

Statistical Reasoning – Collecting and Analyzing Univariate Data Test 2 Review

1. If the mean of a normally distributed data set is 80 and the standard deviation is 10. What is the standard score (z-score) for a value of 90?

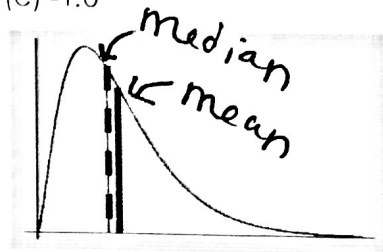
$$z = \frac{90 - 80}{10} = \frac{10}{10} = 1$$

(d) 1.0

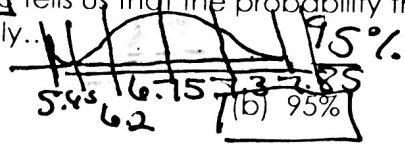
- (a) 90 (b) 0 (c) 10 (e) -1.0

2. Two measures of center are marked on the density curve below.

- (a) The median is at the solid line and the mean is at the dashed line.
(b) The median is at the dashed line and the mean is at the solid line.
 (c) The mode is at the dashed line and the median is at the solid line.
 (d) The mode is at the solid line and the median is at the dashed line.
 (e) The mode is at the dashed line and the mean is at the solid line.



3. An hourly wage is normally distributed with a mean of \$6.75 and a standard deviation of \$0.55. The Empirical Rule tells us that the probability that an employee's hourly wage is between \$5.65 and \$7.85 approximately...



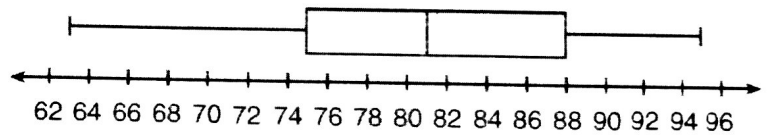
- (a) 34% (b) 95% (c) 99.7% (d) 68%

4. The monthly utility bills in a city are normally distributed with a mean of \$100 and a standard deviation \$12. What is the probability that a randomly selected utility bill is less than \$80?

- (a) 0.0475 (b) 0.1357 (c) 0.9554 (d) 1.0446

* 5. The box and whisker plot at right represents a set of grades in a college statistics class. Which interval contains exactly 50% of the grades?

- ~~(a) 63 - 88~~ ~~(c) 63 - 95~~
~~(b) 75 - 81~~ (d) 75 - 88



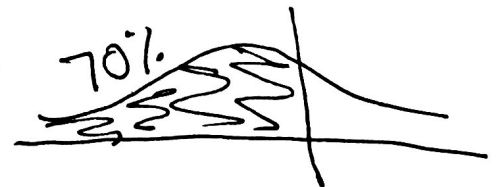
6. In 2012, a survey was given which asked about the salaries of professional athletes. 300 people were surveyed and those who felt that professional athletes were overpaid had a standardized z-score of 1.49. How many people, of the 300, responded that the athletes were overpaid?

- a. 247 (b) 9192 (c) 279 (d) 250

1.49 → .9319 .9319(300)

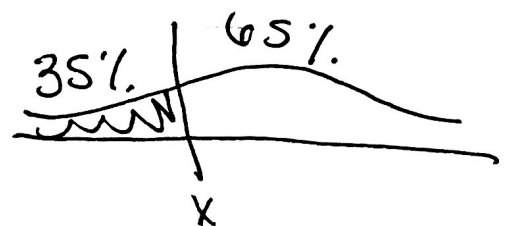
7. The 70th percentile of a distribution is

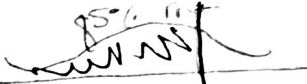
- (a) the number with 70% of the data below it or equal to it
 (b) the number with 70% of the data above it or equal to it
 (c) the number that is 70% of the average
 (d) 70% of the sample size
 (e) the width of the interval around the mean that includes 70% of the data



8. The 35th percentile of a population means

- (a) 35% of the population scores are above x.
(b) 65% of the population scores are above x.
 (c) 65% of the population scores are below x.
 (d) x is 35% of the population median.
 (e) x is 35% of the population mean.





