ECE 257 - LESSON 16
FOR AND WHILE LOOPS - PART I

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IN CLASS

BASIC FOR LOOPS

1. A simple for loop

```
sum_x = 0;
for k = 1: 5
    x = input ('Enter the next data point: ');
    sum_x = sum_x + x;
end
fprintf ('The sum of the five data points = %5.2f\n', sum_x);
```

   a. Describe what the for loop is doing
   b. Describe the syntax of the for loop
   c. Why should the value of k never be modified inside the loop

2. A for loop with a more general index

```
sum_x = 0;
for x = 1:  2:  5
    sum_x = sum_x + 0.3* x;
end
fprintf ('The sum of the x's = %5.2f\n', sum_x);
```

   a. How is this for loop different from the one in Exercise (1)

3. Another for loop with a more general index

```
sum_x = 0;
for x = [1  3  5]
    sum_x = sum_x + 0.3*x;
end
fprintf ('The sum of the x's = %5.2f\n', sum_x);
```

   a. How is this for loop different from the one in Exercise (1)

4. A for loop with a noninteger index

```
sum_x = 0;
for x = 1:  0.5:  2
    sum_x = sum_x + x^2;
end
fprintf ('The sum of the data points = %5.2f\n', sum_x);
```

   a. What happens in this program

5. Suppose dist_day is a vector of how far you travel each day on a trip. Write a program with a for loop to calculate dist_total where dist_total (n) = total distance traveled by the end of the n'th day.

NESTED FOR LOOPS

6. A nested for loop to calculate $s = \sum_{k=1}^{2} \sum_{m=1}^{3} 2km$

```
s = 0;
for k = 1: 2
   for m = 1: 3
      s = s + 2*k*m;
   end
end
fprintf ('s = %i\n', s);
```

   a. Describe what's going on in this program
   b. Use a break point to verify your result in part (a)

PREALLOCATION OF ARRAYS

7. Timing a for loop without preallocation of the vector

```
tic;                          % start timer
clear
for k = 1: 10000
   sqr (k) = k^2;
end
toc                           % elapsed time in seconds
```

   a. How long did this for loop take

8. Timing a for loop with preallocation of the vector

```
tic;
clear
N = 10000;
sqr = zeros (1, N);
for k = 1: N
   sqr (k) = k^2;
end
toc
```

   a. What do we mean by preallocation
   b. Why does the for loop work faster with preallocation

9. Timing a vectorized calculation

```
tic;
clear
k = 1: 10000;
sqr = k.^2;
toc
```

   a. Why did the vectorized calculation work faster than the preallocated for loop
   b. What in general is the tradeoff between for loops and vectorized calculations