Find solution using Simplex(BigM) method
MIN Z = 7560x1 + 1680x2 + 4636.8x3 + 1478.4x4
subject to
x1 + x2 >= 110
x1 + x3 >= 100
x1 + x4 >= 80
x1 <= 90
and x1,x2,x3,x4 >= 0

Solution:
Problem is

$$\text{Min } Z = 7560x_1 + 1680x_2 + 4636.8x_3 + 1478.4x_4$$

subject to

$$x_1 + x_2 \geq 110$$
$$x_1 + x_3 \geq 100$$
$$x_1 + x_4 \geq 80$$
$$x_1 \leq 90$$

and $x_1, x_2, x_3, x_4 \geq 0$;

$$\therefore \text{ Max } Z = -7560x_1 - 1680x_2 - 4636.8x_3 - 1478.4x_4$$

The problem is converted to canonical form by adding slack, surplus and artificial variables as appropiate

1. As the constraint 1 is of type ' $\geq$ ' we should subtract surplus variable S_1 and add artificial variable A_1

2. As the constraint 2 is of type ' $\geq$ ' we should subtract surplus variable S_2 and add artificial variable A_2

3. As the constraint 3 is of type ' $\geq$ ' we should subtract surplus variable S_3 and add artificial variable A_3

4. As the constraint 4 is of type ' $\leq$ ' we should add slack variable S_4

After introducing slack,surplus,artificial variables

$$\text{Max } Z = -7560x_1 - 1680x_2 - 4636.8x_3 - 1478.4x_4 + 0S_1 + 0S_2 + 0S_3 + 0S_4 - MA_1 - MA_2 - MA_3$$

subject to

$$x_1 + x_2 - S_1 + A_1 = 110$$
$$x_1 + x_3 - S_2 + A_2 = 100$$
$$x_1 + x_4 - S_3 + A_3 = 80$$
$$x_1 + S_4 = 90$$

and $x_1, x_2, x_3, x_4, S_1, S_2, S_3, S_4, A_1, A_2, A_3 \geq 0$

Iteration-1		C_j	-7560	-1680	-4636.8	-1478.4	0	0	0	0	$-M$	$-M$	$-M$	
B	**C_B**	**X_B**	**x_1**	**x_2**	**x_3**	**x_4**	**S_1**	**S_2**	**S_3**	**S_4**	**A_1**	**A_2**	**A_3**	**MinRatio $\frac{X_B}{x_1}$**
A_1	$-M$	110	1	1	0	0	-1	0	0	0	1	0	0	$\frac{110}{1} = 110$
A_2	$-M$	100	1	0	1	0	0	-1	0	0	0	1	0	$\frac{100}{1} = 100$
A_3	$-M$	80	(1)	0	0	1	0	0	-1	0	0	0	1	$\frac{80}{1} = 80 \rightarrow$
S_1	0	90	1	0	0	0	0	0	0	1	0	0	0	$\frac{90}{1} = 90$
$Z = 0$		**Z_j**	**$-3M$**	**$-M$**	**$-M$**	**$-M$**	**M**	**M**	**M**	**0**	**$-M$**	**$-M$**	**$-M$**	
		$Z_j - C_j$	$-3M + 7560 \uparrow$	$-M + 1680$	$-M + 4636.8$	$-M + 1478.4$	M	M	M	0	0	0	0	

Negative minimum $Z_j - C_j$ is $-3M + 7560$ and its column index is 1. So, the entering variable is x_1.

Minimum ratio is 80 and its row index is 3. So, the leaving basis variable is A_3.

$\therefore$ The pivot element is 1.

