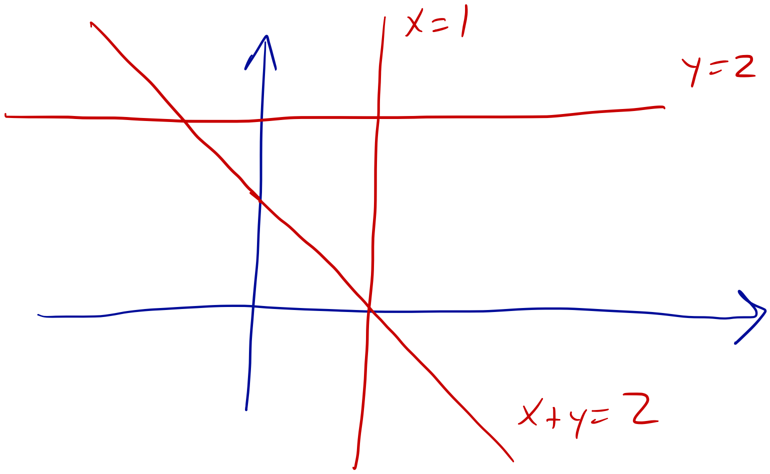
Name: Consider the problem to solve for (x, y)

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}.$$

1. Express this problem from the column perspective by filling in the blanks:

Find a linear combination of $(1,0,1)$ and $(0,1,1)$ that equals $(1,2,1)$.

2. Draw a diagram that expresses this problem from the row perspective.



$x = 1$

$y = 2$

$x + y = 1$

3. Find a vector **n** that is perpendicular to each of the columns of the matrix in this equation.

$n = (1,1,-1)$. Check: $u = (1,0,1)$ $\quad n \cdot u = 1\cdot 1 + 1\cdot 0 + 1\cdot(-1) = 0$

$v = (0,1,1)$ $\quad n \cdot v = 1\cdot 0 + 1\cdot 1 + (-1)\cdot 1 = 0$

4. All of the linear combinations of the columns of this matrix lie in a certain plane. What plane is it?

The plane with normal $n = (1,1,-1)$ passes through $\vec{0}$.

5. Use **n** to show that this problem does not have a solution.

$n \cdot b = (1,1,-1)\cdot(1,2,1) = 1 + 2 - 1 = 2 \neq 0.$