Unit 2 Day 2
MATRICES

More MATRIX Applications

- ***Practice Matrix Multiplication Applications***
- ***Systems of Equations with Matrices***

Warm Up Day 2

1. A florist creates three special floral arrangements. One type uses three lilies. The second type uses two lilies and four carnations. The third uses two daisies and four carnations. Lilies cost $2.35 each, carnations $0.95 each, and daisies $1.45 each.

a. Write a matrix N to represent the number of each type of flower in each arrangement.

b. Write a matrix C to represent the cost of each type of flower.

c. Use matrix operations to find a matrix representing the cost of each type of arrangement.

d. The florist has overstock. She decides to offer a 25% off sale. Use matrix operation(s) to determine the cost of each type of flower now.

2. Simplify. $\begin{bmatrix} -3 & 2a \\ a & 1 \\ 2 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & a \\ 2 & 3 \end{bmatrix}$

Riddle:
Why was 6 afraid of 7?

Warm Up Answers

1. A florist creates three special floral arrangements. One type uses three lilies. The second type uses two lilies and four carnations. The third uses two daisies and four carnations. Lilies cost $2.35 each, carnations $0.95 each, and daisies $1.45 each.

a. Write a matrix N to represent the number of each type of flower in each arrangement.

$$N = \begin{matrix} \\ A1 \\ A2 \\ A3 \end{matrix} \begin{matrix} \begin{matrix} Lil & Cr & Da \end{matrix} \\ \begin{bmatrix} 3 & 0 & 0 \\ 2 & 4 & 0 \\ 0 & 4 & 2 \end{bmatrix} \end{matrix}$$

b. Write a matrix C to represent the cost of each type of flower.

$$C = \begin{matrix} \\ Lil \\ Cr \\ Da \end{matrix} \begin{matrix} \begin{matrix} Cost\ (\$) \end{matrix} \\ \begin{bmatrix} 2.35 \\ 0.95 \\ 1.45 \end{bmatrix} \end{matrix}$$

c. Use matrix operations to find a matrix representing the cost of each type of arrangement.

$$NC = \begin{matrix} \\ A1 \\ A2 \\ A3 \end{matrix} \begin{matrix} \begin{matrix} \text{Cost (\$)} \end{matrix} \\ \begin{bmatrix} 3(2.35)+0(0.95)+0(1.45) \\ 2(2.35)+4(0.95)+0(1.45) \\ 0(2.35)+4(0.95)+2(1.45) \end{bmatrix} \end{matrix} = \begin{matrix} \\ A1 \\ A2 \\ A3 \end{matrix} \begin{matrix} \begin{matrix} \text{Cost (\$)} \end{matrix} \\ \begin{bmatrix} 7.05 \\ 8.50 \\ 6.70 \end{bmatrix} \end{matrix}$$

Warm Up Answers

1. A florist creates three special floral arrangements. One type uses three lilies. The second type uses two lilies and four carnations. The third uses two daisies and four carnations. Lilies cost $2.35 each, carnations $0.95 each, and daisies $1.45 each.

d. The florist has overstock. She decides to offer a 25% off sale. Use matrix operation(s) to determine the cost of each type of flower now.

$$0.75C = 0.75 \bullet \begin{matrix} \\ Lil \\ Cr \\ Da \end{matrix} \begin{matrix} Cost\ (\$) \\ \begin{bmatrix} 2.35 \\ 0.95 \\ 1.45 \end{bmatrix} \end{matrix} = \begin{matrix} Sale\ Cost\ (\$) \\ \begin{matrix} Lil \\ Cr \\ Da \end{matrix} \begin{bmatrix} 1.76 \\ 0.71 \\ 1.09 \end{bmatrix} \end{matrix}$$

Warm Up Answers

2. Simplify.

$$\begin{bmatrix} -3 & 2a \\ a & 1 \\ 2 & 0 \end{bmatrix} \bullet \begin{bmatrix} 1 & a \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} -3(1)+2a(2) & -3a+2a(3) \\ a(1)+1(2) & a(a)+1(3) \\ 2(1)+0(2) & 2(a)+0(3) \end{bmatrix}$$

$$= \begin{bmatrix} -3+4a & 3a \\ a+2 & a^2+3 \\ 2 & 2a \end{bmatrix}$$

Riddle:
Why was 6 afraid of 7?

Because 7 ate 9 (7, 8, 9)

Questions About last night's HW?

- Packet p. 1 ALL
- Packet p. 2 #1-2

Tonight's Homework

Mixed Matrix Applications Handout

AND

Finish Packet p. 2

Before today's Notes

- START Day 2 Handout on Mixed Matrix Applications….try #2 first! Let's make sure we're on the right track. ☺

Unit 2 Day 2
NOTES

More MATRIX Applications:

Solving Systems of Equations with Matrices

Ex 1: Setting up and Solving Matrix Equations

Solve with matrices

$5x - 4y = 8$

$x + 2y = 6$

First, line up the equations.

√ Already done on this one ☺

A linear system can be written as a matrix equation AX=B

$$\begin{bmatrix} 5 & -4 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$$

Coefficient matrix, A

Variable matrix, X

Constant matrix, B

We'll solve for matrix X to find x and y. →

Ex 1: Solving Matrix Equations

Suppose $ax = b$. How do you solve for x?

We cannot divide matrices, but we can multiply by the inverse.

A^{-1} is the inverse of matrix A.

We'll use it to find X.

$$AX = B$$

$$A^{-1}AX = A^{-1}B$$

$$X = A^{-1}B$$

We can do this in the calc. ☺

Details on next slide →

WARNING! This is NOT a -1 exponent!!

Ex 1: Solving Matrix Equations in calculator

Solve

$$5x - 4y = 8$$
$$1x + 2y = 6$$

$$\begin{bmatrix} 5 & -4 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$$

A **B**

In Calc, 2^{nd} x^{-1} Edit
& enter matrices A and B

Remember, $AX = B$

$$X = A^{-1}B$$

On main screen of calc, do

2^{nd} x^{-1} Enter (to get A)

x^{-1} (to get inverse $^{-1}$ on A)

2^{nd} x^{-1} 2 Enter (to get B)

x = 2.857, y = 1.571

(2.857, 1.571)

Ex. 2 Solve using matrices

$2x + 3y + z = -1$

$3x + 3y = 1 - z$

$2x + z = -4y - 2$

$$2x+3y+z=-1$$

$$3x+3y+z=1$$

$$2x+4y+z=-2$$

First, line up the equations

$$AX = B$$

$$X = \underbrace{A^{-1}B}$$

We can do this in the calc. ☺

$$\begin{bmatrix} 2 & 3 & 1 \\ 3 & 3 & 1 \\ 2 & 4 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \\ -2 \end{bmatrix}$$

A **B**

x = 2

y = -1

z = -2

(2, -1, -2)

You Try! Solve using matrices

Ex. 3

$$7x + 3y = 11$$

$$14x - 4y = 2$$

Ex. 4

$$3y + 5z = x - 15$$

$$2x + y = 1$$

$$-9x - 8y = 4z + 12$$

You Try! ANSWERS

Solve using matrices

Ex. 3 $7x + 3y = 11$

$14x - 4y = 2$

x = 5/7

y = 2

(5/7, 2)

Ex. 4

3y + 5z = x – 15

2x + y = 1

-9x – 8y = 4z + 12

$-x + 3y + 5z = -15$

$2x + y = 1$

$-9x - 8y - 4z = 12$

x = 4

y = -7

z = 2

(4, -7, 2)