Name Review Guide Key Portfolio Task____ Solving 3 x 3 Systems Hour______

Assigned Date______________ Due Date______________

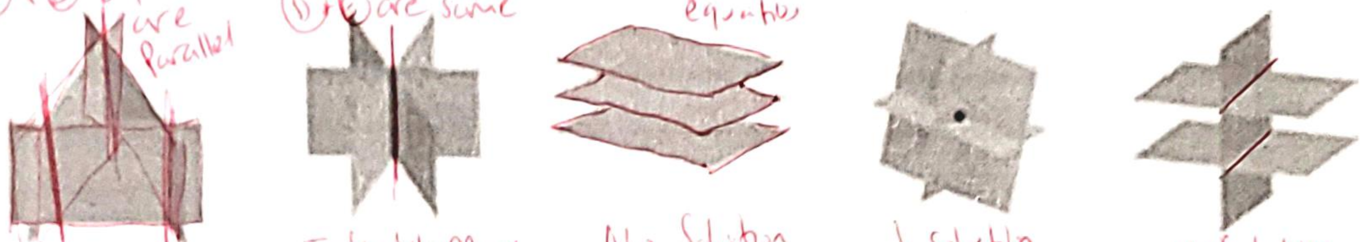
Self-Assessment:	Cannot complete	Attempted	Nearly There	Can explain to others

Objective: Vocabulary Associated with Three Variable Systems
Using Technology to Model Mathematics & Vocabulary

Resource Credit: Section 1.4
BIM Algebra 2 Text p29-36

Unfortunately, sometimes the special cases of 3 x 3 systems of equations are the hardest to understand. If a system of equations does not have a single solution, then it either has NO solutions or it has infinitely many solutions. This is hard to determine which scenario is present using determinants or matrix inverse because the determinant of both types of systems is 0.

(D) + (E) Equations are parallel — 3 unique equations (D) + (E) are same — All 3 parallel equations — 2 Parallel equations



No Solution	Infinitely Many Solutions	No Solution	1 solution	No Solution
System 1	System 2	System 3	System 4	System 5

Solutions to a 3 Variable System: Ordered Triples (x,y,z) points that work for all 3 equations

Use the numbers under each representation of a three variable system to answer the questions below

1. __4__ Which of the systems has exactly one solution?
2. __2__ Which of the systems has infinitely many solutions?
3. __1, 3, 5__ Which of the systems has no solutions?

Directions: Match the systems A, B, C and D to the numbered system examples above and give an ALGEBRAIC reason for the selection of system

System A	System B	System C	System D	System E
$x-2y+3z=2$	$x-2y+3z=2$	$-4x+3y+7z=25$	$5x+5y+5z=-20$	$x+2y-7z=-4$
$2x-4y+6z=48$	$2x-4y+6z=7$	$2x-y+6z=17$	$4x+3y+3z=-6$	$2x+y+z=13$
$-5x+10y-15z=-50$	$-5x-10y-15z=-50$	$-8x-5y+3z=-5$	$-4x+3y+3z=9$	$3x+9y-36z=-33$

·2 ·2 not = ·-5 Parallel

4. System A is an example like System __3__
   Algebraically how do you know this classification? All Parallel equations, A·2 = B + A·-5 = C but constants are different
5. System B is an example like System __5__
   Algebraically how do you know this classification? 2 Parallel equations A·2 = B but constant different C is almost parallel to A but the z term is -15 instead of +15
6. System C is an example like System __4__
   Algebraically how do you know this classification? None are parallel and (D) + (E) are not parallel or same
7. System D is an example like System __1__
   Algebraically how do you know this classification? (D) + (E) are parallel
8. System E is an example like System __2__
   Algebraically how do you know this classification? (D) + (E) are the same (D)·-1 = (E)

(A) $-4x+3y+7z=25$
(B) $+\ 4x-2y+12z=34$
(D) $y+19z=59$

(B) $8x-4y+24z=68$
(C) $-8x-5y+3z=-5$
(E) $-9y+27z=63$

(A) $-2x-4y+14z=8$
(B) $+\ 2x+y+z=13$
(D) $-3y+15z=21$

(A) $-3x-6y+21z=12$
(C) $+\ 3x+9y-36z=-33$
(E) $3y-15z=-21$

(A) $20x+20y+20z=-80$
(C) $+\ -20x+15y+15z=135$
$35y+35z=55$

(E) $-4x+3y+3z=9$
(B) $+\ 4x+3y+3z=-6$
(D) $6y+6z=3$

Link to GeoGebra 3D plotting https://www.geogebra.org/3d?lang=en

Solve these systems of equations. Show all work or thinking. If there is no solution say so, if there are infinitely many solutions say so and write as an ordered triple in terms of y.

