Name: _____ Business Data Analysis
Date: 201-316-VA

In Class Exercise #11: Normal, Sampling, Approx

1. **Satellite Insurance**

   A relay microchip in a telecommunications satellite has a life expectancy that follows a normal distribution with a mean of 90 months and a standard deviation of 3.7 months. When the microchip malfunctions, the entire satellite is useless. An insurance company will insure the satellite, making a $50 million payout in the case of a satellite failure. Assume that all the other components of the satellite will work indefinitely.

   (a) For how many months should the satellite be insured to be 99% confident that it will last beyond the insurance date?

   (b) If the satellite is insured for 84 months, what is the probability that it will malfunction before the insurance coverage ends?

   (c) If the insurance company charges $3 million for 84 months of insurance, how much profit does the company expect to make? Show your computations.

2. **Impulse Buying**

Let x represent the dollar amount spent on supermarket impulse buying in a 10-minute unplanned shopping interval. The mean of the x distribution is about \$20 and the estimated standard deviation is about \$7.

(a) Consider a random sample of 100 customers who have a 10-minute unplanned shopping time.

i. In words, what does the random variable $\overline{x}$ represent?

ii. What can we say about about the probability distribution of $\overline{x}$?

iii. What theorem did you use to answer ii)? What assumptions did you make, if any?

(b) What is the probability that $\overline{x}$ is between \$18 and \$22?

(c) If we assume that x has a distribution that is approximately normal, what is the probability that x is between \$18 and \$22?

3. **New Products**

A study shows that 80% of all new products introduced in grocery stores fail and are taken off the market within 2 years. A grocery store chain introduces 66 new products. Approximate the probability that within 2 years...

(a) 15 or more succeed

(b) fewer than 10 succeed