

# Data analysis using SPSS

**Final Project**

**Prepared by Walid Soliman**

## Lecture 9



# Validity and Reliability

## Lecture 8

**Final Project**  
**Prepared by Walid Soliman**

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3. **The second stage:** Describing the data using statistical measures.
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1. Learn about qualitative and quantitative data types.
2. Learn how to display and analyze data using SPSS, including displaying data using different graphic formats
3. Analyze the data by comparing the means of two different groups.
4. Analyze the data by one-way analysis of variance
5. Analyze the data by measuring the correlation coefficient between the variables.
6. Analyze the data through regression analysis between variables.

# Contents

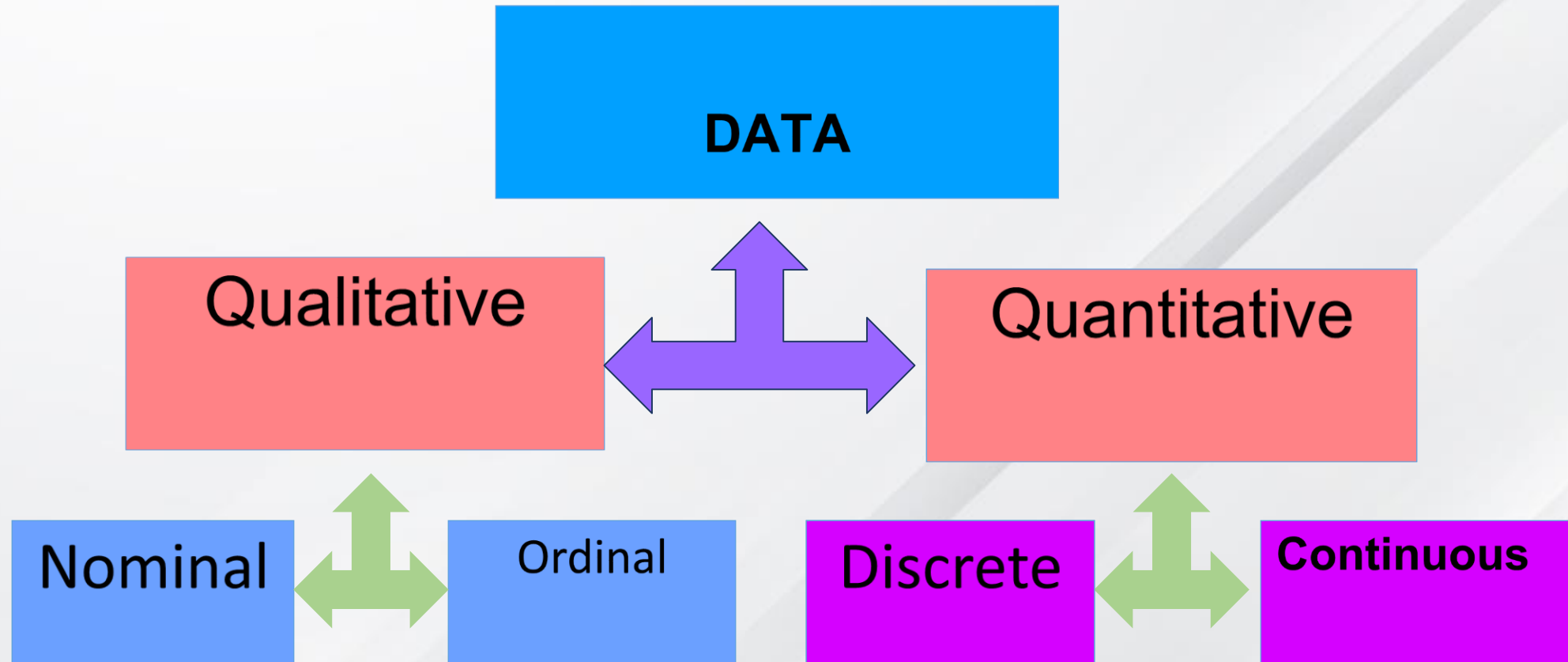
## **By the end of this chapter, you will possess the following Skills:**

- The ability to distinguish between different types of data and the appropriate statistical measures for each.
- Data presentation skills using the SPSS program using appropriate graphic figures.
- Data analysis skills on the SPSS program, which includes a comparison between averages, one-way analysis of variance, measurement and interpretation of the correlation coefficient between variables, regression analysis, and interpretation of results.

# SPSS Program

"SPSS is the most used statistical program by researchers to analyze information in the field of human, administrative and economic sciences, and helps the researcher to obtain accurate results while saving time and effort."

# Data Types



# Data types

## First: Qualitative Data

a) Nominal data: male-female, marital status, nationality

No calculations can be performed on it

b) Ordinal data: educational level, degrees of agreement or disagreement.

## Second: Quantitative Data

a) Discrete data (discontinuous): number of family members or workers.

b) Continuous data: sale price, age, income.

# View and analyze data using SPSS Software

The first stage is data presentation.

a) Circle: The proportions of distribution or structural composition of a variable

The left screenshot shows the SPSS Data Editor window with the dataset 'staffsurvey5ED.sav' open. The 'Graphs' menu is open, and the 'Pie...' option is highlighted. The data table shows columns for 'id', 'city', 'age', and 'service'.

