STAT 35A HW2 Solutions

http://www.stat.ucla.edu/~dinov/courses_students.dir/08/Spring/STAT35.dir

Problem 1

a. $\mathbf{A_1} \cup \mathbf{A_2}$ = 0.36

   probability of getting $\boldsymbol{A_1}$ *or* $\boldsymbol{A_2}$

b. $\mathbf{A'_1} \cap \mathbf{A'_2}$ = 0.64

   probability of not getting $\boldsymbol{A_1}$ *and* ***A2***

c. $\mathbf{A1} \cup \mathbf{A_2} \cup \mathbf{A_3}$ = 0.53

   probability of awarded any of the three projects

d. $\mathbf{A'_1} \cap \mathbf{A'_2} \cap \mathbf{A'}$ = 0.47

   probability of not getting any of the three projects

e. $\mathbf{A'_1} \cap \mathbf{A'_2} \cap \mathbf{A_3}$ = 0.17

   probability of getting $\boldsymbol{A_3}$ *but not* $\boldsymbol{A_1}$ *or* $\boldsymbol{A_2}$

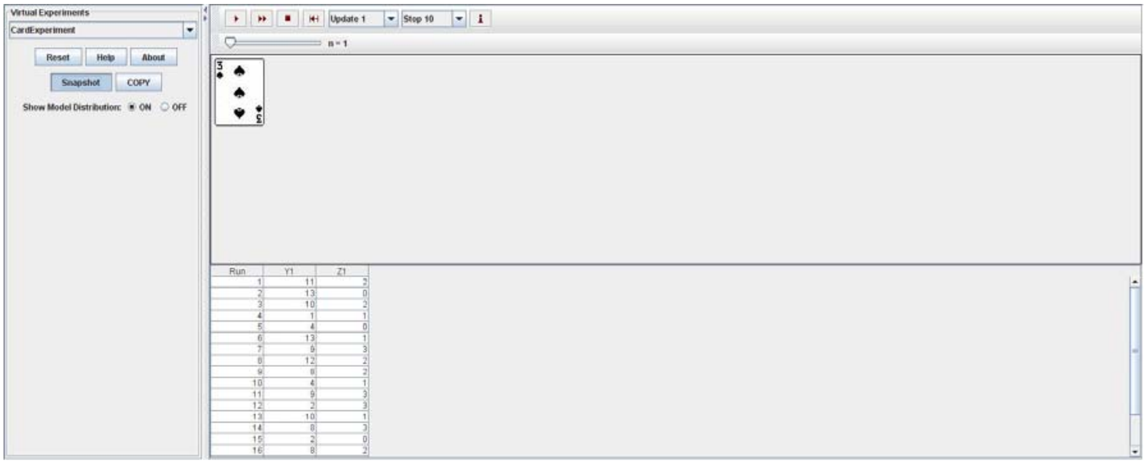
f. $(\mathbf{A'_1} \cap \mathbf{A'_2}) \cup \mathbf{A_3}$ = 0.75

   probability of not getting $\boldsymbol{A_1}$ *or* $\boldsymbol{A_2}$ *or getting* $\boldsymbol{A_3}$

Problem 2

a. What is the probability that the individual has a medium auto deductible and a high homeowner’s deductible?
   0.10.
b. What is the probability that the individual has a low auto deductible? A low homeowner’s deductible?
   0.18. 0.19.
c. What is the probability that the individual is in the same category for both auto and homeowner’s deductibles?
   0.41.
d. Based on your answer in part (c), what is the probability that the two categories are different?
   0.59.
e. What is the probability that the individual has at least one low de-ductible level?
   0.31.
f. Using the answer in part (e), what is the probability that neither deductible level is low?
   0.69.

