Sirindhorn International Institute of Technology

Thammasat University at Rangsit

School of Information, Computer and Communication Technology

ET601: Problem Set 2

Due date: December 18, 2013 (Thursday), 1 PM

Instructions

a) ONE part of a question will be graded (5 pt). Of course, you do not know which part will be selected; so you should work on all of them.
b) It is important that you try to solve all problems. (5 pt)
c) Submit your work as one pdf file (which contains the solution for all the questions). The PDF file name should be ET601_HW2_FIRSTNAME.pdf in which the FIRSTNAME part is replaced by your first name.
d) The solution should contain both the MATLAB codes and the resulting figures. If answers are also displayed in the command window, they should be captured and shown in your solution as well.
e) Late submission will be heavily penalized.

1. In class we have seen several parts of the script SumofTwoDice.m. They are combined and shown below. This was used to study the probabilities related to the sum resulting from a roll of two dice.

```
close all; clear all;

%% Probability Simulation

n = 1e3;
Number_Dice = 2;
D = randi([1,6],Number_Dice,n);
S = sum(D); % sum along each column

RF11 = cumsum(S==11)./(1:n);
plot(1:n,RF11)
hold on
RF12 = cumsum(S==12)./(1:n);
plot(1:n,RF12,'r')

xlabel('Number of Rolls')
ylabel('Relative Frequency')
legend('Sum = 11', 'Sum = 12')
grid on

figure
S_Support = (1*Number_Dice):(6*Number_Dice);
hist(S,S_Support)

N_S_Sim = hist(S,S_Support);
```

```
%% Probability Calculation

Dice_Support = 1:6;
S = [];
for k1 = Dice_Support
    for k2 = Dice_Support
            S = [S k1+k2];
    end
end
Size_SampleSpace = length(S);

Number_11 = sum(S==11)
Number_12 = sum(S==12)

% Count all possible cases at once
N_S = hist(S,S_Support)

P = sym(N_S)/Size_SampleSpace
```

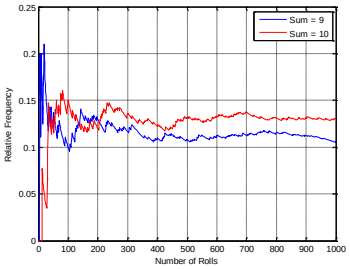
```
figure
stem(S_Support,P)

%%
hold on
RF = N_S_Sim./n;
plot(S_Support,RF,'rx')
legend('probability','relative frequency')
xlabel('sum of two dice')
grid on
```

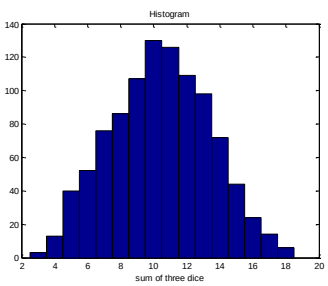
Consider the probability calculation part of the code.

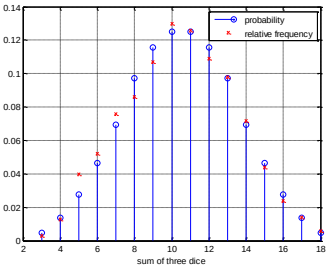
a. Modify the script so that the vector S is preallocated.
b. Modify the script to also create a matrix *SS*. Its size is 6×6. The value of its (k1,k2) element should be k1+k2.

2. Write a MATLAB script to
   a. Simulate N = 1000 repeated rolls of three dices.
   b. Calculate the sum of the three dices from the rolls above.
   c. Plot the relative frequency for the event that the sum is 9.
   d. In the same figure, plot (in red) the relative frequency for the event that the sum is 10.
   e. In another figure, create a histogram for the sum after N rolls of three dice.
   f. Calculate the actual probability for each possible value of the sum.
   g. In another figure, compare the probability with the relative frequency obtained after the N simulations.

The three figures should be similar to the sample figures shown below.







3. Continue from Question 2 in HW1. There, you have created a vector x and its corresponding cumulative sum vector y. Here, without using the cumsum function, create a vector z which also computes the cumulative sum from the vector x via a for loop. Make sure that you use preallocation. Check that your z is the same as the vector y found earlier.
4. Write a MATLAB script to evaluate the relative frequencies involved in the scandal of arithmetic. Figure 1 below shows an example of the plots that your script may produce.

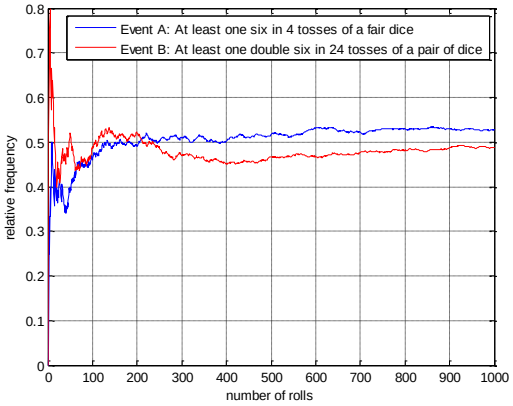


Figure 1

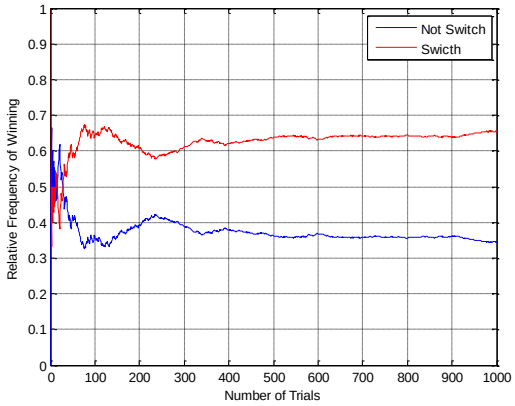


Figure 2

5. Write a MATLAB script to evaluate the relative frequencies involved in the Monty Hall game. Figure 2 above shows an example of the plots that your script may produce.