Math 247: Test 3
(Wright, Fall 2017)

Name: KEY

In-Class Test:_____/ 70 Take Home Test_____/30 Final score _____/100

1. (2 pts) Determine which of the following variables is continuous and which is discrete (circle the answer):

   X = the number of cars not stopping at a stop sign. (DISCRETE) CONTINUOUS

   X = the weight of a 2-year-old boy DISCRETE (CONTINUOUS)

2. (2 pts) If you scored right at the top 30% on an exam, which of the following would be true (there may be more than one correct answer…circle the correct answer(s)).

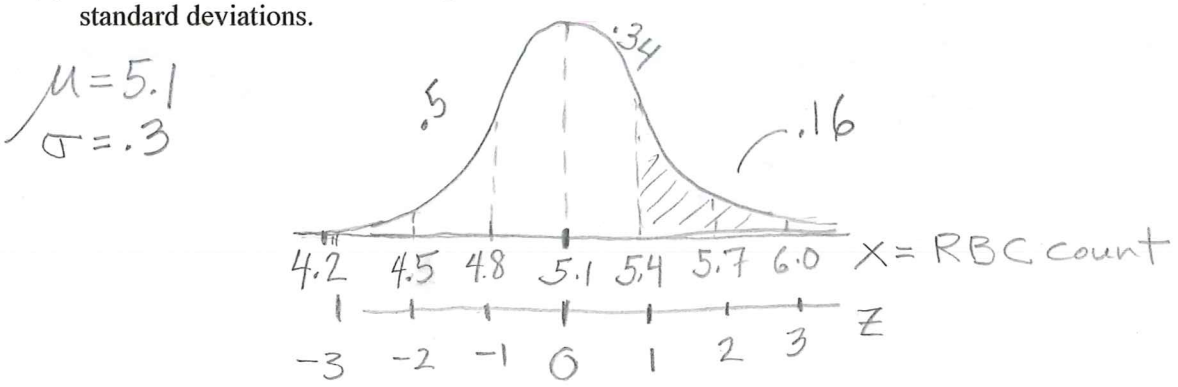
   (a) Your score was at the 30th percentile. (b) Your score was at the 70th percentile.

   (c) You scored a 70% on the exam (d) You scored a 30% on the exam

   (e) You did better than 70% of the other people who took the exam.

3. (9 pts) Blood Cell Count. The distribution of red blood cell (RBC) counts in healthy men is approximately normal, with a mean of 5.1 million cells per microliter and a standard deviation of 0.3 million cells per microliter.

(a) Sketch a normal curve showing the distribution of RBC's . Incude the z-axis, and tick marks based on standard deviations.



(b) Shade the region that represents the percentage of healthy men with RBC count above 5.4 million cells per microliter.

(c) Which of the following is the best estimate of this percentage? (Circle the best answer) None!

(i) 50% (ii) 68% (iii) 32% (iv) 24%

FINAL

4. (3 pts) If you walked around campus and asked various students whether they support stricter gun control laws, would you be obtaining a random sample? Why or why not? 2pts

1pt No! Not every Cuesta student was equally likely to be included in this sample. You would also bring some bias into the process by whom you chose to ask, time of day, etc.

5. (2 pts) Suppose you wanted to find out the proportion of students who read for enjoyment on a regular basis. If you polled students in a Creative Writing class is it likely the the results would be biased? If yes, what kind of bias could there be, positive or negative?

   Bias? (YES) NO

   IF Biased, it it (POSITIVE) or NEGATIVE?

6. (2 pts) Statistical inference includes which of the following (circle the correct answer):

   (a) Using a sample to prove that something is true about a population with 100% certainty

   (b) Using a sample to prove that something is false about a population with 100% certainty

   (c) Using a sample statistic to estimate a population parameter with a level of confidence that is always less than 100%.

   (d) Using a sample to prove something about the sample.

7. (6 pts) Suppose in conducting a study, you've done everything correctly in gathering data, in doing the analysis via hypothesis testing, then in forming a conclusion based on the P-value.

   There is still the possibility, due to Sampling variability, that the evidence led you to a conclusion that is incorrect.

If the evidence led you to reject the null hypothesis, you could have made a Type I error.

If the evidence led you to not reject the null hypothesis, you could have made a Type II error.

8. (2 pts) A poll on a proposition showed that we are 95% confidence that the proportion of all voters supporting it is between 40% and 48%.

   (a) What proportion of the sample supported the proposition? $.44 = \hat{p}$

   (b) What is the margin of error? $\pm$ 4% or $\pm$.04

9. (3 pts) A 2011 Harris poll asked registered voters to rate how happy they were in their lives. The poll report included the following statement: " As has been the trend, men seem to be getting less happy, as 31% are very happy this year (2011), down from 32% last year (2010)."

   The margin of error for the percentages is +/- 4%, with a 95% level of confidence.

Does this poll actually show that there was a decrease in the proportion of "very happy" men in the entire population? Explain, based just on the percentages and margin of error; i.e,, assume the poll was done well, with random sampling, etc. NO!