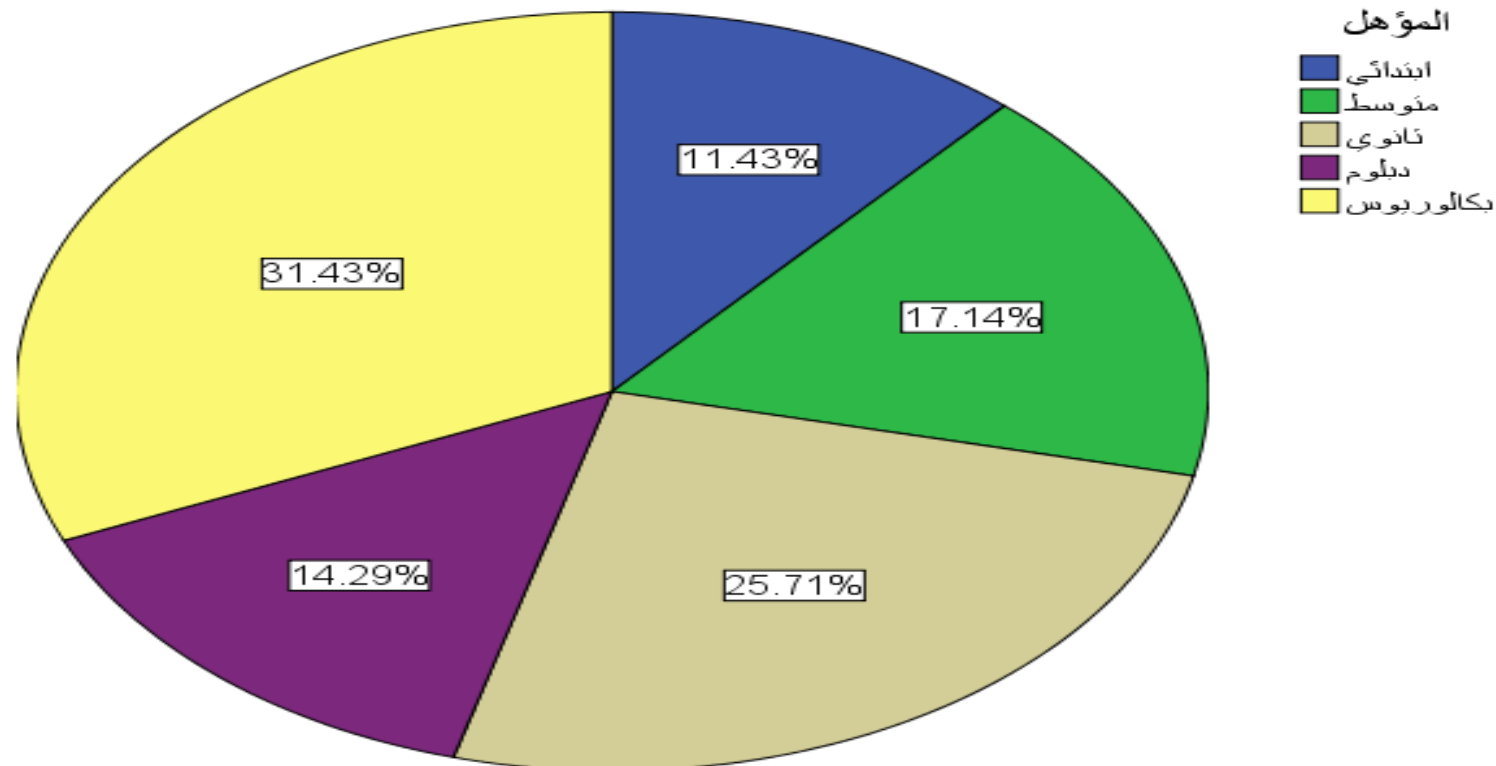
|    | id  | city | age | service |
|----|-----|------|-----|---------|
| 1  | 454 | 8    | 4   |         |
| 2  | 431 | 8    | 4   |         |
| 3  | 432 | 8    | 2   | 5 E-00  |
| 4  | 433 | 8    | 4   | 5 E-00  |
| 5  | 434 | 8    |     |         |
| 6  | 435 | 8    | 2   |         |
| 7  | 436 | 8    | 5   |         |
| 8  | 437 | 8    | 4   |         |
| 9  | 442 | 8    | 5   |         |
| 10 | 445 | 8    | 4   | 1       |
| 11 | 446 | 8    | 5   |         |
| 12 | 447 | 8    | 4   |         |

The right screenshot shows the 'Define Pie: Summaries for Groups of Cases' dialog box. The 'Slices Represent' section has 'N of cases' selected. The 'Define Slices by' section has '[E] الميزان' selected. The 'Panel by' section has 'Rows' and 'Columns' empty.

# View and analyze data using SPSS Software

The first stage is data presentation. (Sample of 35 employees)

