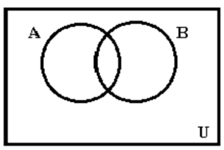
Finite Mathematics (Math 10120), Spring 2016

Quiz 3, Friday February 26

Solutions

1. (5 pts) Half the students in my probability class are from the College of Engineering. One third of the class are seniors. Seven-twelfths of the class are either from the College of Engineering, or seniors, or both. If I pick a student at random from the class, and learn that she is from the College of Engineering, how likely is it that she is a senior? (**Hint**: begin by using the given information to fill out probabilities in the Venn diagram below, with A representing being an engineer and B representing being a senior.)



Solution: Given $\mathbf{P}(A) = 1/2 = 6/12$, $\mathbf{P}(B) = 1/3 = 4/12$ and $\mathbf{P}(A \cup B) = 7/12$, so, since

$$\mathbf{P}(A \cup B) = \mathbf{P}(A) + \mathbf{P}(B) - \mathbf{P}(A \cap B),$$

have

$$\frac{7}{12} = \frac{6}{12} + \frac{4}{12} - \mathbf{P}(A \cap B),$$

so

$$\mathbf{P}(A \cap B) = \frac{3}{12}.$$

We want to know

$$\mathbf{P}(B|A) = \frac{\mathbf{P}(A \cap B)}{\mathbf{P}(A)} = \frac{3/12}{6/12} = \frac{3}{6} = \frac{1}{2} = .5.$$

2. (5 pts) A group of 400 students at a small college were surveyed, and information regarding gender and color blindness status was collected. The results of the study are recorded in the following table:

		Gender	
		Male	Female
Color Blindness status	Yes	10	4
	No	190	196

Studies show that the probability that a randomly selected male is color blind is 8%, while for females the probability is 0.5%. This group of students is not typical of the population as a whole. Why?

(a) Too few males and too many females are color blind in our study.

(b) Too many males and too few females are color blind in our study.

(c) Too few males and too few females are color blind in our study.

(d) Too many males and too many females are color blind in our study.

Solution: The proportion of color blind males in our sample is $10/(10 + 190) = 10/200 = .05 = 5\%$, so there are **too few** males in our sample for it to be typical. The proportion of color blind females in our sample is $4/(4 + 196) = 4/200 = .02 = 2\%$, so there are **too many** females in our sample for it to be typical. So the correct answer is (a).