Name: _____   **Section: <u>MAT098/181 C-</u>**

## MAT098/181C EXAM #3 (FORM C)

*A scientific calculator is permitted. **<u>Cellphones may not be used as calculators and must be off or on vibrate during the exam</u>**. Show all work on the test or on the work paper*

1. Sam received a score of 85 on a history test for which the class average was 80 with standard deviation 10. He received a score of 80 on a biology test for which the class average was 74 with standard deviation 4. *(15 points)*

    On which test did he do better RELATIVE to the rest of the class? Please <u>JUSTIFY</u> your answer.

2. Suppose that students at BHCC have a normally distributed GPA with a mean of 3.0 and a standard deviation = 0.25. **Please label the graph below with the following: (12 points)**

a) The tick marks on the x-axis of the graph below are one standard deviation apart. Label the axis with the ***appropriate GPA values***.

b) ***Label the Z-score*** of each value below its x-value

c) Using the Empirical rule, label each region of the graph with the area for that region

d) What interval will contain 95% of the GPA's around the mean?
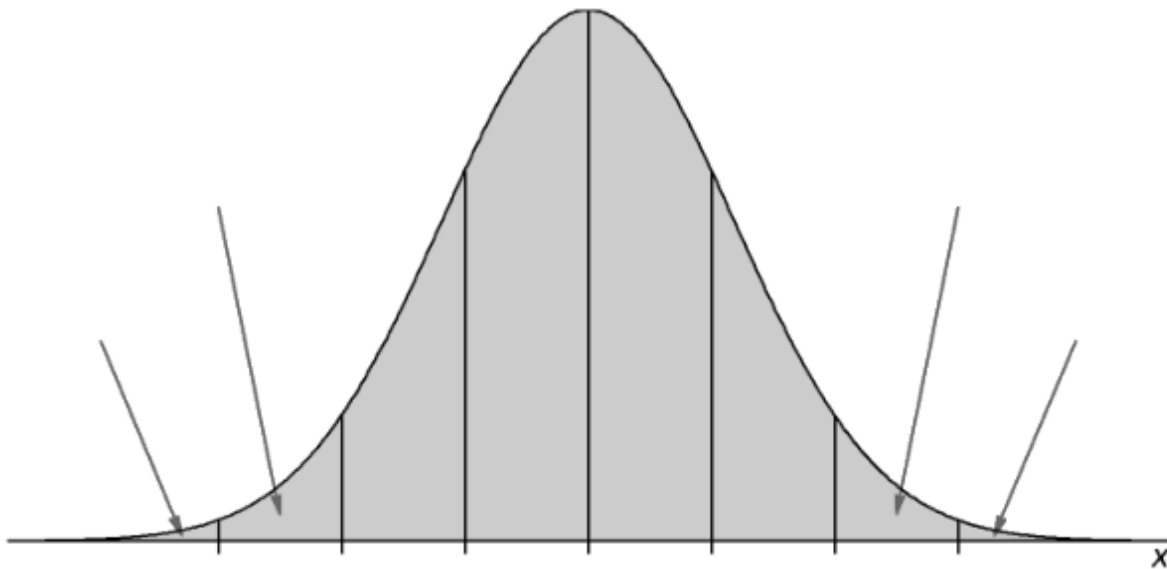
3. Let x be a random variable that represents the red blood cell (RBC) count in millions per cubic of a healthy female. If x has a normal distribution with mean μ = 4.8 and standard deviation σ = 0.8. *(18 points: 4,4,4,2,2,2)*

   Find the probabilities in part a, b, and c, by first converting each of the following x intervals to standardized z intervals.
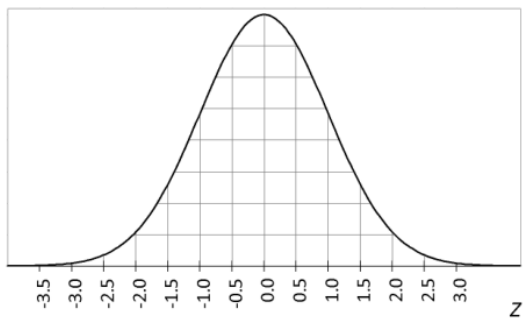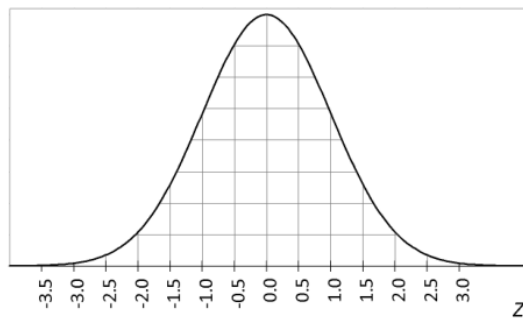
   a) P(x ≤ 4.2) =