The proportion of very happy men (all) in 2010 is between 28% and 36%. In 2011, the interval was 27% and 35%. Since the intervals overlap, it's entirely possible that the population proportions are the same.

Key Word

10. (12 pts) An e-commerce research company claims that 60% of people who click on a particular ad eventually buy the item. Suppose a random sample of 200 people who clicked on the ad is taken and 92 of them went on to buy the item.

Proportion of ad-clickers who buy

6 (a) Find the 95% confidence interval for the population ~~proportion of California residents who think community college should be free~~. z* values are provided.

Confidence Level	z*
80%	1.282
90%	1.645
95%	1.960
99%	2.576

Parking Lot

$p = .60$

$n = 200$

buyers = 92

$\hat{p} = \frac{92}{200} = .46$

$SE_{est} = \sqrt{\frac{.46(.54)}{200}} = .035$

$\hat{p} \pm z^* SE$

$.46 \pm 1.96(.035)$

$.46 \pm .069$

$= (.46 - .069, .46 + .069)$

$= (.391, .529)$

Should use $\hat{p}$ but students used $p_0 = .60$ instead, -1

3 (b) Interpret the confidence interval from (a) in the context of the problem.

We are 95% Confident that the proportion of ad-clickers who go on to buy the product is between 39.1% and 52.9%

3 (c) Does the confidence interval support or not support the claim of the e-commerce research company? Briefly explain.

No! 60% is not in the confidence interval!

11. (3 pts) What is a P-value? A P-value is the probability of getting the observed value (or a value more extreme) if the null hypothesis is true.

12. (2 pts) What is the relationship between the P-value for a one-tailed test and the P-value for a two-tailed test, assuming you are using the same hypotheses and data?

P-value for Two-Tailed = 2 · P-value for One Tailed Test

13. (2 pts) What is the "default" significance level that is most often used in hypothesis tests? .05

14. (4 pts What are the 4 steps of hypothesis testing? You can use one word for each step (no explanation required).

1) Hypothesize
2) Prepare
3) Compute
4) Interpret

15. (16 pts) The mother of a teenager has heard a claim that 25% of high school teenagers who drive reported that they sometimes text while driving. She thinks the rate is too low and wants to test the hypothesis that more than 25% of high school teens have texted while driving. She polls 40 randomly selected teenagers at the local high school and 16 of them report having texted while driving.

Perform all steps of a hypothesis test to see whether the evidence she gathered supports her belief that more than 25% of teenager drive and text.

3 (a) What would the null and alternative hypotheses be for the Hypothesis Test? Write the hypotheses in symbols and also in words.

$H_0: p = .25$ (25% of teenagers text and drive)

$H_a: p > .25$ (more than 25% text and drive)

4 (b) Name the test you will use and check whether the conditions for this test are satisfied. No explanations needed on the check but show computational work!

Z-test for 1 proportion

1) Random sample? yes

2) Independent? yes - assume

3. $np_0 = 40(.25) = 10 \geq 10$

$n(1-p_0) = 40(.75) = 30 \geq 10$

So Large Sample - yes

4. Large Pop: $10n = 10(40) = 400$

400 teenagers in pop? Yes

6 (c) Show all computation up to finding the P-value. For full credit, include a sketch and shade in the area that represents the P-value.

Parking Lot:

$p_0 = .25$

$n = 40$

texters = 16

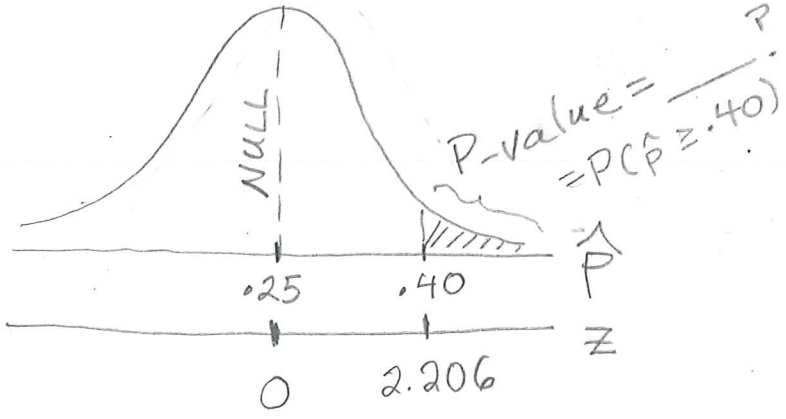
$\hat{p} = \frac{16}{40} = .40$

$SE = \sqrt{\frac{.25(.75)}{40}} = .068$

$Z = \frac{\hat{p} - p_0}{SE}$

$Z = \frac{.40 - .25}{.068}$

$Z = 2.206$



3 (d) Using technology, the P-value for the test would be .0142. Finish the Hypothesis Test using this information.

P-value = .0142 < .05

Reject H_0

We have significant evidence that the proportion of H.S. teens who text and drive is more than 25%

a good question would be what target population does this result apply to?