Math151 at the University of Tennessee, Knoxville - Chat for November 17, 2015 with the course instructor, Louis Gross.

I will be online starting at 8PM and will be happy to answer questions regarding any aspect of the course, assignments, etc. You can type in this document to ask questions.

When you ask a question, please do not use your name because this document will be saved and publicly posted after we close it. I will be on-line at least until 9PM but will stay on longer if there are still questions. Note that I do not know the identity of anyone posting questions - each participant shows up as “Anonymous” animal.

Can you please go over 1 on the practice exam?

For #1, there are several ways an individual can be of type aa - so look at all the possible matings that can lead to a type aa offspring, find the probability of each of those matings, and then multiply these by the probability, given each of those matings that the offspring is of type aa. This is what the answer sheet shows - there are 3 different possible matings that can lead to an individual of type aa - the answer sheet calculates the probability of each of these matings based on the data in the problem and then multiplies each by the fraction of offspring of this mating that are aa. Does this make sense to you? And is there a particular calculation on the answer that isn’t clear?

I understand it now, thank you.

How do you calculate the probability of the matings?

Ok let's take an example - suppose we look at the first one on the answer sheet - the mating Aa x Aa. We are told in the problem that the intermediate spotting is what's left after the 60% which are white spotted wings and the 10% which have fews spots. So there are only three types which means that the remaining 30% must have intermediate spotting (e.g. are Aa). So the probability that a mating between Aa and Aa, assuming there is a large population of the individuals so that when you take away one individual it doesn't affect the probability of drawing another individual of that type, is .3 x .3 or .09

The others are similar - is this OK?

I don't understand where the .25 on the answer sheet comes from, could you explain that?

Sure - given that a mating is between an Aa and an Aa then .25 of the offspring of this mating are of type aa.

Oh okay, I understand now, thank you.

Could you go step wise through number 7?

OK - so first we want to find the probability an individual is obese and not on a low fat diet. We know that the total fraction of the population which is obese is .35 and there are only two ways to be Obese - either the individual eats a low fat diet or does not. So we are also told that .03 of the population are both obese and eat a low fat diet. Then the remaining .32 = .35 -.03 fraction of the obese individuals in the population must be those who eat a non-low fat diet (and are obese.) This is part (a) - OK?

Okay

Now for part (b) we are asked to find the fraction, given that a person is not obese, who eat a low fat diet. So this is a conditional probability - we are given that a person is not obese - this restricts the sample space (the dartboard) to just those individuals who are not obese - this is .65 fraction of the population (the ones who are not obese). Of these, only some are individuals who both are not obese and who eat a low fat diet - we find this fraction in the same way we did in part (a) except we are now splitting up the fraction of obese individuals who are on a low fat diet and not obese - so think of this as looking at all individuals who are on a low fat diet - they are in only two groups - those who are obese and those who are not obese. We know from the problem that .2 are on a low fat diet and that .03 are both obese and eat a low fat diet. So that .2-.03 = .17 are those who are eat a low fat diet and are not obese. This gives the two numbers in the equation in the answer sheet for the conditional probability.

OK?

Also, A, B, and C on number 4?

For #4, part (a) asks for the probability of the intersection of two events and we are told that 20% have a tumor so we need to find the probability using the fact we are told that $P(+|T) = .86$ (which is 1 - sensitivity of the test). So $P(T \text{ and } +) = P(+|T)\, P(T) = .86 \times .2 = .172$

OK on this part?

Part (b) asks what fraction of the entire group of tested individuals have a test which is positive. This can only happen two ways - the test is positive and the individual has a tumor, or the gtest is positive and the individual does not have a tumor. From part (a) we already found the fraction of individuals who have both a positive test and have a tumor. So all we need then is to find the fraction of individuals who have a positive test and do not have a tumor. We are told that P(+|not T) = .06 so P(+ and not T) = P(+|not T) P(not T) = .06 x .8 =.048 since we are told that 20% have a tumor so 80% do not have a tumor. So for the final answer we add this .048 and .172 from part (a) to get .22 - OK?

For part (c ) we are asked for the conditional probability that given a test is positive, an individual has a tumor. We already calculated most of this in part (b) so we want P(T|+) = P(T and +) / P(+) = .172/.22 = .782

OK?

Could you also go over number 8?

OK - part (a) asks us about Joan - one of her parents is AA and the other is Aa so a Punnet square tells us that P(Joan is AA) = .5 and P(Joan is Aa) =.5  OK?

Now part (b) is about Joan and Tim's child and since we don't know what genotype Joan is, we need to look at both cases. That is we need to consider what the [probability is that Alan is AA and there are two ways this can happen - Alan is AA and Joan is AA or Alan is AA and Joan is Aa. These are the only ways that Alan can be AA. This gives the calculation on the answer sheet, since if Joan is AA then Alan has a 50% chance of being AA while if Joan is Aa, then Alan only has a .25 chance of being AA. Now to be careful here, this is assuming we can't say anything about Alan having the disease - think of it as a disease that will not manifest itself until Alan is older.

Okay, I get it, thanks.

Could you go over A and B of number 3?

OK we are asked for the sample space which is just a list of all the possible outcomes of the experiment. So in this case there are 3 levels of a blood lipid and three levels of BMI. So there are nine possibilities A1, A2, A3 are the three options for individuals with above normal lipid - ans similarly for the other two lipid levels.

For part (b ) there are four possible outcomes in each cage and we don't care anything about order or which cage is which. Think of this as having a helper go to the two cages and bringing you the two lizards from the cages without telling you which cage which lizard came from. So then we get the list of possibilities on the answer sheet.

OK?

Could you please explain #2?

OK - so if we have 5 treatments then we want to know how many different ways we can combine these, taking two treatments at a time in which we do not care about the order of which treatment occurs first. So there are 5 ways to pick the first treatment and then 4 ways to choose the second one so a total of 5 x 4 = 20 different treatments if we care which order they are in.

But since we don’t care about the order we divide this by 2. Or if you’d like to just memorize the formula, this is the case of choosing 2 objects from 5 objects in which you don’t care about order of the choice of the objects - thus this is a combination of 5 objects taken 2 at a time. OK?

If there isn’t anything else - I am going offline.

Good night!