Solve the following system of equations using the linear combination (dropout) method:

$$\begin{cases} x + 2y - 6z = 23 \\ x + 3y + z = 4 \\ 2x + 5y - 4z = 24 \end{cases}$$

Step 1 – Select a variable that we will make drop out twice.

It looks like *x* is the easiest one to make drop out twice, so that's the one we'll pick!

Step 2- Pick a combination of two equations to turn into one new equation by making that variable drop out .

Let's start with the red and green equations and make *x* drop out.

$$x + 2y - 6z = 23$$
$$x + 3y + z = 4$$

$$x + 2y - 6z = 23$$
$$-1(x + 3y + z = 4)$$

$$x + 2y - 6z = 23$$
$$\underline{-x - 3y - z = -4}$$
$$-y - 7z = 19$$

← Our first new equation

Step 3- Pick a different combination of two equations to turn into one new equation by making that same variable drop out .

Let's use the green and blue equations and make *x* drop out again.

$$x + 3y + z = 4$$
$$2x + 5y - 4z = 24$$

$$-2(x + 3y + z = 4)$$
$$2x + 5y - 4z = 24$$

$$-2x - 6y - 2z = -8$$
$$\underline{2x + 5y - 4z = 24}$$
$$-y - 6z = 16$$

← Our second new equation

Step 4- Take these two new equations and solve for the two variables.

$$-y - 7z = 19$$
$$-y - 6z = 16$$

$$-y - 7z = 19$$
$$-1(-y - 6z = 16)$$

$$-y - 7z = 19$$
$$y + 6z = -16$$
$$-z = 3$$
$$\boxed{\boldsymbol{z = -3}}$$

$$-y - 7(-3) = 19$$
$$-y + 21 = 19$$
$$-y = -2$$
$$\boxed{\boldsymbol{y = 2}}$$

Step 5- Plug these values in any of the three original equations to solve for the third (and last) variable.

We will use the green equation (it doesn't matter which equation you select).

$$x + 3y + z = 4$$
$$x + 3(2) + (-3) = 4$$
$$x + 6 - 3 = 4$$
$$x + 3 = 4$$
$$\boxed{\boldsymbol{x = 1}}$$

Step 6- Write the solution as an ordered triple [in the form (x, y, z)].

$$(\mathbf{1}, \mathbf{2}, -\mathbf{3})$$

Step 7 (Optional)- Check the solution by substituting the ordered triple into all three equations to make sure it works.