Entering $= x_1$, Departing $= A_3$, Key Element $= 1$

$R_3(\text{new}) = R_3(\text{old})$

$R_1(\text{new}) = R_1(\text{old}) - R_3(\text{new})$

$R_2(\text{new}) = R_2(\text{old}) - R_3(\text{new})$

$R_4(\text{new}) = R_4(\text{old}) - R_3(\text{new})$

Iteration-2		C_j	-7560	-1680	-4636.8	-1478.4	0	0	0	0	$-M$	$-M$	$-M$	

B	C_B	X_B	x_1	x_2	x_3	x_4	S_1	S_2	S_3	S_4	A_1	A_2	A_3	MinRatio $\frac{X_B}{S_3}$
A_1	$-M$	30	0	1	0	-1	-1	0	1	0	1	0	-1	$\frac{30}{1} = 30$
A_2	$-M$	20	0	0	1	-1	0	-1	1	0	0	1	-1	$\frac{20}{1} = 20$
x_1	-7560	80	1	0	0	1	0	0	-1	0	0	0	1	---
S_1	0	10	0	0	0	-1	0	0	**(1)**	1	0	0	-1	$\frac{10}{1} = 10 \rightarrow$
$Z = -604800$		Z_j	**-7560**	**$-M$**	**$-M$**	**$2M - 7560$**	**M**	**M**	**$-2M + 7560$**	**0**	**$-M$**	**$-M$**	**$2M - 7560$**	
		$Z_j - C_j$	0	$-M + 1680$	$-M + 4636.8$	$2M - 6081.6$	M	M	$-2M + 7560 \uparrow$	0	0	0	$3M - 7560$	

Negative minimum $Z_j - C_j$ is $-2M + 7560$ and its column index is 7. So, the entering variable is S_3.

Minimum ratio is 10 and its row index is 4. So, the leaving basis variable is S_1.

∴ The pivot element is 1.

Entering $= S_3$, Departing $= S_1$, Key Element $= 1$

$R_4(\text{new}) = R_4(\text{old})$

$R_1(\text{new}) = R_1(\text{old}) - R_4(\text{new})$

$R_2(\text{new}) = R_2(\text{old}) - R_4(\text{new})$

$R_3(\text{new}) = R_3(\text{old}) + R_4(\text{new})$

Iteration-3		C_j	-7560	-1680	-4636.8	-1478.4	0	0	0	0	$-M$	$-M$	$-M$	
B	C_B	X_B	x_1	x_2	x_3	x_4	S_1	S_2	S_3	S_4	A_1	A_2	A_3	MinRatio $\frac{X_B}{x_2}$
A_1	$-M$	20	0	**(1)**	0	0	-1	0	0	-1	1	0	0	$\frac{20}{1} = 20 \rightarrow$
A_2	$-M$	10	0	0	1	0	0	-1	0	-1	0	1	0	---
x_1	-7560	90	1	0	0	0	0	0	0	1	0	0	0	---
S_3	0	10	0	0	0	-1	0	0	1	1	0	0	-1	---
$Z = -680400$		Z_j	**-7560**	**$-M$**	**$-M$**	**0**	**M**	**M**	**0**	**$2M - 7560$**	**$-M$**	**$-M$**	**0**	
		$Z_j - C_j$	0	$-M + 1680 \uparrow$	$-M + 4636.8$	1478.4	M	M	0	$2M - 7560$	0	0	M	

Negative minimum $Z_j - C_j$ is $-M + 1680$ and its column index is 2. So, the entering variable is x_2.

Minimum ratio is 20 and its row index is 1. So, the leaving basis variable is A_1.

∴ The pivot element is 1.

Entering $= x_2$, Departing $= A_1$, Key Element $= 1$

$R_1(\text{new}) = R_1(\text{old})$

$R_2(\text{new}) = R_2(\text{old})$

$R_3(\text{new}) = R_3(\text{old})$

$R_4(\text{new}) = R_4(\text{old})$

Iteration-4		C_j	-7560	-1680	-4636.8	-1478.4	0	0	0	0	$-M$	$-M$	$-M$	
B	C_B	X_B	x_1	x_2	x_3	x_4	S_1	S_2	S_3	S_4	A_1	A_2	A_3	MinRatio $\frac{X_B}{x_3}$
x_2	-1680	20	0	1	0	0	-1	0	0	-1	1	0	0	---
A_2	$-M$	10	0	0	**(1)**	0	0	-1	0	-1	0	1	0	$\frac{10}{1} = 10 \rightarrow$
x_1	-7560	90	1	0	0	0	0	0	0	1	0	0	0	---
S_3	0	10	0	0	0	-1	0	0	1	1	0	0	-1	---
$Z = -714000$		Z_j	**-7560**	**-1680**	**$-M$**	**0**	**1680**	**M**	**0**	**$M - 5880$**	**-1680**	**$-M$**	**0**	
		$Z_j - C_j$	0	0	$-M + 4636.8 \uparrow$	1478.4	1680	M	0	$M - 5880$	$M - 1680$	0	M	

