The colon operator:

In general, this operator is used in the following manner,

a : c : b

From a to b in steps of c.

For example,
0 : 0.25 : 2   means go from 0 to 2 in steps of 0.25

If you omit c, the default value of c is 1
0:2   means go from 0 to 2 in steps of 1

If you omit a and b as well, the colon operator means "everything" (see below)

(A) If you want to make an array with element values that are evenly spaced, you can use the colon operator.

\> time = [0 : 0.25 : 2]   (this will work with and without the brackets)
time =
  0.00000 0.25000 0.50000 0.75000 1.00000 1.25000 1.50000 1.75000 2.00000

(B) You also can use the colon operator to extract part of an array. In this case, the colon operator means "everything." For example, let's extract the second column out of a 3x3 array.

\> a = [3.5 4.6 7.1 ; 1.1 -0.9 -1. ; 3.3 3.3 2.3]
a =
  3.50000   4.60000   7.10000
  1.10000 -0.90000 -1.00000
  3.30000   3.30000   2.30000
\> b = a(: , 2)   (all rows, second column only)
b =
   4.60000
  -0.90000
   3.30000

The colon operator alone means "all rows" in the second column

(C) If the colon operator is used in an array index and appears between two numbers, it means extract from the first number to the second number. For example,

\> c = a(2:3 , 2:3)   (extract rows 2 to 3, columns 2 to 3 from **a** and put them into **c**)
c =
  -0.90000 -1.00000
   3.30000   2.30000

Homework Example:

In ID12345678_hw2_problem7.m:
% 12345678, Paul Nissenson
% HW2, Problem 7
clear; clc;

% get the input
d = input('Enter the diameter: ');
side = input('Enter the length of the side of a square: ');

% calculate the area
area_circ = pi * (d/2)^2;
area_square = side^2;

% display the output
disp(['The area of the circle is ' , num2str(area_circ)]);
disp(['The area of the square is ' , num2str(area_square)]);

Output:
Enter the diameter: 2
Enter the length of the side of a square: 4
The area of the circle is 3.1416
The area of the square is 16

Homework Example:

We have a function $y(x) = x^2 + 2x - 1$. Allow the user to enter in an initial value of x and then calculate the value of y from x to x+2 in increments of 0.5.

In ID12345678_hw2_problem6.m:
```
clear; clc;
% 12345678, Paul Nissenson
% HW2, Problem 6

% get the initial value of x
x0 = input('Enter an initial value of x: ');

% create x array, from x0 to x0+2 in steps of 0.5
x = [x0 : 0.5 : x0+2];

% create y array based on x array
y = x.^2 + 2.*x .- 1;

% display output to the screen in a table format
disp( '    x        y' )
position = [x ; y];
disp(position')
```

Output:
```
Enter an initial value of x: 5
    x        y
   5.0000   34.0000
   5.5000   40.2500
   6.0000   47.0000
   6.5000   54.2500
   7.0000   62.0000
```