

You may work with classmates and get help at the Math Lab. This test is worth 20 points in Math 215. It should be finished before class on the class day proceeding the exam. Show all work. You may attach pages if needed.

Determine whether the given value is a statistic or a parameter.

- 1) After inspecting all of 55,000 kg of meat stored at the Wurst Sausage Company, it was found that 45,000 kg of the meat was spoiled. What proportion of the meat spoiled? Is this proportion a statistic or a parameter?

Parameter \rightarrow All meat was tested $\hat{p} = \frac{45,000}{55,000}$

Identify the number as either continuous or discrete.

- 2) The number of stories in a Manhattan building is 22.

discrete Count stories

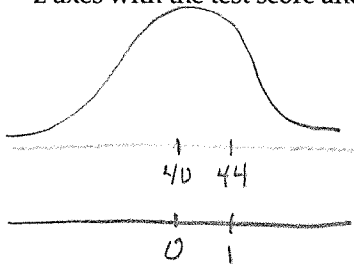
- 3) The average height of all 32 basil plants 3 weeks after germination is 3.4 centimeters.

Continuous we measure cm with a ruler.

- 4) A researcher wants to obtain a sample of 100 school teachers from the 800 school teachers in a school district. On another sheet, describe procedures for obtaining a sample of each type: random, systematic, convenience, stratified, cluster.

Determine which score corresponds to the higher relative position.

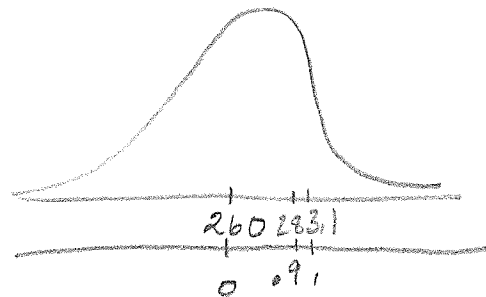
- 5) Draw two Normal curves one for each tests showing a z-axis and an x-axis. Label the mean, test scores and calculated z-score. Which score has a better relative position, a score of 44 on a test for which $\bar{x} = 40$ and $s = 4$, or a score of 283.4 on a test for which $\bar{x} = 260$ and $s = 26$? Draw a Normal distribution for both tests. Label x and z axes with the test score and it's z-score.



$$Z_1 = \frac{x - \bar{x}}{s} = \frac{44 - 40}{4} = 1$$

$$Z_2 = \frac{283.4 - 260}{26} = \frac{23.4}{26}$$

$$Z_2 = .9$$



the 44 has a higher relative position because $1 > .9$.

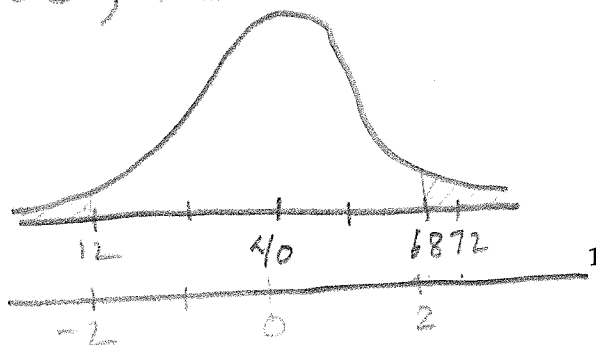
Solve the problem.

- 6) The ages of the members of a gym have a mean of 40 years and a standard deviation of 14. Use the range rule of thumb to estimate the minimum and maximum "usual" ages. Is 72 an unusual age for a gym member?

$$\text{Min Usual} = \bar{x} - 2s = 40 - 2(14) = 12$$

$$\text{Max Usual} = \bar{x} + 2s = 40 + 2(14) = 68$$

Yes, $72 > 68$ so 72 is statistically high.



Compare the two sets of results.

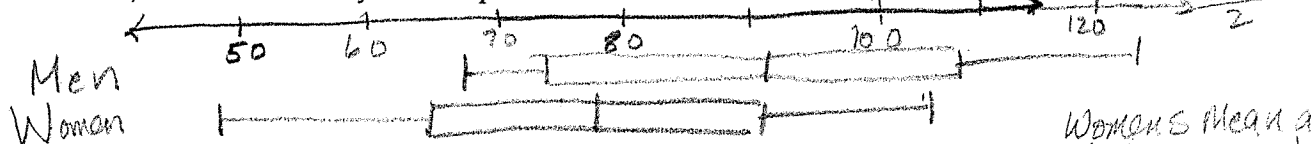
7) When investigating resting pulse rates of men and women the following results were obtained.

