**Quiz – Homework**

Module Name: Applied Statistics Deadline: 2 Aug 2021

## Solve ALL the following Questions. Please Show steps, calculations and comment on the obtained results.

**Question One**

The following data represent the time (in minutes) recorded for a sample of 20 employees in order to get to work using public transportation.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 28 | 29 | 32 | 37 | 33 | 25 | 29 | 32 | 41 | 34 |
| 29 | 31 | 33 | 32 | 34 | 30 | 31 | 32 | 35 | 33 |

1. Does the sample contain any extreme values? Justify your answer with a suitable **test**. Comment on the results
2. According to your conclusion in part (1), calculate the best central and the best absolute dispersion measure.
3. Comment on the results obtained in part (2).

## Question Two

The number of days required for two suppliers to deliver orders is as follows.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Supplier A: | 11 | 10 | 9 | 10 | 11 | 11 | 10 | 11 | 10 | 10 |
| Supplier B: | 8 | 10 | 13 | 7 | 10 | 11 | 10 | 7 | 15 | 12 |

Where, the average number of days required for supplier A to deliver orders = 10.3 days

and Standard Deviation = 0.67 day

1. Which supplier provides more consistent and homogenous delivery times A or B? Justify your answer.

1. And do you think the delivery time for **each** supplier is symmetric. Support your answer with a proper test for skewness.

## Question Three

The management of a supermarket wants to adopt a new promotional policy of giving free gift to every customer who spends more than a certain amount per visit at this supermarket. The expectation of the management is that after this promotional policy is advertised, the expenditure for all customers at this supermarket will be normally distributed with mean 400 £ and a variance of 900 **£2**.

1. If the management wants to give free gifts to at most 10% of the customers, what should the amount be above which a customer would receive a free gift?
2. In a sample of 100 customers, what are the number of customers whose expenditure is between 420 £ and 485 £?
3. What is a probability of selecting a customer whose expenditure differs than the population expenditure by at most 50 £?
4. In a sample of 49 customers, what are the number of customers whose mean expenditure is at least 410 £?
5. What are the values between which the expenditure of 95% of population exist?

## Question Four

The following data represent the net profits made by a sample of 25 companies that operate in real-state sector.

Table (1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 56 | 97 | 78 | 61 | 79 |
| 93 | 84 | 76 | 58 | 92 |
| 89 | 96 | 42 | 44 | 85 |
| 77 | 53 | 88 | 62 | 84 |
| 62 | 82 | 75 | 95 | 89 |

1. Choose the best graphical presentation and justify your answer.
2. Based on your answer in (1), construct the selected graphical presentation and comment on the results.
3. Based on your answer in (2), do you think the sector performance is satisfactory? Justify your answer.

## Question Five

## HR manager in L&B real-state company is working with finance department in improving the salaries and the following descriptive statistics were obtained.

Table (2)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Department | Mean | SD | CoefVar | Min | Q1 | Median | Q3 | Max | IQR | Skewness |
| Finance | 6.052 | 3.874 | 64.01 | 1.630 | 3.393 | 4.585 | 7.500 | 22.860 | 4.107 | 2.00 |
| HR | 5.441 | 3.235 | **(a)** | 2.000 | 3.200 | 4.100 | 6.430 | 21.860 | 3.230 | **(b)** |
| IT | 5.880 | 3.887 | 66.10 | 0.530 | 3.250 | 4.630 | **(C)** | 24.980 | 3.550 | 2.18 |
| Marketing | 6.010 | 3.737 | 62.18 | 1.670 | 3.475 | 5.000 | 6.645 | 22.200 | 3.170 | 2.14 |
| Training | 6.095 | 3.719 | 61.02 | 1.500 | 3.330 | 5.000 | 7.640 | 20.000 | 4.310 | 2.00 |

CoefVar stands for coefficient of variation

graph (1)



The company has hired you to answer the following questions:

1. Find the missing values of **(a), (b)** and **(c).**
2. Do you think that the salaries in the departments are skewed, justify your answer with proper measure from table (2).
3. Based on the boxplot for the salaries by department in graph (1), comment on the graph in terms of existence of outliers, skewness and which department has higher outliers.
4. Based on your answer in (3), comment and compare on the suitable central and absolute dispersion measures depending on table (2).
5. Based on table (1), do you think the salaries of which group is more homogenous, support your answer and comment on the results.

## Question Six

## The following table gives the experience (in years) and the number of stocks sold during the previous three months by seven brokers in the Egyptian stock market.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Experience ( years) | 4 | 12 | 9 | 6 | 10 | 16 | 7 |
| Number of stocks | 19 | 42 | 28 | 31 | 39 | 35 | 21 |

1. Determine both dependent and independent variables, and explain the expected relationship between them.
2. Calculate the correlation coefficient comment on the results.
3. Estimates the simple regression model and comment on the estimated coefficients.
4. Calculate the coefficient of determination and comment on the results.
5. Predict the number of stocks sold during the past three months by broker with eleven years of experience.

## Question Seven

## The dataset in the below table represents the 4-month profits (in million $) of real estate company that operates in Egypt over the period of time between 2014-2018.

|  |  |  |  |
| --- | --- | --- | --- |
|  | I | II | III |
| 2014 | 15.6 | 20.4 | 29.4 |
| 2015 | 13.8 | 23.2 | 35 |
| 2016 | 17.8 | 19.4 | 30.6 |
| 2017 | 21.4 | 24.8 | 33.6 |
| 2018 | 18.4 | 27.2 | 34.2 |

**Answer the following questions:**

1. Graph the time series of company’s profits and comment on its components (trend, seasonality and cycle)?
2. Find the seasonal indices for the company’s profits and comment on the results.
3. Find the deseasonalized values of company’s profits and compare it to the actual values graphically. Comment on the results.
4. By using the deseasonalized values obtained in (3), determine the least squares trend equation. And comment on the results.
5. Predict the expected value of company’s profit in summer 2019 which includes the effects of all the components of time series. And comment on the results.

## End of Exam

**Wish you all the best**

**Formula Sheet**

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
| First quartile location = 1/4 (n+1)  Third quartile location= 3/4 (n+1)  Value of quartile= start + ratio \* distance |  |
|  |  |

Simple linear regression model

Where

Estimated simple linear regression model

