Pick up packet

Bell Ringer

Monday 2/3

Solve each system of equations by substitution or elimination.

$3x + 3y = 27$
$x - 3y = -11$

$4x = 16$
$x = 4$
$4 - 3y = -11$
$-4 \quad -4$
$-3y = -15$
$y = 5$

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

$4x - 2(2x+1) = 6$
$4x - 4x + 2 = 6$
$2 = 6$

$3x + y = 5$
$2x - 2y = -2$

$y = 5 - 3x$
$-3x \quad -3x$

$2x - 2(5-3x) = -2$
$2x - 10 + 6x = -2$
$8x = 8$
$x = 1$
$2(1) - 2y = -2$
$-2 \quad -2$
$-2y = -4$
$y = 2$

If you've ever worked on excel or with a spreadsheet, you've worked with matrices.

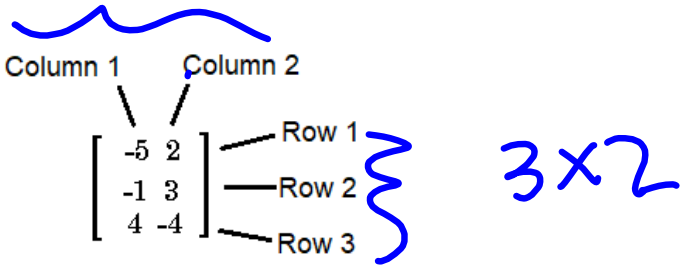
A **MATRIX** is a rectangular arrangement of numbers in **rows** and **columns**.

1	2	3	4
5	6	7	8
9	10	11	12

3 rows 4 columns

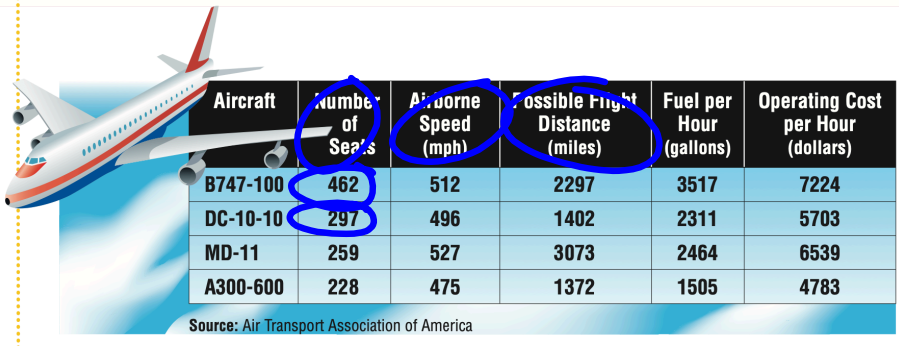
3 x 4

A matrix is usually described by its **dimension**, or the **number of rows and columns**, with the number of *rows stated first.* Each entry in a matrix is called an **element.**



How are matrices used to organize data?

To determine the best type of aircraft to use for certain flights, the management of an airline company considers the following aircraft operating statistics.



Aircraft	Number of Seats	Airborne Speed (mph)	Possible Flight Distance (miles)	Fuel per Hour (gallons)	Operating Cost per Hour (dollars)
B747-100	462	512	2297	3517	7224
DC-10-10	297	496	1402	2311	5703
MD-11	259	527	3073	2464	6539
A300-600	228	475	1372	1505	4783

Source: Air Transport Association of America

The table has rows and columns of information. When we concentrate only on the numerical information, we see an array with 4 rows and 5 columns.

$$\begin{bmatrix} 462 & 512 & 2297 & 3517 & 7224 \\ 297 & 496 & 1402 & 2311 & 5703 \\ 259 & 527 & 3073 & 2464 & 6539 \\ 228 & 475 & 1372 & 1505 & 4783 \end{bmatrix}$$

4x5

This array of numbers is called a matrix.

Identify the dimensions of the following matrices.

