The All Integer Method , Special Cases:

Case 1, No Solution

Solve for x, y and z using the all integers method:

$$\begin{aligned} 2x - 6y + 4z &= 1 \\ 4x - 10y + 10z &= 3 \\ x - 2y + 3z &= 2 \end{aligned}$$

Solve for x, y and z using the all integers method:

$$2x - 6y + 4z = 1$$
$$4x - 10y + 10z = 3$$
$$x - 2y + 3z = 2$$

x	y	z	
2	-6	4	1
4	-10	10	3
1	-2	3	2

Setup Table

2	-6	4	1
0	4	4	2
0	2	2	3

$(2)(-10) - (-6)(2)$

$-20 + 24 = 4$

$(2)(10) - (4)(4)$

$20 - 16 = 4$

$(2)(3) - (1)(4)$

$6 - 4 = 2$

$(2)(-2) - (-6)(1)$

$-4 + 6 = 2$

$(2)(3) - (4)(1)$

$6 - 4 = 2$

$(2)(2) - (1)(1)$

$= 3$

Solve for x, y and z using the all integers method:

$$2x - 6y + 4z = 1$$
$$4x - 10y + 10z = 3$$
$$x - 2y + 3z = 2$$

x	y	z	
2	-6	4	1
4	-10	10	3
1	-2	3	2
2*	-6	4	1
0	4	4	2
0	2	2	3
4	0	20	8
0	4	4	2
0	0	0	4

Setup Table

First Tableau
First Pivot = 2

$$\frac{(4)(4) - (4)(-6)}{2}$$

$$\frac{16 + 24}{2}$$

$$\frac{(4)(1) - (-6)(2)}{2}$$

$$\frac{(4)(2) - (4)(2)}{2} = 0$$

$$\frac{(4)(3) - (2)(2)}{2} = 4$$

$$0x + 0y + 0z = 4$$

$$0 = 4$$

N. S

Solve for x, y and z using the all integers method:

$$2x - 6y + 4z = 1$$
$$4x - 10y + 10z = 3$$
$$x - 2y + 3z = 2$$

x	y	z		
2	-6	4	1	Setup Table
4	-10	10	3	
1	-2	3	2	
2*	-6	4	1	First Tableau First Pivot = 2
0	4	4	2	
0	2	2	3	
2	-6	4	1	Second Tableau Second Pivot = 4
0	4*	4	2	
0	2	2	3	

Solve for x, y and z using the all integers method:

$$2x - 6y + 4z = 1$$
$$4x - 10y + 10z = 3$$
$$x - 2y + 3z = 2$$

x	y	z	
2	-6	4	1
4	-10	10	3
1	-2	3	2
2*	-6	4	1
0	4	4	2
0	2	2	3
2	-6	4	1
0	4*	4	2
0	2	2	3
4	0	20	8
0	4	4	2
0	0	0	4

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Setup Table

First Tableau
First Pivot = 2

Second Tableau
Second Pivot = 4

No Solution.
Any time we have a row with all 0's to the left, and a nonzero to the right, the system is inconsistent or no solution. $0 = 4$ is not possible.

But, it is ok to have a zero on the right and nonzeros on the left (when variables are = 0). For example:

0	3	0	0

or: $3y = 0$

$y = 0$

The All Integer Method , Special Cases:
Case 2, Infinite Number of Solutions

Solve for x, y and z using the all integers method:

$$\begin{aligned} 2x - 3y - 9z &= -5 \\ x + 3z &= 2 \\ -3x + y - 4z &= -3 \end{aligned}$$

Solve for x, y and z using the all integers method:

$$2x - 3y - 9z = -5$$
$$x + 3z = 2$$
$$-3x + y - 4z = -3$$

x	y	z	
2*	-3	-9	-5
1	0	3	2
-3	1	-4	-3

Setup Table

2	-3	-9	-5
0			
0			

Solve for x, y and z using the all integers method:

$$2x - 3y - 9z = -5$$
$$x + 3z = 2$$
$$-3x + y - 4z = -3$$

x	y	z	
2	-3	-9	-5
1	0	3	2
-3	1	-4	-3

Setup Table

2*	-3	-9	-5
0	3	15	9
0	-7	-35	-21

First Tableau, First Pivot = 2

3	0		
0	3	15	9
0	0		

$(2)(3) - (-9)(1)$

$6 + 9 = 15$

Solve for x, y and z using the all integers method:

$$\begin{aligned} 2x - 3y - 9z &= -5 \\ x + 3z &= 2 \\ -3x + y - 4z &= -3 \end{aligned}$$

x	y	z	
2	-3	-9	-5
1	0	3	2
-3	1	-4	-3
2*	-3	-9	-5
0	3	15	9
0	-7	-35	-21
3	0	9	6
0	3*	15	9
0	0	0	0

Setup Table

First Tableau, First Pivot = 2

Second Tableau, Second Pivot = 3

Eliminate the line of all 0's.
Move to the next pivot if possible.

$0 = 0$

Solve for x, y and z using the all integers method:

$$\begin{aligned} 2x - 3y - 9z &= -5 \\ x + 3z &= 2 \\ -3x + y - 4z &= -3 \end{aligned}$$

x	y	z	
2	-3	-9	-5
1	0	3	2
-3	1	-4	-3
2*	-3	-9	-5
0	3	15	9
0	-7	-35	-21
3	0	9	6
0	3*	15	9
0	0	0	0
1	0	3	2
0	1	5	3

Setup Table

First Tableau, First Pivot = 2

Second Tableau, Second Pivot = 3

Eliminate the line of all 0's.
Move to the next pivot if possible.

No more pivotes, then divide all elements by last pivot.
Translate the solution. It is **Linearly Dependent**

Solve for x, y and z using the all integers method:

$$2x - 3y - 9z = -5$$
$$x + 3z = 2$$
$$-3x + y - 4z = -3$$

x	y	z	
2	-3	-9	-5
1	0	3	2
-3	1	-4	-3

Setup Table

2*	-3	-9	-5
0	3	15	9
0	-7	-35	-21

First Tableau, First Pivot = 2

3	0	9	6
0	3*	15	9
0	0	0	0

Second Tableau, Second Pivot = 3

Eliminate the line of all 0's.
Move to the next pivot if possible.

1	0	3	2
0	1	5	3

No more pivotes, then divide all elements by last pivot.
Translate the solution. It is **Linearly Dependent**

$$x + 3z = 2 \quad \text{or} \quad y + 5z = 3$$

$$x = 2 - 3z$$
$$y = 3 - 5z$$
$$z = \text{any number}$$