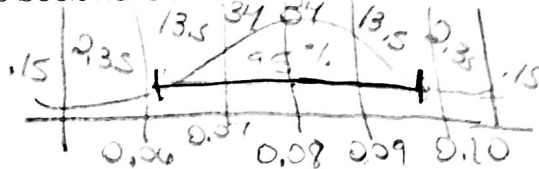
You are told that your score on an exam is at the 85th percentile of the distribution of scores. This means...

- (a) Your score was equal to or lower than approximately 85% of the people who took this exam
- (b) Your score was equal to or higher than approximately 85% of the people who took this exam
- (c) You answered 85% of the questions correctly
- (d) If you took this test (or one like it) again, you would score as well as you did this time 85% of the time.
- (e) 85% of the people who took this test earned the same score you did.

Suppose that the BAC of male students at a particular college who drink 5 beers varies from student to student according to a Normal distribution with mean 0.08 and standard deviation 0.01.

10. The middle 95% of students who drink 5 beers have BAC between

- (a) 0.07 and 0.09
- (b) 0.06 and 0.10
- (c) 0.05 and 0.11
- (d) 0.04 and 0.12
- (e) 0.03 and 0.13



11. What percent of students who drink 5 beers have BAC above 0.08 (the legal limit for driving in most states)?

50% $P(X > 0.08)$

12. What percent of students who drink 5 beers have BAC above 0.10 (the legal limit for driving in other states)?

2.5% $P(X > 0.10)$

13. The scores on a university examination are normally distributed with a mean of 70 and a standard deviation of 10. If the middle 68% of students will get a "C", what is the lowest mark that a student can have and still be awarded a C?



60 is lowest score for grade of C.

14. The lifetime of lightbulbs of a particular type are normally distributed with a mean of 100 mmHg and a standard deviation of 6 mmHg. What percentage of 18-year-old women have a systolic blood pressure between 88 mmHg and 112 mmHg? [LOL]

type



95%

15. Lewis earned 80 on his biology midterm and a 71 on his history midterm. In the biology class the mean score was 75 with a standard deviation of 4. In the history class the mean score was 73 with a standard deviation of 3.

skip

16. A class of 217 students participated in a softball throw for the distance test. The mean performance of the group was 173 and the standard deviation was 31.

a. What percentage of students was able to throw the softball **between** 151 and 180?

$P(151 < X < 180)$ 0.3504 35.04%

c. What percentage of the students could only throw **less** than 114 feet?

$P(X < 114)$ 0.0285 2.85%

b. What percentage of the students could throw **farther** than 200 feet?

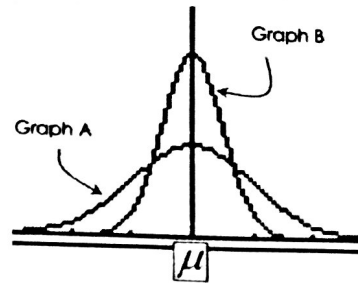
$P(X > 200)$ $1 - 0.8081 = 0.1919$ 19.19%

d. How far could the **top 10%** throw?

70% | 10% 212.73 feet or more

Which graph has a larger mean?

Neither - they are equal



18. Which graph has a larger standard deviation?

Group A - more spread out

19. The number of students registered at a particular high school is 982. If the mean age of a student is 17 with a standard deviation of 1.1 years. How many students, older than 19, attend the school?

$$P(X > 19) = 1 - 0.9655 = 0.0345$$

$$0.0345(982) = 34 \text{ students over 19 years old}$$

20. A class of 203 students participated in a softball throw for distance test. The mean performance of the group was 164 ft. and the standard deviation was 20 ft. Based on this data, answer the following questions:

a. What percentage of the students was able to throw the softball between 150ft. and 190 ft.?

$$0.6012 = 60.12\%$$

c. What percentage of the students could only throw less than 120 ft. feet?

$$P(X < 120) = 0.0137 = 1.37\%$$

b. What percentage of the students could throw farther than 200 ft. feet?

$$P(X > 200) = 1 - 0.9641 = 0.0359 = 3.59\%$$

d. How many of the 203 students, threw between 3 standard deviation of the mean?

$$99.7\%$$

$$0.997(203) = 202.39$$

202 students

21. Mr. H earned 83 on his biology midterm and 79 on his history midterm. In the biology class the mean score was 81 with a standard deviation of 5. In the history class the mean score was 76 with a standard deviation of 3.

a. Convert each score to a standard z score.

