Name: …… Period: …… Date: …….

**Mathematics III Unit 1 Matrices Test# 1**

*Direction: Show your work on a separate sheet of paper.*

(MM3A4)

Simplify (scalar multiplication and addition).

1. $\begin{bmatrix}5 & 10 & 7\\ 3 & 0 & -2\end{bmatrix}$ + (-3) $\begin{bmatrix}7 & -3 & 1\\ 6 & 0 & -5\end{bmatrix}$

(MM3A4)

Perform the indicated operation (scalar multiplication by a fraction). Write your answer in fraction form.

2. $\frac{1}{60}\begin{bmatrix}1 & 2 & 3\\ 5 & 6 & 12\\ 15 & 30 & 60\end{bmatrix}$

(MM3A4)

3. Find the product of the following matrices, if possible.

a. $\begin{bmatrix}1 & 2 & 0\\ 3 & -5 & 2\end{bmatrix}\begin{bmatrix}-3 & 2\\ 0 & 4\\ 1 & -1\end{bmatrix}$

b. $\begin{bmatrix}1 & 2\\ 3 & 4\\ 5 & 6\end{bmatrix}\begin{bmatrix}1 & 0\\ 2 & 5\\ 0 & 1\end{bmatrix}$

(MM3A4)

4. Evaluate the following determinants

a. $\begin{vmatrix}-7 & 6\\ -5 & 4\end{vmatrix}$

b. $\begin{vmatrix}1 & 2 & 3\\ -4 & 0 & 5\\ 6 & -7 & 4\end{vmatrix}$

(MM3A4)

5. If A = $\begin{bmatrix}8 & -3\\ -5 & 2\end{bmatrix}$, find the inverse Matrix $A^{-1}$. Check your answer by finding $A\,A^{-1}$.

(MM3A5)

6. Use Matrices to solve the given system of equations:

2x + 3y = -5

5x + 4y = -2

(MM3A5)

7. A dog breeder finds that certain brands of dog food contain different amounts of three main nutrients, measured in milligrams per serving, as shown in the matrix A. The dog breeder decides to mix the brands in order to give the healthiest feeding mixture possible. Matrix B gives the portion of the mixture for each brand.

$$\begin{array}{l} \\ \text{Nutrient1} \\ \text{Nutrient2} \\ \text{Nutrient3} \end{array} \begin{array}{c} \begin{array}{cccc} W & X & Y & Z \end{array} \\ \begin{bmatrix} 250 & 480 & 360 & 200 \\ 320 & 510 & 475 & 315 \\ 180 & 200 & 230 & 155 \end{bmatrix} \end{array} = A$$

$$\begin{array}{c} \\ W \\ X \\ Y \\ Z \end{array} \begin{array}{c} \\ \begin{bmatrix} 40\,\% \\ 10\,\% \\ 15\,\% \\ 35\,\% \end{bmatrix} \end{array} = B$$

a. Which matrix product is defined, AB or BA? Find that matrix product.

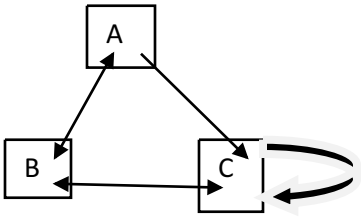
b. How many milligrams of nutrient 3 are in a serving of the mixture?

(MM3A5)

8. Given a triangle with vertices A (-3, 1), B (5, 1), and C (0, 6), find the area of the triangle using the determinant formula: Area of a $\Delta = \mp \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$ square units.

(MM3A7)

9. The diagram below shows the flights between three cities A, B, and C.




Lines with only one arrow indicate that the flow of traffic is in one direction only.

a. Construct a route matrix R for the network shown in the diagram.

b. Find the square of the route matrix, $R^2$.

c. What information does $R^2$ give you?