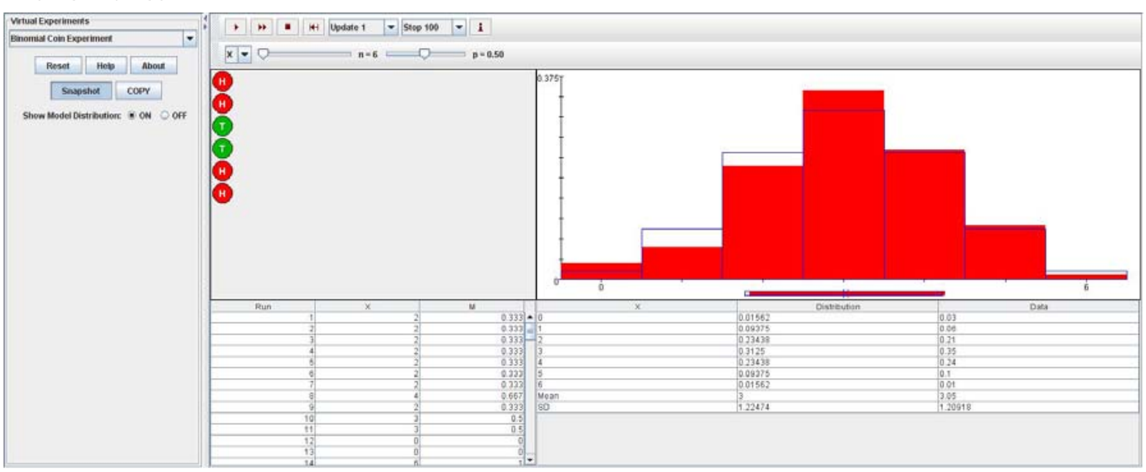
Problem 3



What is the theoretical probability of the event A = {the drawn card is a king or a club}?
16/52=0.3077.
How close are the observed and the theoretical probabilities for the event A?
Answer varies.
Would the discrepancy between these increase or decrease if the number of hands drawn increases?
The discrepancy should decrease.

Problem 4

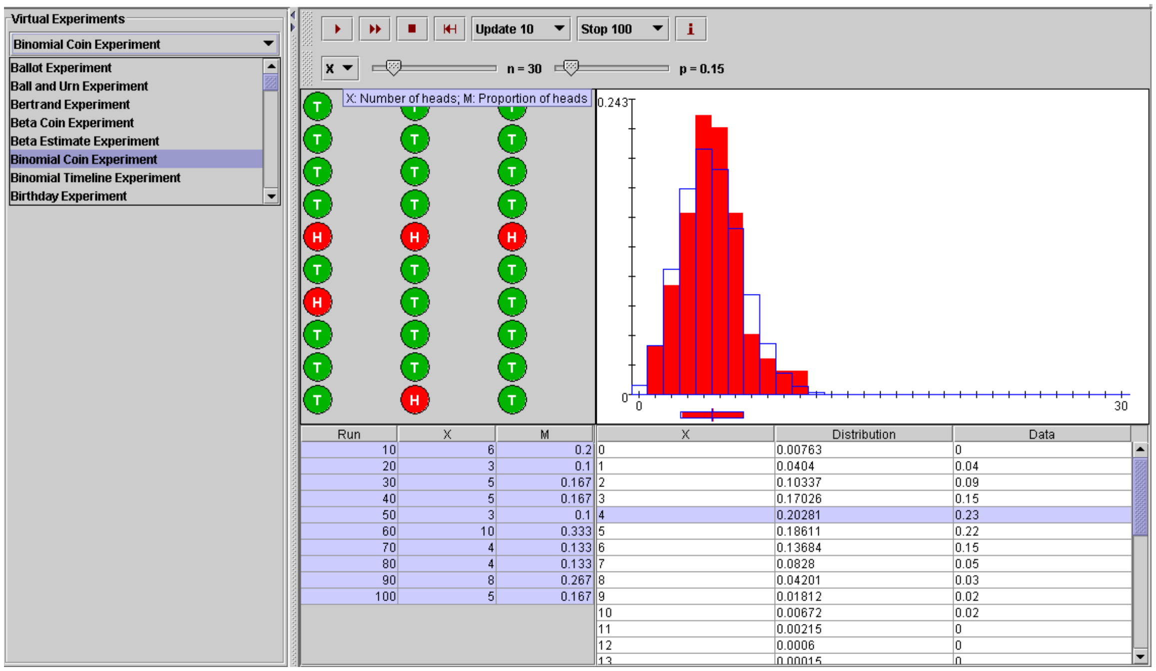
Under these fair coin assumptions what is the (theoretical) probability that only 1 Head is observed in 6 tosses?
0.0938.
Empirically compute the odds (chances) of observing one Head in 6 fair-coin-tosses (run 100 experiments and record the number of them that contain exactly 1 Head).
Answer varies.



Empirically estimate the Bias of the coin we have tested. Experiment with tossing 30 coins at a time. You should change the p-value=P(Head), run experiments and pick a value on the X-axis that the empirical distribution (red-histogram) peaks at. Perhaps you want this peak X value to be close to the observed 1-out-of-6 Head-count for the original test of the coin. Include some graph snapshots and some brief discussion regarding your experiments and findings.

