Answers Part A

1. Woman's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. Find the probability that a single randomly selected woman will be 67 inches tall.

   P(x = 67) = 0, because x is a continuous random variable

2. Find the following probabilities:

   a. $P(z < 1.89)$
   b. $P(-1.13 < z < -0.67)$
   c. $P(z > 2.14)$

   a. 0.9706 **b. 0.1222** **c. 0.0162**

3. Birth weights are normally distributed with a mean of 3570 g and a standard deviation of 495 g. If a hospital wants to watch carefully the lightest 2% of infants, find the weight that separates the bottom 2% from the others.

   2555.25 g

4. Assume that healthy human body temperatures are normally distributed with a mean of 98.6 degrees and a standard deviation of 0.62 degrees. Find the probability of a healthy adult person having a body temperature below 97 degrees.

   0.0049

5. IQ scores are normally distributed with a mean of 100 and a standard deviation of 15. Find the probability that a sample of 25 randomly selected people will have an average IQ of 102 or less.

   0.7486

6. Women's heights are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. The US army requires that women's heights be between 58 inches and 80 inches. What is the percentage of women being denied the opportunity to join the Army?

   1 – p(accepted) = 1 – 0.9875 = 0.0125

7. Human body temperatures are normally distributed with a mean of 98.20 and a standard deviation of 0.62. Find the temperature that separates the top 7% from the bottom 93%.

   99.12

8. The heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 16 women are selected at random, find the mean of the population of sample means.

   63.6 same as the original mean by the CLT

9. The heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. If 16 women are selected at random, find the standard deviation of the population of sample means.

   2.5/4 = 0.625 by the CLT

Answers Part B:

1. While eating in FIU cafeteria, 200 randomly selected students are asked to perform a taste test in which they drink from two unmarked cups. They are then asked which drink they prefer.

1) Identify the **variable of interest** to the cafeteria administration.

Taste preference

2) Identify the **data collection method** used by the administration in this study.

Designed experiment

3) Identify the **type of the data** collected by the administration.

Qualitative data

4) Identify the **population of interest** to the cafeteria administration.

All students who use FIU cafeteria.

2. The distance traveled per day is given below for a sample of 20 FIU students.

2, 5, 5, 12, 8, 4, 2, 7, 8, 7, 9, 10, 3, 10, 8, 4, 5, 11, 1, 9

1) Calculate the **variance** of the distances.

$$s^2 = \frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)} = \frac{20\times1042-(130)^2}{20\times19} \approx 10.37$$

2) Calculate the **mean, median, mode and range** of the distances.

Mean: $\bar{X} = \frac{\sum X}{n} = \frac{130}{20} = 6.5$ Median: 7; Mode = 5; R = 11

3) Calculate the **standard deviation** of the distances.

$\boldsymbol{S} = \sqrt{\boldsymbol{S}^2}$ **= 3.22**

4) What is the approximate value of the **first Quartile**? $\mathbf{Q_1} = \mathbf{4}$

3. The 2014 U.S. Open statistician reported that the mean serve speed of the best players was 100 miles per hour (mph) and the standard deviation was 10 mph.

1) Assume that the statistician also gave us the information that the distribution of serve speeds was **mound shaped and symmetric**. What proportion of serves was between **90** mph and **130** mph?

$$\frac{68\%}{2} + \frac{99.7\%}{2} = 83.85\%$$

2) If nothing is known about the shape of the distribution, **give an interval of speeds** that will contain the speeds of **at least 15/16** serves.

$\left(1 - \frac{1}{K^2}\right) = \frac{15}{16}$ K = $\sqrt{16}$ = 4 Answer: 100 ± 4×10 = (60, 140) mph

3) Suppose that the statistician indicated that the serve speed distribution was **skewed to the right**. Which of the following values is most likely the value of the **median** serve speed?

a. 105 mph **b. 95 mph** c. 100 mph d. 108 mph

4. Choose the highest level of measurement for variable

A. Temperature of refrigerators (in degrees Celsius). **Interval**

B. Horsepower of racecar engines. **Ratio**

C. Marital status of school board members. **Nominal**

D. Ratings of television programs (poor, fair, good, excellent) **Ordinal**

E. Ages of children enrolled in a daycare **Ratio**

5. Suppose the average height and SD of 50 students in a class are 66 inch and 3 inch respectively.

a) If nothing is known about the shape of the distribution, what proportion represents the number of students **outside** the interval **from 60 to 72 inch?**

At most 25%

b) If the heights have a **mound shaped and symmetric** histogram, what proportion of the observations will be **less than 57** inch?

(100 – 99.7) : 2 = 0.15%

c) If the heights have a **mound shaped and symmetric** histogram, what proportion of the observations will be **less than 60 and more than 69 inch?**

$1 - \left(\frac{95\%}{2} + \frac{68\%}{2}\right) = 18.5\%$

6. The tread life of a particular brand of tire is a random variable best described by a normal distribution with a mean of 60,000 miles and a standard deviation of 8,300 miles.

a) What proportion of the tires of this particular brand last **longer than 54,000** miles?

