Fall 2021 Precalc
Lesson 11.1

Dr. O'Brien
Herbert H. Lehman High School
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VOCAB
transpose
cofactor matrix

Do now…Get out your notebook/binder. Write down the date and goal.

Be sure to…

1. Carefully examine the table below.
2. Answer the following questions in complete sentences:
   a. What new information is added to this table?
   b. What will the *profit* be for each type of mix (bulk, standard, and fancy)?
   c. How do you think this information will influence production at Jada^2 Inc.?

	Raisins kg/batch	Peanuts kg/batch	Chocolate kg/batch	Cost $/kg	Sale Price $/kg
Bulk	7	6	2	3.69	4.99
Standard	6	4	5	3.86	5.50
Fancy	2	5	8	4.45	6.50
Storage (kg)	380	500	620		

class: precalc **goal:** HDW use linear algebra strategies to calculate profit?

THIS PROBLEM CONTINUES ONE FROM PAST WEEKS HW.

1. Every batch has the same amount of peanuts (5 kg). The table contains info with new recipes.
2. 7b + 6s + 2f = 380
   5b + 5s + 5f = 500
   2b + 5s + 8f = 620
3. You could **try** to find the inverse for the coefficient matrix, the multiply that by the solution matrix to find the value of [b s f].

framing

- **what:** Use linear algebra strategies to to calculate profit?
- **why:** This is an important real world use of linear algebra
- **where to:** More real world problems involving linear algebra

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Warm up

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Be sure to… make sure the vocab below is in your notes (should be in yesterday's notes). Then answer the questions below. Be sure to write at least a complete sentence in your notes for each question.

Be sure to answer the questions below…:

1. How many kg. are produced of each mix, assuming each batch is 15 kg.?
2. What is the total profit for a single day, assuming all batches are sold?

Based on the recipe below, 20 batches of bulk, 20 batches of standard, and 60 batches of fancy need to be produced so that no ingredients are left over at the end of the day.

	Raisins kg/batch	Peanuts kg/batch	Chocolate kg/batch	Cost $/kg	Sale Price $/kg
Bulk	7	6	2	3.69	4.99
Standard	6	4	5	3.86	5.50
Fancy	2	5	8	4.45	6.50
Storage (kg)	380	500	620		

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1. Each element in the cofactor matrix represents the cofactor for the corresponding element of A.
2. The adjugate is the transpose of the cofactor matrix of A.
3. If you know the adjugate and determinant for a matrix, you can find its inverse by dividing the adjugate by the determinant. The variable matrix X for a matrix equation AX=B can be found by multiplying the inverese by B.
4. IT means the matrix has no inverse!

Today's activity

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Be sure to…

1. Complete **Pset #7**
2. When you're finished complete the challenge problem below:

Challenge problem

The cost and sales price for the revised recipes suggested by the Marketing Dept. is given below. Based on your work in **Pset #7,**

(i) find the total *profit* for the solution you found

(ii) find **two** additional solutons and determine if the profit is greater or smaller.

	Raisins kg/batch	Peanuts kg/batch	Chocolate kg/batch	Cost $/kg	Sale Price $/kg
Bulk	7	5	3	3.70	4.99
Standard	6	5	4	3.85	5.50
Fancy	2	5	8	4.45	6.50
Storage (kg)	380	500	620		

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See handwritten answer key for solutions

Pre-planned questions:

+What does it tell you if the matrix has no inverse? It means that there isn't just one solution for this problem, so the quick formula won't work

+How do determine if the system has no solutions or infinitely many? Apply gaussian elimination to [A | B]. You'll get row echelon form [A' | B'] if you get any rows where all the values of A' are 0 then there isn't one solution (but you already know this because the determinant is 0). If the value for B' in that row is not 0, then there's no solution, otherwise infinitely many.

+ How can I find a solution that works? Pick an arbitrary value for for f, then think about how you can use your row echelon form to figure out the amount of b and s to use.

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Reflection: Thinking about thinking

be sure to: Answer each question below with a complete sentence. Be prepared to share out!

1. Why is it **impossible** to use up all the ingredients with the new recipes?
2. How does using linear algebra make this problem **easier** to solve than without it?

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last five minutes of class. share out.

wrapping up!

be sure to: read the directions below!

1. Make sure there isn't any litter near your workstation.
2. If you borrowed headphones, sign them back in.
3. **Make sure you are logged out of your computer!**
4. Remain in your seat until the bell rings.

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