EXERCISES ON DESCRIPTIVE STATISTICS

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1. SPEED AND GAS MILEAGE

- Is there a linear relationship between the speed at which a car is driven and the gas mileage? A car was driven on a test track for one hour at each of 5 speeds and the gas mileage calculated. Here are the results:
- Draw a scatterplot and determine whether there appears to be a linear relationship between speed and gas mileage. If so, describe the relationship, calculate r

Miles/Hour	Miles/Gallon
20	24
30	28
40	30
50	28
60	24

$$cov(X,Y) = \frac{1}{N}\sum_{i=1}^{N}(x_i - \bar{x})(y_i - \bar{y})$$

2. PREDICTING THE MENTAL ABILITY

- Is there a linear relationship between the age at which a child first begins to speak and his or her mental ability later on? To answer this question a study was conducted in which the age (in months) at which a child first spoke and the child's score on an aptitude test as a teenager were recorded:
- Draw a scatterplot and determine whether there appears to be a linear relationship between these two variables.
- If so, describe the relationship, calculate r

Age	Score
15	95
26	71
10	83
9	91
15	102
20	87
18	93
11	100
8	104
20	94

STOCK RETURNS

- take a sample of stock returns from the Excelsior Corporation and the Adirondack Corporation from the years 2008 to 2012, as shown here:
- What are the covariance and correlation between the stock returns?

Population Covariance Formula

$$Cov(x,y) = \frac{\Sigma(x_i-\bar{x})(y_i-\bar{y})}{N}$$

Sample Covariance

$$Cov(x,y) = \frac{\Sigma(x_i-\bar{x})(y_i-y)}{N-1}$$

Year	Nvidia Annual Return (percent) (*X*)	Radeon Annual Return (percent) (*Y*)
2008	1	3
2009	–2	2
2010	3	4
2011	0	6
2012	3	0

GDP AND PRODUCT GROWTH LINE ANALYSIS

- You are an analyst in a company has a five-quarter data set that shows quarterly gross domestic product (GDP) growth in percentages (x) and a company's new product line growth in percentages (y). Find how the GDP is affected by the growth of new product. The data set will look like:

  - Q1: x = 2, y = 10
  - Q2: x = 3, y = 14
  - Q3: x = 2.7, y = 12
  - Q4: x = 3.2, y = 15
  - Q5: x = 4.1, y = 20

NORMAL DISTRIBUTION PROBLEMS

- X is a normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$. Find
  a) $P(x < 40)$
  b) $P(x > 21)$
  c) $P(30 < x < 35)$

SPEED DISTRIBUTION

- A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr?

PAY SCALE

- The annual salaries of employees in a large company are approximately normally distributed with a mean of $50,000 and a standard deviation of $20,000.

  a) What percent of people earn less than $40,000?

  b) What percent of people earn between $45,000 and $65,000?

  c) What percent of people earn more than $70,000?

STANDARD ERROR

- The mean salary of all employees in a company is 3578, and standard deviation is 1980. Find the z-score for the mean of a sample of 18 employees to be less than 3000.

2. EXERCISE FOR CLT

- The record of weights of male population follows normal distribution. Its mean and standard deviation are 70 kg and 15 kg respectively. If a researcher considers the records of 50 males, then what would be the mean and standard deviation of the chosen sample?

3. EXERCISE FOR CLT

- A car manufacturer crash tests a certain model of car and measures the impact force. The test and model in question produce impact forces that are normally distributed with a mean of 303030 metric tons and a standard deviation of 1.51.51, point, 5 metric tons. Suppose that the manufacturer tests a random sample of 333 cars and calculates the sample mean impact force. Assume that the cars in the sample are independent.
- **What will be the mean and S.D of the sample**
- **What will be the shape of the sampling distribution of the sample mean impact force?**

1. EXERCISE FOR CONFIDENCE INTERVALS

- From a population with a known standard deviation of 2.76, we draw a sample of size 52 and from that sample we get a sample mean=–22.8. Find the 95.0% confidence interval for that statistic. (Express answer rounded to 3 decimal places.)

2. EXERCISE FOR CONFIDENCE INTERVALS

- A manufacturer produces piston rings for an automobile engine. It is known that the ring diameter is approximately normally distributed and has a standard deviation (population) = 0.03mm. A random sample of 32 pistons has a mean diameter, of 74.036mm. Construct a confidence interval around true population mean for the piston ring diameter.

3. EXERCISE FOR CONFIDENCE INTERVALS

- The life in hours of a 75-watt light bulb is known to be approximately normally distributed, with standard deviation of 25hours. A random sample of 62 bulbs have a mean life of 1014 hours. Construct a 98% confidence interval around the true population mean life of the light bulb

4. EXERCISE FOR CONFIDENCE INTERVALS

A polymer is manufactured in a batch chemical process. Viscosity measurements show that it is approximately normally distributed with a standard deviation of 20. A random sample of 42 batches has a mean viscosity of 759. construct a 99% confidence interval around true population mean viscosity.