Bias = | Expected value – Observed mean |

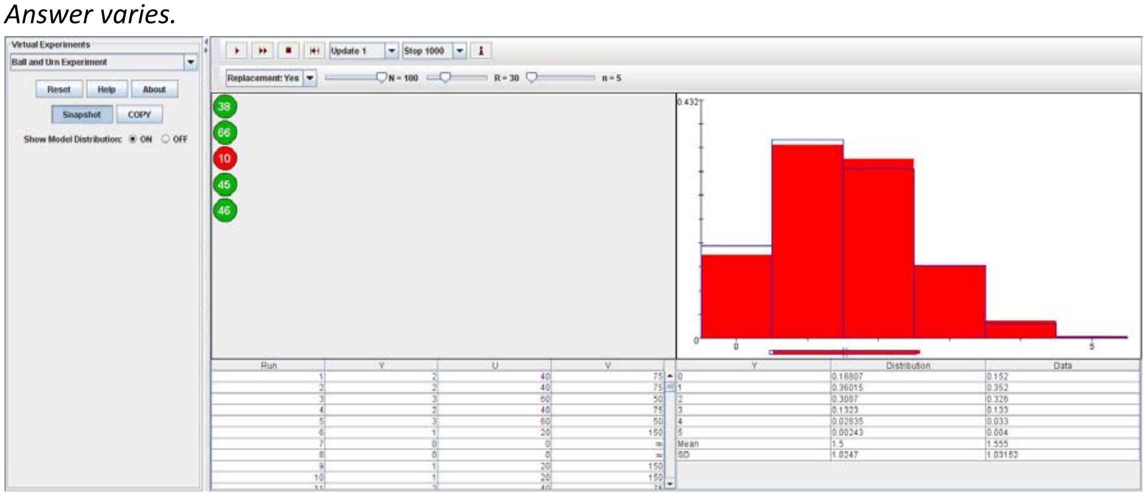
For a fair coin, the expected value (number of heads expected in 30 trials) is 15 (30x0.5). If you run the experiment with (p=1/6), then the expectation of a Head in one trial is around 0.15 and the expected number of heads would be about 4 (30x0.15). Thus, Bias = |E – O|=|15 – 4| ≈ 11.



Problem 5

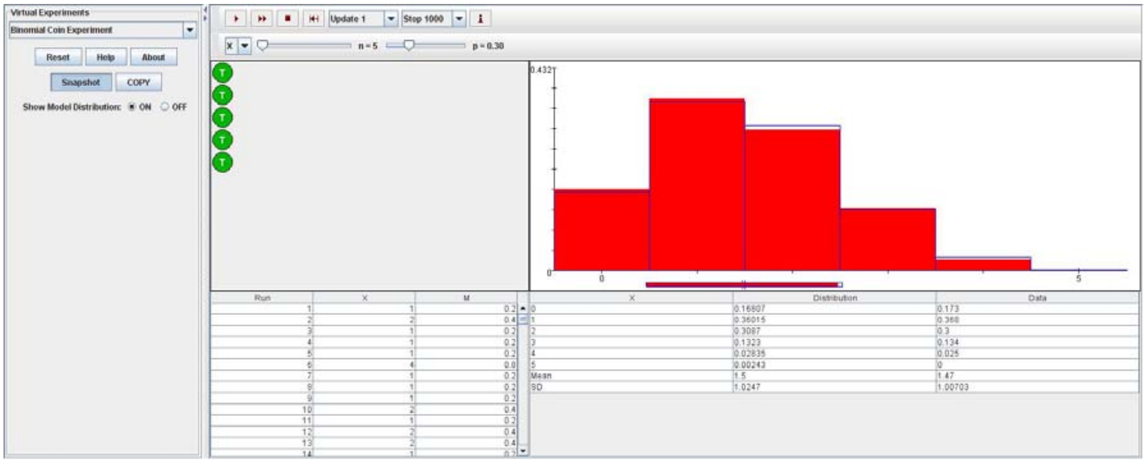
Suppose N=100, n=5, R=30 and you run 1,000 experiments. What proportion of the 1,000 samples had zero or one red balls in them? Record this value.

Answer varies.



Now run the Binomial Coin Experiment with n=5 and p= 0.3. Run the Binomial experiment 1,000 times? What is the proportion of observations that have zero or one head in them? Record this value also. How close is the proportion value you attained before to this sample proportion value? Is there a reason to expect that these two quantities (coming from two distinct experiments and two different underlying probability models) should be similar? Explain.

Answer varies.



The answers should be similar, because they are essentially the same experiment (if the Ball and Urn experiment is done with replacement), with the only difference being one using balls and one using coins.