

Carson-Newman University MATH 201 Test 2, Spring 2020**Directions:**

- You may use your calculator, book, notes, or any resource linked to from the course webpage.
 - Do not seek help from any other individual, whether in person or electronically.
 - Compose an email with your answers as described in the class announcements page.
 - To receive full credit, you must show all relevant work (and calculator commands) to justify your answer.
 - Clearly identify your final answer, correct to at least 3 significant digits.
 - Use notation as described in class.
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Honor Pledge: I pledge that I will neither give nor receive unauthorized help on this test from any person, technology, or other resource, and that I will abide by the honor code of Carson-Newman University.

Signed: _____

1. The Easter bunny leaves your family a dozen chocolate covered eggs.

- 5 are filled with peanut butter
- 4 are filled with vanilla creme
- 3 are filled with caramel

But you can't tell which is which. Your mom lets you pick two eggs without replacement.

(a) Find the probability that both are peanut butter.

Answer: $(5/12)(4/11) = .152$

(b) Find the probability that at least one is peanut butter.

Answer: $1 - (7/12)(6/11) = .682$

(c) Find the probability that the two eggs have different fillings, i.e. not (PP or VV or CC).

Answer: $1 - (5/12)(4/11) - (4/12)(3/11) - (3/12)(2/11) = .712$

2. Assume these given probabilities, and that the events are independent.

- Alabama beats Tennessee $P(A) = .85$
- Biden becomes president $P(B) = .32$

(a) Find the probability of both A and B .

Answer: $(.85)(.32) = .272$

(b) Find the probability of neither A nor B .

Answer: $(.15)(.68) = .102$

(c) Find the probability of either A or B .

Answer: $.85 + .32 - .272 = .898$

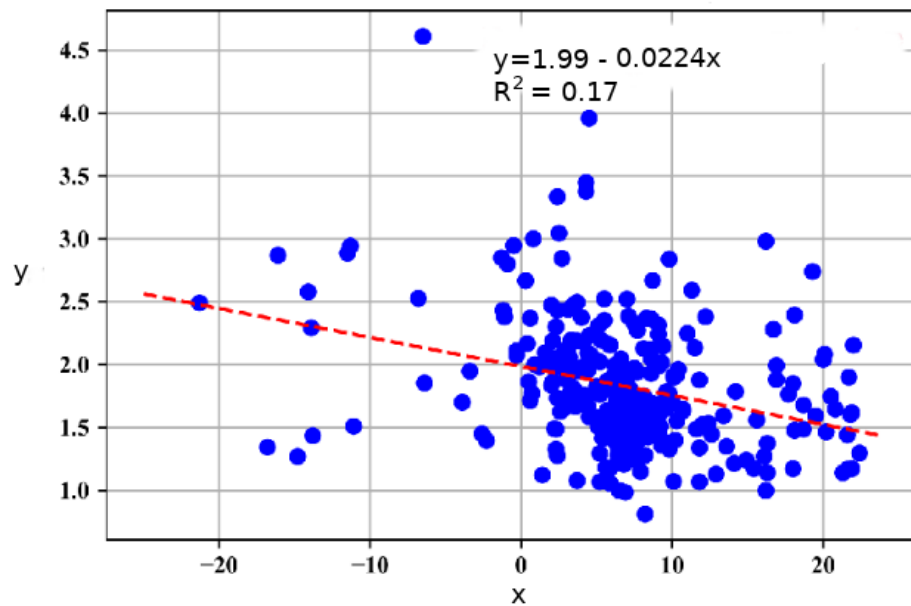
3. Suppose there is a remote chance that a tornado hits your house this month. Say the estimated probability is $p = 0.0000078$. You could write that probability as one out of _____.

Answer: $1/.0000078 \approx 128200$

4. The nutrition lab wants to estimate the number of calories in a muffin. If the standard deviation in caloric readings of individual muffins is $\sigma = 40$, then find the standard error if we average the caloric readings of 5 muffins.

Answer: $\sigma_{\bar{x}} = 40/\sqrt{5} = 17.9$

5. Here is a scatterplot of COVID-19 contagion rate (y) versus the average daily temperature (x degrees celcius) for a sample of individuals tracked in various Chinese cities.



(a) Find the slope.

Answer: $-.0224$

(b) Find the correlation.

Answer: $r = -\sqrt{.17} = -.412$

(c) Use the linear model to find \hat{y} in a warm climate with $x = 28$ degrees celcius.

Answer: $\hat{y} = 1.99 - .0224(28) = 1.36$

(d) Would that prediction be considered (intepolation) or (extrapolation) ?

Answer: extrapolation, since 28 is beyond known x values

6. Suppose a COVID-19 test has a 8% false positive rate, meaning there is an 8% chance that somebody who does NOT have the virus will test positive anyway. If 50 such people get tested, model the number of false positives as $X \sim BI(50, 0.08)$; assume independence.

(a) Find the expected value of X .

Answer: $\mu = (50)(.08) = 4$

(b) Find $P(X \geq 5)$.

Answer: $1 - bincdf(50, .08, 4) = .371$

7. Suppose John's time to finish a sprint is $X \sim N(500, 35)$ seconds.

(a) Find the 99th percentile time; write your answer as minutes : seconds.

Answer: $invnorm(.99, 500, 35) = 581$ seconds, or 9:41

(b) Find the z-score of 8 minutes.

Answer: $z = \frac{480 - 500}{35} = -.57$

(c) Find the probability he finishes in under 8 minutes.

Answer: $normcdf(0, 480, 500, 35) = .284$

8. This table shows the probability distribution of X , the week of the year in which Jefferson City, TN has its last frost.

x	PDF	CDF
12		.06
13		.22
14		.43
15		.71
16		.86
17		.97
18		1

- (a) Complete the table

	x	PDF	CDF
	12	.06	.06
	13	.16	.22
Answer:	14	.21	.43
	15	.28	.71
	16	.15	.86
	17	.11	.97
	18	.03	1

- (b) Find the expected value of X . (do not round)

Answer: $\mu = 14.75$

- (c) Find $P(X > 15)$.

Answer: $1 - CDF(15) = .29$

- (d) Find $P(X > 15 \text{ or } X = 12)$.

Answer: $.29 + .06 = .35$

- (e) Find $P(X > 15 \text{ and } X = 12)$.

Answer: 0, impossible, disjoint

9. Let X be the week of the year when Jeff City gets their last frost, and let Y be the week of the year when Nashville gets their last frost. Do you think X and Y are independent? Explain with a brief paragraph.

Answer: These are not independent. Since the cities are fairly close geographically, if a cold weather system comes through TN, it is likely that both Jeff City and Nashville would experience a frost. Knowing that there was a late frost in Nashville would make it more likely that there was also a late frost in Jeff City.