

Name: Key

Math 127 – Test 1 – Spring 2016

Oath: "I will not discuss the exam contents with anyone on planet Earth until the answer key is posted to Blackboard."

Sign Name: Key

The penalty for cheating on this exam is a grade of 0% for Math 127 Exam 1.

#### Testing Center Staff Instructions

1. One sheet of handwritten or typed notes is OK.

Students may not use the "pink sheet" or any copied or scanned answer keys or Math 127 department documents.

2. Collect the sheet of notes and staple it to the test when submitted.
3. Testing Center issued TI calculator is OK.
4. www.statcrunch.com is required. All other webpages are prohibited.
5. Test must be completed in one sitting, but it is untimed. Very short bathroom breaks are permitted.

#### Student Instructions

1. This test is graded out of 100 points and counts for 20% of your Math 127 grade.
2. You can use a calculator, but you cannot use your phone. You can use the calculator on the computers if you wish.
3. You will need to use www.statcrunch.com. This is the only permitted webpage.
4. You are permitted to use one 8.5" by 11" sheet of notes, front and back. You will submit it with your test.  
  
You may not use the pink sheet or copies of the pink sheet.  
  
You must produce (handwritten or typed up) your own sheet of notes.  
  
You may not use copies or scans of any instructor-created Math 127 content or answer keys.
5. Show work or points will be deducted. If you only report an answer and it is wrong, you will receive no credit.

1. Short answer.

- 1a. (5) In Aspen, Colorado, at a weeklong retreat for higher education administrators, there was a cocktail party to kick things off. Every administrator in attendance put their "Name", "Title", and "College" on a raffle ticket and it was placed into a large bin. Throughout the evening, 15 administrators had their names pulled and won fabulous prizes.

Sampling method: Simple Random Sample

Type of Variables (Q, C, or I): "Name" I "Title" C "College" C

- 1b. (5) For Spring 2016, the Math 127 faculty randomly select three students from each section (we have eight sections). We have a meeting with those students and faculty and ask about "Number of Hours Spent Each Week on Math 127", "Preference" for paper quizzes or online BB homework, and "Ideal Classroom Temperature".

Sampling method: Stratified

Type of Variables (Q, C, or I): "Number of Hours Spent Each Week on Math 127" Q  
"Preference" for paper quizzes or online BB homework C  
"Ideal Classroom Temperature" Q

- 1c. (2) In general, explain why we prefer the median and IQR for skewed data.

Skewed data has outliers on one side.  
The outliers will pull the mean and inflate SD.

- 1d. (2) In general, explain the difference between the Upper Limit on a boxplot (StatCrunch) and the UF = Upper Fence. Words please, no formulas.

Upper Limit: Most Extreme data value inside UF  
Upper Fence: Cutpoint to be outlier (line in sand)

- 1e. (2) Jack applied for a job as an IT technician and during the interview process, had to complete a programming quiz. His exam score was converted to a z-score of 0. How did Jack do?

Jack did exactly average.

- 1f. (3) Choose from these words to fill in the blanks (use each word once):

statistics      unbiased      fixed      parameters      unknown      representative

The values of population parameters are fixed and unknown. These are the values we really care about when answering research questions, but collecting population data is costly, time consuming, or impossible. Therefore, we must rely on good samples that are unbiased and representative of the population we are interested in. We will calculate sample Statistics and use those values to make decisions about the population.



2. (3) In the "Hip Surgery Outcomes" dataset, which "Surgeon" tends to have the longest recovery times and why? Support your answer with summary statistics.

Hetterberg has the highest mean,  
 $\bar{y} = 20.525$  days and the highest  
 median = 21.5 days.

3. (3) Invent a dataset with 7 values with the mean = 10.93 (exactly) and IQR = 1 (exactly).

Put your 7 numbers in ascending order please.

Need Sum = 76.51

e.g.

0	0	0	1	1	1	73.51
---	---	---	---	---	---	-------

4. (2) Invent a dataset with a standard deviation of 1. Number of values doesn't matter.

Sadly 1, 2, 3 works... e.g.

5. (5) Describe the distribution of "Year" released in the "IMDB Movie Ratings" dataset. Bullet points are OK, use the values of the best summary statistics in your write up.

Shape: Skewed left, Unimodal

Center: Median = 2000

Spread: IQR = 27

Outliers: 88 low outliers, starting below 1941 or 1940.5

6. (4) In the "Parents" dataset, look at the conditional distributions of "Raw Responses" based on "Gender". People in Europe were asked, "What is the ideal setup for raising a family, given the necessity to also earn an income?"

Does it appear "Raw Responses" are dependent on or independent from "Gender"? Why or why not? Support with statistics.

Using Classroom Rule of Thumb, no conditional percentages differ by 10%+, so independent.

	Female	Male
Both Part	9%	7%
Both Full	20%	23%
No Opin	4%	6%
One Full, one Home	23%	27%
One Full one Pt	44%	37%

Retired

7. Load up the "Calendar Year 2016 Large Survey" dataset. Round all summary statistics to two decimals if necessary. Give all percentages rounded to two decimals, e.g. 13.58%. (3 points each)

7a. ~~6.32%~~ 6.78% What percentage of students like neither "Cats Nor Dogs"?

7b. Never How often does the youngest student drink "Alcohol"?

7c. ~~11.59~~ 11.22 Give the mean "College Credits" for our "Christian" students.

7d. ~~28.57%~~ 21/56 = 37.5% What percentage of the "Smokers" have "Student Loans"?

7e. ~~6~~ 12 How many students do not use the "Cecil Gym" and also "Smoke" cigarettes and also drink "Alcohol" "Very Often"?