Men	120	77	89	97	124	68	72	96
Women	115	86	49	56	78	76	78	95

a) Find the \bar{x} , s_x , s_x^2

	Mean	Standard Deviation	Variation	Minimum	Q1	Median	Q3	Maximum	Mode	Range	Midrange
Men	92.9	20.9	436.1	68	74.5	92.5	108.5	124	None	56	96
Women	79.1	20.8		49	66	78	90.5	115	78	66	82

b) Construct a side by side box plot and for these two data sets.



c) Compare the centers of these two sets.

Women have a lower center than Men, Women's Mean and Median are less than men's pulse rate.

d) Compare the spread of these two sets.

Men & Women have similar spread, $s_m \approx s_w$

8) Explain how two data sets could have equal means and modes but still differ greatly. Give an example with two data sets to illustrate. One set can be much more spread out than the other.

$L_1 = 10 \ 20 \ 50 \ 80 \ 90 \ \bar{x}_1 = 50 \ s_1 = \text{Large}$

$L_2 = 47 \ 48 \ 50 \ 52 \ 53 \ \bar{x}_2 = 50 \ s_2 = \text{Small}$

9) The textbook defines unusual values as those data points with z scores less than $z = -2.00$ or z scores greater than $z = 2.00$. Comment on this definition with respect to "the Empirical Rule"; refer specifically to the percent of scores which would be defined as unusual according to "the Empirical Rule".

The Empirical Rule tells us that when data is NORMALLY Distributed then 95% of Data lies within 2 standard deviations of the mean.

Determine which of the four levels of measurement (nominal, ordinal, interval, ratio) is most appropriate.

10) Temperatures of the ocean at various depths.

Interval

11) Amount of fat (in grams) in cookies.

Ratio

Determine whether the numerical value is a parameter or a statistic. Explain your reasoning.

12) (3 points) The average salary of all assembly-line employees at a certain car manufacturer is \$41,500.

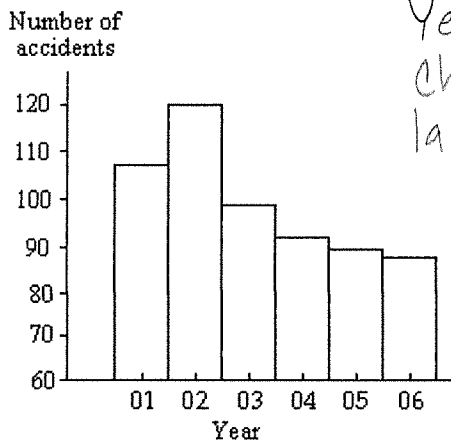
Parameter, Since all employees are included

Provide an appropriate response.

- 13) A group of men aged 50–59 followed a strict exercise regime for one year. The mean reduction in systolic blood pressure at the end of the year was 2.7 mmHg. Methods of statistics were used to determine that if the exercise regime had no effect on blood pressure, the likelihood of seeing this reduction in blood pressure by chance would be less than 1 in 100.

- a) What is the sample for this study? *The group of Men on strict exercise.*
- b) What is the population for this study? *All Men 50-59*
- c) Is this study observational or an experiment? *Experiment*
- d) Do the results have statistical significance? *Yes, $.01 < .05$ so it is statistically significant*
- e) Do they have practical significance? Explain. *No, a decrease of 2.7 mmHg is practically small*

- 14) (3 points) The graph below shows the number of car accidents occurring in one city in each of the years 2001 through 2006. The number of accidents dropped in 2003 after a new speed limit was imposed. Does the graph distort the data? How would you redesign the graph to be less misleading?



Yes, the Nonzero Y-axis Makes the change in Number of accidents look larger than it is.

Fix by starting y-axis at zero

Find the number of standard deviations from the mean. Round your answer to two decimal places.

- 15) (3 points) The number of hours per day a college student spends on homework has a mean of 6 hours and a standard deviation of 0.5 hours. Yesterday she spent 3 hours on homework. How many standard deviations from the mean is that?

the Number of Standard deviations From the Mean

$$= Z = \frac{X - \bar{X}}{S} = \frac{3 - 6}{.5} = \frac{-3}{.5} = -6$$

*3 hours is 6 Standard deviations below the mean.
this is way below average.*

$$Z = \frac{x - \bar{x}}{s}$$

$$\bar{x} = 2353 \quad s = 647$$

Provide an appropriate response.

- 16) (3 points) The birth weights for twins are normally distributed with a mean of 2353 grams and a standard deviation of 647 grams. Calculate the z-scores and use them to determine which birth weight could be considered statistically high or low?

A) 2000 g

B) 1200 g

C) 3647 g = Max Usual

D) 2353 g

$$Z = \frac{2000 - 2353}{647} = -0.54$$

$$Z = \frac{1200 - 2353}{647}$$

$$Z = -1.78$$

$$Z = \frac{3647 - 2353}{647}$$

$$Z = 2$$

$$Z = 0$$

3647 is a statistically high/heavy weight

$$\text{Min usual} = \bar{x} - 2s = 2353 - 2(647) = 1059$$

- 17) (4 points) A market researcher obtains a sample of 50 people by standing outside a store and asking every 20th person who enters the store to fill out a survey until she has 50 people. The method of sampling used was

simple random,

stratified,

systematic,

cluster,

or convenience.

