# B-365 HW 1

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## Problem 1

Three players, A,B, and C, each flip their coins until one person has a different result from the others. The person having the different coin wins.

### (A)

**Answer** See the .r file. The result was player A won 3255 out of 10000 times.

### (B)

**Answer** $1/\sqrt{n} = 0.01$ , n = 10000

### (C)

**Answer** There is a 95% chance that p(A wins) is in this interval, this is because I used the vale for 95% in my calculations.

### (D)

**Answer** The true probability of an event cannot ever be known because it it would require a running the experiment an infinite number of times to find out.

# Problem 2

A and B alternate drawing cards from a shuffled pack, replacing each card when done. A goes first. Play continues until a heart is drawn. Simulate this experiment to compute P(A draws first heart) to 2 decimal places($\pm.005$) using the $\sqrt{n}$ rule.

**Answer** the probability is 0.4967179. The 95% interval is from 0.4917556 to 0.5016803. The half width of the interval is 0.004962316. See the .r file for the simulation and the calculation code.

# Problem 3

Two cards are drawn from a shuffled deck.

## (A)

**Answer** The sample space for the experiment is $\Omega = \{(AH, 2H), (2H, 3H), ...(KC, KS)\}$ or every possible permutation of 2 cards drawn from the deck. $\|\Omega\| = 2652$

## (B)

**Answer** 156 elements

## (C)

**Answer** $156/2652 = 0.05882353$

# Problem 4

Suppose we are interested in P(A) for some event...

## (A)

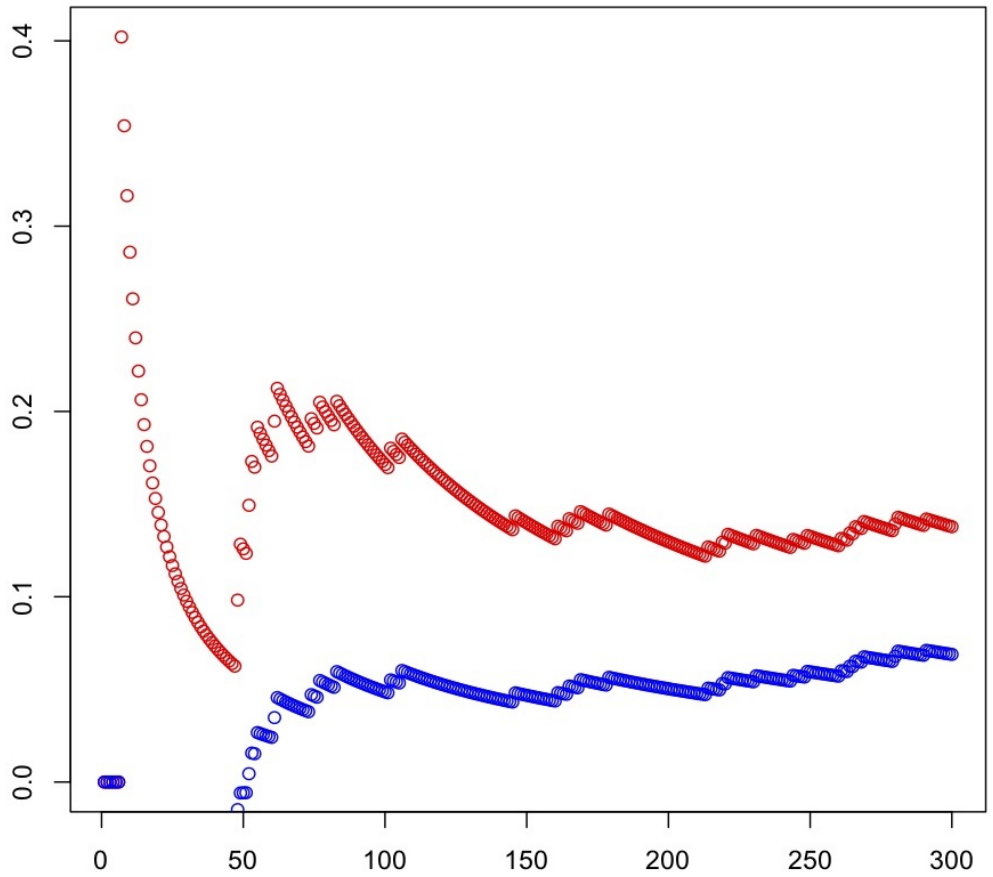
**Answer** The out put of running problem 4 in the .r file is bellow:
A occurred 31 out of 300 times
the probability is 0.103333

The 95% interval is from 0.06888794 to 0.1377787
The half width of the interval is 0.0344454

## (B)

**Answer** The plot is emended bellow and can be generated using the method problemFourB() in the .r file.

prob4 chart.jpg




## (C)

**Answer** The actual probability was in the interval 0.949 % of the time. See the method problemFourC() in the .r file.

# Problem 5

A bag contains n distinct (all different) numbers:{x1, x2, . . . , xn}. Person A draws a number at random, while person B draws a number from the remaining choices. What is the exact probability that A's number is greater than B's number? Explain your reasoning in detail.

**Answer** The probability is exactly 50%. This can be seen in in the .r file in the method problemFive(). This is also demonstrated the table bellow. The number of green squares is the same as red squares and so the chance is exactly 50%.

table.png

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | Player One Picks This Number | Player Two Picks this number | Player Two Picks this number | Player Two Picks this number | Player Two Picks this number |
| 2 | Player Two Picks this number | Player One Picks This Number | Player Two Picks this number | Player Two Picks this number | Player Two Picks this number |
| 3 | Player Two Picks this number | Player Two Picks this number | Player One Picks This Number | Player Two Picks this number | Player Two Picks this number |
| 4 | Player Two Picks this number | Player Two Picks this number | Player Two Picks this number | Player One Picks This Number | Player Two Picks this number |
| 5 | Player Two Picks this number | Player Two Picks this number | Player Two Picks this number | Player Two Picks this number | Player One Picks This Number |
| | | | | | |
| | Red = loss for p2 | | | | |
| | Green = win for p2 | | | | |

# Problem 6

Suppose we want to simulate an experiment that can take outcomes...

**Answer** See the .r file for the code.