Solve by simplex method

Max $z = 5x+4y$, $4x+5y \leq 10$, $3x+2y \leq 9$, $8x+3y \leq 12$, $x, y \geq 0$

Sol

Max $z = 5x+4y$

Subject to $4x+5y \leq 10$

$3x+2y \leq 9$

$8x+3y \leq 12$

and $x_1, x_2 \geq 0$

Introducing slack variable S_1, S_2, S_3

Max $z = 5x+4y+0S_1+0S_2+0S_3$

Subject to $4x+5y+S_1+0S_2+0S_3 = 10$

$3x+2y+0S_1+S_2+0S_3 = 9$

$8x+3y+0S_1+0S_2+S_3 = 12$

and $x_1, x_2, S_1, S_2, S_3 \geq 0$

Iteration

		C_j	5	4	0	0	0	
B	C_B	X_B	x_1	y	S_1	S_2	S_3	Ratio
S_1	0	10	4	5	1	0	0	$10/4 = 2.5$
S_2	0	9	3	2	0	1	0	$9/3 = 3$
S_3	0	12	8	3	0	0	1	$12/8 = 1.5$
		Z_j	0	0	0	0	0	
		$Z_j - C_j$	-5	-4	0	0	0	

$Z_j - C_j = -5$

leaving variable is S_3, Min ratio is 1.5

Entering variable is x

new pivot eq = old pivot eq ÷ pivot element

new variable eq = old variable eq - new pivot eq × column Coefficient

Iteration :

		C_j	5	4	0	0	0	
B	C_B	X_B	x	y	S_1	S_2	S_3	ratio
S_1	0	4	0	7/2	1	0	-1/2	1.1429
S_2	0	9/2	0	7/8	0	1	-3/8	5-1429
x	5	3/2	1	3/8	0	0	1/8	4
		Z_j	5	15/8	0	0	5/8	
		$Z_j - C_j$	0	-17/8	0	0	5/8	

$Z_j - C_j = -17/8$, min ratio is 1.1429

Entering variable = y, leaving variable is S_1,

new pivot eq = old pivot eq ÷ pivot element

new variable eq = old variable eq - new pivot eq × column Coefficient.

Iteration 2

B	CB	XB	x	y	S_1	S_2	S_3	ratio
x_2	4	8/7	0	1	2/7	0	-1/7	
S_2	0	7/2	0	0	-1/4	1	-1/4	
x_1	5	15/4	1	0	-3/28	0	5/28	
		Z_j	5	4	17/28	0	9/28	
		$Z_j - C_j$	0	0	17/28	0	9/28	

$Z_j - C_j \geq 0$

Hence optimal solution is arrived with value of variable as $x = 15/4$, $y = 8/7$

$$\text{Max } Z = \frac{139}{14}$$