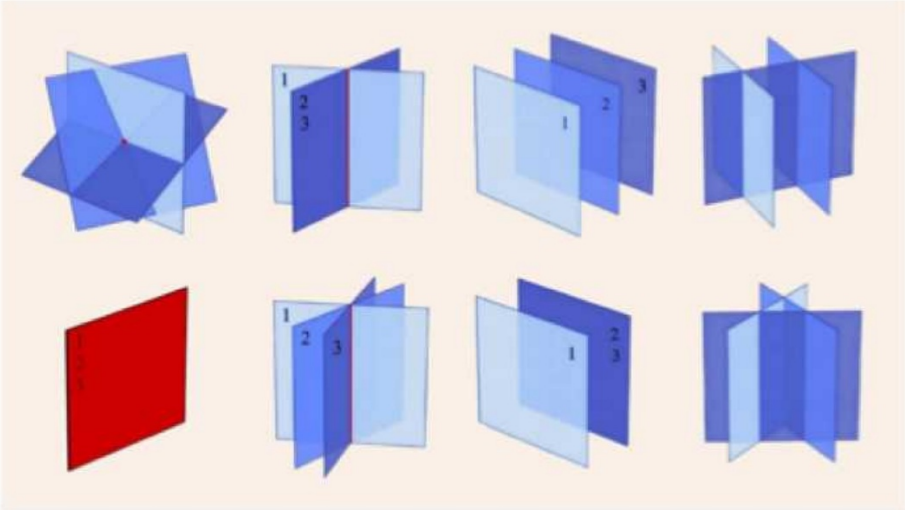
3x3 System of Equations

Solution Types:



Algebraic Solving Methods:

- Substitution
- Elimination

*See printout.

HW

3x3 systems 1, 2, 3
word problems 1, 4, 18, 19
Cramer's rule 5, 6, 7, 8

Quiz topics

2x2 systems (all methods)
3x3 systems (NOT Cramer's rule)
word problems
2x2 inequalities

~~Substitution~~

ex: Solve.

$$2x - 4z = 20$$

a) $-2(-3x + y - 4z = 20)$

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

$$6x - 2y + 8z = -40$$

$$2x + 11z = -55$$

$$-(2x - 4z = 20)$$

$$2x + 11z = -55$$

$$+\ -2x + 4z = -20$$

$$15z = -75$$

$$z = -5$$

$$x = 0$$

$$-3(0) + y - 4(-5) = 20$$

$$y = 0$$

$$(0, 0, -5)$$

Elimination

ex: Solve.

$(-1, -5, 7)$

① $3x - 2y + 4z = 35$

b) $(-4x + y - 5z = -36)\,3$

② $-12x + 3y - 15z = -108$

③ $5x - 3y + 3z = 31$

① + ②

$3x - 2y + 4z = 35$

$+\ -8x + 2y - 10z = -72$

$-5x - 6z = -37$

$-2(5x + 6z = 37)$

$7x + 12z = 77$

$-10x - 12z = -74$

$7x + 12z = 77$

$-3x = 3$

$x = -1$

② + ③

$-12x + 3y - 15z = -108$

$5x - 3y + 3z = 31$

$-7x - 12z = -77$

ex: Solve.

c)

$$5x+4y-5z=-10$$
$$-4x-10y-8z=-16$$
$$6x+15y+12z=24$$

$$4x-y+2z=11$$
$$x+2y-z=-1$$
$$2x+2y-3z=-1$$

pennies 1 cent
nickels 5 cents
dimes 10 cents
quarters 25 cents

$(2,-1,1)$

ex: Solve.

d) $$\begin{aligned} -6a+9b-12c &= 21 \\ -2a+3b-4c &= 7 \\ 10a-15b+20c &= -30 \end{aligned}$$

no solution

ex: Sandy has nickels, dimes and quarters that amount to $3.75 in change. She has three more quarters than dimes but twice as many nickels as quarters. How many dimes, nickels and quarters does Sandy have?

$.05n + .10d + .25q = 3.75$

$q = 3 + d \rightarrow d = (q - 3)$

$n = 2q$

$.05 \cdot 2q + .10(q - 3) + .25q = 3.75$

$.10q + .10q - .3 + .25q = 3.75$

$.45q = 4.05 \quad q = 9$

$n = 18$

$q = 9$

$d = 6$

ex: My friends and I went to the candy store on the weekend. One friend bought 4 gumballs, 3 lollipops, and 8 gummy rings, for a total of $3.25. Another friend bought 10 gumballs, 8 lollipops and 4 gummy rings, for a total of 5.90. I bought 3 gumballs, 2 lollipops, and 15 gummy rings, for a total of $3.70. How much did each of the candy items cost?

$4g + 3l + 8r = 3.25$

$10g + 8l + 4r = 5.90$

$3g + 2l + 15r = 3.70$

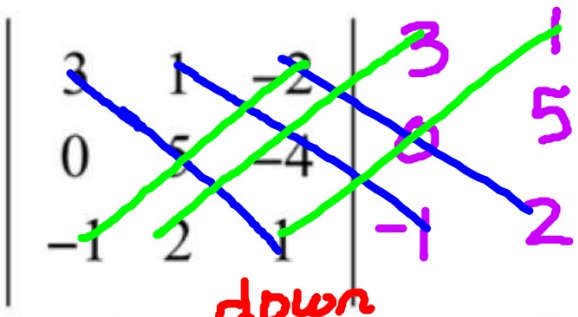
$g = .25$

$l = .35$

$r = .15$

ex: Evalutate.

c)



$$(15 + 4 + 0) - (10 + -24 + 0)$$

$$19 - (-14)$$

$$33$$

ex: Evalutate.

d)

0	0	1	0	0
4	12	1	4	12
−2	8	1	−2	8

$(0+0\ 32) - (-24+0+0)$

$32+24$

56

ex: Solve the system using Cramer's Rule, if possible.

d) $x + 2y + 3z = -5$

$3x + y - 3z = 4$

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

$(-35+42+48) - (-21+60+56)$

$$x = \frac{D_x}{D} = \frac{\begin{vmatrix} -5 & 2 & 3 \\ 4 & 1 & -3 \\ -7 & 4 & 7 \end{vmatrix} \begin{matrix} -5 & 2 \\ 4 & 1 \\ -7 & 4 \end{matrix} =}{\begin{vmatrix} 1 & 2 & 3 \\ 3 & 1 & -3 \\ -3 & 4 & 7 \end{vmatrix}}$$

$(-1, 1, -2)$

$$D_z = \begin{vmatrix} 1 & 2 & -5 \\ 3 & 1 & 4 \\ -3 & 4 & -7 \end{vmatrix} \begin{matrix} 1 & 2 \\ 3 & 1 \\ -3 & 4 \end{matrix}$$

ex: Solve the system using Cramer's Rule, if possible.

e) $x + y + z = 1$

$2x - 5y + z = 7$

$2y - 4z = -10$

$y = -1$ ✓