$\begin{bmatrix} 2 & 3 \\ 5 & 4 \\ 1 & 7 \end{bmatrix}$ 3x2

$\begin{bmatrix} 3 \\ 0 \end{bmatrix}$ 2x1

$\begin{bmatrix} 2 & 1 & 3 \end{bmatrix}$ 1x3

$\begin{bmatrix} 5 & 2 & 3 \\ 3 & 1 & 4 \end{bmatrix}$ 2x3

$\begin{bmatrix} 1 & 0 \\ 2 & 2 \end{bmatrix}$ 2x2

To add or subtract matrices, the matrices must have the same dimensions.

$$\begin{bmatrix} 1 & -5 \\ 4 & 2 \end{bmatrix} + \begin{bmatrix} 3 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 2 & 3 \end{bmatrix}$$

$$A=\begin{bmatrix}3&-4&0\\2&5&2\\2&7&-3\end{bmatrix} \quad B=\begin{bmatrix}-1&-2&-3\\-4&-3&-2\\-5&-4&-3\end{bmatrix} \quad C=\begin{bmatrix}1&-1&-2\\3&-4&8\\-2&9&0\end{bmatrix}$$

1. A+C

$$\begin{bmatrix}4&-5&-2\\5&1&10\\0&16&-3\end{bmatrix}$$

$$A=\begin{bmatrix}3&-4&0\\2&5&2\\2&7&-3\end{bmatrix} \quad B=\begin{bmatrix}1&2&3\\4&3&2\\5&4&3\end{bmatrix} \quad C=\begin{bmatrix}1&-1&-2\\3&-4&8\\-2&9&0\end{bmatrix}$$

2. A - B

$$\begin{bmatrix}4&-2&5\\6&8&4\\7&11&0\end{bmatrix}$$

$$A=\begin{bmatrix}3&-4&0\\2&5&2\\2&7&-3\end{bmatrix} \quad B=\begin{bmatrix}-1&-2&-3\\-4&-3&-2\\-5&-4&-3\end{bmatrix} \quad C=\begin{bmatrix}1&-1&-2\\3&-4&8\\-2&9&0\end{bmatrix}$$

3. C+A

$$\begin{bmatrix}4&-5&-2\\5&1&10\\0&16&-3\end{bmatrix}$$

$$A=\begin{bmatrix}3&4&0\\2&5&2\\2&7&3\end{bmatrix} \quad B=\begin{bmatrix}-1&-2&-3\\-4&-3&-2\\-5&-4&-3\end{bmatrix} \quad C=\begin{bmatrix}1&-1&-2\\3&-4&8\\-2&9&0\end{bmatrix}$$

3. B - A

$$\begin{bmatrix}-4&2&-3\\-6&-8&-4\\-7&-11&0\end{bmatrix}$$

Due Wednesday

Name _____ **Date** _____ **Period** ___

Adding and Subtracting Matrices

Find each sum or difference.

1. $\begin{bmatrix} 4 & 4 \\ 3 & -5 \end{bmatrix} + \begin{bmatrix} -3 & 1 \\ -2 & 5 \end{bmatrix}$

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

3. $\begin{bmatrix} 4 & 2 \\ 6 & -2 \\ 3 & 4 \\ -3 & 0 \end{bmatrix} + \begin{bmatrix} 3 & -2 \\ 2 & 0 \\ 1 & 1 \\ 1 & -2 \end{bmatrix}$

4. $\begin{bmatrix} 0.8 & -0.3 \\ 1.7 & 2.4 \end{bmatrix} - \begin{bmatrix} 0.2 & 0.3 \\ 0.4 & -1.4 \end{bmatrix}$

Solve each matrix equation.

