Objectives:

The main task of this lab is to get familiar with loops in Matlab including commonly used for loop, while, and etc.

Introduction to loops:

Loops are used to repeat statements for a specific number of times. The general format is:

```matlab
for variable = initval : endval
    statement
    ...
    statement
end
```

The scope of the for statement is always terminated with a matching end.

Examples:

Assume k has already been assigned a value. Create the Hilbert matrix, using zeros to preallocate the matrix to conserve memory:

```matlab
clear,clc;
k = 20;
a = zeros(k,k);  % Preallocate matrix

for m = 1:k     % Outer loop
    for n = 1:k  % Inner loop
        a(m,n) = 1/(m+n-1);   % Statement
    end
end             % End inner loop
```

Practice:

1. Calculate sequence sum: \( x(n) = 1+2+3+\ldots+100 \) by using a for loop
   
   *(Hint: define a variable with initial value of 0, and the total number of values is 20 in this sequence.)*
Consider two discrete sequences $x(m) = [1.5 \ 1.5 \ 1.5 \ 1.5]$ and $y(n) = [2 \ 2 \ 2 \ 2]$.
Calculate $x(m) \times y(n)$ ranging from -10 to 15, and plot the product by using `stem()` function.

Useful Matlab functions and tricks:
- `ones(m,n)`: creates an m-by-n matrix with all ones
- `zeros(m,n)`: creates an m-by-n matrix with all zeros
- `end`: end can be used to terminate a loop, it is more often used as indexing keywords:
  i.e.
  ```matlab
  >> x = [1:10]
  x =
  1  2  3  4  5  6  7  8  9  10
  >> x(end)
  ans =
  10
  >> x(10)
  ans =
  10
  ```
- Shifting a sequence:
  ```matlab
  >> x = [1:10];
  >> y = [x(end), x(1:9)]
  y =
  10  1  2  3  4  5  6  7  8  9
  ```