Unit 2 Day 1 Practice KEY to Slides Worksheet

MATRIX APPLICATIONS

Application Example 1
(on power point slide handout)

Ex 1) Last year at Green Hope, there were 214 senior girls, 243 senior guys, 245 junior girls, 233 junior guys, 258 sophomore girls, 288 sophomore guys, and 345 freshman girls, and 303 freshman guys. At Cary, there were 223 senior girls, 252 senior guys, 250 junior girls, 200 junior guys, 260 sophomore girls, 248 sophomore guys, and 352 freshman girls, and 333 freshman guys.

a) Write matrices G and C that represent the population of each school.

$$G = \begin{array}{c} F \\ M \end{array} \begin{bmatrix} \overset{Sr}{214} & \overset{Jr}{245} & \overset{So}{258} & \overset{Fr}{345} \\ 243 & 233 & 288 & 303 \end{bmatrix}$$

$$C = \begin{array}{c} F \\ M \end{array} \begin{bmatrix} \overset{Sr}{233} & \overset{Jr}{250} & \overset{So}{260} & \overset{Fr}{352} \\ 252 & 200 & 248 & 333 \end{bmatrix}$$

b) Add these two together. What does this new matrix represent?

$$G + C = \begin{array}{c} F \\ M \end{array} \begin{bmatrix} \overset{Sr}{447} & \overset{Jr}{495} & \overset{So}{518} & \overset{Fr}{697} \\ 495 & 433 & 536 & 636 \end{bmatrix}$$

This represents the amount of each grade and gender for high school students in Cary.

Application Example 2

(on power point slide handout)

Last year at Green Hope, there were 214 senior girls, 243 senior guys, 245 junior girls, 233 junior guys, 258 sophomore girls, 288 sophomore guys, and 345 freshman girls, and 303 freshman guys.

Ex 2) Use the matrix of Green Hope students from the last example. If a college claims it is 5 times as large as our school, with students being distributed the same by year and gender, create a new matrix that shows the number of students at the college.

$$5G = 5\begin{bmatrix} 214 & 245 & 258 & 345 \\ 243 & 233 & 288 & 303 \end{bmatrix} = \begin{matrix} F \\ M \end{matrix}\begin{bmatrix} 1070 & 1225 & 1290 & 1725 \\ 1215 & 1165 & 1440 & 1515 \end{bmatrix}$$

$$\begin{matrix} Sr & Jr & So & Fr \end{matrix}$$

5·214   5·243

YOU TRY Application ANSWERS: The A-Plus auto parts store has two outlets, one in Greensboro and one in Charlotte. Among other things, it sells wiper blades, windshield cleaning fluid, and floor mats. The monthly sales of those products are given below.

January Ss	G'boro	Charlotte
Wiper Blades	20	15
Cleaning Fluid	10	12
Floor Mats	8	4

February Ss	G'boro	Charlotte
Wiper Blades	23	12
Cleaning Fluid	8	12
Floor Mats	4	5

1) Use matrix arithmetic to calculate the change in sales of each product in each store from January to February. Label your matrices.

$$F - J = \begin{array}{c} \\ WB \\ CF \\ FM \end{array} \begin{array}{cc} Gb & Ch \\ \end{array} \begin{bmatrix} 23 & 12 \\ 8 & 12 \\ 4 & 5 \end{bmatrix} - \begin{array}{cc} Gb & Ch \\ \end{array} \begin{bmatrix} 20 & 15 \\ 10 & 12 \\ 8 & 4 \end{bmatrix} = F - J = \begin{array}{c} \\ WB \\ CF \\ FM \end{array} \begin{array}{cc} Gb & Ch \\ \end{array} \begin{bmatrix} 3 & -3 \\ -2 & 0 \\ -4 & 1 \end{bmatrix}$$

You Try: Application The January revenue at the Greensboro A-Plus store was $140 for wiper blades, $30 for cleaning fluid, and $96 for floor mats. The January revenue for the Charlotte store was $105 for wiper blades, $36 for cleaning fluid, and $48 for floor mats.

