Station 1

1) $y = 6x - 11$
$-2x - 3y = -7$

$-2x - 3(6x - 11) = -7$
$-2x - 18x + 33 = -7$
$-20x = -40$
$x = 2$
$y = 1$
$(2, 1)$

2) $2x - 3y = -1$
$y = x - 1$

$2x - 3(x - 1) = -1$
$2x - 3x + 3 = -1$
$-x + 3 = -1$
$-x = -4$
$x = 4$
$y = 3$
$(4, 3)$

3) $y = -3x + 5$
$5x - 4y = -3$

$5x - 4(-3x + 5) = -3$
$5x + 12x - 20 = -3$
$17x = 17$
$x = 1$
$y = 2$
$(1, 2)$

4) $-3x - 3y = 3$
$y = -5x - 17$

$-3x - 3(-5x - 17) = 3$
$-3x + 15x + 51 = 3$
$12x = -48$
$x = -4$
$y = 3$
$(-4, 3)$

1) $-4x - 2y = -12$
$+ \; 4x + 8y = -24$

$6y = -36$
$y = -6$
$x = 6$
$(6, -6)$

2) $4x + 8y = 20$
$+ \; -4x + 2y = -30$

$10y = -10$
$y = -1$
$x = 7$
$(7, -1)$

3) $x - y = 11$
$+ \; 2x + y = 19$

$3x = 30$
$x = 10$
$y = -1$
$(10, -1)$

4) $-6x + 5y = 1$
$+ \; 6x + 4y = -10$

$9y = -9$
$y = -1$
$x = -1$
$(-1, -1)$

Does multiplying an equation in a system of equations by a constant change the solution?

NAME:

Pre-Calculus

Station 2

Complete the given operation.

1) $\begin{bmatrix} 3 & 6 \\ -1 & -3 \\ -5 & -1 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ 6 & 0 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ 5 & -3 \\ -3 & 2 \end{bmatrix}$

2) $\begin{bmatrix} -5 & 2 & -2 \\ 4 & -2 & 0 \end{bmatrix} - \begin{bmatrix} 6 & -5 & -6 \\ 1 & 3 & -3 \end{bmatrix} = \begin{bmatrix} -11 & 7 & 4 \\ 3 & -5 & 3 \end{bmatrix}$

3) $-5\begin{bmatrix} 5 & 6 & -4 \\ 4 & -2 & -1 \end{bmatrix} = \begin{bmatrix} -25 & -30 & 20 \\ -20 & 10 & 5 \end{bmatrix}$

4) $-5\begin{bmatrix} -3 & 0 \\ 0 & 5 \end{bmatrix} = \begin{bmatrix} 15 & 0 \\ 0 & -25 \end{bmatrix}$

5) $\begin{bmatrix} 4 & 2 \end{bmatrix} + \begin{bmatrix} -2 & -6 \end{bmatrix} = \begin{bmatrix} 2 & -4 \end{bmatrix}$

6) $5\begin{bmatrix} 4 \\ 3 \end{bmatrix} = \begin{bmatrix} 20 \\ 15 \end{bmatrix}$

7. $\underset{3\times 2}{\begin{bmatrix} 1 & 0 \\ -1 & 2 \\ 0 & -1 \end{bmatrix}} \cdot \underset{2\times 2}{\begin{bmatrix} 3 & 0 \\ 2 & 2 \end{bmatrix}} = \underset{3\times 2}{\begin{bmatrix} 3 & 0 \\ 1 & 4 \\ -2 & -2 \end{bmatrix}}$

$1(3)+0(2)=3$ $\quad 0(3)+(-1)(2)=-2$

$1(0)+0(2)=0$ $\quad 0(0)+(-1)(2)=-2$

$-1(3)+2(2)=1$

$-1(0)+2(2)=4$

8. Solve for a $\begin{bmatrix} 2a-3 & 4 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ -1 & 2 \end{bmatrix}$

$2a-3=5$

$2a=8$

$a=4$

State the determinant of the following matrices. Then determine the inverse if it exists.

1. $\begin{bmatrix} 3 & 6 \\ 1 & 2 \end{bmatrix}$ Det: $3(2)-6(1)=0$ No inverse. b/c det=0

Det $\begin{bmatrix} a & b \\ c & d \end{bmatrix} = ad-bc$

2. $\begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix}$ Det: $1(0)-2(1)=-2$ $\quad \frac{1}{-2}\begin{bmatrix} 0 & -2 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ \frac{1}{2} & -\frac{1}{2} \end{bmatrix}$ $\quad \frac{1}{\text{Det}}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

3. $\begin{bmatrix} -1 & -1 \\ 3 & 2 \end{bmatrix}$ Det: $-1(2)-(-1)(3)=-2+3=1$ $\quad \frac{1}{1}\begin{bmatrix} 2 & 1 \\ -3 & -1 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & -1 \end{bmatrix}$ $\quad \frac{1}{\text{Det}}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

Station 3

Solve the system of equations using INVERSE Matrices and your calculator.