5. $C + \begin{bmatrix} 3 & 5 \\ 10 & 2 \\ 1 & 5 \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 8 & 12 \\ 0 & 2 \end{bmatrix}$

6. $B - \begin{bmatrix} 0 & -7 & 4 \\ 9 & -1 & 5 \\ -1 & 0 & -5 \end{bmatrix} = \begin{bmatrix} 2 & 9 & -3 \\ 0 & 1 & -6 \\ 4 & -1 & 12 \end{bmatrix}$

7. $\begin{bmatrix} 2 & 3 \\ -2 & -2 \end{bmatrix} = X - \begin{bmatrix} -1 & -3 \\ -1 & 2 \end{bmatrix}$

8. $\begin{bmatrix} 2 & 2 & 0 \\ 1 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 2 & -2 & 5 \\ -3 & 3 & 2 \end{bmatrix} + Y$

Find each sum.

9. $\begin{bmatrix} 2 & -3 & 4 \\ 5 & -4 & 0 \end{bmatrix} + \begin{bmatrix} -2 & 3 & -4 \\ -5 & 4 & 0 \end{bmatrix}$

10. $\begin{bmatrix} 10 & -2 \\ 4 & -1 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

Find the value of each variable.

11. $\begin{bmatrix} 14 & 10 \\ -7 & -1 \end{bmatrix} = \begin{bmatrix} 3a-1 & 2a \\ 5b+3 & a+3b \end{bmatrix}$

12. $\begin{bmatrix} 4 & -3 \\ 6 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 0 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} p & q \\ 7 & r \end{bmatrix}$

Find each matrix sum or difference if possible. If not possible, explain.

$M = \begin{bmatrix} 0 & 2 & 5 \\ 7 & 3 & 4 \end{bmatrix}$ $N = \begin{bmatrix} -1 & -3 & 4 \\ 8 & 5 & 0 \end{bmatrix}$ $P = \begin{bmatrix} 2 & -3 & 0 \\ 8 & 2 & 4 \\ 6 & -4 & 1 \end{bmatrix}$ $Q = \begin{bmatrix} 1 & -2 & 4 \\ 4 & 6 & 2 \\ 0 & -2 & 5 \end{bmatrix}$

13. $M + N$

14. $Q - P$

15. $Q + N$

16. $P + Q$

17. The table shows the number of males and females in four clubs at a high school for two school years.

Club Membership

	1971-1972		2010-2011	
	Males	**Females**	**Males**	**Females**
Book	7	27	56	58
Spanish	43	64	76	82
Chess	28	0	35	26
French	16	18	59	73

a. Write four 4 × 1 matrices, A, B, C, and D, to represent the male and female club membership for 1971–1972 and 2010–2011.

b. Write and solve a matrix equation to find matrix X, the total number of members in each club for 1971–1972.

c. Did the total number of female club member's increase or decrease between the two school years, and by what amount?

18. **Think about it:** Let $C = \begin{bmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{bmatrix}$, $D = \begin{bmatrix} d_{11} & d_{12} \\ d_{21} & d_{22} \end{bmatrix}$, and $C + D = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

If $c_{11} \cdot d_{11} = -6$ and $c_{11} > 0$, what is the value of d_{11}?

Relay Race Results:

19. The table shows the time each member of two relay teams took to complete his leg of a relay race. Team II won the race by 3 seconds. How many seconds did Gino take to run his leg of the race?

	Team I		Team II	
Leg	**Name**	**Time (s)**	**Name**	**Time (s)**
1	Juan	22	Miguel	23
2	Julio	25	James	22
3	Alex	23	Gino	
4	Ted	21	Cody	20

Writing: Determine whether the two matrices in each pair are equal. Explain.

20. $\begin{bmatrix} 2 & \frac{3}{4} & -1 \\ \sqrt{16} & 4 & 9 \end{bmatrix}$; $\begin{bmatrix} \frac{4}{2} & 3 & 4^2 \end{bmatrix}$

21. $\begin{bmatrix} 2\sqrt{9} & 3^2 \\ 7 & \frac{15}{3} \end{bmatrix}$; $\begin{bmatrix} 6 & 9 \\ 7 & 5 \end{bmatrix}$