

Name: _____
PCH

Date: _____
Ms. Loughran

Do Now:

1. Solve for x :
$$\begin{vmatrix} 2x & 0 & 3 \\ 7 & 5 & -1 \\ 4 & 2 & x \end{vmatrix} = 8x^2 - 3x + 12$$

$$\begin{array}{ccccc} 2x & 0 & 3 & 2x & 0 \\ 7 & 5 & -1 & 7 & 5 \\ 4 & 2 & x & 4 & 2 \end{array}$$

$$\det = 10x^2 + 0 + 42 - (60 - 4x + 0)$$

$$\det = 10x^2 + 4x - 18$$

$$10x^2 + 4x - 18 = 8x^2 - 3x + 12$$

$$2x^2 + 7x - 30 = 0$$

$$(2x - 5)(x + 6) = 0$$

$$x = \frac{5}{2}, -6$$

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 PCH: Applications of Matrix Multiplication

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Do Now:

- In a certain city the proportion of voters in each age group who are registered as Democrats, Republicans, or Independents are given by the following matrix.

3×3

	Age		
	18-30	31-50	Over 50
Democrat	0.30	0.60	0.50
Republican	0.50	0.35	0.25
Independent	0.20	0.05	0.25

$= A$

$.3(5,000) + .60(10,000) + .50(12,000)$
 $\frac{3}{10}(5,000) + \frac{60}{100}(10,000) + \frac{1}{2}(12,000)$
 $1500 + 6,000 + 6,000$

$.3(6,000) + .60(12,000) + .5(15,000)$
 $\frac{3}{10}(6,000) + \frac{60}{100}(12,000) + \frac{1}{2}(15,000)$
 $1800 + 7200 + 7,500$
 $9,000 + 7,500$

Political preference by age

The next matrix gives the distribution, by age and sex, of the voting population of this city.

3×2

		Male	Female
Age	18-30	5,000	6,000
	31-50	10,000	12,000
	Over 50	12,000	15,000

$= B$

Age by gender

For this problem, let's make the assumption that within each age group, political preference is not related to gender.

(a) Calculate the product AB .

	Male	Female
Democrat	13,500	16,500
Republican	9,000	10,950
Independent	4,500	5,550

- (b) How many males are registered as Democrats in this city? $13,500$

- (c) How many females are registered as Republicans? $10,950$

Classwork (taken from textbook)

49. **Fast-Food Sales** A small fast-food chain with restaurants in Santa Monica, Long Beach, and Anaheim sells only hamburgers, hot dogs, and milk shakes. On a certain day, sales were distributed according to the following matrix.

3×3

	Number of items sold		
	Santa Monica	Long Beach	Anaheim
Hamburgers	4000	1000	3500
Hot dogs	400	300	200
Milk shakes	700	500	9000

$\begin{bmatrix} 4000 & 1000 & 3500 \\ 400 & 300 & 200 \\ 700 & 500 & 9000 \end{bmatrix} = A$

Food items by location

The price of each item is given by the following matrix.

1×3

Hamburger	Hot dog	Milk Shake
[\$0.90	\$0.80	\$1.10]

$= B$

price by food item

- (a) Calculate the product BA .
(b) Interpret the entries in the product matrix BA .

Santa Monica Long Beach Anaheim

(a) $BA = \begin{bmatrix} 4,690 & 1,690 & 13,210 \end{bmatrix}$

- (b) The entries in BA represent the total food sales by location.

50. **Car-Manufacturing Profits** A specialty-car manufacturer has plants in Auburn, Biloxi, and Chattanooga. Three models are produced, with daily production given in the following matrix.

		Cars produced each day			
		Model K	Model R	Model W	
Auburn	$\begin{bmatrix} 12 & 10 & 0 \\ 4 & 4 & 20 \\ 8 & 9 & 12 \end{bmatrix} = A$	12	10	0	3×3
Biloxi		4	4	20	
Chattanooga		8	9	12	

Because of a wage increase, February profits are less than January profits. The profit per car is tabulated by model in the following matrix.

		January	February	
Model K	$\begin{bmatrix} \$1000 & \$500 \\ \$2000 & \$1200 \\ \$1500 & \$1000 \end{bmatrix} = B$	\$1000	\$500	3×2
Model R		\$2000	\$1200	
Model W		\$1500	\$1000	

- (a) Calculate AB .
- (b) Assuming all cars produced were sold, what was the daily profit in January from the Biloxi plant?
- (c) What was the total daily profit (from all three plants) in February?

(a)

		January	February
Auburn	$\begin{bmatrix} 32,000 & 18,000 \\ 42,000 & 26,800 \\ 44,000 & 26,800 \end{bmatrix}$	32,000	18,000
Biloxi		42,000	26,800
Chattanooga		44,000	26,800

(b) \$42,000

(c) $18,000 + 26,800 + 26,800 = \$71,600$