1) $3x - y + 4z = -17$
$4x + 3y - 5z = 4$
$x + 6y + 2z = -6$

$\begin{bmatrix} 3 & -1 & 4 \\ 4 & 3 & -5 \\ 1 & 6 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -17 \\ 4 \\ -6 \end{bmatrix}$

A X B

$X = A^{-1}B$

$X = \begin{bmatrix} -466/205 \\ 43/205 \\ -511/205 \end{bmatrix}$

2) $m + n + p + q = 7$
$-2m + 4n - p + 3q = 1$
$4m - 2n + 4p + q = 4$
$-m + 2n - 3p - 2q = 8$

$\begin{bmatrix} 1 & 1 & 1 & 1 \\ -2 & 4 & -1 & 3 \\ 4 & -2 & 4 & 1 \\ -1 & 2 & -3 & -2 \end{bmatrix} \begin{bmatrix} m \\ n \\ p \\ q \end{bmatrix} = \begin{bmatrix} 7 \\ 1 \\ 4 \\ 8 \end{bmatrix}$

$X = \begin{bmatrix} -3 \\ 9 \\ 11 \\ -10 \end{bmatrix}$

3. Write the system of equations as an augmented matrix. Then use Gaussian elimination to write the system on row echelon form. What is the solution to the system of equations?

$x + 2y - z = 3$
$3x + 7y - 3z = 12$
$-2x - 4y + 3z = -5$

$\begin{bmatrix} 1 & 2 & -1 & 3 \\ 3 & 7 & -3 & 12 \\ -2 & -4 & 3 & -5 \end{bmatrix} \xrightarrow{-3R_1 + R_2} \begin{bmatrix} 1 & 2 & -1 & 3 \\ 0 & 1 & 0 & 3 \\ -2 & -4 & 3 & -5 \end{bmatrix} \xrightarrow{2R_1 + R_3} \begin{bmatrix} 1 & 2 & -1 & 3 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 1 \end{bmatrix}$

$z = 1 \quad y = 3 \quad x + 2y - z = 3$
$x + 6 - 1 = 3$
$x = -2$
$(-2, 3, 1)$

4. Ee have already reduced an augmented matrix using elementary row operations to the row echelon form below. What would the REDUCED row echelon form be? Show your steps. Then identify the solution

$\begin{bmatrix} 1 & -1 & 2 & -3 \\ 0 & 1 & -1 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

$\begin{bmatrix} 1 & -1 & 2 & -3 \\ 0 & 1 & -1 & 4 \\ 0 & 0 & 1 & 3 \end{bmatrix} \xrightarrow{R_3 + R_2} \begin{bmatrix} 1 & -1 & 2 & -3 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 3 \end{bmatrix} \xrightarrow{R_2 + R_1} \begin{bmatrix} 1 & 0 & 2 & 4 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

$\xrightarrow{-2R_3 + R_1} \begin{bmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 3 \end{bmatrix}$

$(-2, 7, 3)$

Calc ok.

Station 4

CLASS DEBATE In Exercises 37–39, use the following information.

Three teams participated in a debating competition. The final score for each team is based on how many students ranked first, second, and third in a debate. The results of 12 debates are shown in matrix A.

MATRIX A

	1st	2nd	3rd
Team 1	3	5	4
Team 2	5	2	5
Team 3	4	6	2

37. Teams earn 6 points for each first place, 5 points for each second place, and 4 points for each third place. Organize this information into a matrix B.

38. Find the product AB.

39. LOGICAL REASONING Which team won the competition? How many points did the winning team score?

37. $B = \begin{matrix}1^{st}\\2^{nd}\\3^{rd}\end{matrix}\begin{bmatrix}6\\5\\4\end{bmatrix}$

38. $\begin{matrix}\#1\\\#2\\\#3\end{matrix}\begin{bmatrix}3&5&4\\5&2&5\\4&6&2\end{bmatrix}\cdot\begin{bmatrix}6\\5\\4\end{bmatrix}=\begin{bmatrix}59\\60\\62\end{bmatrix}$ (1st 2nd 3rd; Total Points)

Team 3 w/ 62 points.

4. Bata Aerobics manufactures two models of steppers used for aerobic exercises. Manufacturing each luxury model requires 10 lb of plastic and 10 min of labor. Manufacturing each standard model requires 16 lb of plastic and 8 min of labor. The profit for each luxury model is \$40, and the profit for each standard model is \$30. If 6000 lb of plastic and 60 labor-hours are available for the production of the steppers per day, how many steppers of each model should Bata produce each day in order to maximize its profit?

3600 minutes

x: # of luxury y: # of standard

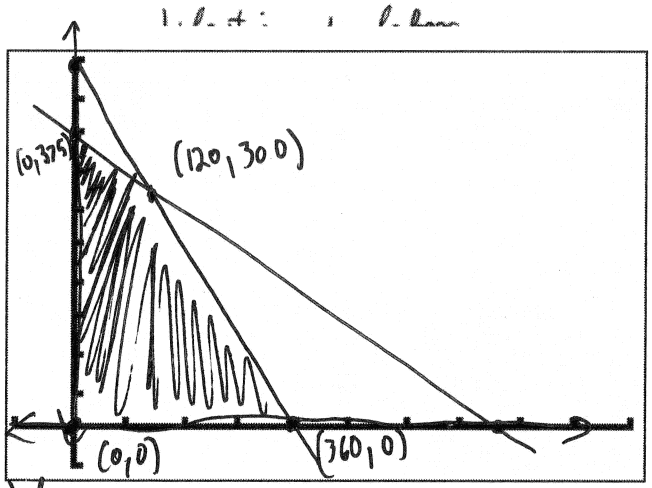
OF: $P = 40x + 30y$

Constraints: $10x + 16y \leq 6000$

$10x + 8y \leq 3600$

$x \geq 0$

$y \geq 0$



	(0,0)	(360,0)	(120,300)	(0,375)
P	0	14,400	13,800	11,250

360 luxury steppers per day