**The Normal Model 2**

COR1-GB.1305 – Statistics and Data Analysis

## Normal Cumulative Distribution Function (CDF)

1. Suppose that an automobile muffler is designed so that its lifetime (in months) is approximately normally distributed with mean 26 months and standard deviation 4 months. The manufacturer has decided to use a marketing strategy in which the muffler is covered by warranty for 18 months. Approximately what proportion of the mufflers will fail before the warranty expires?

2. Suppose that the daily demand for change (meaning coins) in a particular store is approximately normally distributed with mean $800.00 and standard deviation $60.00. What is the probability that, on any particular day, the demand for change will be below $600?

## Inverse Normal CDF

3. Suppose that the daily demand for change (meaning coins) in a particular store is approximately normally distributed with mean \$800.00 and standard deviation \$60.00. Find the amount $M$ of change to keep on hand if one wishes, with certainty 99%, to have enough change. That is, find $M$ so that $\mathrm{P}(X \leq M) = 0.99$.

4. Suppose that $Z$ is a standard normal random variable. Find the value $w$ so that $\mathrm{P}(|Z| \leq w) = 0.60$.

5. A machine that dispenses corn flakes into packages provides amounts that are approximately normally distributed with mean weight 20 ounces and standard deviation 0.6 ounce. Suppose that the weights and measures law under which you must operate allows you to have only 5% of your packages under the weight stated on the package. What weight should you print on the package?

## The Central Limit Theorem

6. Consider the population of all Fortune 500 CEOs and their salaries. Suppose that the mean salary (in millions of dollars) is $\mu = 20$, and the standard deviation of the salaries is $\sigma = 5$. You sample 50 CEOs and find their salaries.

   (a) Draw a histogram of what you think the population looks like.

   (b) Consider the sample mean $\bar{X}$ to be a random variable. What is the expectation of $\bar{X}$?

   (c) What is the standard deviation of $\bar{X}$?

   (d) Draw a picture of what you think the PDF of $\bar{X}$ looks like.

7. You draw a random sample of size $n = 64$ from a population with mean $\mu = 50$ and standard deviation $\sigma = 16$. From this, you compute the sample mean, $\bar{X}$.
   (a) What are the expectation and standard deviation of $\bar{X}$?
   (b) Approximately what is the probability that the sample mean is above 54?
   (c) Do you need any additional assumptions for part (c) to be true?

8. You draw a random sample of size $n = 16$ from a population with mean $\mu = 100$ and standard deviation $\sigma = 20$. From this, you compute the sample mean, $\bar{X}$.
   (a) What are the expectation and standard deviation of $\bar{X}$?
   (b) Approximately what is the probability that the sample mean is between 95 and 105?
   (c) Do you need any additional assumptions for part (c) to be true?