Name: _____ Date: _____
PCH: Applications of Matrix Multiplication Ms. Loughran

Do Now:

1. 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.

	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

$= A$

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

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

$= B$

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.

(b) How many males are registered as Democrats in this city?

(c) How many females are registered as Repubicans?

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.

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

$= A$

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

Hamburger	Hot dog	Milk Shake
[$0.90	$0.80	$1.10] $= B$

(a) Calculate the product BA.

(b) Interpret the entries in the product matrix BA.

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	12	10	0
Biloxi	4	4	20
Chattanooga	8	9	12

$= A$

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	\$1000	\$500
Model R	\$2000	\$1200
Model W	\$1500	\$1000

$= B$

(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?

51. Canning Tomato Products Jaeger Foods produces tomato sauce and tomato paste, canned in small, medium, large, and giant sized tins. The matrix A gives the size (in ounces) of each container.

	Small	Medium	Large	Giant	
Ounces	[6	10	14	28]	$= A$

The matrix B tabulates one day's production of tomato sauce and tomato paste.

	Cans of sauce	Cans of paste	
Small	2000	2500	
Medium	3000	1500	
Large	2500	1000	$= B$
Giant	1000	500	

(a) Calculate the product of AB.

(b) Interpret the entries in the product matrix AB.

52. Produce Sales A farmer's three children, Amy, Beth, and Chad, run three roadside produce stands during the summer months. One weekend they all sell watermelons, yellow squash, and tomatoes. The matrices A and B tabulate the number of pounds of each product sold by each sibling on Saturday and Sunday.

Saturday

	Melons	Squash	Tomatoes
Amy	120	50	60
Beth	40	25	30
Chad	60	30	20

$= A$

Sunday

	Melons	Squash	Tomatoes
Amy	100	60	30
Beth	35	20	20
Chad	60	25	30

$= B$

The matrix C gives the price per pound (in dollars) for each type of produce that they sell.

Price per pound

Melons	0.10
Squash	0.50
Tomatoes	1.00

$= C$

Perform the following matrix operations, and interpret the entries in each result.

(a) AC **(b)** BC **(c)** $A + B$ **(d)** $(A + B)C$