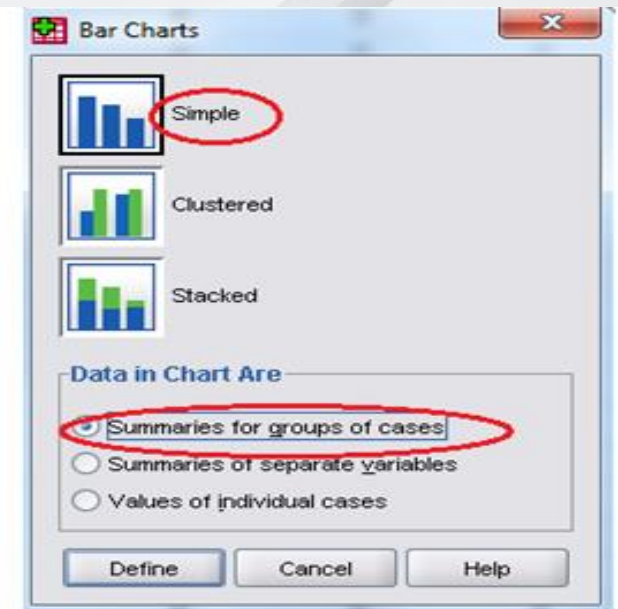
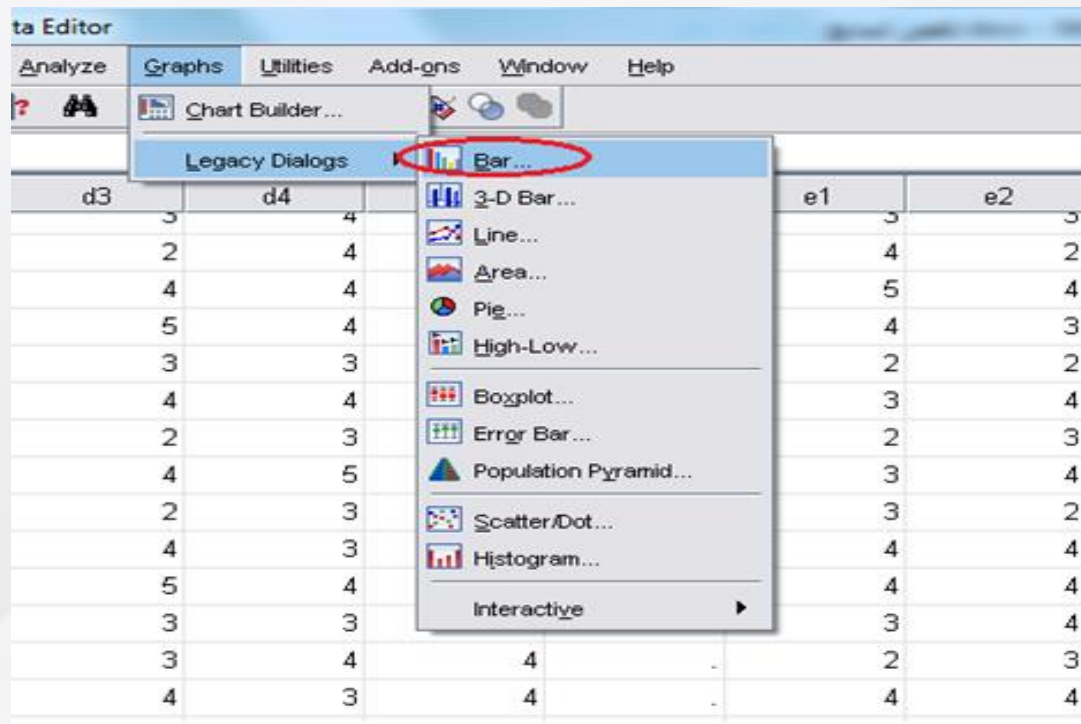
a) Circle: The proportions of distribution or structural composition of a variable



# View and analyze data using SPSS software

The first stage is data presentation (Sample of 35 employees).

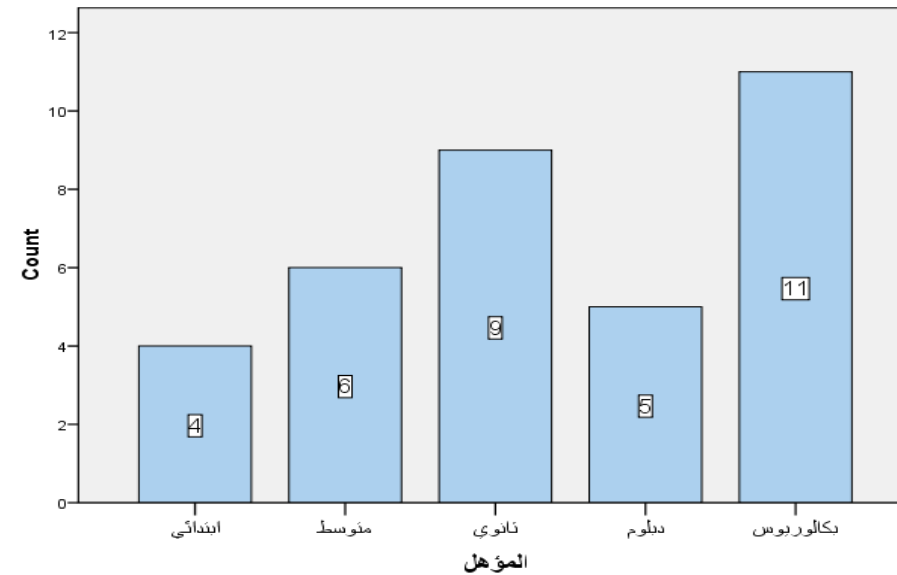
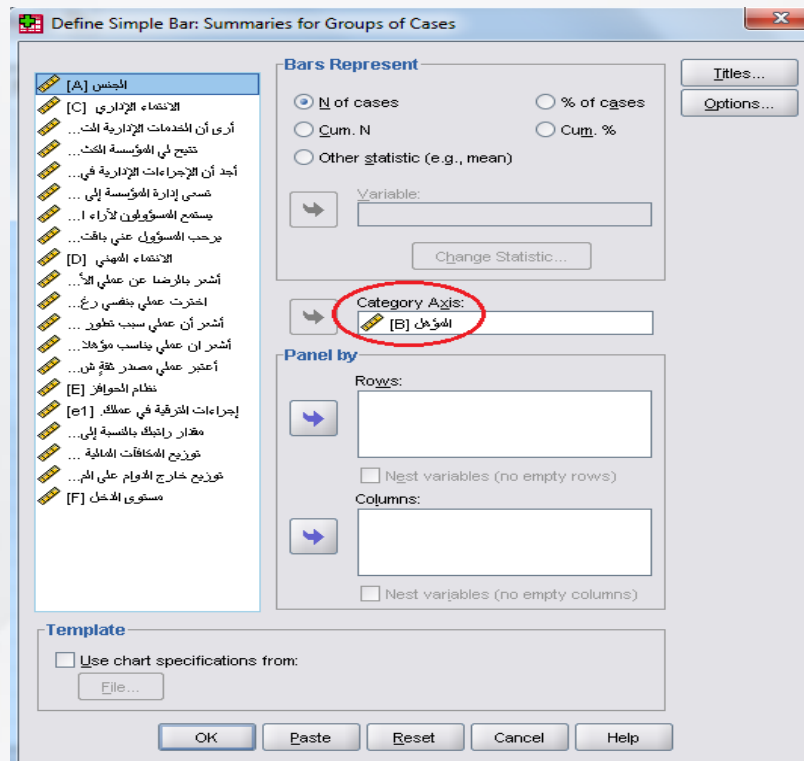
b) Bar graphs: discrete ordinal and quantitative data.



