**ECE 302: Probability, Statistics, and Random Processes for EE**

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Assignment 1: Basic Concepts of Probability Theory

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# Problem 1.2

Solution:

1. The urn experiment had the sample space, S1={0,1,2,3}, and the coin flipped has the sample space, S2={HH,TH,HT,TT}. Therefore, both experiments have four possible outcomes. If the 4 balls in the urn are each labeled with one of the events in S2, then the two experiment can generate the same relative frequencies.
2. Since there are two dice, each one has 6 possible outcomes; therefore, the pair of die tossed once have 36 outcomes. If the urn has 36 labeled balls (labels ranging from 1 to 6 – repeated 6 times) and only two are drawn, then it will have the same relative frequency as if we tossed two dice. Otherwise, 6 labeled balls (labels 1 to 6) can be in the urn, and one selected. Then, the selected one is replaced, and a second draw occurs. This method would also have the same relative frequency.
3. If two cards are drawn with replacement, then there are 52\*52=2704 possible solutions. Hence, if we label 52 balls with 52\*52 labeled pairs (matching the cards), then two draws can be made from the urn (replacing the 1st drawn card before the second draw) to achieve the same relative frequency. If the two cards are not replaced, then the 52 balls in the urn should be still labeled with 52\*52 pairs. Two draws still need to be made, but the first ball is not replaced.

# Problem 1.4

Solution:

1. Lisa:

Homer:

Bart:

# Problem 2.3

Solution:

1. , |w-n| = k ---- w = number rolled of 1st dice, n = number rolled of 2nd dice

**{5} = {(1,6), (6,1)}**

**{4} = {(1,5), (5,1), (6,2), (2,6)}**

**{3} = {(1,4), (4,1), (2,5), (5,2), (3,6), (6,3)}**

**{2} = {(1,3), (3,1), (2,4), (4,2), (3,5), (5,3), (4,6), (6,4)}**

**{1} = {(1,2), (2,1), (2,3), (3,2), (3,4), (4,3), (4,5), (5,4), (5,6), (6,5)}**

**{0} = {(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)}**

# Problem 2.8

Solution:

**(0.75,1]**

# Problem 2.21

Solution:



# Problem 2.22

Solution:

1. Sample space: 6\*6 = 36

If die is considered fair:

1. A – number of dots in the first toss (m) is not less than numbers of dots in second toss (n) – m>n

\*\*\* A has total of 21 events

B – number of dots in first toss is 6

C – number of dots in dice differ by 2

# Computer Experiments

Solution:

1. Outcome MATLAB Plot:



1. Relative Frequency – N=50 trials
2. Relative Frequency – N=500 trials