Linear Algebra Exercises

Consider the following table of values for the vitamin content of 1 gram of certain foods[1]:

Vitamin content of 1 teaspoon of certain foods

	B_{12}	C	D
Clams	1mg	1mg	3mg
Spaghetti	2mg	3mg	2mg
Cupcake	3mg	2mg	1mg

One medium-rare Stegasaurus steak has the following vitamin content[2]: 39mg of B_{12}, 34mg of C, and 26mg of D.

EX 1: How many teaspoons of clams, spaghetti, and cupcakes would you have to eat to perfectly match the vitamin content of one medium-rare Stegasaurus steak? Set this up as a system of equations and solve.

Recall from the reading (Bretscher 1.1) the ancient Chinese problem taken from *Nine Chapteres on the Mathematical Art.*

> The yield of one bundle of inferior rice, two bundles of medium grade rice, and three bundles of superior rice is 39 duo of grain. The yield of one bundle of inferior rice, three bundles of medium grade rice, and two bundles of superior rice is 34 duo. The yield of three bundles of inferior rice, two bundles of medium grade rice, and one bundle of superior rice is 326 duo. What is the yield of one bundle of each grade of rice.

EX 2: Do you get the same matrix equation from this problem as from the Stegasaurus meat problem?

EX 3: The video that I asked you to watch talks about a "row picture" and a "column picture" interpretation of a linear system of equations. Which problem lends itself to which geometric interpretation?

There is a third type of geometric interpretation that is often employed in linear algebra. This interpretation, which we will call the "matrix transformation" picture, comes from the fact that an $m \times m$ matrix represents a geometric transformation of $\mathbb{R}^m$.

EX 4: Write out the system of linear equations from the previous problem in matrix-vector form (*i.e.* $A\vec{x} = \vec{b}$). How might you put in picture form this geometric interpretation?

[1] I absolutely made these up
[2] Pure speculation