CS1115 Lab 2 (August 30, 2012)

Completing the lab is very important, but your work is not graded and it is not submitted. If you finish before the hour is over, then you can leave early or you can work on the "Finished Early" problems. If you do not finish the problems before the end of class, then be sure to ask enough questions so that you can complete the exercises in the next day or two on your own.

1 Boolean Practice

Download `RandQuad` from the course website and perform the indicated modifications

```
% Script RandQuad
%
% This estimates the probability that the quadratic
% q(x) = ax^2 + bx + c has two real roots given that the coefficients
% a, b, and c are randomly selected from the interval [-1,1]

N = 1000000; % the number of trials
count = 0;
for k=1:N
    a = -1+2*rand; b = -1+2*rand; c = -1+2*rand;
    d = b*b-4*a*c;
    if d>=0
        count = count+1;
    end
end
prob = count/N;
fprintf('N = %1d   Prob Estimate = %10.6f\n',N,prob)


% Modify so that the script estimates the probability that the roots are
% real and both to the right of the origin.


% Modify so that the script estimates the probability that the roots
% are real and that the magnitude of the larger root is greater that 1/10

% Modify so that the script estimates the probability that roots are
% real and opposite in sign.
```

2 For/While Practice

Download `ForWhile` from the course website and perform the indicated modifications.

```
%  Script ForWhile
%  Practice converting a for-loop to an equivalent while-loop

% These two loops display the same thing...
clc
disp('For loop output...')
for k=1:5
    fprintf('k = %3d\n',k)
end

disp(' ')

disp('While loop output...')
k = 1;
while(k<=5)
    fprintf('k = %3d\n',k)
    k = k+1;
end


%  (a) Change the for-loop statement to  for k=1:2:10
%      and modify the while-loop so it does the same thing.

%  (b) Change the for-loop statement to  for k=6:-1:3
%      and modify the while-loop so it does the same thing.

%  (c) Change the for-loop statement to  for k=100:-20:30
%      and modify the while-loop so it does the same thing.
```

3   Finished Early Problem
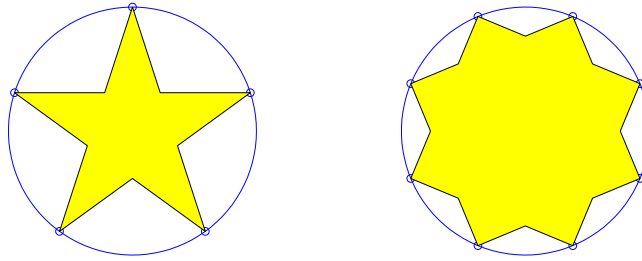
Here are the *n-stars* of size 5 and 8:

Figure 1: n-stars ($n = 5$, $n = 8$)

The precise definition of an n-star is not important. Suffice it to say that the area of an n-star that is inscribed in the unit circle is given by

$$A(n) \;=\; \begin{cases} n\dfrac{\sin((n-1)\theta)\sin(\theta)}{\sin(\theta) + \sin((n-2)\theta)} & \text{if } n \text{ is odd} \\[3ex] n\,\dfrac{\sin((n-2)\theta)\sin(\theta)}{\sin(\theta) + \sin((n-3)\theta)} & \text{if } n \text{ is even} \end{cases}$$

where $\theta = \pi/n$.

(a) Write a script that prints a table whose k-th line has the values n, $A(n)$, and $A(n+1)$ where $n = 10k$. The value of k should range from 1 to 20.

(b) Write a script that prints the smallest odd integer n_{odd} such that

$$|A(n_{odd} + 2) - A(n_{odd})| \le .0001$$

Please delete your files from the computer before you leave the lab!