

STAT 313. ASSIGNMENT NO. 3

Due on Tuesday, February 13, 2001

Show Your Work!

- **Read** Chapters 3 and 4.

- **Do** the following exercises:

1. 3.40, 3.41, 3.46, 3.54¹

2. 3.50 (a-c and d: what's the connection *between* the probability of selecting 2 chips from a random sampling without replacement *and* the number of times to choose 2 chips out of 100 chips?)

3. 3.75, 3.76, 3.80, 3.82, 3.97, 3.104

4. A Q from a Science article: "Decisions based on statistical information can mean the difference between life and death—for instance, when a cancer patient has to decide whether to undergo a painful medical procedure based on the likelihood that it will succeed, or when a jury has to decide whether to convict someone based on DNA evidence. Unfortunately, most of us, experts included, have difficulty understanding and combining statistical information effectively... 'If a test to detect a disease whose prevalence is 1/1000 has a false positive rate of 5 per cent, what is the chance that a person found to have a positive result actually has the disease, assuming that you know nothing about the person's symptoms or signs?' ..."

5. 3.83-3.91, 4.13, 4.20, 4.29, 4.31

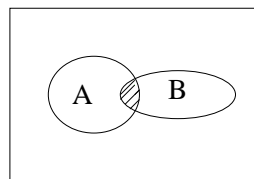
- **Try** (optional): 3.58², and

Continuation from the Science article Q: Read the original article at

<http://www.sciencemag.org/cgi/content/full/290/5500/2261>

Provide a critique to the article and try to compute the following probabilities in the application to law: a) the probability that the person reported to have a match indeed has the same DNA profile, given a positive test; b) the probability that this person indeed has the same DNA profile, given 2 independent positive test results; c) the probability that this person indeed has the same DNA profile, given 3 independent positive tests; and d) the probability that the DNA profile is this person's, given a positive test, and in addition that the person is known to be one of the 10 possible suspects (one of these 10 people must be guilty).

¹Recall that a Venn diagram is a diagram representing union or intersection or complement (or some of these operations) of events, such as the diagram on the right.



$A \cap B$

¹

²Use the total probability rule: $P(A) = P(A|B)P(B) + P(A|B')P(B')$.