Math 247: Homework Set 2 (Spring, 2020) **Name:**________________________________

Non-StatCrunch ______________/14 points **Class Time**:______________________________

StatCrunch ________________ /6 points

Copying homework from the back of the book and giving yourself credit for it is not okay! This is considered academically dishonest and, if you do so, your homework score will be a zero.

Requirements: In order to give yourself credit for homework problems, you must

- Briefly **summarize** the question asked by the problem. *Writing just a few words (e.g. "find mean and standard deviation") is fine; you don't have to write down the entire problem. You can also include the question in the answer by writing a sentence "The mean is ______, and the standard deviation is ______"*
- **Show your work**
  - If the question is conceptual, write the answer and BE SURE to include an explanation in your own answer if the problem asks for one.
  - If the problem involves computation by hand then clearly show your work.
- **Check your answers** in the back of the book. If your answer is incorrect, then you have to go back to *find and fix the error*.
- If the problem involves computation by **StatCrunch** then save your work in Google Docs and **print it out**. **Write the answers to the follow-up questions** for that problem by typing or by writing it later by hand on the printout.

Self-Assessment: Determine total number of correctly done problems (they don't have to be done correctly the first time…just make sure you find and fix any errors in your work!) and put that score in the last column.

If you give credit for a problem that hasn't been completed, you will lose 1 point on the overall grade (for example, if you put down 4/4 in Assignment 1 but have completed only 1 problem, your entire score on the homework packet will lose 3 points).
Please be honest and accurate in your assessment.

	Read this section:	**Do these problems:**	**Completed/ Total (you fill in)**
	Section 5.1: What is Randomness?	**5.1 Exercises**, page 240: 3, 4, 5, 6,	/4
	Section 5.4: Finding Empirical Probabilities(Continuation of 5.1)	**5.4 Exercises**, page 244: 69, 72, 73, 75 **Chapter 5 Review**, page 246: 83	/5
	Section 5.2: Finding Theoretical Probabilities	**5.2 Exercises**, page 240: 7, 8, 9, 11, 13, 15, 16, 17, 29, 30, 33, 35, 39	/13
	Section 1.3: Organizing Categorical Data: Two-Way Tables **Section 5.2:** continued	**1.3 Exercises**, page 28: 15, 16, 17, 19, 21, 22, 29 **5.2 Exercises**, page 241: 19, 20, 21, 22, 23	/12
	Section 5.3: Associations in Categorical Variables	**5.3 Exercises**, page 243: 47(i)(ii), 49, 51, 52, 53, 55, 59, 60, 63, 65, 67	/11
	Section 10.1 and 10.3 : Hypothesis Tests with Categorical Variables	**10.1 and 10.3 Exercises**, page 515: 9, 15, 35 (Note: #9, 15, and 35 are all linked)	/3

	Section 10.3 : Chi-Square Tests for Association Read up through page 503.	**10.3 Exercises**, page 516: 35 (Table given in problem, no StatCrunch needed) **Use StatCrunch:** 37, 39, 45 Note: For the StatCrunch Problems, you will just type in the tables by hand, as we did in class.	☐ /3
	Section 10.2: The Chi-Square Test for Goodness of Fit	**10.2 Exercises**, page 517: **Concepts:** 17 **Use StatCrunch:** 19, 23, 26 Note: For the StatCrunch Problems, you will just type in the Categories, Observed Values, and Hypothesized (Comparison) Proportions by hand, as we did for the M&M problem. **Guidance on #23 and #25a:** #23: Choose "equal proportions" when using StatCrunch #25: If people are guessing then they should get the answer correct (Stradivarius) $1/5$ = .20 = 20% of the time. They should get it wrong $4/5$ = .80 = 80% of the time.	☐ /4

Even Answers:

Section 5.1:

5.4: This is empirical probability since he actually performed the experiment (flipped the coins).

5.6: This is a theoretical probability since he didn't actually flip the coins, he (presumably) just reasoned out what the probability would be.

Section 5.2

5.8: (a) {Peters, Parker, Diaz, Nguyen, Black} (b) {Peters. Parker, Nguyen} (c) P(experienced) = 3/5 = .60 = 60%
(d) A^C = {Diaz, Black} (e) P (inexperienced) = 2/5 = .40 = 40%

5.16: X = number of heads (a) P(X = 0) = 1/8 =.125 = 12.5% (b) P(X = 1) = 3/8= .375 = 37.5%
(c) P(X = 2) = 3/8= .375 = 37.5% (d) P(X = 3) = 1/8 =.125 = 12.5%
(e) These probabilities add up to 1 since they are mutually exclusive and they cover all the possible outcomes.

5.20: (a) P(female) = 722/1275 = .434 = .566 = 56.6% (b) P(No) = 101/1275 = .079 = 7.9%

5.22: P(male AND no) = 56/1275 = .044 = 4.4%

5.30: (a) Being a skier and being a snow boarder <u>are not</u> mutually exclusive (you can be both).
(b) Being 5 years old and being a senator <u>are</u> mutually exclusive (a 5-year-old can't be a senator).

Section 5.3:

5.52: Handedness and sex are associated since the percentage of left-handed males is different than that of females.

Section 5.4

5.72: Let X = the number on the die
For 20 trials: P(X=1) = 8/20 = .40 = 40% For 100 trials: P(X = 1) = 20/100 = .20 = 20%
For 1000 trials: P(X = 1) = 167/1000 = .167 = 16.7%

Theoretically: P(X = 1) = 1/6 = .167 = 16.7%

As the number of trials increased, the Empirical Probability got closer to the Theoretical Probability, which is what the Law of Large Numbers says should happen.

Section 1.3

1.16 a.

	Men	Women	Total
Work	15	65	$15+65=80$
Not Work	23	28	51
Total	38	$65+28=93$	131

b. $15/38=39.5\%$

c. $23/38=60.5\%$

d. $65/93=69.9\%$

e. $80/131=61.1\%$

f. $65/80=81.25\%$

g. $15/80=18.75\%$

h. $65/93\times 800=559$

1.22 a. and b.

	Men	Women	Total
Brown	3	5	8
Blue	1	1	2
Hazel	0	1	1
Total	4	7	11

c. $5/7=71.4\%$

d. $5/8=62.5\%$

e. $8/11=72.7\%$

f. $0.714(60)=42.84$ or about 43

Section 10.3:

10.34 a. $\frac{53}{53+87}=\frac{53}{140}$, or 37.9% of the treatment group lost 5% or more, and $\frac{32}{32+108}=\frac{8}{35}$, or 22.9% of the control group lost 5% or more. Thus the treatment group did better in losing weight in the sample.

b. *Step 1*: H_0: Form of treatment and result are independent. H_a: Form of treatment and result are not independent.

Step 2: Chi-square test of homogeneity: *Random Assignment* and *Independent Observations* are met *Large Samples*: the smallest expected count is $42.5>5$. $\alpha=0.05$

Step 3: $X^2=7.45$, p-value = 0.006.

$$X^2=\frac{(53-42.5)^2}{42.5}+\frac{(32-42.5)^2}{42.5}+\frac{(87-97.5)^2}{97.5}+\frac{(108-97.5)^2}{97.5}=7.45$$

Chi-Square Test: Treatment Group, Control Group

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Expected counts are printed below observed counts
       Treatment  Control
           Group    Group  Total
    1         53       32     85
           42.50    42.50
    2         87      108    195
           97.50    97.50
Total        140      140    280
Chi-Sq = 7.450, DF = 1, P-Value = 0.006
```

Step 4: Reject H_0. Form of treatment and result are not independent.