7f. ~~44.14%~~ 118/260 = 45.38% What percentage of "Females" have "Tattoos"?

7g. YES Yes or No: Do a majority of the "Males" think we should teach "Both" creationism and evolution in "High School Science"?

7h. ~~20~~ 33 How many students are exactly 21 years old?

7i. ~~2.24~~ 2.29 Mean "Ideal Children" for all students.

7j. 2.21 Mean "Ideal Children" for "Males".

7k. ~~1.2~~ 2 Mean "Ideal Children" for "Males" in their 30s.

7l. Median Best measure of center for "Online Time"? (Median = 7 hours)

7m. ~~1.63~~  $z = \frac{14 - 2.21}{5.75} = 2.05$  Convert Professor Kupe's "Talk Radio / Podcasts" to a z-score. He's in row 1. Show calculation below.

7n. 0 The person in row 124 did not report an "Ideal Children". Suppose we know her z-score was  $z = -1.671123495$ . Solve for the number of "Ideal Children". Show calculation below.

~~Kupe~~  
 ~~$z = \frac{14 - 2.52}{7.06} = 1.63$~~

~~Ideal Children~~  
 ~~$-1.671123495 = \frac{y - 2.243}{1.342}$~~   
 ~~$y = 2.243 - 1.6711(1.342)$~~   
 ~~$y = 0$~~



Retired

- 8a. (2) Use our "Calendar Year 2016 Library Data" to calculate the fences for "Copyright" date. Show your calculations.

$$LF = Q_1 - 1.5(IQR) = 1972 - 1.5(28) = 1930$$

$$UF = Q_3 + 1.5(IQR) = 2000 + 1.5(28) = 2042$$

$$2000 + 1.5(30) = 2045$$

- 8b. (2) How many low-valued outliers are in the dataset? 2 4

How many high-valued outliers are in the dataset? 0

9. (3) For a sample of Diet Coke cans, we have a mean fill amount of 12.005 ounces. The upper fence was  $UF = 12.02$  ounces and the third quartile was  $Q_3 = 12.01$  ounces. Solve for the IQR,  $Q_1$ , and lower fence. Show calculation.

Answers:  $LF = 11.9933$   $Q_1 = 12.0033$   $IQR = 0.0067$

Show work:

$$UF = Q_3 + 1.5(IQR)$$

$$Q_1 = Q_3 - IQR$$

$$12.02 = 12.01 + 1.5(IQR)$$

$$Q_1 = 12.01 - 0.0067$$

$$IQR = \frac{0.01}{1.5}$$

$$Q_1 = 12.0033$$

$$= 0.0067$$

$$LF = UF - 4(IQR) = 12.02 - 4(0.0067) =$$

10. (5) Use the "Titanic" dataset. Report your answers as  $54 / 67 = 0.8060 = 80.60\%$ .

- 10a. Percentage of all passengers that were adult females.

$$425 / 2201 = 0.1931 = 19.31\%$$

- 10b. Percentage of all passengers that were first or second class.

$$610 / 2201 = 0.2771 = 27.71\%$$

- 10c. Percentage of the crew that were females.

$$23 / 885 = 0.0260 = 2.60\%$$

- 10d. Percentage of the children that survived.

$$57 / 109 = 0.5229 = 52.29\%$$

- 10e. Percentage of all passengers that were adult male survivors.

$$338 / 2201 = 0.1536 = 15.36\%$$

11. A scientist designed an experiment to determine if feeding rats coconut oil would improve brain function. Twenty-four rats were randomly divided into three equal-sized groups. Group 1 received the typical rat diet, Group 2 received the typical rat diet infused with 100 milligrams of coconut oil, and Group 3 received the typical rat diet infused with 300 milligrams of coconut oil. This experiment ran daily for 28 days.

To measure brain function, each day, the rats were put into the rat maze and time (seconds) was measured. Lower times are better. The summarized data is presented below.

**Summary statistics (Maze time in seconds):**

Column	n	Mean	Std. dev.	10th Per.	20th Per.	30th Per.	40th Per.	50th Per.	60th Per.	70th Per.	80th Per.	90th Per.
Group 1	224	51.29	5.57	44.05	46.71	48.73	49.90	51.28	52.48	53.89	55.98	58.14
Group 2 (100 mg)	224	51.13	6.26	42.79	45.51	47.86	49.70	50.88	52.97	54.09	55.82	59.24
Group 3 (300 mg)	224	45.80	5.49	38.53	40.86	43.03	44.54	46.17	47.60	48.83	50.18	52.15

- 11a. (1) What was the response variable for this experiment? Maze Time
- 11b. (1) What was the factor variable for this experiment? Diet
- 11c. (1) Which Group would be considered the placebo group? Group 1
- 11d. (2) Interpret with a sentence in context the value of the 60<sup>th</sup> percentile for Group 3: 60% of Maze Times were at 47.60 s or quicker.  
40% of Maze Times were 47.60 s or slower.
- 11e. (2) Using the idea of z-scores, give a range of maze time finishes that would not be unusual if a rat was in the 300 milligram of coconut oil group. Show calculation:

$$\text{Take } \bar{y} \pm 2s$$

$$45.80 \pm 2(5.49)$$

$$45.80 \pm 10.98$$

$$(34.82 \text{ s}, 56.78 \text{ s})$$

12. (3) Describe the *Who* for each scenario.

- 12a. The data found in our "Calendar Year 2016 Library Data". Answer: Each book
- 12b. Happyville activity presented in class. Answer: Each household
- 12c. Sample you took at StatCrunch U in class. Answer: Each Student at SCU