Panel 1

What is matrix Y if
$$\begin{bmatrix} 12 & -27 \\ 9 & 15 \\ -34 & -50 \end{bmatrix} - Y = \begin{bmatrix} 48 & -23 \\ 57 & -2 \\ 0 & 18 \end{bmatrix}$$

You could add Y to both sides first to get

$$\begin{bmatrix} 12 & -27 \\ 9 & 15 \\ -34 & -50 \end{bmatrix} = \begin{bmatrix} 48 & -23 \\ 57 & -2 \\ 0 & 18 \end{bmatrix} + Y$$

Then you could subtract the matrix on the right from both sides to get

$$\begin{bmatrix} 12 & -27 \\ 9 & 15 \\ -34 & -50 \end{bmatrix} - \begin{bmatrix} 48 & -23 \\ 57 & -2 \\ 0 & 18 \end{bmatrix} = Y$$

Now do matrix subtraction to get

$$\begin{bmatrix} -36 & -4 \\ -48 & 17 \\ -34 & -68 \end{bmatrix} = Y$$

Panel 2

Matrices using the graphing calculator.

To enter a matrix on a calculator:

1. 2ND x^{-1} (MATRIX)   → EDIT

2. Move up/down to pick the matrix you want to use [A] then   ENTER

3. Enter the dimensions for your matrix

4. Enter the data in the matrix

to enter other matrices just repeat this process but use different matrices, i.e. B or C or D.....

When you are finished entering the matrices you must press 2ND mode (quit)

in order to perform any matrix operations with these matrices.

Panel 3

Enter the following matrices on the calculator.

$$A \begin{bmatrix} 5 & 6 & 3 \\ 0 & -9 & 12 \end{bmatrix} \quad B \begin{bmatrix} 10 & 3 & 9 \\ 17 & -5 & 1 \end{bmatrix} \quad C \begin{bmatrix} -6 & -9 & -1 \\ 20 & -13 & 49 \end{bmatrix}$$

Perform this matrix operation on the calculator: A + B

to get [A]+[B] on the home screen at this point do the following:

Press 2nd x^{-1} (matrix)   Choose: NAME, 1:[A]

Press   +

Press 2nd x^{-1} (matrix)   Choose: NAME, 2:[B]

You will see this on the home screen   [A]+[B]   then press enter

$$A + B = \begin{bmatrix} 15 & 9 & 12 \\ 17 & -4 & 13 \end{bmatrix}$$

Panel 4

$$A \begin{bmatrix} 5 & 6 & 3 \\ 0 & -9 & 12 \end{bmatrix} \quad B \begin{bmatrix} 10 & 3 & 9 \\ 17 & -5 & 1 \end{bmatrix} \quad C \begin{bmatrix} -6 & -9 & -1 \\ 20 & -13 & 49 \end{bmatrix}$$

Find each

1. B - C

$$\begin{bmatrix} 15 & 12 & 10 \\ -3 & 8 & -48 \end{bmatrix}$$

2. C - A - B

$$\begin{bmatrix} -20 & -18 & -13 \\ 3 & 1 & 36 \end{bmatrix}$$

3. B + C - A

$$\begin{bmatrix} 0 & -12 & 5 \\ 37 & -9 & 38 \end{bmatrix}$$

Panel 1 (top-left):

$$A \begin{bmatrix} 5 & 6 & 3 \\ 0 & -9 & 12 \end{bmatrix} \quad B \begin{bmatrix} 10 & 3 & 9 \\ 17 & -5 & 1 \end{bmatrix} \quad C \begin{bmatrix} -6 & -9 & -1 \\ 20 & -13 & 49 \end{bmatrix}$$

Find this matrix: 2A $= \begin{bmatrix} 10 & 12 & 6 \\ 0 & -18 & 24 \end{bmatrix}$

Panel 2 (top-right):

$$A \begin{bmatrix} 5 & 6 & 3 \\ 0 & -9 & 12 \end{bmatrix} \quad B \begin{bmatrix} 10 & 3 & 9 \\ 17 & -5 & 1 \end{bmatrix} \quad C \begin{bmatrix} -6 & -9 & -1 \\ 20 & -13 & 49 \end{bmatrix}$$

2A is called scalar multiplication

A scalar is a real number.
When you multiply a matrix by a scalar you multiply each element in the matrix by that scalar.

Panel 3 (bottom-left):

Properties	Scalar Multiplication
If $A, B,$ and O are $m \times n$ matrices and c and d are scalars, then	
cA is an $m \times n$ matrix.	Closure Property
$(cd)A = c(dA)$	Associative Property of Multiplication
$c(A + B) = cA + cB$ $(c + d)A = cA + dA$	Distributive Property
$1 \cdot A = A$	Multiplicative Identity Property
$0 \cdot A = O$ and $cO = O$	Multiplicative Property of Zero

Panel 4 (bottom-right):

Solve this matrix equation for matrix X.

If you define these two matrices using variables:

$$-3X + 2 \begin{bmatrix} 6 & 9 \\ -12 & 15 \end{bmatrix} = \begin{bmatrix} 27 & -18 \\ 2 & 9 \end{bmatrix}$$

$$A \begin{bmatrix} 6 & 9 \\ -12 & 15 \end{bmatrix} \quad B \begin{bmatrix} 27 & -18 \\ 2 & 9 \end{bmatrix}$$

This equation becomes:

$-3X + 2A = B$ move 2A to the right side by subtracting to get

$-3X = B - 2A$ using the calculator you get:

$-3X = \begin{bmatrix} 15 & -36 \\ -26 & 7 \end{bmatrix}$ if you tried to divide the matrix on the right side of the equation by -3 you'll get an error message because you can't use division when working with matrices. To avoid this error message you can multiply by -1/3 instead of dividing by -3.

$X = \left(-\dfrac{1}{3}\right) \begin{bmatrix} 15 & -36 \\ -26 & 7 \end{bmatrix} = \begin{bmatrix} -5 & 12 \\ -8.67 & 7 \end{bmatrix}$

Enter these matrices on the graphing calculator:

$$A \begin{bmatrix} 8 & 5 \\ -3 & 7 \end{bmatrix} \quad B \begin{bmatrix} 10 & 3 & 9 \\ 17 & -5 & 1 \end{bmatrix} \quad C \begin{bmatrix} 4 & 20 \\ 0 & 2 \\ -1 & 6 \end{bmatrix} \quad D \begin{bmatrix} 7 & 13 & 8 \\ -1 & 4 & 10 \end{bmatrix}$$

1. Which matrices can be added?   B & D only

2. Which can be subtracted?   B & D only

In order to add and subtract matrices they must have the same dimensions.