Name:_____   Date:_____

AP Statistics Assignment 2.1: Relative Standing and Z-scores

1. What does "relative standing" mean? What is the purpose of it?

2. What does it mean to standardized a distribution or a score? What is the formula to standardized a score? Explain:

3. What are Z-scores? What are Z-scores used for? What information is required to find the Z-score?

4. What is a density curve? What is it used for? What are the conditions required for a density curve? Explain:

5. What is a Normal curve? Why is it called "normal"? What does it look like?

6. When given a density curve, how do you find the "mean" , "median" and "mode"?

7. When given a normal distribution, where is the "mean", "median" and "mode"?

8. What is Chebyshev's inequality? What is it used for? When can you use Chebyshev's inequality? What is the formula?

9. What is a standard deviation? What is it used for? When do you use the "standard deviation" of a distribution? Explain:

10. Given the image below, what percentile is each student at?
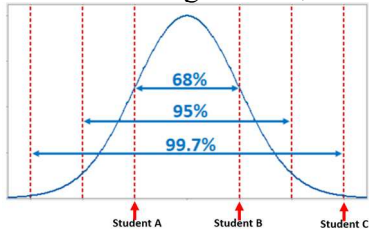
11. Use your Ti 83 to find the z-score for each of the following percentile of a normal distribution:

a) 34th percentile   b) 55th percentile   c) 96th percentile

12. Given the z-score of a normal distribution, find the area to the left of that score:

a) z=-2.3   b) z=0.78   c) z = 1.55

13. Jim was in a first year calculus class and he ended up with 79% in his class. The scores in his class are approximately Normally distributed with mean 68% and standard deviation 5.5 %

a) What was Jim's z-score?

b) What percentile did Jim fall in?

c) What does it mean for Jim to be in that percentile?

d) Is the size of the class required to calculate Jim's z-score? Explain:

e) If another student in the same class is in the 16th percentile, what score did that student get?

14. The mean age of a flight attendant of PAL is 40 years old, with a standard deviation of 8. What percent of the data set lies between 20 and 60? Use Chebyshev's Inequality

15. The mean score on an accounting test is 80, with a standard deviation of 10. Between which two scores must this mean lie to represent 8/9 of the data set? Use Chebyshev's Inequality

16. In order to be accepted into a particular prestigious Med School, undergrad students need to be in the top 5% of their class. Jeremy (92%) went to Columbia Univ. where the mean score of his class was 86% with a std dev of 4.5%. Sally (74%) went to Stanford where the mean score of her class was 67% with a std dev of 3.5%. Did either Jeremy or Sally score in the top 5% of their respective classes?

17. If the mean length of bananas grown is 15.2 cm with a standard deviation of 0.5cm, what percentage of bananas will be:

    a. Less than 15cm long

    b. Between 15 to 15.5 cm long

    c. What is the length of the top 15% of bananas grown?

18. A group of 78 third-grade students in a midwestern elementary school took a "self-concept" test that measured how well they felt about themselves. Higher scores indicate more positive self-concepts. A histogram and some summary statistics from Minitab for these students' self-concept scores are given below.
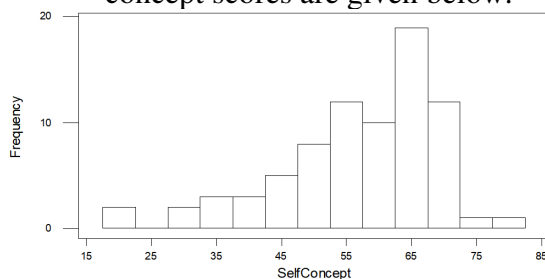
Descriptive Statistics: SelfConcept

Variable	N	Mean	Median	TrMean	StDev	SE Mean
SelfConc	78	56.96	59.50	57.81	12.41	1.41

Variable	Minimum	Maximum	Q1	Q3
SelfConc	20.00	80.00	51.00	66.25

i) Draw an appropriate density curve for summarizing the histogram on the graph above. How would you describe the shape of this density curve?

ii) One student in the group had a self-concept score of 62. Thirty-four students had self-concept scores higher than 62. Describe the location of this value within the distribution using raw data, percentiles, and standardized values (z-scores).

iii) What is a "typical" self-concept score for a third-grader in this group? Justify your answer.

19. Suppose a toddler sleeps 13.5 hours per day and is at the 12th percentile of the distribution of sleep times for all toddlers around the same age. Assuming the distribution is normal with a standard deviation of 0.45 hours, approximately what is the mean sleep time, in hours per day, for toddlers?

20. The distribution of student exam test times for a math question is approximately normal with a mean of 4.8 minutes and standard deviation of 23seconds. What percentage of student test times are between 4 to 5 minutes?

21. Chebyshev's inequality: Atleast $1-\dfrac{1}{k^2}$ of data points must fall within "k" standard deviations from the mean:

a) A class of 5$^{\text{th}}$ graders has a mean height of five feet with a standard deviation of one inch. Atleast what percent of the class must be between 4'10" and 5'2"?

b) Computers from a store are found to last on average for three and a half years without any hardware malfunction, with a standard deviation of 3.5 months. Atleast what percent of computers last between 37months and 47 months?

c) The bacteria in a culture live for an average time of 5 hours with a standard deviation of 25minutes. Atleast what fraction of the bacteria live between 4.5hours to 5.5 hours?

d) What is the smallest number of standard deviations from the mean that we must go if we want to ensure that we have at least 50% of the data of a distribution?

e) Suppose police response time has a mean of 50minutes with a standard deviation of 2 minutes. If a statistician wants a time frame to capture 95% of all data points, what should the time range be?