Math 247: Review for Test 2

- You will need a *calculator* (any type is fine) for the exam. You may not use your phone as a calculator.
- You may have 1 3x5 note card for the exam.
- The suggested review problems are a good indication of most of, but not necessarily all of the types of problems that will be on the exam. **Be sure to also review your notes!**

Chapter 5 Review Read: Chapter 5 **Key Terms**, **Summary** (page 239)
Do: Review Exercises , page 246: 86, 89, 109, 111, 113, 115, 117, 119, 121, 127, 128,
129 (on #129, set up a probability distribution, where X = number of believers, then answer the questions)
133
Even answers: #86 (a) Independent (b) Associated
#128: (a) No, we could not find the probability a female student is married OR has a child
(b) We would have to know the percentage of female students who are married AND have a child. The given percentages double count those women.
Guidance on #129:
The events: M = man believes, W = woman believes
The given probabilities: P(M) = .62, P(W) = .50

We also need the complements (negation) of the events: M^C = man doesn't believe, W^C = woman doesn't believe
The probabilities of the complements: $P(M^C) = .38$, $P(W^C) = .50$

X = number of believers	0 believers	1 believer	2 believers
	M^C and W^C	M and W^C OR W and M^C	M and W
P(X)	(.38)(.50) = .19	(.62)(.50) + (.38)(.50) = .50	(.62)(.50) = .31

Chapter 10 Review Read: Chapter 10 **Key Terms**, **Summary** (page 514)

Do: Review Exercises, page 524: 66abe **Add part f:** What would have been a possible confounder if this was an observational study instead of a controlled experiment?

Even answers: #10.66abe

a. 6/43, or 14.0%, of the experimental group had been arrested by age 15, whereas 37/123, or 30.1%, of the control group had been arrested. This suggests that parental training had a good effect, but we don't yet know whether the effect was significant.

b. H0: Parental training and arrest rates are NOT associated. They are independent.
Ha: Parental training and arrest rates are associated.

Level of significane is .05.

$$X^2 = \frac{(6-11.14)^2}{11.14} + \frac{(37-31.86)^2}{31.86} + \frac{(37-31.86)^2}{31.86} + \frac{(86-91.14)^2}{91.14} = 4.32$$

(Note: The P-value for this will be given either directly or with in a Minitab printout.)
P-value = .038

Conclusion. P-value = .038 is less than the significance level of .05, so reject H0, accept Ha.

There is a only a 3.8% chance that the association we saw in the data is due only to **sampling variability**. Since this is such a small chance, we reject that there is no association and conclude that there is a **significant association** between Parental Training and Arrests.

Answers continued:

e. You can say that Parental Training CAUSES the change in arrests because this was an EXPERIMENT (the assignment to the groups was random)**.** (The participants didn't choose which group they would be part of.)

f. (answer to added question) If the participants had chosen their groups (Observational Study) then the parents who are more involved with their children may have selected the "Parental Training" group. The confounder in this case would be Parental Involvement. In other words, the lower arrest rates could have been due to how involved the parents were with their kids in general, not the Parental Training itself.

Chapter 5 Concepts to study (and Section 1.3):

- Given the description of a probability problem, be able to **find the probability of an event**
- **Know** the difference between **Empirical Probability** (you did the experiment) and **Theoretical Probability** (you just thought about what could happen).
    - **Know the Law of Large Numbers. (**If you do the experiment, like flipping a coin, a large number of times then your Empirical Probability results will get closer and closer to the Theoretical Probability.)
- Find probability using the **General Addition Rule**, "OR" means add, but you have to subtract off any double counted values.
- **Identify Mutually Exclusive events**. (They can't both happen.)
- Find or identify the **complement** of an event and find the probability.
- **Identify Independent** or **Associated events** based on your knowledge of the world, or based on probabilities or percentages.
- Know the **Multiplication Rule** for finding probability for multiple trials ("**And**" Rule)
- **(Chapter 1)** Construct a **Two-Way Table** and use it to find percentages or probabilities. Use those values to determine association or independence of events.

Chapter 10 Concepts to study:

(10.1 and 10.3) Chi-Square Hypothesis Test for Association: Given a Two-Way table relating two categorical variables

- Write the hypotheses for a Test for Association
- Find the Expected Counts
- By hand, find the Chi Square value and degrees of freedom for the hypothesis test

You will be given a printout with the P-value. Write a thorough conclusion (see answer to 10.66 for an example.)
(1) Compare the P-value to the Level of Significance and write that you either "Reject H0" or "Do not reject H0" based on the P-value.
(2) Write the conclusion in words. Words and phrases that I'll be looking for include "sampling variability", "significant", and "association".