

Q.1 Max(z) = 40x<sub>1</sub> + 30x<sub>2</sub> + 20x<sub>3</sub>

Group - B -

$$\begin{aligned} 2x_1 + 5x_2 + 10x_3 &\leq 900 & y_1 \\ 2x_1 + 5x_2 + 3x_3 &\leq 400 & y_2 \\ 4x_1 + 2x_2 + 2x_3 &\leq 600 & y_3 \end{aligned}$$

~~Max~~ Min(z) = 900y<sub>1</sub> + 400y<sub>2</sub> + 600y<sub>3</sub>

$$\begin{aligned} 2y_1 + 2y_2 + 4y_3 &\geq 40 & *(-1) \\ 5y_1 + 5y_2 + 2y_3 &\geq 30 & *(-1) \\ 10y_1 + 3y_2 + 2y_3 &\geq 20 & *(-1) \end{aligned}$$

Min(z) = 900y<sub>1</sub> + 400y<sub>2</sub> + 600y<sub>3</sub>

$$\begin{aligned} -2y_1 - 2y_2 - 4y_3 &\leq -40 \\ -5y_1 - 5y_2 - 2y_3 &\leq -30 \\ -10y_1 - 3y_2 - 2y_3 &\leq -20 \end{aligned}$$

Min(z) = 900y<sub>1</sub> + 400y<sub>2</sub> + 600y<sub>3</sub>

$$\begin{aligned} -2y_1 - 2y_2 - 4y_3 + s_1 &= -40 \\ -5y_1 - 5y_2 - 2y_3 + s_2 &= -30 \\ -10y_1 - 3y_2 - 2y_3 + s_3 &= -20 \end{aligned}$$

→  
entire is 1

	$y_1$	$y_2$	$y_3$	$S_1$	$S_2$	$S_3$	R.H.S	Ratio
$Z-C_j$	-900	-400	-600	0	0	0	0	
$S_1$	-2	-2	-4	1	0	0	-40	$\div (-4)$
$S_2$	-5	-5	-2	0	1	0	-30	
$S_3$	-10	-3	-2	0	0	1	-20	

$$\frac{-900}{-2} = 450 \quad \frac{-400}{-2} = 200 \quad \boxed{\frac{-600}{-4} = 150}$$

	$y_1$	$y_2$	$y_3$	$S_1$	$S_2$	$S_3$	R.H.S	Ratio
$Z-C_j$	-600	-100	0	-150	0	0	6000	
$y_3$	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{4}$	0	0	10	
$S_2$	-4	-4	0	$-\frac{1}{2}$	1	0	-10	
$S_3$	-9	-2	0	$-\frac{1}{2}$	0	1	0	

$$\begin{array}{r} *600 \left( \frac{1}{2} \quad \frac{1}{2} \quad 1 \quad \frac{1}{4} \quad 0 \quad 0 \quad 10 \right) \\ -900 \quad -400 \quad -600 \quad 0 \quad 0 \quad 0 \quad 0 \\ \hline -600 \quad -100 \quad \boxed{0} \quad -150 \quad 0 \quad 0 \quad 6000 \end{array} \quad (Z)$$

$$\begin{array}{r} *2 \left( \frac{1}{2} \quad \frac{1}{2} \quad 1 \quad \frac{1}{4} \quad 0 \quad 0 \quad 10 \right) \\ -5 \quad -5 \quad -2 \quad 0 \quad 1 \quad 0 \quad -30 \\ \hline -4 \quad -4 \quad \boxed{0} \quad -\frac{1}{2} \quad 1 \quad 0 \quad -10 \end{array} \quad (S_2)$$

$$\begin{array}{r} *2 \left( \frac{1}{2} \quad \frac{1}{2} \quad 1 \quad \frac{1}{4} \quad 0 \quad 0 \quad 10 \right) \\ -10 \quad -3 \quad -2 \quad 0 \quad 0 \quad 1 \quad -20 \\ \hline -9 \quad -2 \quad \boxed{0} \quad -\frac{1}{2} \quad 0 \quad 1 \quad 0 \end{array} \quad (S_3)$$

$$Q_2) \text{ Min}(z) = 4x_1 + x_2$$

$$x_1 + 2x_2 \leq 4$$

$$3x_1 + x_2 = 3$$

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

Group - B.)

