When given a system of three equations,

$$ax + by + cz = s$$

$$dx + ey + fz = r$$

$$gx + hy + iz = t$$

We can create a coefficient matrix from the coefficients of the variables.

$$\det \begin{bmatrix}
 a & b & c \\
 d & e & f \\
 g & h & i
 \end{bmatrix} = D$$

Then the system of equations,

$$ax + by + cz = s$$

$$dx + ey + fz = r$$

$$gx + hy + iz = t$$

has solutions,

$$x = \frac{\begin{vmatrix} s & b & c \\ r & e & f \\ t & h & i \end{vmatrix}}{D} \qquad y = \frac{\begin{vmatrix} a & s & c \\ d & r & f \\ g & t & i \end{vmatrix}}{D} \qquad z = \frac{\begin{vmatrix} a & b & s \\ d & e & r \\ g & h & t \end{vmatrix}}{D}$$

$$y = \frac{\begin{vmatrix} a & s & c \\ d & r & f \\ g & t & i \end{vmatrix}}{D}$$

$$z = \begin{bmatrix} a & b & s \\ d & e & r \\ g & h & t \end{bmatrix}$$

D = determinant of the coefficient matrix This is knows as Cramer's Rule

Cramer's Rule

1. Put System of Equations in Form...

$$ax + by + cz = s$$

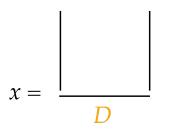
$$dx + ey + fz = r$$

$$gx + hy + iz = t$$

2. Find Coefficient Matrix

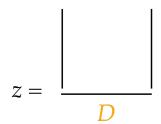
4. Calculate value of x.

5. Calculate value of *y*.



 $y = \frac{\left| \begin{array}{c} \\ \\ \end{array} \right|}{D}$

6. Calculate value of *z*.



3. Find Determinant of Coefficient Matrix

Use Cramer's Rule to solve the following system

$$x - y + z = -4$$

 $2x - 3y + 4z = -15$
 $5x + y - 2z = 12$

Use Cramer's Rule to solve the following system

$$x - 2y + 3z = 7$$
$$2x + y + z = 4$$

$$-3x + 2y - 2z = -10$$

Cramer's Rule

1. Put System of Equations in Form...

$$ax + by + cz = s$$

$$dx + ey + fz = r$$

$$gx + hy + iz = t$$

2. Find Coefficient Matrix

$$det \begin{bmatrix} & & & & \\ & & & & \\ & & & & \\$$

3. Find Determinant of Coefficient Matrix

$$Set = D$$

4. Calculate value of x.

$$= \begin{array}{c|cccc} s & b & c \\ r & e & f \\ t & h & i \end{array}$$

$$y = \frac{\begin{vmatrix} a & s & c \\ d & r & f \\ g & t & i \end{vmatrix}}{D}$$

6. Calculate value of *z*.

$$z = \begin{array}{c|c} a & b & s \\ d & e & r \\ g & h & t \end{array}$$