9. A $5x + 5y + 5z = -20$ ·4
B $4x + 3y + 3z = -6$
C $-4x + 3y + 3z = 9$ ·-5

Elimination

B $4x + 3y + 3z = 6$
C $-4x + 3y + 3z = 9$

D $6y + 6z = 15$
$\frac{6y+6z}{6} = \frac{15}{6}$

D $y + z = 2.5$
E $-y - z = 1$

$0 = 3.5$
False
No Solution

Parallel

A $20x + 20y + 20z = -80$
C $-20x + 15y + 15z = +45$

E $35y + 35z = -35$
$\frac{35y+35z}{35} = \frac{-35}{35}$

E $(y + z = -1)$ ·-1

System 1

10. A $6x + 10y + 4z = 122$
B $-5x + y - 4z = -25$
C $-3z = x$

Substitution

A $6(-3z) + 10y + 4z = 122$
$-18z + 10y + 4z = 122$
D $10y - 14z = 122$

B $-5(-3z) + y - 4z = -25$
$15z + y - 4z = -25$
E $(y + 11z = -25)$ ·-10

E $-10y - 110z = +250$
D $10y - 14z = 122$
$-124z = 372$
$\frac{-124z}{-124} = \frac{372}{-124}$
$z = -3$

E $y + 11(-3) = -25$
$y - 33 = -25$
$y = 8$

C $x = -3(-3)$
$x = 9$

System 4
$(9, 8, -3)$
1 solution

11. $3x + 3y + 3z = -12$
$2x + 3y + 5z = 9$
$-x - y - z = 3$
-3·

not ·-3
So

A and C are Parallel
B not parallel

No Solution
System 5

C $-3x - 3y - 3z = 9$
A $3x + 3y + 3z = -12$

$0 = -3$
False
No Solution

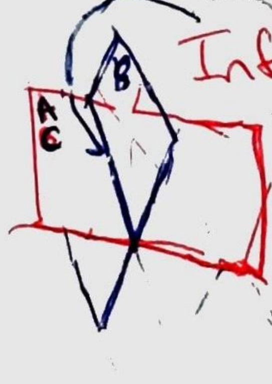
12. $3x + 3y + 3z = -12$
$2x + 3y + 5z = 9$
$-x - y - z = 4$
·-3 ·-3

A and C are the same line, A ·-3 = C

C $-3x - 3y - 3z = 12$
A $3x + 3y + 3z = -12$

$0 = 0$
True

Infinite Solutions



7. Write the system of 3 variable equations for the matrix.

$$\begin{array}{c|ccc|c} & x & y & z & = \\ \hline 1) & 2 & 5 & 0 & 13 \\ 2) & -3 & 1 & 2 & 6 \\ 3) & 4 & 0 & -3 & 5 \end{array}$$

1) $2x + 5y = 13$
2) $-3x + y + 2z = 6$
3) $4x - 3z = 5$

8. Write the system of 3 variable equations for the matrix.

$$\left[\begin{array}{ccc|c} 6 & -3 & 6 & 5 \\ 4 & 6 & -7 & 4 \\ -2 & 6 & 6 & 7 \end{array}\right]$$

1) $6x - 3y + 6z = 5$
2) $4x + 6y - 7z = 4$
3) $-2x + 6y + 6z = 7$

Write the matrix for the system of equations and solve (remember $[A]^{-1}[B]$).

9. $\begin{cases} 3x + y = -4 \\ -2x + 4y = 7 \end{cases}$

$$\begin{array}{cc|c} x & y & \\ \hline 3 & 1 & -4 \\ -2 & 4 & 7 \end{array}$$

$x = -1.643$
$y = 0.929$

10. $\begin{cases} 4x - y + 2z = 10 \\ 5x + 2y - 3z = 0 \\ x - 3y + z = 6 \end{cases}$

$$\left[\begin{array}{ccc|c} 4 & -1 & 2 & 10 \\ 5 & 2 & -3 & 0 \\ 1 & -3 & 1 & 6 \end{array}\right]$$

$x = 1.407$
$y = -0.963$
$z = 1.704$

11. $\begin{cases} 3x - 2y + z = 6 \\ 4x - 6z = 6 \\ -3y - 4z = -10 \end{cases}$

$$\left[\begin{array}{ccc|c} 3 & -2 & 1 & 6 \\ 4 & 0 & -6 & 6 \\ 0 & -3 & -4 & -10 \end{array}\right]$$

$\begin{array}{c} x = \\ y = \\ z = \end{array} \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$

12. Last year, a baseball team purchased new equipment. The equipment manager paid \$20 per bat and \$12 per glove and \$15 per ball, spending a total of \$646. The manager bought 40 pieces of equipment. They bought 7 more bats than balls. Write a system of equations and solve for the amount of bats, gloves, and balls that were bought.