$Z = \frac{54000-60000}{8300} = -0.72$ **P = 0.5 + 0.2642 = 0.7642**

b) What proportion of the tires last **between 40,000 and 45,000** miles?

$Z_1 = \frac{40000-60000}{8300} = -2.40$ $Z_2 = \frac{45000-60000}{8300} = -1.80$ **P = 0.4918 – 0.4641 = 0.0277**

c) Find the point in the mileage distribution, which **33% of the tires will exceed**.

$X_0 = \mu + z\sigma = 60{,}000 + 0.44 \times 8{,}300 = 60{,}365$ **mi**

d) Suppose the manufacturer guarantees the tread life of the tires for **the first 55,000** miles. What proportion of the tires will need to be replaced under warranty?

$Z = \frac{55000-60000}{8300} = -0.60$ **P = 0.5 - 0.2257 = 0.2743**

e) How long should tires be guaranteed if the company wishes to replace **less than 10%** of the tires?

$X_0 = \mu + z\sigma = 60{,}000 + (-1.28 \times 8{,}300) = 49{,}376$ **mi**

g) What warranty should the company use if they want **96%** of the tires to outlast the warranty?

$X_0 = \mu + z\sigma = 60{,}000 + (-1.75 \times 8{,}300) = 45{,}475$ **ml**

7. Which of the following is a measure of variation?

a. Percentile
b. Z-score
c. Mode
d. Standard Deviation

8. In skewed-left distributions, What is the relationship of the mean, median, and mode?

a. Mean > median > mode
b. Median > mean > mode
c. Mode > median > mean
d. Mode > mean > median

9. Which of the following measures the center of a distribution?

a. Standard deviation
b. Median
c. Range
d. Percentile

10. To what type of data can Empirical rule be applied?

a. Skewed left data
b. Symmetric data
c. Skewed right data
d. All of the above

11. Consider the four following statements and identify the one that is a **statistical inferential statement**:

a) Many people agree that the government should do something to reduce taxes.

b) According to the last Human Resource Office Report, 40% of the faculty at O'Connor College consists of adjunct professors.

c) Based on a sample survey, where 500 businessmen were interviewed, a study concluded that 78% of executives of international companies prefer water to soft drink during their flights.

d) The number 28 is a multiple of seven. The number 56 is its double. Then the number 56 is a multiple of 7.

12. Consider the following statements about measures. Identify the measure as "parameter" or "statistic"

a) A sample survey among working women revealed that **78%** prefer man doctors ___ **Statistic**

b) **Two third** of the students in Broward college, registered on line this summer _**Parameter**

13. The delivery time for a package sent within the United States is normally distributed with mean of 4 days and standard deviation of approximately 1 day. If 300 packages are being sent, how many packages will arrive in less than 3 days?

(a) 8 (b) 96 (c) 102 (d) 198 **(e) 48**

14. Suppose, at FIU the μ and σ of all students cumulative GPAs, are 2.5 and 0.5, respectively. The president of FIU wishes to graduate the top 2.5% of the students with cum laude honors and the top .15% with summa cum laude honors. Assume that distribution for the GPAs scores is mound shaped and symmetric.

a) Where should be the limits be set in terms of GPAs? **3.5, 4.0**

b) In terms of percentile scores? **$P_{97.5}$, $P_{99.85}$.**

15. Time to take standardized Exam is known to have mound shaped and symmetric distribution with σ = 10 min and $P_{2.5}$ = 55 min. How much time will it take for 50% of the entire class to finish this Exam?

X = 55 + 20 = 75 min

16. As part of a quality control program at a factory, random samples of 36 6-ounce cans of juice are taken, and the contents carefully measured. When the manufacturing process is working properly, the cans are filled with an average of 6.04 oz of juice. The standard deviation is 0.02 oz. When the process is working properly, what is the probability a sample of 36 of the 6-oz cans of juice would contain an average of 6.03 oz or less?

$Z = \frac{6.04-6.03}{\frac{0.02}{\sqrt{36}}} = -3.00$ **P = 0.5 - 0.4987 = 0.0013**

17. The weight of corn chips dispensed into a 10–ounce bag by the dispensing machine has been identified as possessing a normal distribution with a mean of 10.5 ounces and a standard deviation of .2 ounces. Suppose 100 bags of chips were randomly selected from this dispensing machine. Find the probability that the sample mean weight of these 100 bags exceeded 10.45 ounces.

$Z = \frac{10.45-10.5}{\frac{0.2}{\sqrt{100}}} = -2.50$ **P = 0.5 + 0.4938 = 0.9938**

18. A professor believes that if a class is allowed to work on an examination as long as desired, the times spent by the students would be approximately mound shaped with a mean of 40 minutes and a standard deviation of 6 minutes. Approximately how long should be allotted for the examination if the professor wants almost all, say 97.5%, of the class to finish?

$$X_0 = \mu + z\sigma = 40 + 2\times 6 = 52 \text{ min}$$