MAT 135, Discussion Questions 3.07

1. What does it mean for two events to be independent?

knowing that event A occurred does not change the probability event B will occur

2. Suppose you flip a fair coin and a fair six-sided die together. What is the probability of getting a head on the coin and a 6 on the die?

$$\underbrace{\left(\frac{1}{2}\right)}_{\text{head}} \cdot \underbrace{\left(\frac{1}{6}\right)}_{\text{corn}=6} = \frac{1}{12}$$

multiply as they are independent.

3. Give five examples of dependent events. Give two examples that are independent.

answers will vary

coin flips

coin flip / die roll

gender / cat ownership

age / voting

4. What is conditional probability?

the probability of event B know event A has occurred

5. A department store sells shirts in three sizes and in three patterns (small, medium and large; plaid, print and stripes). The table below gives the number of shirts of each type sold on a particular, typical day.

Size	**Plaid**	**Print**	**Stripes**
Small	3	2	3
Medium	10	5	7
Large	4	2	8

a. If you choose a sales receipt at random from that day, what is the probability that the shirt on that receipt is a print shirt?

$$\frac{9}{44}$$

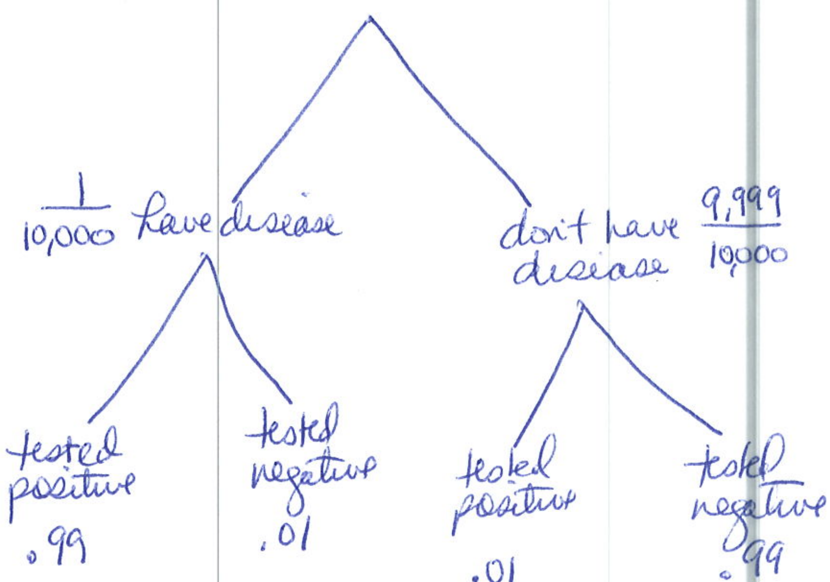
b. If the shirt is a print shirt, what is the conditional probability that the shirt is a size medium?

$$\frac{22}{44}$$

c. Are the size and style of shirts independent? Why or why not?

No. Consider print shirts. 9/44 overall, but among size medium they are $\frac{5}{22} \neq \frac{9}{44}$ this is similar but other calculation can be less so.

6. Use the conditional probability rule to answer the following question: Suppose that you are worried that you might have a rare disease. You decide to get tested, and suppose that the testing methods for this disease are correct 99 percent of the time (in other words, if you have the disease, it shows that you do with 99 percent probability, and if you don't have the disease, it shows that you do not with 99 percent probability). Suppose this disease is actually quite rare, occurring randomly in the general population in only one of every 10,000 people. If your test results come back positive, what are your chances that you actually have the disease? [Hint: It may help to draw a tree diagram.]



$$\frac{\text{Positive \& disease}}{\text{all positive tests}} \quad \frac{\frac{1}{10{,}000}(.99)}{\frac{1}{10{,}000}(.99) + \frac{9{,}999}{10{,}000}(.01)} = .0098$$

less than 1% chance of actually having disease