# View and analyze data using SPSS software

The first stage is data presentation.

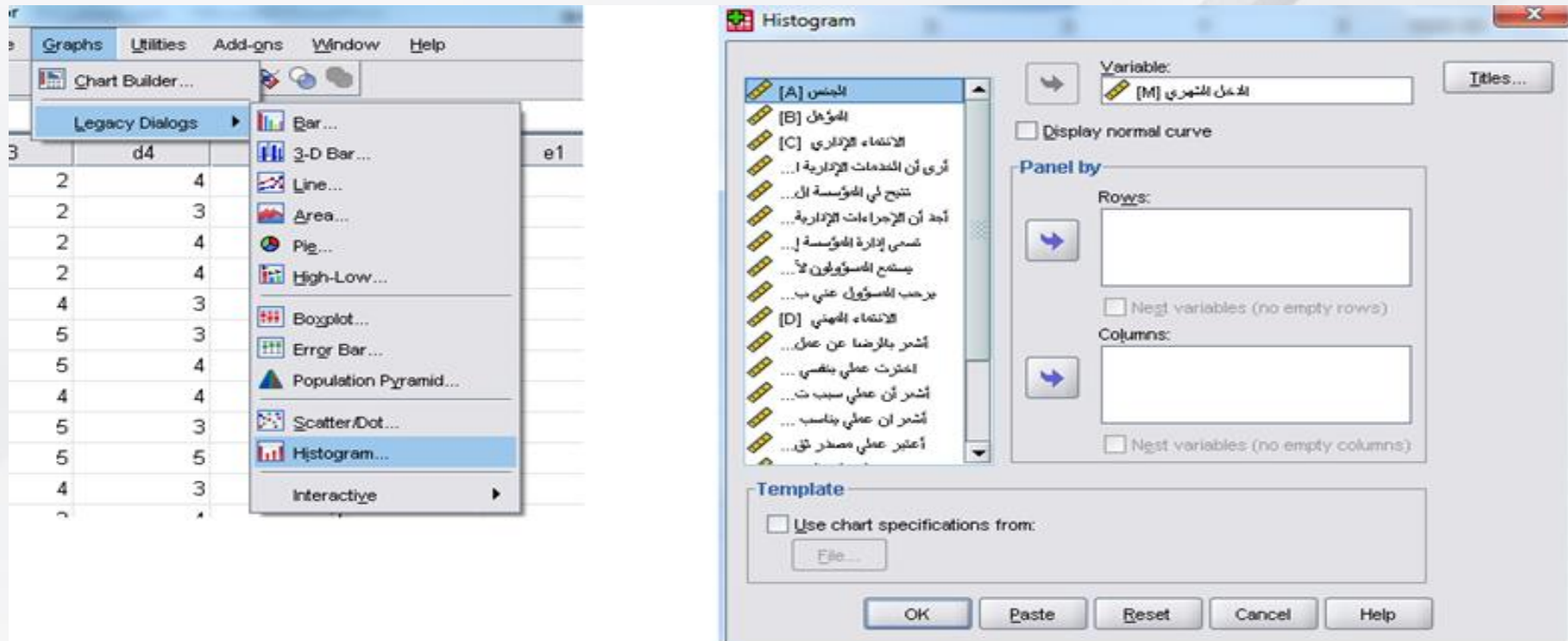
b) Bar graphs: discrete ordinal and quantitative data.



# View and analyze data using SPSS Software

The first stage is data presentation.

c) Histogram and Interpolation line: connected quantitative data.

