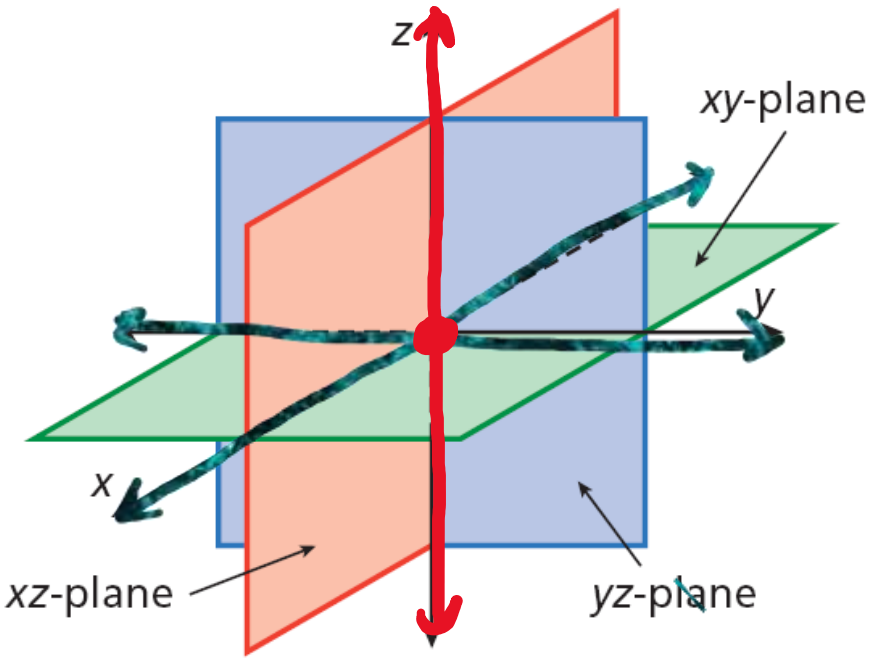
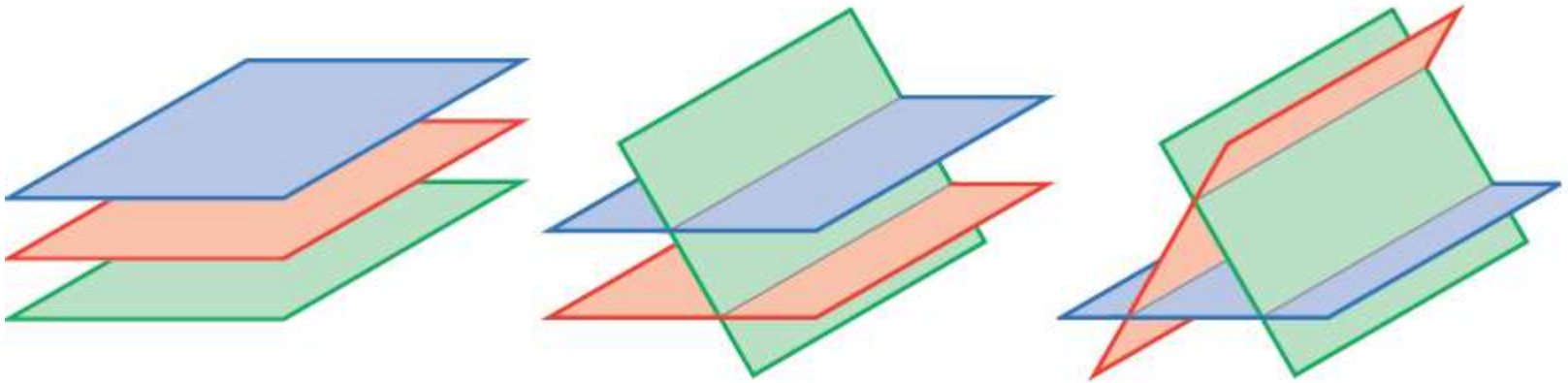
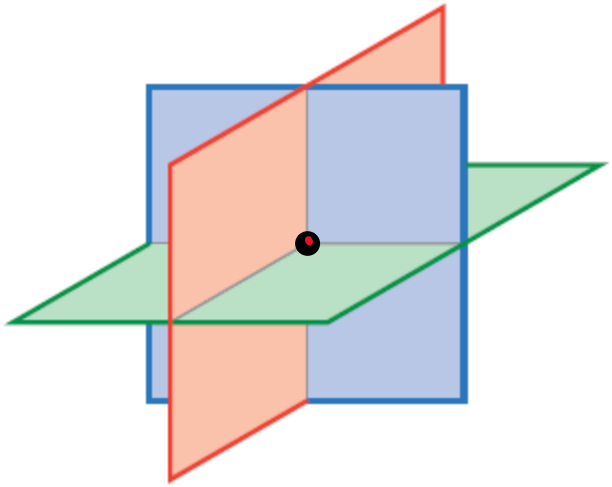
Each point in coordinate space can be represented by an **ordered triple** of the form (x, y, z). The system is similar to the coordinate plane but has an additional coordinate based on the ***z*-axis**. Notice that the axes form three planes that intersect at the origin.



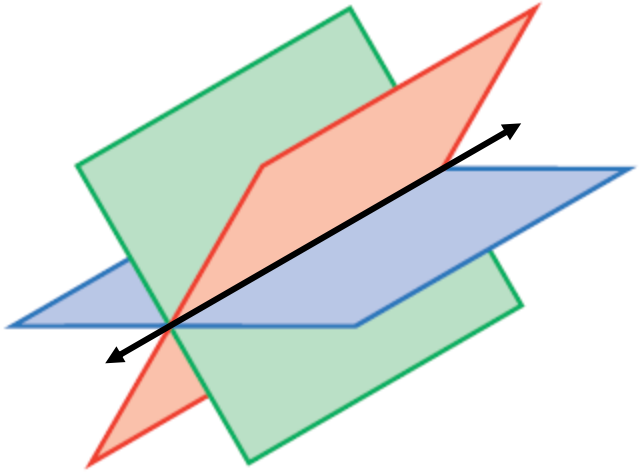
No Solutions
Inconsistent Systems



One Solution
Independent Systems



Infinitely Many Solutions
Dependent Systems



OR they are all the same plane

Determine the number of solutions.

$$\begin{cases} 2x - 6y + 4z = 2 \\ -3x + 9y - 6z = -3 \\ 5x - 15y + 10z = 5 \end{cases}$$

$\frac{2x - 6y + 4z = 2}{2}$ $\quad x - 3y + 2z = 1$ ❶

$\frac{-3x + 9y - 6z = -3}{-3}$ $\quad x - 3y + 2z = 1$ ❷

$\frac{5x - 15y + 10z = 5}{5}$ $\quad x - 3y + 2z = 1$ ❸

all 3 are the same plane

∴ Infinitely Many Solutions

Determine the number of solutions.

$$\begin{cases} x+y+z = 5 & (1) \\ x+y+z=4 & (2) \\ x+y+z=2 & (3) \end{cases}$$

all 3 parallel

No solution

Determine the number of solutions.

$2x - y + 3z = 6$ ❶

$2x - 4y + 6z = 10$ ❷

$y - z = -2$ ❸

$2x - y + 3z = 6$

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

$3y - 3z = -4$

$3y - 3z = -4$

$-3y + 3z = 6$

$0 = 2$

No solution