Review for 2nd Midterm

Topics

- Probability
  - Multiplication rule and conditional prob
  - Independence
  - Complete lists
  - Addition rule
  - Binomial coeff
  - Binomial prob formula

- Chance variability
  - Box models
  - Sums of draws
  - Chance error
  - Law of averages
  - Expected value and se for sums
  - Probability histograms and normal approx to binomial and more general sums

- Sampling
  - methods, bias, prob samples
  - EV and SE for percentages and averages
  - Bootstrap estimate of SE
  - Confidence intervals

A bag contains 3 red apples and 2 green apples. You take out one apple and then another (without replacement).

(a) The chance that you get two red apples equals ________.

(b) The chance you get one red apple and one green apple equals ________.
A circuit in a complex electronic device fails with probability 0.1, in which case an identical and independent back-up unit is used. The entire device fails if both circuits fail.

(a) The chance the device works equals ________.
(b) The chance the device fails at least once on 100 independent trials is ________.

One box contains tickets with the numbers 1, 2, and 3 and another box contains tickets with the numbers 3, 4, and 5. One ticket is drawn from each box.

(a) The chance that they are both even equals ________.
(b) The chance at least one number is even equals ________.

A store serves 12 different flavors of ice cream. If you order a bowl with 3 scoops, each of a different flavor, how many choices (possible bowls) do you have to choose from?
A family has five children. Suppose that the genders of the children are independent and that each has probability ½.
(a) The chance that there are exactly three boys equals ______. 
(b) The chance that there is at least one boy equals ______.

A bag contains three red apples and two green apples. If you reach in and pull out a green apple you win $2 and if you choose a red apple you lose $1. You play this game 100 times (drawing apples with replacement).
(a) By how much do you expect to be behind or ahead after playing 100 times? 
(b) The chance that you come out ahead is approximately ______.

A box contains 100 tickets with various numbers whose average equals 0. You can choose to play one of two games: (i) you draw 100 times from the box and win $1 if the sum is between –10 and 10, or (ii) you draw 400 times and win $1 if the sum is between –40 and 40. Choose one option and circle it. Explain your answer.
(a) You would be better off to play game (i). 
(b) You would be better off to play game (ii). 
(c) The games are equivalent.
A school lunch program prepares food for 400 students and they wonder how many apples to stock on a given day. Suppose that each student independently chooses to take an apple with probability $1/5$ or not take an apple with probability $4/5$. A worker claims that there is little chance that they will run out if they stock 100 apples. Do you agree or disagree and why?

A survey was done of 50,000 households from which a simple random sample of 400 was taken. Of those 400 households, 398 had at least one TV set. If possible, find an approximate 95% confidence interval for the percentage of households in the population having at least one TV.

A simple random sample of 400 households was taken from a population of 50,000 households. All the adults over 21 were asked if they were employed and of 916, 715 were employed. If possible, give a 95% confidence interval for the percentage of adults in the population who were employed. If not possible, state why not.