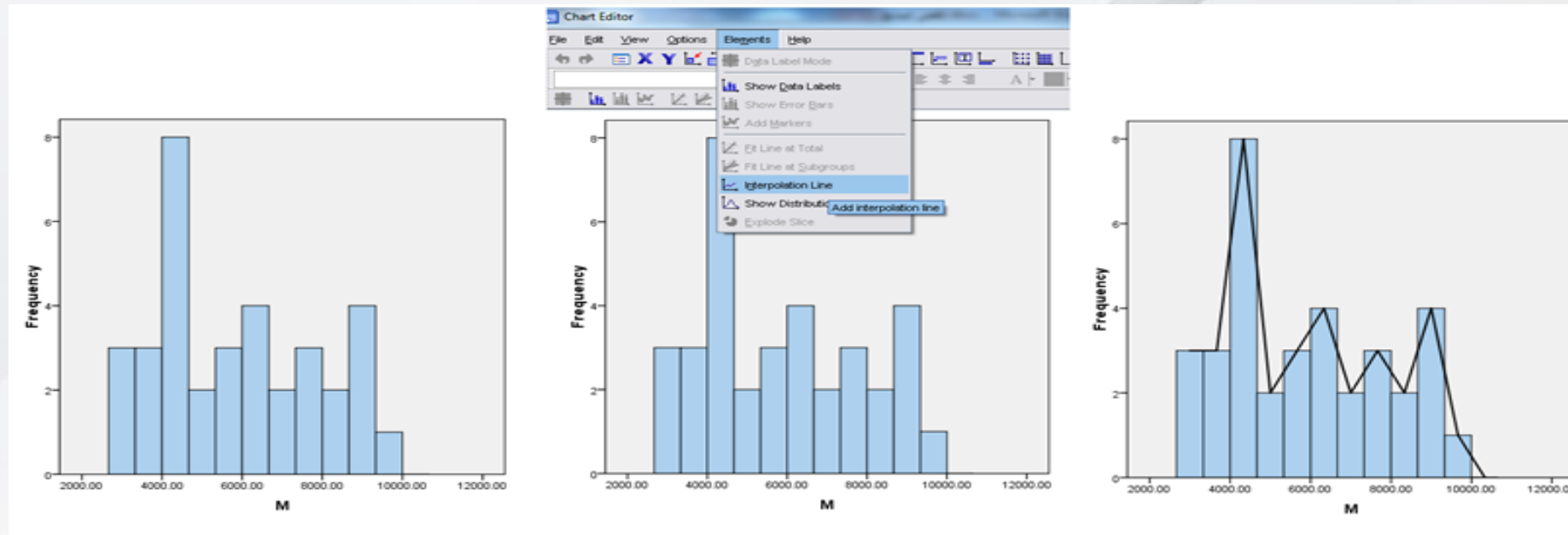


# View and analyze data using SPSS software

The first stage is data presentation.

c) Histogram and Interpolation line: connected quantitative data.

We chose the Chart editor, and then we chose the Interpolation line from the list of elements.



# View and analyze data using SPSS Software

**The second stage: describing the data using statistical measures**

**A good scale:**

- Its exact value should be determined and not left to objectivity.
- To enter all data or observations in his account.
- Easy to understand and calculate.
- His ability to coercive dealing.
- Not affected by outliers (extremes).

# View and analyze data using SPSS Software

The second stage: describing the data using statistical measures

(descriptive statistical measures)

## Definition of central tendency

It is the tendency of the data to center around a specific value in the middle of the data.

### **A. The measure of central tendency:**

- Mean
- Median
- Mod

# View and analyze data using SPSS software

## Mean

It is the most common and used measure in all scientific and practical fields, and the process of measuring the arithmetic mean is a very simple process, as in the first step, all the values are collected, and in the second step, the sum of the values is divided by their number to obtain the arithmetic mean for a group of values

## Median

It is the value that lies in the middle of the data distribution

# View and analyze data using SPSS Software

## Mod

The measure determines the value or variable that occurs frequently in the data distribution. The mode can be calculated for any quantitative or descriptive data.

# View and analyze data using SPSS Software

## **B. Frequency Table:**

It is a table that organizes and summarizes statistical data, whether descriptive or quantitative and distributes them to categories that determine the number of individuals who belong to each category.

# View and analyze data using SPSS Software

## C. Measures of Dispersion:

To determine the extent of convergence, homogeneity, or divergence of the given data, we need measures other than measures of central tendency. These measures are called measures of dispersion.

The dispersion of the data (i.e., the divergence around the mean value of the data) can be measured by several measures:

- **Variance**
- **Standard Deviation**
- **RANGE**

# View and analyze data using SPSS Software

## ❖ Variance

To calculate it, the arithmetic mean must be found first, then, subtract each value given in the data from the arithmetic mean, square it, add all the results from the squaring process, and divide the result by the number of values.

## ❖ Standard deviation

It is a measure of dispersion, which measures how far away or close the data are from their arithmetic mean

is the positive square root of the variance

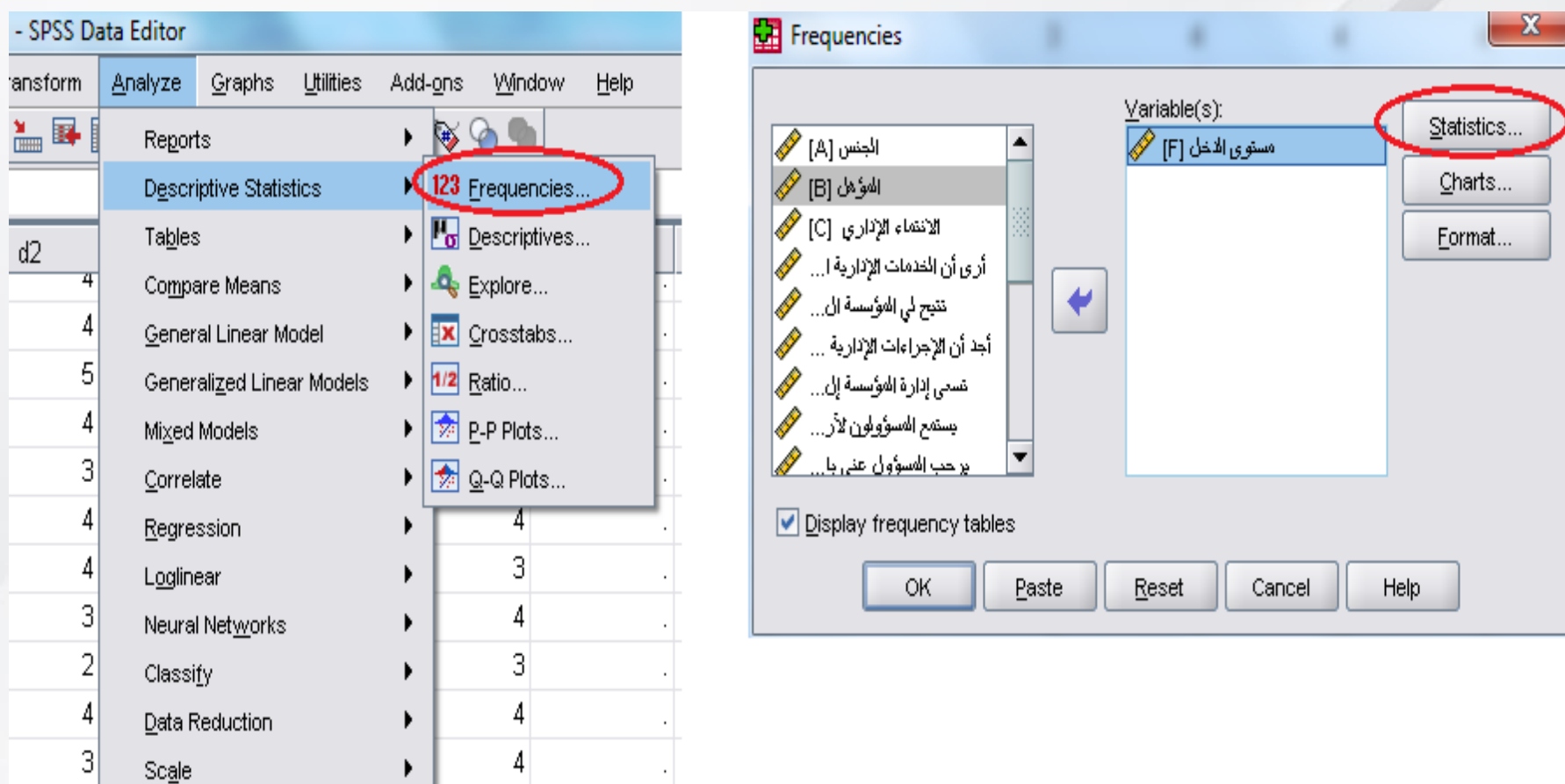
## View and analyze data using SPSS Software