Determine Variables x: # of bats y: # of gloves z: # of balls

Total Valued Equation: $20x + 12y + 15z = 646$

Total Object Equation: $x + y + z = 40$

Relationship Equation: $x = z + 7$

17 bats, 13 gloves, and 10 balls were bought

(A) $20(z+7) + 12y + 15z = 646$
$20z + 140 + 12y + 15z = 646$
(D) $12y + 35z = 506$
(E) $-12y - 24z = -396$
$11z = 110$
$z = 10$
$x = (10) + 7$
$x = 17$

(B) $(z+7) + y + z = 40$
$7 + y + 2z = 40$
(E) $y + 2z = 33$
-12
(E) $y + 2(10) = 33$
$y + 20 = 33$
$y = 13$

13. Andrea Liskow was the top scorer in a women's professional basketball league for the 2006 regular season, with a total of 822 points. The number of two-point baskets that Andrea made was 60 less than double the number of three-point baskets she made. The number of free throws (each worth one point) she made was 15 less than the number of two-point field goals she made. Find how many free throws, two-point baskets, and three-point baskets Andrea Liskow made during the 2006 regular season.

Determine Variables x: # of free throws y: # of 2pt baskets z: # of 3 pt baskets

Total Valued Equation: $x + 2y + 3z = 822$ (A)

Total Object Equation: $\boxed{y} = 2z - 60$ (B)

Relationship Equation: $x = y - 15$ (C) → $\boxed{y} = x + 15$

(A) $x + 2(x+15) + 3z = 822$
$x + 2x + 30 + 3z = 822$
(D) $3x + 3z = 792$
(E) $-3x + 6z = 135$
$9z = 927$
$\frac{9z}{9} = \frac{927}{9}$
$z = 103$

(B) $(x+15) = 2z - 60$
(E) $(x - 2z = -45)$ -3
(E) $-3x + 6z = 13$

(E) $x - 2(103) = -45$
$x - 206 = -45$
$x = 161$

(C) $y = 161 + 15$
$y = 176$

Andrea Liskow
161 free throws
176 2 pt baskets
103 3 pt baskets

14. Graph and find the solution to the system of inequalities

$y \geq x - 3$ slope $m = 1$ $b = -3$ $(0, -3)$ shade above solid line

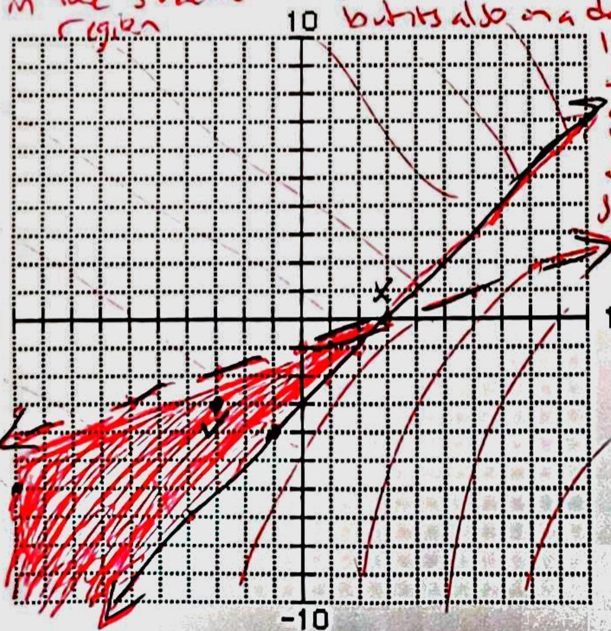
$y < \frac{1}{3}x - 1$ slope $m = \frac{1}{3}$ $b = -1$ $(0, -1)$ shade below dashed line

Two Solution points include: $(-1, -4)$ $(-10, -4)$ $(1, -1)$ $(1, -2)$

Prove it by plugging the points into the equations to check for true statements
$(-2) \geq (1) - 3$ $(-2) < \frac{1}{3}(1) - 1$
$-2 \geq -2$ ✓ $-2 < 0.33 - 1$
$-2 < -0.66$ ✓

Is (-3,-3) a solution? Explain
Yes its in the shaded region

Is (3,0) a solution? Explain
No, its on one solid line but its also on a dashed line so it doesn't work for the second inequality



15. Which region/s are solutions to the above system graphed below? Give two points in the solution set. If there are more than one region include one point from each region. Determine if the given point is a solution and explain your thinking

$y < -|x - 5| + 2$
$y \leq \frac{1}{2}x - 6$

Solution Region/s: 4 (darkest overlapping region)

Two Solution points include: $(1, -6)$ $(-5, -4)$ $(8, -10)$

Is (0,-6) a solution? Yes on boundary + on solid line
Is (10,-3) a solution? No, on boundary, but line is dashed
Is (-6,-9) a solution? No, intersection with dashed line
(0,0) No, not in shaded regions
(5,-1) Not in overlapping shaded regions