Name: Key Math 127 – Exam 2 – Summer 2016

Oath: *"I will not discuss the exam contents with anyone until it is returned to me by my instructor".*

Sign Name: Key

The penalty for cheating on this exam is a grade of 0% for Math 127 Exam 2.

Do not discuss this exam with others.

Do not check your answers with others.

The Math Lab is off limits for help.

Email your instructor if you need clarifications

Student Instructions

1. **This test is graded out of 100 points and counts for 1/7 of your Math 127 grade.**
2. **Show work when necessary or points will be deducted. If you only report an answer and it is wrong, you will receive no credit. You may use the StatCrunch calculators for any probability calculations when appropriate.**
3. **Points are in parentheses for each question.**
4. **Good luck, do your best.**

Due Date: 12:00 noon for the day section 5:00 pm for the night section

1. Use the "**Roller Coasters**" dataset. We'll use the "***Height***" (in feet, measured from the ground to the top of the first hill) to predict the "***Drop***" (in feet, measured from the top of the first hill to the bottom of the first hill).

1a. (4) Using the data, give the linear regression equation.

$\hat{Drop} = 3.46 + 0.934(Height)$

1b. (6) Based on our data, which five roller coasters have statistically unusual "***Drops***" given their "***Heights***"?

1. Xcelerator
2. Apollo's Chariot
3. Manhattan Express
4. Hercules
5. Rattler

How did you determine these five coasters were the unusual ones? Studentized residuals exceeded ± 2

1c. (6) Interpret the value of the slope with a sentence in the context of the problem.

For each extra 1 foot in height, we expect an extra 0.934 feet in Drop.

1d. (4) There are three reasons the y-intercept has no interpretation. Give two of them.

1. No data by x = 0 ft Height
2. 0 foot height is a pretty wimpy coaster!
3. 3.46 foot drop is also pretty wimpy!

1e. (4) With a sentence in the context of the problem, interpret the value of $R^2 = 85.62\%$:

85.62% of the variation in Drop can be explained by knowing Height. 14.38% is still unexplained.

1f. (4) With a sentence in the context of the problem, interpret the value of s_e: On average, our predicted Drops are off by ~ 21.3 feet when using x = Height.

1g. (4) Interpret the residual for "***Superman – Ride of Steel***" with a sentence in context.

Superman's Drop is 23.24 feet larger than expected for its Height of x = 208 feet.

1h. (4) Increasing the "***Height***" by 25 feet will do what to the expected "***Drop***"? Show calculation.

$25(0.934) = 23.35$ feet

1i. (4) Which coaster is the most influential in the dataset?

Coaster: Xcelerator

Why? Cook's Distance is the largest

1j. (4) Show the calculation for the residual for the "***Tennessee Tornado***".

e = Actual Drop − Predicted Drop.

$-27.72 = 128 - 155.72$

1k. (2) Considering this dataset, give a range of "***Heights***" for which you would be comfortable predicting the "***Drop***".

55 to 310

or approx 5 to approx 300

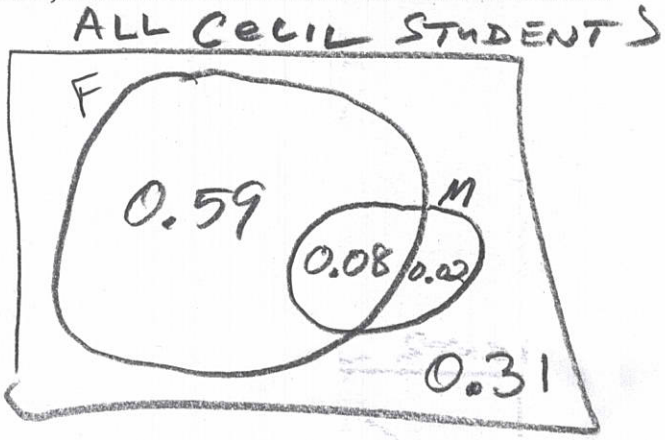
1l. (4) Predict the "***Drop***" for a coaster that has the mean "***Height***", based on our dataset. Show calculation:

$\bar{x} = \overline{\text{Height}} = 150.125$

$\hat{\text{Drop}} = 3.46 + 0.934(150.125)$

≈ 143.68 feet.

2a. (3) Draw the Venn diagram and label everything properly: 67% of Cecil students are female, 10% of Cecil students are married, and 8% of Cecil students are married females.



2b. (2) What's the probability that a student is female if we know they're married? Show calculation:

$$P(F|M) = \frac{P(F \text{ and } M)}{P(M)} = \frac{0.08}{0.10} = 0.80$$

80%

2c. (2) P(unmarried and male) = 0.31

2d. (2) Show calculation: P(unmarried | male) =

$$\frac{P(\text{Un And M})}{P(M)} = \frac{0.31}{0.33} = 0.9394$$

$$= 93.94\%$$

3. The time until a computer component fails follows an Exponential probability distribution with a mean "***Time to Fail***" of $X = 8$ days.