### ❖ Range

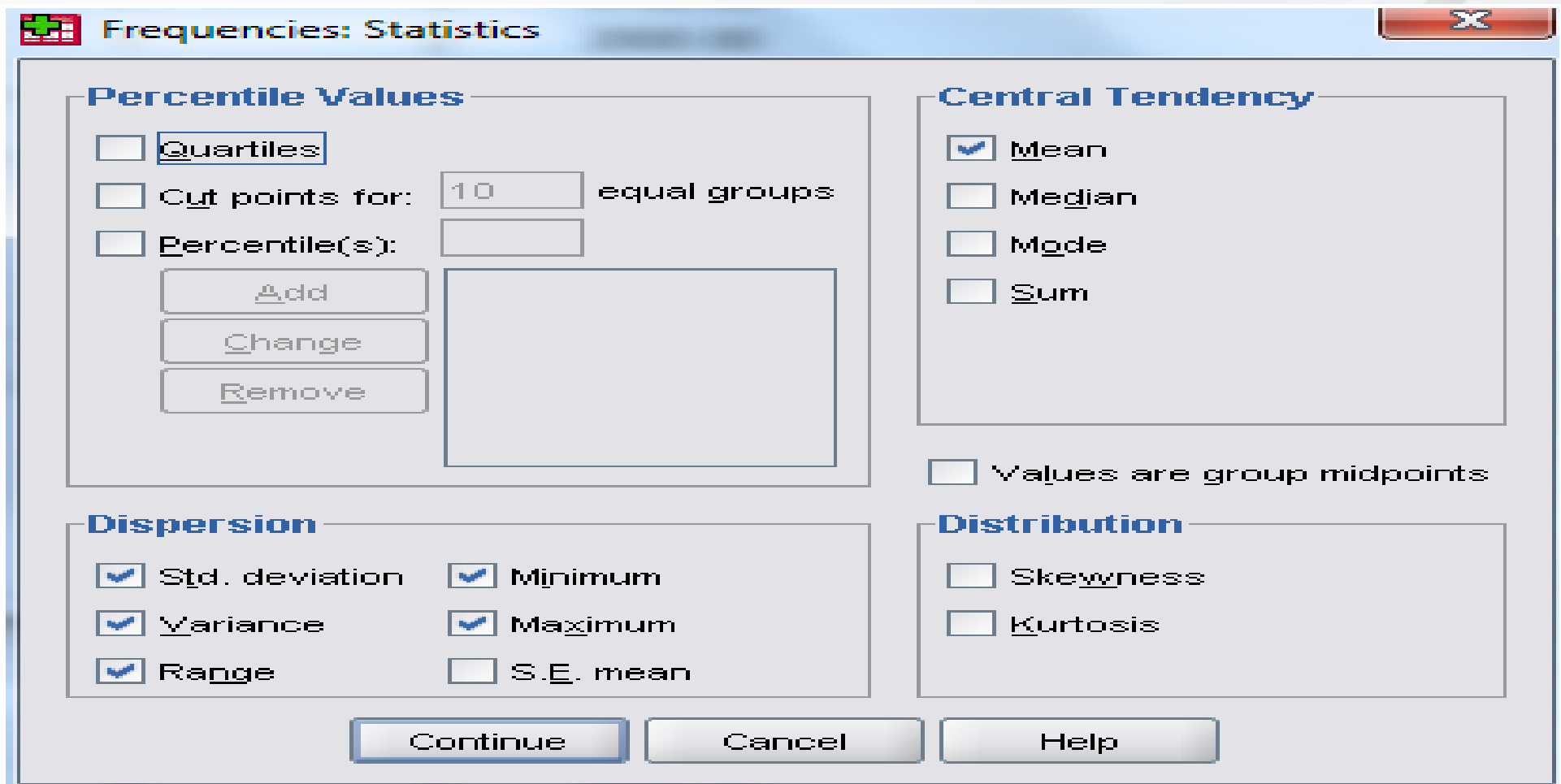
It is the difference between the most significant and lowest values of the data, symbolized by the symbol (R).

# View and analyze data using SPSS Software

## ❖ The second stage: describing the data using statistical measures



# View and analyze data using SPSS Software



The image shows the 'Frequencies: Statistics' dialog box in SPSS. It is divided into four main sections: Percentile Values, Central Tendency, Dispersion, and Distribution. The 'Percentile Values' section has three checkboxes: 'Quartiles' (unchecked), 'Cut points for: 10 equal groups' (unchecked), and 'Percentile(s):' (unchecked). Below these are three buttons: 'Add', 'Change', and 'Remove'. The 'Central Tendency' section has four checkboxes: 'Mean' (checked), 'Median' (unchecked), 'Mode' (unchecked), and 'Sum' (unchecked). Below this is a checkbox for 'Values are group midpoints' (unchecked). The 'Dispersion' section has six checkboxes: 'Std. deviation' (checked), 'Variance' (checked), 'Range' (checked), 'Minimum' (checked), 'Maximum' (checked), and 'S.E. mean' (unchecked). The 'Distribution' section has two checkboxes: 'Skewness' (unchecked) and 'Kurtosis' (unchecked). At the bottom are three buttons: 'Continue', 'Cancel', and 'Help'.

