8.

	x	y	Availability
Turning	10	6	2500
Milling	5	10	2000
finishing	1	2	500
Income	23	32	

primal is

Maximize $z = 23x + 32y$

subject to
$$10x + 6y \le 2500$$
$$5x + 10y \le 2000$$
$$1x + 2y \le 500$$

9.

	x	y	Availability
Turning	10	6	2500
Milling	5	10	2000
finishing	1	2	500
Income	23	32	

primal is

Maximize $z = 23x + 32y$

subject to
$$10x + 6y \le 2500$$
$$5x + 10y \le 2000$$
$$1x + 2y \le 500$$

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∴ Dual is

Since there are 3 constraints in primal we will have 3 variables in dual

let variables be y_1, y_2, y_3

Minimize $z = 2500y_1 + 2000y_2 + 500y_3$

subject to

$$10y_1 + 5y_2 + y_3 \geq 23$$

$$6y_1 + 10y_2 + 2y_3 \geq 32$$

Hence, Dual is formed

11. Minimize

$$C = 21x_1 + 50x_2$$

subject to $2x_1 + 5x_2 \geq 12$

$$3x_1 + 7x_2 >= 17$$

$$x_1, x_2 \geq 0$$

Dual of given problem is

Since there 2 constraints y_1, y_2 be variables

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12. The formulation of the custom molding example including the new activity of producing champagne glasses is straight forward. we have exactly the same capacity limitation hour of production capacity, cubic feet of ware house capacity, and limit on six-ounce juice glass demand - and one additional variable for production of champagne glasses

Let

x_1 = No. of cases of six-ounce juice glasses in hundreds

x_2 = No. of case of ten-ounce juice glasses, in hundreds

x_3 = No of cases of champagne glasses in hundreds.

Formulation

Maximize $z = 5x_1 + 4.5x_2 + 6_3$

$$6x_1 + 5x_2 + 8x_3 \le 60$$

$$10x_1 + 20x_2 + 10x_3 \le 150$$

$$x_1 \le 8$$

After introducing slack variable

$$6x_1 + 5x_2 + 8x_3 + x_4 = 60$$

$$10x_1 + 20x_2 + 10x_3 + x_5 = 150$$

$$x_1 + x_6 = 8$$

$$5x_1 + 4.5x_2 + 6x_3 - z = 0$$

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Table - 1

C_B	Basic Variables	x_1	x_2	x_3	x_4	x_5	x_6	Sol	
	c_j	5	4.5	6	0	0	0		
0	x_4	6	5	8	1	0	0	60	$\frac{60}{8}=7.5$
0	x_5	10	20	10	0	1	0	150	$\frac{150}{10}=15$
0	x_6	8	1	0	0	0	1	8	—
	z_j	0	0	0	0	0	0		
	$c_j - z_j$	5	4.5	6	0	0	0		

key element = 8

Iteration-1

C_B	Basic Variables	x_1	x_2	x_3	x_4	x_5	x_6	Sol	Ratio
	c_j	5	4.5	6	0	0	0		
6	x_3	$\frac{3}{4}$	$\frac{5}{8}$	1	$\frac{1}{8}$	0	0	$\frac{15}{2}$	12
0	x_5	$5/2$	$55/4$	0	$-5/4$	1	0	75	5.45
0	x_6	1	0	0	0	0	1	8	—
	z_j	$\frac{9}{2}$	$\frac{15}{4}$	6	$\frac{3}{4}$	0	0		
	$c_j - z_j$	$\frac{1}{2}$	0.75	0	$-\frac{3}{4}$	0	0		

Iteration - 2

C_B	Basic Variables	x_1	x_2	x_3	x_4	x_5	x_6	Sol	Ratio
	c_j	5	4.5	6	0	0	0		
6	x_3	$\frac{7}{11}$	0	1	$\frac{2}{11}$	$\frac{-1}{22}$	0	$\frac{45}{11}$	$\frac{45}{7}$
4.5	x_2	$\frac{2}{11}$	1	0	$-\frac{1}{11}$	$\frac{4}{55}$	0	$\frac{60}{11}$	30
0	x_6	1	0	0	0	0	1	8	8
	z_j	4.6	4.5	6	0.6	0.05	0		
	$c_j - z_j$	0.36	0	0	-0.6	-0.05	0		

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		c_j	5	4.5	6	0	0	0	
C_B	Basic variables		x_1	x_2	x_3	x_4	x_5	x_6	Sol
5	x_1		1	0	$\frac{11}{7}$	$\frac{2}{7}$	$-\frac{1}{14}$	0	$45/7$
4.5	x_2		0	1	$-\frac{2}{7}$	$-\frac{1}{7}$	$3/35$	0	$30/7$
0	x_6		0	0	$-\frac{11}{7}$	$-\frac{2}{7}$	$\frac{1}{14}$	1	$11/7$
	z_j		5	4.5	6.5	0.7	0.2	0	
	$c_j - z_j$		0	0	-0.5	-0.7	-0.2	0	

$\because$ All $c_j - z_j \le 0$

This is optimal solution

$x_1 = \frac{45}{7}$ $x_2 = \frac{30}{7}$ $x_3 = 0$

Max $z = 51.4286$