Does this sampling plan result in a random sample? Simple random sample?

This sample is

Random

Simple Random

Both

Neither

Why Every person is equally likely to be included

No sample will include adjacent customers

- 18) (3 points) Explain what bias there is in a study done entirely online.

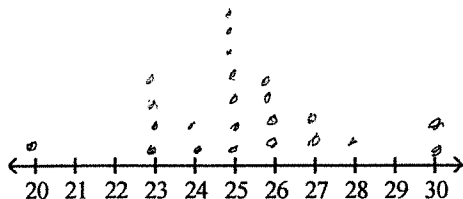
People choose to reply or be included so it is Voluntary Response

Construct the dotplot for the given data.

- 19) (5 points) An instructor encourages students in her class to use reusable drink containers by recording the number of students who remember to bring their reusable drink container each class meeting.

Make a dot plot for the data below.

20 23 24 25 25 23 26 26 30 30 25 25 26 26 27 28 27 23 23 24 25 25 25



Does the graph indicate that the data comes from a populations that is far from normal? Explain.

No, There is one max in middle, low on sides and is fairly symmetric

Be ready to make any of the graphs

Find the z-score corresponding to the given value and use the z-score to determine whether the value is unusual. Consider a score to be unusual if its z-score is less than -2.00 or greater than 2.00. Round the z-score to the nearest tenth if necessary.

- 20) (15 points) On a recent road trip a Chevy Bolt had a range of 91 miles among a population of all such electric cars which having a mean range of 162 miles and a standard deviation of 24.5 miles.

Is the range in miles discrete or continuous? cts

What is the Z-score when the range is 91 miles $z = \frac{x - \bar{x}}{s} = \frac{91 - 162}{24.5} = -2.90$

Use the range rule of thumb to estimate the minimum and maximum "usual" range in this population.

min usual range = 113

max usual range = 211

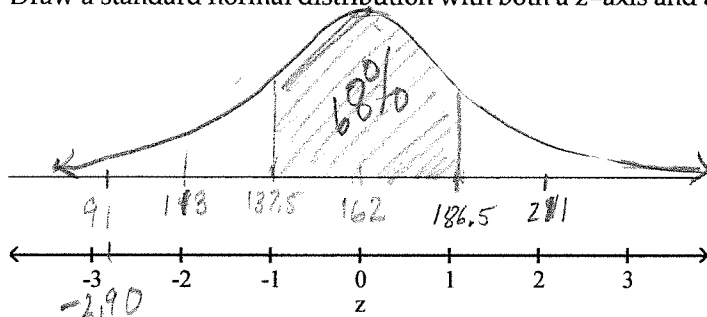
$162 - 2(24.5) = 113$

$162 + 2(24.5) = 211$

Is a range of 91 miles statistically low yes Why? $-2.90 < -2$ and $91 < 113$ miles

According to the Empirical Rule, what percentage of the population of all such electric cars have ranges between 137.5 miles and 186.5 miles? 68%

Draw a standard normal distribution with both a z-axis and an x-axis. Label all of the above information.



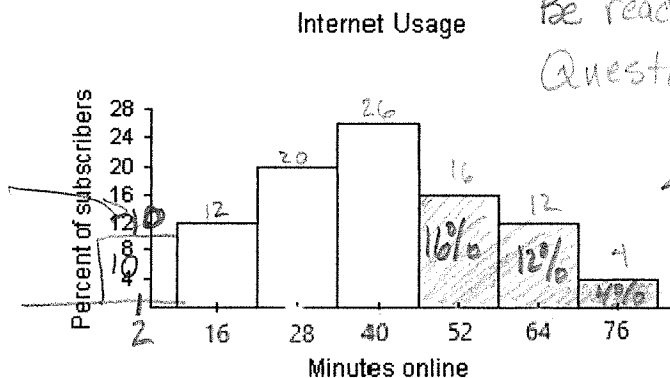
Identify the data set's level of measurement.

21) (8 points)

Boundaries 9.5, 21.5, 33.5, 45.5, 57.5, 69.5, 81.5

Be ready for any histogram Questions

Sum of % Must be 1



Identify the data set's level of measurement (nominal, ordinal, interval or ratio) for the data listed on the horizontal axis in the graph. Minutes are Ratio

Does the data appear to be normally distributed? yes

What is the width of each class? 12 Minutes

Approximately what percentage of internet users spend at least 46 minutes online? 32%

$$P(x \geq 46) = 32\%$$