Sequence & Series Applications

1) Caleb has a new car that cost $25,000. If it depreciates $4,000 every year, how much would it be worth after six years?

2) A piece of paper is cut in half. Then each half is cut in half again. If this process is repeated 8 more times, what is the size of each piece compared to the original?

3) Hannah is constructing a seating chart for an event tonight. The seats are arranged so that there are 4 seats in the first row and each row has 5 more seats than the previous row. There are a total of 15 rows.

4) A ball is dropped from a height of 4 meters. The ball bounces to 75% of its previous height after each sequential bounce. How high does the ball bounce on the 1st, 2nd, and 3rd bounce? (2 decimal places) What would be the combined height of 6 bounces?

Central Limit Theorem

1) How can you tell if the Central Limit Theorem applies for means and proportions?
   Means: **Proportions:**

2) Explain how the sample size affects the distribution. (include words such as: standard deviation, standard error, mean, mean proportion, normal distribution, tighter, closer, wider, increase, decrease)

In Exercises 1 – 2, determine if the Central Limit Theorem applies. If it does, find the mean/mean proportion and standard error for the sampling distribution described. Round all answers to the nearest hundredth (2 decimal places)

1) The mean salary of police officers in Metro Atlanta is $53,000 with a standard deviation of $3200. Multiple random samples of 40 police officers were drawn from the population.

2) In a random sample of 358 new students to Georgia State, 47.9% rated taking Math IV in high school as a very important part of the preparation for college.

3) The consumption of processed fruits by Americans averages 154.8 pounds. The standard deviation is 51.6 pounds. Random samples of 21 Americans are taken from the population.

4) Parents in the Ola community were concerned about the percentage of children that weren't vaccinated. A random sample of 263 preschool children in Ola revealed that only 60 had been vaccinated.

5) The Visa credit card company shows their card holders have normal distribution of balances A sample of 25 credit card holders reported a mean balance of $2870 with a standard deviation of $900.

Notations:

Write the correct symbol for each statistical term.

1) Mean of a population
2) Mean of a sample
3) Proportion of a population
4) Proportion of a sample
5) Sample size
6) Mean of a sampling distribution of means
7) Mean of a sampling distribution of proportions
8) Standard error of a sampling distribution of means
9) Standard error of a sampling distribution of proportions
10) Critical value needed for a certain confidence interval

Confidence Intervals with Means & Proportions

1. A production manager knows that historically, the amounts of impurities in bags of a chemical follow a normal distribution with a standard deviation of 3.8 grams. A random sample of nine bags of the chemical yielded the following amounts of impurities in grams:

   18.2 13.7 15.9 17.4 21.8 16.6 12.3 18.8 16.2

   Find a 90% confidence interval for the population mean weight of impurities and interpret your answer in this context.

2. Delta constructed a survey of 935 adults to see what mode of transportation the public felt was safest. The survey revealed that 45% felt air travel was the safest. Construct a 99% confidence interval for the proportion of adults who think that airplanes are the safest mode of transportation.

3. A study of 74 patients with ulcers was conducted in which they were prescribed 40 mg of Pepcid. After 8 weeks, 58 patients' reports showed their ulcer healing. Construct and interpret a 90% confidence interval for the proportion of patients whose ulcer showed healing.

4. A random sample of 1,582 undergraduates enrolled in public relations courses was asked to respond on a scale from one (strongly disagree) to seven (strongly agree) to the statement: "Most customers want to feel appreciated when being served." The sample mean response was 3.92 and the sample standard deviation was 1.57.

   (a) If possible find a 95% confidence interval for the population mean response and explain what this says about your population.

(b) **Without doing the calculations**, state whether an 80% confidence interval for the population mean would be wider than, narrower than, or the same as (a). Explain why.

5. We sampled 29 Mr. FixIt car repair stores at random and found the average labor costs for car repairs is $48.25 with a standard deviation of $4.25. Construct and interpret a 95% confidence interval for the population mean labor cost for car repairs at Mr. FixIt shops.

6. Grandma's Cookie Company claims that on average, if you eat one of their cookies, you will find about 28 chips per chocolate chip cookie. You doubt this claim so you decide to test it. To start, you collect a random sample of 35 cookies and count the number of chips in each cookie. Your sample has a mean of 23.8 with a standard deviation of 2.5chips per cookie.
    a) Construct and interpret a 99% confidence interval for the mean number of chocolate chips in one of Grandma's cookies.

    b) What can you say about the claim from Grandma's Cookie Company?

Margin of Error and Sample Size

1) Fill in the blanks with one of the following: *increases, decreases,* or *stays the same* where

   $$E = z * \left(\frac{\sigma}{\sqrt{n}}\right) \text{ OR } E = z * \left(\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right)$$

    a) As the sample size (n) increases, the margin of error (E) _____.

    b) As the confidence level (C) increases, the margin of error (E) _____.

    c) As the standard deviation (σ) increases, the margin of error (E) _____.

2) From a random sample of 36 days in a recent year, the closing stock prices for Hasbro had a mean of $24.63 and a standard deviation of $1.26. What is the margin of error for when constructing a 95 % confidence level for this statistic?

3) You want to estimate the mean repair cost for dishwashers. The estimate must be within $10 of the population mean. Determine the required sample size to construct a 99% confidence interval for the population mean. Assume the population standard deviation is $22.50.

4) A random sample of 156 fields of durum wheat has a mean yield of 26.8 bushels per acre and standard deviation of 8.0 bushels per acre. What is the margin of error for when constructing an 80 % confidence level for this statistic?

5) 461 adults, in a survey of 2001 adults, would prefer to have a girl if they could only have one child. What is the margin of error for when constructing a 90 % confidence level for this statistic?

6) John works at the Apple store and trying to estimate the average daily income for the store. Based on the other stores, he knows the population standard deviation for daily income is $56.25. If John wants to be 99% confident that his estimate is within $25 of the actual average daily income, what sample size (# of days) is needed to guarantee this accuracy?

7) In a survey of 2000 American adults age 65 and over, 1320 received a flu shot. Find the minimum sample size needed to estimate the population proportion at the 90% confidence level in order to ensure the estimation is accurate within 4% of the population proportion.

8) A study of 1907 fatal traffic accidents found 449 of the fatalities were alcohol related. What is the margin of error for when constructing a 99% confidence level for this statistic?

9) A health care professional wishes to estimate the birth weights of infants. How large a sample must she select if she desires to be 90% confident that the true mean is within 6 oz of the sample mean? Assume the standard deviation is 8 oz.