Two Phase

$$x_1, x_2 \geq 0$$

$$\text{Min}(z) = 4x_1 + x_2 \Rightarrow \text{Min}(z) = R_1 + R_2$$

$$x_1 + 2x_2 + S_1 = 4$$

$$3x_1 + x_2 + R_1 = 3$$

$$4x_1 + 3x_2 - S_2 + R_2 = 6$$

$$R_1 = 3 - 3x_1 - x_2$$

$$R_2 = 6 - 4x_1 - 3x_2 + S_2$$

$$\text{Min}(z) = 3 - 3x_1 - x_2 + 6 - 4x_1 - 3x_2 + S_2$$

$$\text{Min}(z) = -7x_1 - 4x_2 + S_2 + 9$$

$$\text{Min}(z) + 7x_1 + 4x_2 - S_2 = 9$$

	$x_1$	$x_2$	$S_1$	$S_2$	$R_1$	$R_2$	R.H.S	Ratio
	7	4	-1	0	0	0	9	
$S_1$	1	2	1	0	0	0	4	4
$R_1$	3	1	0	0	1	0	3	1 $\div 3$
$R_2$	4	3	0	-1	0	1	6	1.5

	$x_1$	$x_2$	$S_1$	$S_2$	$R_1$	$R_2$	R.H.S	Ratio
	0	$5/3$	-1	0	$-7/3$	0	2	
$S_1$	0	$5/3$	1	0	$-1/3$	0	3	1.8
$x_1$	1	$1/3$	0	0	$1/3$	0	1	3
$R_2$	0	$5/3$	0	-1	$-4/3$	1	2	1.2 $\div 5/3$

$$* -7 \begin{pmatrix} 1 & 1/3 & 0 & 0 & 1/3 & 0 & 1 \\ 7 & 4 & -1 & 0 & 0 & 0 & 9 \end{pmatrix} \quad (Z)$$


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$$\begin{pmatrix} 1 & 1/3 & 0 & 0 & 1/3 & 0 & 1 \\ 0 & 5/3 & -1 & 0 & -7/3 & 0 & 2 \end{pmatrix}$$

$$* -1 \begin{pmatrix} 1 & 1/3 & 0 & 0 & 1/3 & 0 & 1 \\ 1 & 2 & 1 & 0 & 0 & 0 & 4 \end{pmatrix} \quad (S_1)$$


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$$\begin{pmatrix} 1 & 1/3 & 0 & 0 & 1/3 & 0 & 1 \\ 0 & 5/3 & 1 & 0 & -1/3 & 0 & 3 \end{pmatrix}$$

$$* -4 \begin{pmatrix} 1 & 1/3 & 0 & 0 & 1/3 & 0 & 1 \\ 4 & 3 & 0 & -1 & 0 & 1 & 6 \end{pmatrix} \quad (R_2)$$


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$$\begin{pmatrix} 1 & 1/3 & 0 & 0 & 1/3 & 0 & 1 \\ 0 & 5/3 & 0 & -1 & -4/3 & 1 & 2 \end{pmatrix}$$

	$x_1$	$x_2$	$S_1$	$S_2$	$R_1$	$R_2$	R.H.S
	0	0	-1	$25/9$	-1	-1	0
$S_1$	0	0	1	$25/9$	1	-1	$1/5$
$x_1$	1	0	0	$5/9$	$3/5$	$-3/5$	$3/5$
$x_2$	0	1	0	$-5/3$	$-4/5$	$3/5$	$6/5$

$$* -5/3 \begin{pmatrix} 0 & 1 & 0 & -5/3 & -4/5 & 3/5 & 6/5 \\ 0 & 5/3 & -1 & 0 & -7/3 & 0 & 2 \end{pmatrix} \quad (Z)$$


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$$\begin{pmatrix} 0 & 1 & 0 & -5/3 & -4/5 & 3/5 & 6/5 \\ 0 & 5/3 & -1 & 0 & -7/3 & 0 & 2 \end{pmatrix}$$

$$* -5/3 \begin{pmatrix} 0 & 1 & 0 & -5/3 & -4/5 & 3/5 & 6/5 \\ 0 & 5/3 & 1 & 0 & -1/3 & 0 & 3 \end{pmatrix} \quad (S_1)$$