ICE for Week 4

Practice Problem

Write a function that will receive as an input argument a temperature in degrees Fahrenheit, and will return the temperature in both degrees Celsius and Kelvin. The conversion factors are: $C = (F - 32) * 5/9$ and $K = C + 273.15$.

Practice Problem

Write a function that will receive as an input argument a length in feet and will return the length in both yards and centimeters. One yard is equal to 3 feet. One inch is equal to 2.54 centimeters, and there are 12 inches in a foot.

Practice Problem

Write a function that will receive the radius of a circle and will print both the radius and diameter of the circle in a sentence format. This function will not return any value; it simply prints.

Practice Problem

Write a function that receives a vector as an input argument and prints the elements from the vector in a sentence format.

```
>> printvecelems([5.9 33 11])
Element 1 is 5.9
Element 2 is 33.0
Element 3 is 11.0
```

Practice Problem

Write a function that will receive an integer *n* and a character as input arguments, and will print the character *n* times.

Practice Problem

The resistance R in ohms of a conductor is given by $R=\frac{E}{I}$, where E is the potential in volts and I is the current in amperes. Write a script that will

- Call a function to prompt the user for the potential and the current.
- Call a function that will print the resistance; this will call a subfunction to calculate and return the resistance.

Practice Problem

Write a function *per2* that receives one number as an input argument. The function has a persistent variable that sums the values passed to it. Here are the first two times the function is called:

```
>> per2(4)
ans =
    4
>> per2(6)
ans =
    10
```

Practice Problem

What would be the output from the following program? Think about it, write down your answer, and then type it in to verify.

testscope.m

```
answer = 5;
fprintf('Answer is %d\n',answer)
pracfn
pracfn
fprintf('Answer is %d\n',answer)
printstuff
fprintf('Answer is %d\n',answer)
```

pracfn.m

```
function pracfn
persistent count
if isempty(count)
   count = 0;
end
count = count + 1;
fprintf('This function has been called %d times.\n',count)
```

printstuff.m

```
function printstuff
answer = 33;
fprintf('Answer is %d\n',answer)
pracfn
fprintf('Answer is %d\n',answer)
```

Practice Problem

The hyperbolic sine for an argument x is defined as:

$$hyperbolicsine(x) = (e^{x} - e^{-x})/ 2$$

Write a function *hypsin* to implement this. The function should receive one input argument x and return the value of the hyperbolic sine of x. Here are some examples of using the function:

```
>> hypsin(2.1)
ans =
4.0219
>> help hypsin
   Calculates the hyperbolic sine of x
>> fprintf('The hyperbolic sine of %.1f is %.1f\n',...
1.9,hypsin(1.9))
The hyperbolic sine of 1.9 is 3.3
```

Practice Problem

The velocity of an aircraft typically is given in either miles/hour or meters/second. Write a function that will receive one input argument that is the velocity of an airplane in miles per hour and will return the velocity in meters per second. The relevant conversion factors are: one hour = 3600 seconds, one mile = 5280 feet, and one foot = .3048 meters.

Practice Problem

Write a function called *pickone* that will receive one input argument x, which is a vector, and will return one random element from the vector. For example,

```
>> pickone(4:7)
ans =
   5
>> disp(pickone(-2:0))
```

```
-1
>> help pickone
pickone(x) returns a random element from vector x
```

Practice Problem

A function can return a vector as a result. Write a function *vecout* that will receive one integer argument and will return a vector that increments from the value of the input argument to its value plus 5, using the colon operator. For example,

```
>> vecout(4)
ans =
   4   5   6   7   8   9
```

Practice Problem

If the lengths of two sides of a triangle and the angle between them are known, the length of the third side can be calculated. Given the lengths of two sides (b and c) of a triangle, and the angle between them α in degrees, the third side a is calculated as:

$$a^2 = b^2 + c^2 - 2b\ c\ \cos(\alpha)$$

Write a script *thirdside* that will prompt the user and read in values for b, c, and α (in degrees), and then calculate and print the value of a with three decimal places. (**Note:** To convert an angle from degrees to radians, multiply the angle by $\pi/180$.) The format of the output from the script should look exactly like this:

```
>> thirdside
Enter the first side: 2.2
Enter the second side: 4.4
Enter the angle between them: 50
The third side is 3.429
```

For more practice, write a function to calculate the third side, so the script will call this function.

Practice Problem

a. Generate a random sized array of random numbers using:
   `x = 10*rand(ceil(10*rand)+2,1)`
b. Use "for" loop to add up all the values in the array and assign the result to the variable mysum.
   i. For example, if the array is x = [1 1 1 1 1 1 1 1 1 2], then the sum of all the elements would be mysum = 11.
c. Check your answer using the built-in MATLAB sum( ) function by adding the following code snippet to the end of your script.

```
if mysum == sum(x)
    disp('Congratulations!!, you did it right')
    load handel;sound(y,Fs)
else
    fprintf('Sorry, %.2f ~= %.2f.  Please try
again.\n',mysum,sum(x))
end
```

Practice Problem

Write your own MATLAB function to compute the exponential function directly from the Taylor series:

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots .$$

The series should end when the last term is less than 10^{-6}. Test your function against the built-in function `exp`, but be careful not to make x too large—this could cause a rounding error.