PROBLEM # 6.1 Contents of a 32-ounce Bottle- The foreman of a bottling plant has observed that the amount of soda in each 32-ounce bottle is actually a normally distributed random variable, with a mean of 32.2 ounces and a standard deviation of .3 ounce.

a. If a customer buys one bottle, what is the probability that the bottle will contain more than 32 ounces?
b. If a customer buys a carton of four bottles, what is the probability that the mean amount of the four bottles will be greater than 32 ounces?

PROBLEM # 6.2 A random variable is normally distributed with mean $\mu = \$\ 1{,}500$ and standard deviation $\sigma = \$\ 100$. Determine the standard error of the sampling distribution of the mean for simple random samples with the following sample sizes:

a. n = 16
b. n= 400
c. n= 1000

PROBLEM # 6.3 A normally distributed population has a mean of 40 and a standard deviation of 12. What does the central limit theorem say about the sampling distribution of the mean if samples of size 100 are drawn from the population?

PROBLEM # 6.4 What is the difference between a probability distribution and a sampling distribution?

PROBLEM # 6.5 What is the difference between a standard deviation and a standard error?

PROBLEM # 6.6 A simple random sample of size 100 is selected from a population with p=.40

a. What is the expected value of $\bar{p}$?
b. What is the standard error of $\bar{p}$?
c. Show the sampling distribution of $\bar{p}$.
d. What does the sampling distribution of $\bar{p}$ show?

PROBLEM # 6.7 A sample of n=16 observations is drawn from a normal population with $\mu = 1{,}000$ and $\sigma = 200$. Find the following.

a. $P(\bar{X} > 1{,}050)$
b. $P(\bar{X} < 960)$
c. $P(\bar{X} > 1{,}100)$

PROBLEM # 6.8 Given a normal population whose mean is 50 and whose standard deviation is 5,

a. Find the probability that a random sample of 4 has a mean between 49 and 52.
b. Find the probability that a random sample of 16 has a mean between 49 and 52.
c. Find the probability that a random sample of 25 has a mean between 49 and 52.

PROBLEM # 6.9 From past experience, an airline has found the luggage weight for individual air travelers on its trans-Atlantic route to have a mean of 80 pounds and a standard deviation of 20 pounds. The plane is consistently fully booked and holds 100 passengers. The pilot insists on loading an extra 500 pounds of fuel whenever the total luggage weight exceeds 8300 pounds. On what percentage of the flights will she end up having extra fuel loaded?

PROBLEM # 6.10 The sign on the elevator in the Peters building, which houses the School of Business and Economics at Wilfrid Laurier University, states, “Maximum Capacity 1,140 kilograms (2500 pounds) or 16 Persons.” A professor of statistics wonders hat the probability is that 16 persons would weigh more than 1,140 kilograms. Discuss what the professor needs (besides the ability to perform the calculations) in order to satisfy his curiosity.

PROBLEM # 6.11 Refer to PROBLEM # 6.10. Suppose that the professor discovers that the weights of people who use the elevator are normally distributed with an average of 75 kilograms and a standard deviation of 10 kilograms. Calculate the probability that the professor seeks.

PROBLEM # 6.12 The time is takes for a statistics professor to mark his midterm test is normally distributed with a mean of 4.8 minutes and a standard deviation of 1.3 minutes. There are 60 students in the professor's class. What is the probability that he needs more than 5 hours to mark all the midterm tests? (the 60 midterm tests of the students in this year's class can be considered a random sample of the many thousands of midterm test the professor has marked and will mark.)

PROBLEM # 6.13

a. In a binomial experiment with n=300 and p=0.5, find the probability that $\hat{P}$ is greater than 60%.
b. Repeat part a with p=.55

PROBLEM # 6.14

a. The probability of success on any trial of a binomial experiment is 25%. Find the probability that the proportion of successes in a sample of 500 is less than 22%.
b. Repeat part a) with n=800.