Biology: $z = \frac{83 - 81}{5} = 0.4$

History: $z = \frac{79 - 76}{3} = 1$

b. On which test did he do better compared to the rest of the class?

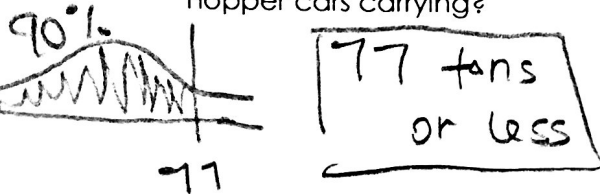
History - larger z-score

22. On one measure of attractiveness, scores are normally distributed with a mean of 3.93 and a standard deviation of .75. Find the probability of randomly selecting a subject with a measure of attractiveness that is greater than 2.75.

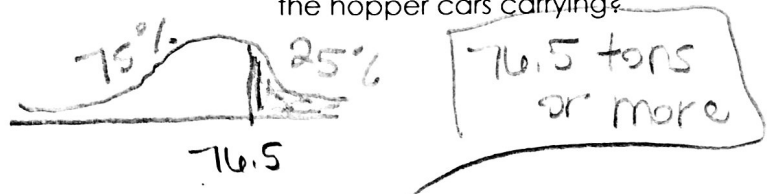
$$P(X > 2.75) = 1 - 0.0578 = 0.9422 = 94.22\%$$

23. Coal is carried from a mine in West Virginia to a power plant in New York in hopper cars on a long train. The automatic loader is set to dump 76 tons of coal in each car. The actual weights of coal loaded into each car are approximately normally distributed with $\mu = 76$ tons and $\sigma = 0.8$ tons.

a. How many tons are 90% of the hopper cars carrying?



b. How many tons are the top 25% of the hopper cars carrying?



Statistical Reasoning – Collecting and Analyzing Univariate Data

Test 2 Review

Empirical Rule says that ...

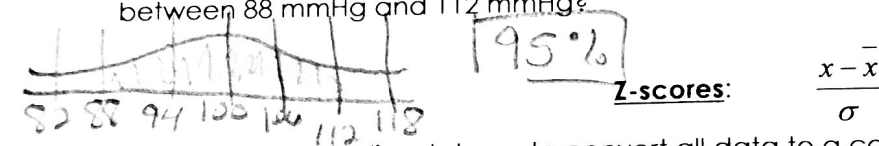
- 68% of the data in a normally distributed data set is within **1 standard deviation**.
- 95% of the data in a normally distributed data set is within **2 standard deviations**.
- 99.7% of the data in a normally distributed data set is within **3 standard deviations**.

Types of questions involving the Empirical Rule:

24. The scores on a university examination are normally distributed with a mean of 70 and a standard deviation of 10. If the middle 68% of students will get a "C", what is the lowest mark that a student can have and still be awarded a C?



25. The lifetime of lightbulbs of a particular type are normally distributed with a mean of 100 mmHg and a standard deviation of 6 mmHg. What percentage of 18-year-old women have a systolic blood pressure between 88 mmHg and 112 mmHg?



Z-scores are used to normalize data, or to convert all data to a common unit. A z-score tells you how many standard deviations away your data is from the mean.

Types of z-score questions:

1. Lewis earned 80 on his biology midterm and a 71 on his history midterm. In the biology class the mean score was 75 with a standard deviation of 4. In the history class the mean score was 73 with a standard deviation of 3.
- a. Convert each test score to a standard z-score.

$$\text{Biology } z = \frac{80 - 75}{4} = 1.25 \quad \text{History } z = \frac{71 - 73}{3} = -0.67$$

- b. On which test did he do better compared to the rest of the class?

Biology - higher z-score.

Z-table:

Types of z-table questions: (or calc)

1. A class of 217 students participated in a softball throw for the distance test. The mean performance of the group was 173 and the standard deviation was 31. Based on this data, answer the following questions:

- a. What percentage of students was able to throw the softball **between** 151 and 180?

$$P(151 < x < 180) = 0.3504 \quad \boxed{35.04\%}$$

- b. What percentage of the students could throw **farther** than 200 feet?

$$P(x > 200) = 1 - 0.8081 = 0.1919 \quad \boxed{19.19\%}$$

- c. What percentage of the students could only throw **less** than 114 feet?

$$P(x < 114) = 0.0285 \quad \boxed{2.85\%}$$