_3 + s_2 = -2$

$3x_1 + x_2 + 7x_3 + s_3 = 3$

$x_1 + 4x_2 + 6x_3 + s_4 = 5$

$Z = 2x_1 - 2x_2 - 4x_3 + 0s_1 + 0s_2 + 0s_3 = 0$

WHERE,  $x_1, x_2, x_3, s_1, s_2, s_3 \geq 0$

- P1P

0 0 0 | P1P | S

- P1S

0 0 1 | P1S | S

P1S

0 1 0 | P1S | S

P1P

1 0 0 | P1P | S

- P1

1 0 0 0 | P1 | S

P1

0 1 0 0 | P1 | S

P1

0 0 1 0 | P1 | S

0 = P1  $Z = 8x = 5x = 1x$ ,  $P1 = S$

0 = P1  $Z = 8x = 5x = 1x$ ,  $P1 = S$

ITERA. VAR.  $x_1$   $x_2$   $x_3$   $s_1$   $s_2$   $s_3$  RHS FORMULA

0	Z	-2	-2	-4	0	0	0	0	$x - 2/3 y$
	$s_1$	-2	-3	-5	1	0	0	-2	$y \leq 3$
	$s_2$	3	1	7	0	1	0	3	$x + 1/3 y$
	$s_3$	1	4	6	0	0	1	5	$x + 4/3 y$

RATIO

1	Z	$-2/3$	0	$-2/3$	$-2/3$	0	0	0	$4/3$
	$x_2$	$2/3$	1	$5/3$	$-1/3$	0	0	$2/3$	$y \leq 3/1$
	$s_2$	$7/3$	0	$13/3$	$1/3$	1	0	$13/3$	
	$s_3$	$-1/3$	0	$-2/3$	$4/3$	0	1	$7/3$	

RATIO

2	Z	-2	-2	-4	0	0	0	0	$x - 2/3 y$
	$s_1$	-2	-3	-5	1	0	0	-2	$y \leq 3$
	$s_2$	3	1	6	0	1	0	5	$x + 1/3 y$
	$s_3$	$7/3$	9	6	0	0	1	5	$x + 4/3 y$

RATIO

3	Z	-0.66	0	-0.66	-0.66	0	0	0	1.33
	$x_2$	$2/3$	1	$1.66$	$-0.33$	0	0	$0.66$	
	$s_2$	2.33	0	4.33	0.33	1	0	4.33	
	$s_3$	$-1/3$	0	-0.66	1.33	0	1	2.33	

$$\rightarrow Z = \frac{4}{3}, x_1 = 0, x_2 = \frac{2}{3}, x_3 = 1$$

(9)

$$\text{MIN, } Z = 2x_1 - x_2 + 3x_3$$

$$\text{SUB, } 3x_1 - x_2 + 3x_3 \leq 7$$

$$2x_1 - 4x_2 \geq 12$$

$$\text{WHE, } x_1, x_2, x_3 \geq 0$$

$$+3x_1 - x_2 + 3x_3 + s_1 = 7$$

$$-2x_1 + 4x_2 + 0x_3 + s_2 = 12$$

$$Z = 2x_1 - x_2 + 3x_3 + 0s_1 + 0s_2$$

$$Z - 2x_1 + x_2 - 3x_2 - 0s_1 - 0s_2 = 0$$

ITER.	Z	$x_1$	$x_2$	$x_3$	$S_1 + S_2$	RHS	FORMULA
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0	Z	-2	1	-3	8	0	$x - 1/4 \cdot y$
	$S_1$	3	-1	3	8	1	$x + 1/4 \cdot y$
	$S_2$	-2	4	0	5	0	$y = 12$

RATIO      1     $1/4$     —    —    —

$$Z = 12 + 8R - 1xS -$$

$$= -1/4 \cdot 3 - 1xP -$$

$$S_1 = 1/4 - 4P + 10C$$

$$x_2 = -1/2 + R - 1/4 \cdot P - 12C - 5$$

RATIO      30     $-20$      $-50$      $-20 + 5R - 12C - 5$

$$Z = 0 - 3 - 3P + 0 - 1 \cdot 12$$

$$S_1 = 0 + 5 - 3P + 1 \cdot 3/2 - 11$$

$$x_2 = 1 - 2 + 0 + 0 - 1/2 \cdot 6$$

RATIO      —    —    —    —    —

$$\rightarrow Z_{\min} = 12$$

$$x_1 = 6$$

$$x_2 = 0$$

$$x_3 = 0$$

(5)

$$\text{MIN, } Z = 2x_1 + x_2$$

$$\text{SUB, } 3x_1 + x_2 \geq 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 3$$

WHERE  $x_1, x_2, x_3 \geq 0$

$$-3x_1 - x_2 + s_1 = 3$$

$$-4x_1 - 3x_2 + s_2 = -6$$

$$x_1 + 2x_2 + s_3 = 3$$

$$Z - 2x_1 - x_2 + 0s_1 + 0s_2 + 0s_3 = 0$$

$$s_1 = 1 - 0 \quad s_2 = 3 - 0 \quad s_3 = 0$$

$$2 = 1x$$

$$0 = 5x$$

$$0 = 8x$$

ITERA.

VAR.

 $x_1$  $x_2$  $s_1$  $s_2$  $s_3$ 

RHS FORMULA

0

 $Z$ 

-2

-1

0

0

0

0

 $x - 1/3 \cdot y$  $s_1$ 

-3

-1

1

0

0

0

 $x - 1/3 \cdot y$  $s_2$ 

-4

-3

0

1

0

-3

 $y \leq 3$  $s_3$ 

1

2

0

1

0

-6

 $y \leq 3$ 

RATIO

0.5

0.33

—

—

—

3

 $x + 2/3 \cdot y$ 

1

 $Z$ 

-2/3

0

0

-1/3

0

2

 $s_1$ 

-5/3

0

1

0

-1

 $x_2$ 

4/3

1

0

-1/3

0

-1

 $s_3$ 

-5/3

0

0

2/3

0

2

RATIO

0.4

—

—

1

—

-1

—

2

 $Z$ 

0

0

-4/5

0

-6/5

—

 $x_1$ 

1

0

-4/15

0

34/15

—

 $x_2$ 

0

1

0

0

—

 $s_3$ 

0

0

-2/3

1

-1/3

—

RATIO

2

 $Z$ 

0

0

-2/5

0

12/5

2.4

 $x_1$ 

1

0

-3/5

0

3/5

0.6

 $x_2$ 

0

1

4/5

0

8/5

1.2

RATIO

 $s_3$ 

0

0

-1

1

0

—

—

—

0.66

—

—

4

$$\rightarrow Z_{\min} = \frac{12}{5}$$

$$x_1 = \frac{3}{5}$$

$$x_2 = \frac{6}{5}$$