$\begin{bmatrix}1 & 5\end{bmatrix} + \begin{bmatrix}2 & 4\end{bmatrix}$ ✓

1 x 2 1 x 2

$\begin{bmatrix}1 & 5\end{bmatrix} + \begin{bmatrix}2\\4\end{bmatrix}$ X

**Adding and Subtracting**

Matrices must be the SAME size

add/subtract corresponding elements

**Scalar Multiplication**

Multiply everything by a scale factor

multiply each element by scale factor

**Multiplication**

# Columns in A

=

# Rows in B

$\begin{bmatrix}a & b\\c & d\end{bmatrix} \cdot \begin{bmatrix}m & n & o\\p & q & r\end{bmatrix}$

$2 \times \boxed{2 \quad 2} \times 3 = 2 \times 3$

**Equal Matrices**

SAME Size

Corresponding Elements are EQUAL

Solve for variable

GLUE

# Welcome to the Matrix

The Basics:

A Matrix is a rectangular array used to organize data.

| 2004 National H.S. Rodeo Finals – Barrel Racing Scores | | | |
|---|---|---|---|
| Participant | 1st Ride | 2nd Ride | 3rd Ride |
| Sierra Thomas (UT) | 16.781 | 16.29 | 17.318 |
| Kelly Allen (TX) | 16.206 | 16.606 | 17.668 |

Row 1, Row 2

Column 1, Column 2, Column 3

Matrix ROW x COLUMN 2 x 3

The value 16.206 has an address of $A_{21}$.

row 2, column 1

Use the packaging data for the costs of the packages given.

| Cost of 4-Inch Cubic Box ($) | | |
|---|---|---|
| | Plastic | Paper |
| Total Cost | 0.48 | 0.72 |
| Cost per in$^2$ | 0.005 | 0.0075 |
| Cost per in$^3$ | 0.0075 | 0.01125 |

(a) Display the data as matrix $C$.

$$C = \begin{matrix}R1\\R2\\R3\end{matrix}\begin{bmatrix}.48 & .72\\.005 & .0075\\.0075 & .01125\end{bmatrix}$$

C1 C2

(b) What are the dimensions of $C$? 3x2

(c) What is the entry at $c_{12}$? .72

What does it represent?

(d) What is the address of the entry 0.005? $C_{12}$

$$A=\begin{bmatrix}1 & 5 & -6\\ 7 & -2 & 4\end{bmatrix} \quad B=\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix} \quad C=\begin{bmatrix}4 & -8\\ 3 & 0\\ -1 & 2\end{bmatrix}$$

$$D=\begin{bmatrix}5\\ 3\end{bmatrix} \quad E=\begin{bmatrix}6\\ 0\end{bmatrix} \quad F=\begin{bmatrix}-2 & 4\end{bmatrix} \quad G=\begin{bmatrix}5 & -4\\ 3 & -2\end{bmatrix}$$

$$H=\begin{bmatrix}18 & -12\\ -6 & 0\end{bmatrix} \quad I=\begin{bmatrix}3x & 2y-2\\ 10-z & w+4\end{bmatrix}$$

$2\times1 \quad 1\times2 = 2\times2$

DF + G

$$\begin{bmatrix}5\\3\end{bmatrix}\begin{bmatrix}-2 & 4\end{bmatrix}$$

$$\begin{bmatrix}5(-2) & 5(4)\\ 3(-2) & 3(4)\end{bmatrix}=\begin{bmatrix}-10 & 20\\ -6 & 12\end{bmatrix}$$

$$\begin{bmatrix}-10 & 20\\ -6 & 12\end{bmatrix}+\begin{bmatrix}5 & -4\\ 3 & -2\end{bmatrix}=\begin{bmatrix}-5 & 16\\ -3 & 10\end{bmatrix}$$

3G − H

$$\begin{bmatrix}-3 & 0\\ 15 & -6\end{bmatrix}$$

3A − B

$$\begin{bmatrix}1.2 & 16.5 & -28.6\\ 29.8 & -9.4 & 12\end{bmatrix}$$

2DF

$$\begin{bmatrix}-20 & 40\\ -12 & 24\end{bmatrix}$$

A + B

$$\begin{bmatrix}1 & 5 & -6\\ 7 & -2 & 4\end{bmatrix}+\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix}$$

$$\begin{bmatrix}2.8 & 3.5 & 4.6\\ -1.8 & 1.4 & 4\end{bmatrix}$$

$$\begin{bmatrix}a & b\\ c & d\end{bmatrix}+\begin{bmatrix}w & x\\ y & z\end{bmatrix}$$

$$=\begin{bmatrix}a+w & b+x\\ c+y & d+z\end{bmatrix}$$

3C

$$3\begin{bmatrix}4 & -8\\ 3 & 0\\ -1 & 2\end{bmatrix}$$

$$\Rightarrow\begin{bmatrix}12 & -24\\ 9 & 0\\ -3 & 6\end{bmatrix}$$

$\frac{1}{3}H$

$$\frac{1}{3}\begin{bmatrix}18 & -12\\ -6 & 0\end{bmatrix}$$

$$\Rightarrow\begin{bmatrix}6 & -4\\ -2 & 0\end{bmatrix}$$

$$2\begin{bmatrix}a & b & c & d\end{bmatrix}$$

$$\Rightarrow\begin{bmatrix}2a & 2b & 2c & 2d\end{bmatrix}$$

$$3\begin{bmatrix}w & x\\ y & z\end{bmatrix}\Rightarrow\begin{bmatrix}3w & 3x\\ 3y & 3z\end{bmatrix}$$

FG

$1\times2 \quad 2\times2 = 1\times2$

$$\begin{bmatrix}-2 & 4\end{bmatrix}\cdot\begin{bmatrix}5 & -4\\ 3 & -2\end{bmatrix}$$

$$\begin{bmatrix}-2(5)+4(3) & -2(-4)+4(-2)\end{bmatrix}$$

$$\begin{bmatrix}2 & 0\end{bmatrix}$$

$1\times2 \quad 2\times2 = 1\times2$

$$\begin{bmatrix}a & b\end{bmatrix}\cdot\begin{bmatrix}w & x\\ y & z\end{bmatrix}$$

Rows in A • Columns in B

$$\begin{bmatrix}a(w)+b(y) & a(x)+b(z)\end{bmatrix}$$

H = I

$$\begin{bmatrix}18 & -12\\ -6 & 0\end{bmatrix}=\begin{bmatrix}3x & 2y-2\\ 10-z & w+4\end{bmatrix}$$

$$\begin{bmatrix}18=3x & -12=2y-2\\ -6=10-z & 0=w+4\end{bmatrix}$$

$x=6$
$y=-5$
$z=16$
$w=-4$

Set corresponding Elements equal to each other and solve for each variable