

Consistent and Independent
"One Solution"

$y = mx + b$ (different slopes)

$$y = \boxed{\frac{1}{4}}x - 7$$

$$y = \boxed{\frac{1}{3}}x - 4$$

Consistent and Dependent
"Many Solutions"

One Solution on top of the other

$y = mx + b$

Slopes and
y-intercept
are the same

$$y = \boxed{-4x + 9}$$
$$y = \boxed{-4x + 9}$$

Inconsistent
"No Solutions"

$y = mx + b$

Slopes are the same

$$y = \boxed{\frac{1}{5}}x - 30$$

$$y = \boxed{\frac{1}{5}}x - 2$$

$$\begin{cases} 7x - 4y - 2z = 7 \\ 8x - 2y - 8z = 1 \\ x + 2y - 6z = -6 \end{cases}$$

↓

$$\boxed{9x - 14z = -5}$$

$$\begin{aligned} 9x - 14z &= -5 \\ -1(9x - 14z) &= -5(-1) \end{aligned}$$

$$\begin{aligned} 9x - 14z &= -5 \\ -9x + 14z &= 5 \end{aligned}$$

$$\boxed{0 = 0} \quad \text{Many Solutions}$$

$$\text{let } \boxed{z = a}$$

$$\begin{aligned} 9x - 14a &= -5 \\ +14a + 14a \\ \hline 9x &= \frac{14a - 5}{9} \end{aligned}$$

$$x = \frac{14a - 5}{9} \quad \text{or} \quad \boxed{x = \frac{14a - 5}{9}}$$

$$\left(\frac{14a - 5}{9}, \frac{40a - 49}{18}, a \right)$$

$$\begin{aligned} 7x - 4y - 2z &= 7 \\ 2(x + 2y - 6z) &= (-6)2 \end{aligned}$$

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$$\begin{aligned} 7x - 4y - 2z &= 7 \\ 2x + 4y - 12z &= -12 \end{aligned}$$

$$\boxed{9x - 14z = -5}$$

$$x + 2y - 6z = -6 \quad z = a$$

$$\begin{aligned} \text{Solve for } y \\ \cancel{9} \left(\frac{14a - 5}{\cancel{9}} + 2y - 6a \right) &= -6 \left(\frac{\cancel{9}}{\cancel{1}} \right) \end{aligned}$$

↓

$$\begin{aligned} 14a - 5 + 18y - 54a &= -54 \\ -5 - 40a + 18y &= -54 \\ +5 & \qquad \qquad +5 \end{aligned}$$

$$\begin{aligned} -40a + 18y &= -49 \\ +40a & \qquad \qquad +40a \end{aligned}$$

$$\frac{18y}{18} = \frac{40a - 49}{18}$$

$$\boxed{y = \frac{40a - 49}{18}}$$