   b.) P(x ≥ 4.5) =

   c.) P(4.0 ≤ x ≤5.5) =

   For the z intervals you calculated above, shade the area under the curve that represents the associated probability.
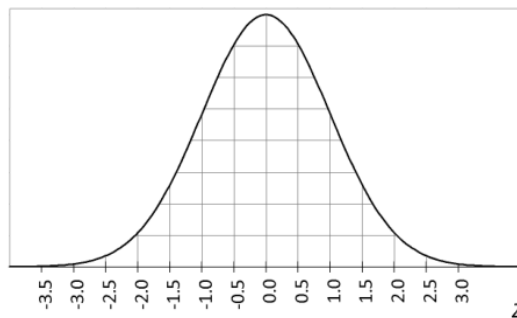   a)   b)

   c)

4. ***Draw a sketch for each part.** *(15 points*) Suppose that after 12-hour fast, a person's blood glucose level follows a normal distribution with mean μ =85 milligrams of glucose per deciliter of blood and standard deviation σ = 20 milligrams of glucose per deciliter of blood. What is the probability that after a 12-hour fast,

a) the blood glucose level is less than 110 milligrams of glucose per deciliter of blood? **Draw a sketch.**

b) the blood glucose level is greater than 60 milligrams of glucose per deciliter of blood? **Draw a sketch.**

c) the blood glucose level is between 60 and 110 milligrams of glucose per deciliter of blood? **Draw a sketch.**

5. Suppose that the average diameter of a certain type of roller bearing is mound-shaped and symmetric with population mean μ = 6mm and standard deviation σ = 1.1mm. If 35 roller bearings are tested, describe the sample mean $\bar{x}$ distribution and find the probability that the ***average (mean)*** $\bar{x}$ is between 5.5 and 6.5 mm. ***Draw a sketch.** *(15 points)*

6. A random sample of 200 Math text books purchased at BHCC Bookstore showed that 70% of the text books purchased were College Algebra text books. If $\hat{p}$ is the sample proportion of College Algebra text books purchased, what is the mean of the sampling distribution of $\hat{p}$? (*10 points)*

   a) Can we approximate the $\hat{p}$ distribution with a normal distribution? Are the conditions met?

   b) What is the mean of the sampling distribution of $\hat{p}$?

   c) What is the standard deviation of the sampling distribution of $\hat{p}$?

7. It is found that 70% of the aluminum cans sold in one of the communities in California were recycled. *(15 points)*

    (a) If a random sample of 400 cans are sold today, use the normal approximation to the binomial, to find the probability that 300 or more will be recycled?

    (b) Will the normal distribution make a good approximation to the binomial for this problem? Are the assumptions satisfied? Explain your answer.

8. ****EXTRA CREDIT:**

   a) A coffee machine automatically pours coffee into cups. The amount of coffee dispensed into a cup is normally distributed with a mean of 6.7 ounces and standard deviation of 0.3 ounce. Suppose that we are interested in reducing the amount of extra coffee that is poured into the 6.7 once cup. We are seeking to identify the highest 2.5% of the fill amounts poured by this machine. For what fill amount are we searching? Round to the nearest hundredth.

   b) The machine has just been loaded with 956 cups. How many of these do you expect will not overflow when served?

Formula sheet:

Empirical Rule
- about 68% of the *x* values lie within 1 standard deviation of the mean.
- about 95% of the *x* values lie within 2 standard deviations of the mean.
- about 99.7% of the *x* values lie within 3 standard deviations of the mean.

z-score

$$z = \frac{x - \mu}{\sigma}$$

Central Limit Theorem

Mean of the sample mean is $\mu_{\bar{x}} = \mu$

Standard deviation of the sample mean is $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

z-score for sample mean

$$z = \frac{x - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$$

Binomial Distribution

Mean: $\mu = np$

Standard Deviation: $\sigma = \sqrt{np(1 - p)}$

Sampling Distribution of Sample Proportion

Mean: p

Standard Deviation: $\sigma = \sqrt{\frac{p(1-p)}{n}}$