PROBLEM # 6.15 The heights of North American women are normally distributed with a mean of 64 inches and a standard deviation of 2 inches.

a. What is the probability that a randomly selected woman is taller than 66 inches?
b. A random sample of four women is selected. What is the probability that the sample mean height is greater than 66 inches?
c. What is the probability that the mean height of a random sample of 100 women is great than 66 inches?

PROBLEM # 6.16 The marks on a statistics midterm test are normally distributed with a mean of 78 and a standard deviation of 6.

a. What proportion of the class has a midterm mark of less than 75?
b. What is the probability that a class of 50 has an average midterm mark that is less than 75?

PROBLEM # 6.17 The manager of a restaurant in a commercial building has determined that the proportion of customers who drink tea is 14%. What is the probability that in the next 100 customers at least 10% will be tea drinkers?

PROBLEM # 6.18 For a population of five individuals, television ownership is as follows:

	x= Number of Television Sets Owned
Allen	2
Betty	1
Chuck	3
Dave	4
Eddie	2

a. Determine the probability distribution for the discrete random variable, x = number of television sets owned. Calculate the population mean and standard deviation.
b. For the sample size n = 2, determine the mean for each possible simple random sample from the five individuals.
c. For each simple random sample identified in part (b), what is the probability that this particular sample will be selected?

sample	$\bar{x}$ **= mean of this sample**	**probability of selecting this sample**
Allen, Betty		
Allen, Chuck		
Allen, Dave		
Allen, Eddie		
Betty, Chuck		
Betty, Dave	(1 + 4)/2 = 2.5	
Betty, Eddie	(1 + 2)/2 = 1.5	
Chuck, Dave	(3 + 4)/2 = 3.5	
Chuck, Eddie	(3 + 2)/2 = 2.5	
Dave, Eddie	(4 + 2)/2 = 3.0	

d. Combining the results of parts (b) and (c), describe the sampling distribution of the mean.

PROBLEM # 6.19 Determine the probability that in a sample of 100 the sample proportion is less than .75 if p=.80.

PROBLEM # 6.20 The assembly line that produces an electronic component of a missile system has historically resulted in a 2% defective rate. A random sample of 800 components is drawn. What is the probability that the defective rate is greater than 4%? Suppose that in the random sample the defective rate is 4%. What does that suggest about the defective rate on the assembly line?

PROBLEM # 6.21 A university bookstore claims that 50% of its customers are satisfied with the service and prices.

a. If this claim is true what is the probability that in a random sample of 600 customers less than 45% are satisfied?
b. Suppose that in a random sample of 600 customers, 270 express satisfaction with the bookstore. What does this tell you about the bookstore's claim?

<u>Understanding the Basics</u>: Suggested Problems from the Book.

In **Bold** are the Suggested Problems, in Green are the problems on Connect and the book.

	Chapter 7 - Sampling Distribution														
7.1	The Sampling Distribution of the Sample Mean	**7.01**	**7.02**	**7.03**	**7.04**	**7.05**	**7.06**	**7.07**	7.08	**7.09**	7.10	**7.11**	**7.12**	**7.13**	
7.2	The Sampling Distribution of the Sample Proportion	**7.14**	**7.15**	**7.16**	**7.17**	**7.18**	**7.19**	**7.20**	**7.21**	7.22	**7.23**	**7.24**	7.25	**7.26**	**7.27**
	Supplementary	7.28	7.29	7.30	**7.31**	**7.32**									

This statistical workbook is compiled from the following books:

- Keller, G. (2012). *Statistics for management and economics*. Mason: Cengage Learning.
- McClave, J. T., Benson, G. P., & Sincich, T. (2008). *Statistics for Business and Economics*. New Jersey: Prentice Hall.
- Weiers, R. M. (2011). *Introduction to Business Statistics*. Mason: Cengage Learning.
- (GMAC), F. t. (Ed.). (2005). *GMAT -Quantitative Review.* Oxford, UK: Blackwell.

Bowerman, B. L., O'Connell, R. T., Murphree, E., Huchendorf, S. C., & Porter, D. C. (2003). *Business statistics in practice*(pp. 728-730). New York: McGraw-Hill/Irwin.