Negative minimum Z_j - C_j is $-M + 4636.8$ and its column index is 3. So, the entering variable is x_3.

Minimum ratio is 10 and its row index is 2. So, the leaving basis variable is A_2.

∴ The pivot element is 1.

Entering $= x_3$, Departing $= A_2$, Key Element $= 1$

R_2(new) $= R_2$(old)

R_1(new) $= R_1$(old)

R_3(new) $= R_3$(old)

R_4(new) $= R_4$(old)

Iteration-5		C_j	-7560	-1680	-4636.8	-1478.4	0	0	0	0	$-M$	$-M$	$-M$	
B	**C_B**	**X_B**	**x_1**	**x_2**	**x_3**	**x_4**	**S_1**	**S_2**	**S_3**	**S_4**	**A_1**	**A_2**	**A_3**	**MinRatio $X_B S_4$**
x_2	-1680	20	0	1	0	0	-1	0	0	-1	1	0	0	---
x_3	-4636.8	10	0	0	1	0	0	-1	0	-1	0	1	0	---
x_1	-7560	90	1	0	0	0	0	0	0	1	0	0	0	90 1 = 90
S_3	0	10	0	0	0	-1	0	0	1	(1)	0	0	-1	10 1 = 10 →
$Z = -760368$		Z_j	**-7560**	**-1680**	**-4636.8**	**0**	**1680**	**4636.8**	**0**	**-1243.2**	**-1680**	**-4636.8**	**0**	
		$Z_j - C_j$	0	0	0	1478.4	1680	4636.8	0	-1243.2 ↑	$M - 1680$	$M - 4636.8$	M	

Negative minimum Z_j - C_j is -1243.2 and its column index is 8. So, the entering variable is S_4.

Minimum ratio is 10 and its row index is 4. So, the leaving basis variable is S_3.

∴ The pivot element is 1.

Entering $= S_4$, Departing $= S_3$, Key Element $= 1$

R_4(new) $= R_4$(old)

R_1(new) $= R_1$(old)$+R_4$(new)

R_2(new) $= R_2$(old)$+R_4$(new)

R_3(new) $= R_3$(old)$-R_4$(new)

Iteration-6		C_j	-7560	-1680	-4636.8	-1478.4	0	0	0	0	$-M$	$-M$	$-M$	
B	**C_B**	**X_B**	**x_1**	**x_2**	**x_3**	**x_4**	**S_1**	**S_2**	**S_3**	**S_4**	**A_1**	**A_2**	**A_3**	**MinRatio**
x_2	-1680	30	0	1	0	-1	-1	0	1	0	1	0	-1	
x_3	-4636.8	20	0	0	1	-1	0	-1	1	0	0	1	-1	
x_1	-7560	80	1	0	0	1	0	0	-1	0	0	0	1	
S_4	0	10	0	0	0	-1	0	0	1	1	0	0	-1	
$Z = -747936$		Z_j	**-7560**	**-1680**	**-4636.8**	**-1243.2**	**1680**	**4636.8**	**1243.2**	**0**	**-1680**	**-4636.8**	**-1243.2**	
		$Z_j - C_j$	0	0	0	235.2	1680	4636.8	1243.2	0	$M - 1680$	$M - 4636.8$	$M - 1243.2$	

Since all $Z_j - C_j \geq 0$

Hence, optimal solution is arrived with value of variables as :
$x_1 = 80, x_2 = 30, x_3 = 20, x_4 = 0$

Max $Z = -747936$

Min $Z = 747936$