

Math 50 Stat Inf: Homework 1—clarified

due Wed Jan 11 . . . but best if do relevant questions after each lecture

Some of your homework time this week is devoted to getting started with either Matlab (a versatile and powerful package which I promise will bring you joy and success in your future careers), or an alternative if you are already used to one (Maple, R, Mathematica, python, etc). For Matlab help, always start with our course website <http://math.dartmouth.edu/~m50w06>, then ask friends, myself, or Susan A. Schwarz.

- A. Install Matlab (or equivalent) on your personal machine, *e.g.* from <http://hydra.dartmouth.edu/matlab/download>

Susan Schwarz can help with installation. Instead you could work at computer labs where Matlab is already installed. Try out a couple of commands from the Matlab introductions linked on our course site.

Try `d = rand(100,1)>0.5` then `sum(d)` to sum the number of heads given by 100 unbiased coin-tosses. Repeat it.

Try `hist(sum(rand(100,10000)>0.5))` to histogram the results of repeating the above 10000 times! (What's the shape?)

Problems are from Larsen & Marx 3rd Ed., (LM3) unless indicated. GS indicates Grinstead and Snell 2nd Ed., available online.

Since most of you have 4th edition LM4 I now either type out problems or include both refs

First we review probability stuff you should know from *e.g.* Math 20.

GS 1.2: 25 (p.38), 31 (p.40).

2.4: 5. (with odd problems, since answer is available, you must give working). [Note this and all other problems are from LM since there's no GS].

Since it's not in LM4, here's the question: "An urn contains 5 chips, numbered 1 through 5. 3 chips are drawn out at random. What is the probability that the largest chip in the sample is a 4? Assume order with which chips drawn is irrelevant".

2.5: 3.

"The length of a cotter pin that is part of a wheel assembly is supposed to be 6 cm. The machine that stamps out the parts, though, makes them $6 + y$ cm long, where y varies from pin to pin according to the probability function $f(y) = k(y + y^2)$, $0 \leq y \leq 2$, where k is a constant. If a pin is longer than 7 cm it is unusable. What proportion of cotter pins produced by this machine will be unusable?"

2.6: 5.

"Consider families with two children and assume that the four possible outcomes—(younger is a boy, older is a boy), (younger is a boy, older is a girl), and so on—are all equally likely. What is the prob. that both children are boys given that at least one is a boy?"

18 [which is LM4 2.4.27], 28 (crucial example of Bayes rule).

"Suppose that 0.5% of all the students seeking treatment at a school infirmary are eventually diagnosed as having mono. Of those who do have mono, 90% complain of a sore throat. But 30% of those not having mono also have sore throats. If a student comes to the infirmary and says that he has a sore throat, what is the prob. that (s)he has mono?"

2.7: 2 [which is LM4 2.5.1], 20.

“Two myopic deer hunters fire rifles simultaneously and independently at a nearby rooster. The probability of hunter A’s shot killing the rooster is 0.2; hunter B’s prob. is 0.3. Suppose that rooster is hit and killed by only one bullet. What is the prob. that hunter B fired the fatal shot?”

2.8: 7. [LM4 2.5.25] (You start to see how far back the history goes)

2.9: 24 [LM4 2.6.25], 48 [LM4 2.6.53].

2.10: 2 [LM4 2.7.2].

Now for a little new stuff:

3.2: 4.

“A fair coin is tossed 3 times. Let the random variable X denote the number of head in the tosses *times* the number of tails. Use a listing of the eight possible outcomes to tabulate the pdf for X .”

3.3: 1.

“There are nine candidates, 5 men and 4 women, from which 3 must be given jobs. If all 3 are men, or all 3 are women, this will be perceived as biased. What is the probability that a *random* choice of 3 from the 9 will be biased?”

10 [LM4 3.2.27], 15 [LM4 3.2.2].