**Frequencies: Statistics**

**Percentile Values**

- ☐ Quartiles
- ☐ Cut points for:  equal groups
- ☐ Percentile(s):
- 
- 
- 

**Central Tendency**

- ☒ Mean
- ☐ Median
- ☐ Mode
- ☐ Sum
- ☐ Values are group midpoints

**Dispersion**

- ☒ Std. deviation
- ☒ Variance
- ☒ Range
- ☒ Minimum
- ☒ Maximum
- ☐ S.E. mean

**Distribution**

- ☐ Skewness
- ☐ Kurtosis

# View and analyze data using SPSS Software

❖ The second stage: describing the data using statistical measures

| Monthly income variable |         |
|-------------------------|---------|
| Statistics              | Value   |
| Mean                    | 5897.1  |
| Std. Deviation          | 2026.6  |
| Variance                | 4107000 |
| Range                   | 6700    |
| Minimum                 | 2800    |
| Maximum                 | 9500    |

# View and analyze data using SPSS Software

❖ The Second Stage: describing the data using statistical measures

## Frequency

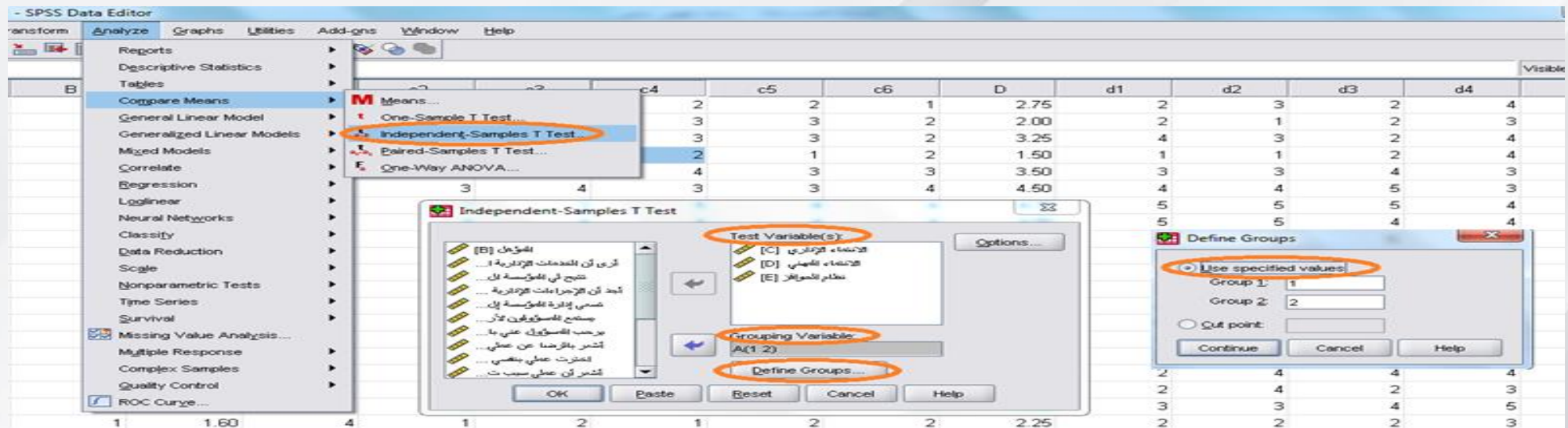
| The Degree    | Frequency | Percent |
|---------------|-----------|---------|
| Primary       | 4         | 11.4    |
| Middle School | 6         | 17.1    |
| High School   | 9         | 25.7    |
| Diploma       | 5         | 14.3    |
| BSC           | 11        | 31.4    |
| Total         | 35        | 100.0   |

# View and analyze data using SPSS Software

## ❖ The third stage:

a) Comparing the mean of two different groups:

Example: In our previous example, we will test the difference or equality between the averages of the three variables (administrative affiliation, professional affiliation, and incentive system) according to each gender (male, female).



# View and analyze data using SPSS Software

## ❖ The third stage:

a) Comparison of the mean of two different groups:

| Variable                      | M&F      | N  | Mean  | Std. Deviation |
|-------------------------------|----------|----|-------|----------------|
| administrative<br>affiliation | <b>M</b> | 23 | 3.087 | .92013         |
|                               | <b>F</b> | 12 | 3.200 | .82682         |
| professional<br>affiliation   | <b>M</b> | 23 | 3.511 | 1.04305        |
|                               | <b>F</b> | 12 | 3.583 | .57735         |
| Incentive System              | <b>M</b> | 23 | 3.250 | .90139         |
|                               | <b>F</b> | 12 | 3.500 | .48850         |

# View and analyze data using SPSS Software

❖ The third stage: a) Comparing the mean of two different groups:

| Independent Samples Test   |                             |                                         |      |                              |       |      |
|----------------------------|-----------------------------|-----------------------------------------|------|------------------------------|-------|------|
| Variable                   |                             | Levene's Test for Equality of Variances |      | t-test for Equality of Means |       |      |
|                            |                             | F                                       | Sig. | t                            | df    | Sig. |
| administrative affiliation | Equal variances assumed     | .142                                    | .709 | -.357                        | 33    | .724 |
|                            | Equal variances not assumed |                                         |      | -.369                        | 24.66 | .715 |
| professional affiliation   | Equal variances assumed     | 10.628                                  | .003 | -.223                        | 33    | .825 |
|                            | Equal variances not assumed |                                         |      | -.264                        | 32.80 | .793 |
| Incentive System           | Equal variances assumed     | 8.049                                   | .008 | -.891                        | 33    | .380 |
|                            | Equal variances not assumed |                                         |      | -1.064                       | 32.89 | .295 |