2a) Write a matrix to represent the data above. Label it.

$$J = \begin{array}{c} \\ WB \\ CF \\ CM \end{array} \begin{array}{cc} Gb & Ch \\ \begin{bmatrix} 140 & 105 \\ 30 & 36 \\ 96 & 48 \end{bmatrix} \end{array}$$

b) If the US dollar was worth $0.76 Canadian dollars at the time, compute the revenue in Canadian dollars using matrix arithmetic. Show your matrix operations. Label your matrices.

$$Can.\,Value = 0.76J = 0.76 \begin{array}{cc} Gb & Ch \\ \begin{bmatrix} 140 & 105 \\ 30 & 36 \\ 96 & 48 \end{bmatrix} \end{array} = \begin{array}{c} \\ WB \\ CF \\ CM \end{array} \begin{array}{cc} Gb & Ch \\ \begin{bmatrix} 106.4 & 79.8 \\ 22.8 & 27.36 \\ 72.96 & 36.48 \end{bmatrix} \end{array}$$

Inverse Matrices and Systems

(on power point slide handout) **DONE IN NOTES***

Ex 1) A linen shop has several tables of sheets and towels on special sale. The sheets are all priced the same, and so are the towels. Mario bought 3 sheets and 5 towels at a cost of $137.50. Marco bought 4 sheets and 2 towels at a cost of $118.00. Find the price of each item.

Relate: 3 sheets and 5 towels cost $137.50.
         4 sheets and 2 towels cost $118.00.

Define: Let x = the price of one sheet.
         Let y = the price of one towel.

Write: $\begin{bmatrix} 3 & 5 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 137.50 \\ 118.00 \end{bmatrix}$

Let A = coefficient matrix and B = constant matrix. Do $A^{-1} * B$

The price of a sheet is $22.50. The price of a towel is $14.00.

You try Answers:

1. My mom has three brothers. Together, their ages total 108. The youngest is 8 years less than the oldest. The middle one is four years older than the youngest. How old is each brother?
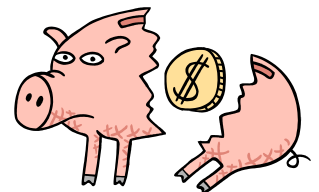
$$x + y + z = 108$$

$$x = z - 8$$

$$y = x + 4$$

The youngest is 32 years old, Middle is 36 years old, and the oldest is 40 years old

coefficient matrix: A = $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & -1 \\ -1 & 1 & 0 \end{bmatrix}$

Do A^{-1} •B in calc! ☺

constant matrix: B = $\begin{bmatrix} 108 \\ -8 \\ 4 \end{bmatrix}$

You try Answers:

2. I have nickels, dimes, and quarters in my piggy bank. When I totaled it up last weekend, I had $12.60. I remember I had 110 coins, and that there were only two more dimes than quarters. How many of each type did I have?

I have 52 nickels, 30 Dimes, and 28 Quarters

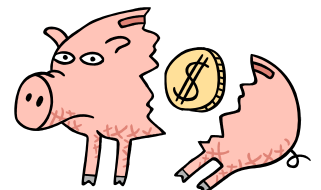$$n + d + q = 110$$

$$.05n + .10d + .25q = 12.60$$

$$d = q + 2$$

coefficient matrix: $A = \begin{bmatrix} 1 & 1 & 1 \\ .05 & .10 & .25 \\ 0 & 1 & -1 \end{bmatrix}$ Do A⁻¹ ●B in calc! ☺

constant matrix: $B = \begin{bmatrix} 110 \\ 12.60 \\ 2 \end{bmatrix}$

You try!

3. Janet is spending the allowance she has saved on clothes. If she buys 3 shirts, 2 skirts, and 4 pairs of jeans, she will spend $292. If she buys 4 shirts, 1 skirt, and 3 pairs of jeans, she will spend $252. If jeans cost $4 more than skirts, find the price of each item.

> Janet paid $28 for each shirt,
> $32 for each skirt, and
> $36 for each pair of jeans.

4. At Morgan's Fine Cuisine, meals are served a la carte. That is, each item on the menu is priced separately. Jackie and Ted Paris went to celebrate their anniversary. Jackie ordered prime rib, 2 side dishes, and a roll. Ted ordered prime rib, 3 side dishes, and 2 rolls. Jackie's meal cost $36 while Ted's cost $44. If the prime rib is three times as expensive as a side dish, what is the cost of each item?

> The prime rib was $21 each,
> side dishes were $7 each,
> and rolls were $1 each.