3a. (2) P(Component dies within the first week) = 0.5831

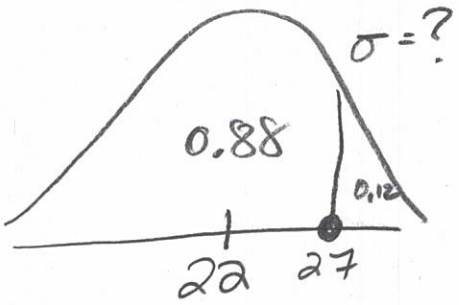
3b. (2) P(Component lasts longer than a month) = 0.0235 (presume 30 days)

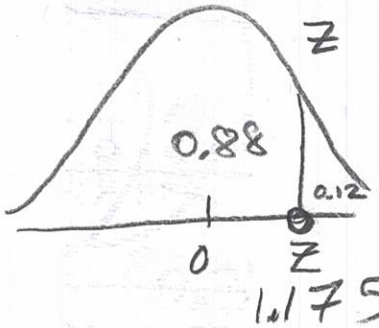
3c. (3) A computer has 10 of these components and the components acts independently of each other. What is the probability that all 10 components last for one week or longer? Show calculation.

P(10 for 10 exceed 7 days) =

$$(0.4169)^{10} = 0.0001586$$

4. (4) Lifespan for male grizzly bears is estimated at 22 years. If a Normal model applies, and 12% of grizzlies are known to live for 27 years or longer, find the standard deviation and show your calculations.





$$z = \frac{y-\mu}{\sigma}$$

$$1.175 = \frac{27-22}{\sigma}$$

$$\sigma = \frac{5}{1.175}$$

$$\sigma = 4.26 \text{ years}$$

5. Now, for female grizzlies, the correct probability model is N(26, 3). Answer the following questions for female grizzly bears.

5a. (2) What's the probability that a female grizzly lives to be at least 30 years old? 0.0912

5b. (2) What's the probability that a female grizzly dies before she turns 25? 0.3694

5c. (2) What's the 90th percentile for this probability model? 29.84 years

5d. (2) Interpret the 90th percentile with a sentence in the context of the problem:

90% of females die by the age of 29.84, and 10% of females live longer.

6a. (4) Presume 60.27% of all Cecil students live with their parents. What is the probability that in a sample of 5 students, not a single one lives with their parents? Show calculation:

P(5 for 5 not with parents) =

$(1-0.6027)^5 = 0.0099$

6b. (4) Presume 7.32% of Cecil students have been in the military. In a sample of 8 students, what is the probability that at least one student has been in the military. Show calculation:

P(military) = 0.0732 P(not military) = 0.926

P(at least one in eight in military) =

1 − P(8 for 8 not) =

$1 - (0.9268)^8 = 0.4556$

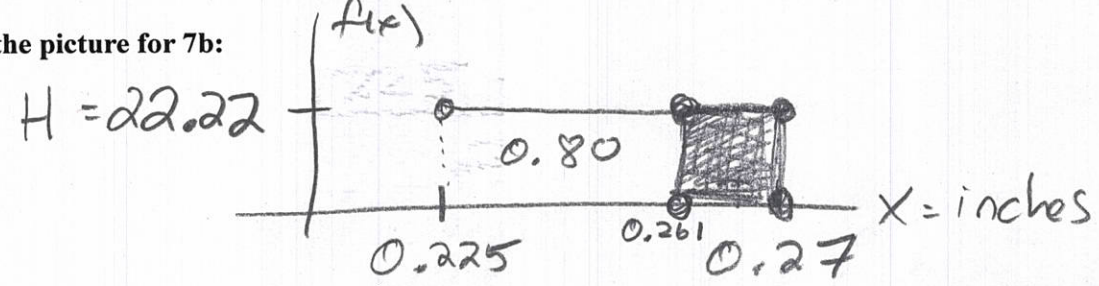
7. Plywood is cut at the plywood factory to be one-quarter inch thick. Due to board-to-board variation, a Uniform model applies on the interval [0.225", 0.27"].

7a. (2) Calculate the mean of this probability model. Show calculation. Don't round.

$$\mu = \frac{a+b}{2} = \frac{0.225 + 0.27}{2} = 0.2475"$$

7b. (3) Determine the 80th percentile of this probability model: 0.261"

Draw and label the picture for 7b:



7c. (2) Give the uniform probability function, $f(x)$: $f(x) = 22.22, \quad 0.225 \le x \le 0.27$

7d. (2) What proportion of boards are undersized? $P(X < 0.25) = 0.5556$

8. Professor Kupe is trying to sell his house and presume the following probability distribution applies:

Price The House Sells For -	Probability
$189,999	0.17
$184,900	0.22
$179,900	0.32
$175,000	0.20
$170,000	0.09

8a. (2) P(He gets at least $180,000 for it) = 0.17 + 0.22 = 0.39

8b. (3) Show calculation. Determine the expected sales price.

$$\mu = 189,999(0.17) + 184,900(0.22) + 170,000(0.09) = 180,845.83$$