# View and analyze data using SPSS Software

## ❖ The third stage: b) One-way ANOVA:

The screenshot shows the SPSS Data Editor interface. The 'Analyze' menu is open, and 'One-Way ANOVA...' is selected. The 'One-Way ANOVA' dialog box is displayed, showing the 'Dependent List' and 'Factor' fields. The 'Dependent List' contains '[C] الانتماء الإداري', '[D] الانتماء المهني', and '[E] نظام الحوافز'. The 'Factor' field contains '[B] المؤهل'. The background data table is visible, showing columns c2, c4, c5, c6, D, and d1.

| c2 | c4 | c5 | c6   | D    | d1 |
|----|----|----|------|------|----|
| 2  | 2  | 1  | 2.75 |      |    |
| 3  | 3  | 2  | 2.00 |      |    |
| 3  | 3  | 2  | 3.25 |      |    |
| 2  | 1  | 2  | 1.50 |      |    |
| 4  | 3  | 3  | 3.50 |      |    |
| 3  | 4  | 3  | 4    | 4.50 |    |

# View and analyze data using SPSS Software

❖ The third stage: b) One-way ANOVA:

**Sum of Squares:**

- Between Groups
- Within Groups
- df
- Mean Square
- F ratio

**Null hypothesis:** The means of the sampled populations are equal.

**Alternative hypothesis:** There are at least two sampled populations with different means.

# View and analyze data using SPSS Software

**b) One-way ANOVA** The analysis of the variance test indicates that the value of F for the three variables is significant at 1%, which means that there is a significant difference in the averages of these variables according to qualification

| ANOVA                      |                |                |    |             |        |      |
|----------------------------|----------------|----------------|----|-------------|--------|------|
| Variable                   |                | Sum of Squares | Df | Mean Square | F      | Sig. |
| administrative affiliation | Between Groups | 20.858         | 4  | 5.215       | 29.031 | .000 |
|                            | Within Groups  | 5.389          | 30 | .180        |        |      |
|                            | Total          | 26.247         | 34 |             |        |      |
| professional affiliation   | Between Groups | 24.294         | 4  | 6.073       | 54.407 | .000 |
|                            | Within Groups  | 3.349          | 30 | .112        |        |      |
|                            | Total          | 27.643         | 34 |             |        |      |
| Incentive System           | Between Groups | 18.177         | 4  | 4.544       | 48.408 | .000 |
|                            | Within Groups  | 2.816          | 30 | .094        |        |      |
|                            | Total          | 20.993         | 34 |             |        |      |

# View and analyze data using SPSS Software

## ❖ C) Measuring the correlation between variables: Correlation

- Correlation coefficient between +1 and -1
- Correlation coefficient between two variables between  $\pm 0.01$ ,  $\pm 0.3$  (**weak correlation**)
- Correlation coefficient ranged from  $\pm 0.3$ , with  $\pm 0.6$
- The correlation coefficient is between  $\pm 0.6$  and  $\pm 0.99$  (**strong correlation**)
- Correlation coefficient = 1, **perfect correlation**
- Pearson Correlation

# View and analyze data using SPSS Software

## D) Correlation

The screenshot displays the SPSS Data Editor interface. The 'Analyze' menu is open, and the 'Correlate' option is selected, leading to the 'Bivariate...' dialog box. The 'Bivariate Correlations' dialog box is shown with the following settings:

- Variables:** [C] الانتماء الإداري, [D] الانتماء المهني, [E] نظام الحوافز, [M] الدخل الشهري
- Correlation Coefficients:** ☒ Pearson, ☐ Kendall's tau-b, ☐ Spearman
- Test of Significance:** ☒ Two-tailed, ☐ One-tailed
- ☒ Flag significant correlations

The background shows a data table with columns labeled c2, c3, c4, c5, c6, D, d1, and d2. The data values are as follows:

|   | c2 | c3 | c4 | c5 | c6 | D    | d1 | d2 |
|---|----|----|----|----|----|------|----|----|
| 1 | 2  | 2  | 2  | 2  | 1  | 2.75 | 2  |    |
| 2 | 1  | 1  | 1  | 1  | 1  | 2.75 | 2  |    |
| 3 | 3  | 3  | 3  | 3  | 3  | 2.75 | 2  |    |
| 4 | 1  | 1  | 1  | 1  | 1  | 2.75 | 2  |    |

# View and analyze data using SPSS Software

## D) Correlation

| Variables                     |                                        | administrat<br>ive affiliation | professional<br>affiliation | Incentive<br>System | Monthly<br>Income |
|-------------------------------|----------------------------------------|--------------------------------|-----------------------------|---------------------|-------------------|
| administrative<br>affiliation | Pearson Correlation<br>Sig. (2-tailed) | 1                              |                             |                     |                   |
| professional<br>affiliation   | Pearson Correlation<br>Sig. (2-tailed) | .841**<br>.000                 | 1                           |                     |                   |
| Incentive<br>System           | Pearson Correlation<br>Sig. (2-tailed) | .840**<br>.000                 | .901**<br>.000              | 1                   |                   |
| Monthly Income                | Pearson Correlation<br>Sig. (2-tailed) | .781**<br>.000                 | .846**<br>.000              | .789**<br>.000      | 1                 |

# View and analyze data using SPSS Software

## E) Linear Regression analysis

- The causal relationship between the variables
- The dependent variable and the dependent variable (or variables).
- Simple linear regression:  $Y = a + b X + u$
- Multiple linear regression:  
 $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_nX_n + u$



# Thank You