Day 2 HW Matrix multiplication KEY

Follow instructions on the following problems and show all of your work

1. The student council is selling flowers for mother's day. They bought 200 roses for $1.67 each, 150 daffodils for $1.03 each and 100 orchids for $2.59 each. They sold the roses for $3.00 each, the daffodils for $2.25 each and the orchids for $4.50 each.

   a. Organize the data in two matrices, and use matrix multiplication to find the total amount spent on the flowers.

   $$N = \#\,of \begin{bmatrix} Roses & Daff & Orc. \\ 200 & 150 & 100 \end{bmatrix} \qquad C = \begin{matrix} Roses \\ Daff. \\ Orc. \end{matrix} \begin{bmatrix} Cost\ of \\ 1.67 \\ 1.03 \\ 2.59 \end{bmatrix}$$

   NC = Total spent = $747.50

   b. Write two matrices, and use matrix multiplication to find the total revenue the student council brought in for the flower sale.

   $$R = \begin{matrix} Roses \\ Daff. \\ Orc. \end{matrix} \begin{bmatrix} Received\ for \\ 3.00 \\ 2.25 \\ 4.50 \end{bmatrix}$$

   NR = Total revenue = $1387.50

   c. Use matrix operations to find how much profit the student council made on the project.

   Profit = NR – NC = $640.00

2. A nut distributor wants to know the nutritional content of various mixtures of almonds, cashews, and pecans. Her supplier has provided the following nutrition information:

	Almonds	Cashews	Pecans
Protein (g/cup)	26.2	21	10.1
Carbs (g/cup)	40.2	44.8	14.3
Fat (g/cup)	71.9	63.5	82.8

Her first mixture, a protein blend, consists of 6 cups of almonds, 3 cups of cashews, and 1 cup of pecans. Her second mixture, a low fat mix, consists of 3 cups of almonds, 6 cups of cashews, and 1 cup of pecans. Her third mixture, a low carb mix consists of 3 cups of almonds, 1 cup of cashews, and 6 cups of pecans. **Determine the amount of protein, carbs, and fats in a 1 cup serving of each of the mixtures.**

Solution:

$$\begin{matrix} \\ Protein \\ Carbs \\ Fat \end{matrix} \begin{bmatrix} 26.2 & 21 & 10.1 \\ 40.2 & 44.8 & 14.3 \\ 71.9 & 63.5 & 82.8 \end{bmatrix} \times \begin{matrix} Almonds \\ Cashews \\ Pecans \end{matrix} \begin{bmatrix} 6 & 3 & 3 \\ 3 & 6 & 1 \\ 1 & 1 & 6 \end{bmatrix} = \begin{matrix} \\ Protein \\ Carbs \\ Fat \end{matrix} \begin{bmatrix} 230.3 & 214.7 & 160.2 \\ 389.9 & 403.7 & 251.2 \\ 704.7 & 679.5 & 776 \end{bmatrix}$$

Almonds, Cashews and Pecans — Protein, Low-Fat and Carb — Protein, Low-Fat and Carb

But we have to be careful, since these amounts are for **10 cup mixtures!**

So to get the answers, we have to **divide each answer by 10** to get **grams per cup**. So the numbers in bold are our answers:

	Protein Blend	Low Fat Mixture	Low Carb Mixture
Protein (grams)	230.3/10 = **23.03**	214.7/10 = **21.47**	160.2 = **16.02**
Carbs (grams)	389.9/10 = **38.9**	403.7/10=**40.37**	251.2/10 = **25.12**
Fat (grams)	704.7/10 = **70.47**	679.5/10 = **67.95**	776/10 = **77.6**

3. An outbreak of Chicken Pox hit the local public schools. Approximately **15%** of the male and female juniors and **25%** of the male and female seniors are currently healthy, **35%** of the male and female juniors and **30%** of the male and female seniors are currently sick, and **50%** of the male and female juniors and **45%** of the male and female seniors are carriers of Chicken Pox.
There are **100** male juniors, **80** male seniors, **120** female juniors, and **100** female seniors.
Using two matrices and one matrix equation, find out **how many males and how many females (don't need to divide by class) are healthy, sick, and carriers.**

Solution:

$$\begin{matrix} & Junior & Senior \\ Male \\ Female \end{matrix} \begin{bmatrix} 100 & 80 \\ 120 & 100 \end{bmatrix} \times \begin{matrix} & H & S & C \\ Junior \\ Senior \end{matrix} \begin{bmatrix} .15 & .35 & .50 \\ .25 & .30 & .45 \end{bmatrix} = \begin{matrix} H & S & C & \\ 35 & 59 & 86 & Male \\ 43 & 72 & 105 & Female \end{matrix}$$

So there will be 35 healthy males, 59 sick males, and 86 carrier males, 43 healthy females, 72 sick females, and 95 carrier females. Pretty clever!

#1 came from http://militantgrammarian.com/DAY/LSandSTAT/1314/Matrices/Matrix%20Multiplication%20word%20problems%20with%20key.docx

#2 and 3 came from http://www.shelovesmath.com/algebra/advanced-algebra/matrices-and-solving-systems-with-matrices/#MultiplyingMatrices