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## Average and Standard Deviation

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### 1. Menu

#### File

- \*Save As : Saves the image with a filename.
- \*Printer Setup : Allows printer section and the setup.
- \*Print Zoom : Sets the print zooming factor.
- \*Print : Prints the image.
- \*Exit : Closes the application.

#### Edit

- \*Copy : Copies the image to Clipboard.

#### Statistics

- \*Data Input : Sets data for the analysis.
- \*Previous Page : Moves to the previous page.
- \*Next Page : Moves to the next page.
- \*Analysis : Analyzes the data.

#### Data

- \*Data Read : Reads data from a data file.
- \*Data Save : Copies the data to a file.

### 2. Introduction

Is it enough for you to calculate the <mean> and <standard deviation> of a data set in statistical data analysis?

It seems to me these are not sufficient to understand the characteristics of a data set.

For example, suppose Company <A> has 50 employees and Company <B> has 20 employees. The bank deposits of the employees are as follows;

#### Company A:

Size of Bank Account	No. of employees
\$10000	2 persons
\$20000	4 persons
\$30000	6 persons
\$40000	8 persons
\$50000	10 persons
\$60000	8 persons
\$70000	6 persons
\$80000	4 persons
\$90000	2 persons

#### Company B:

Size of Bank Account	No. of employees
\$50000	16 persons
\$94721	2 persons
\$5279	2 persons

Both data sets have \$50 k and \$400 k for the mean and the variance (denominator = N), respectively.

Do you think that the employees of both companies have the same characteristics in the pattern of their deposits including the <Confidence Interval>?

### 3. Inputting Data

- (1) Open the Data Input Window by pressing the <Data Input> button, or by clicking the <Data Input> menu.
- (2) Input a datum by keyboard and press <Enter>. Repeat for all entries.
- (3) If you want to correct a datum before hitting <Enter> key, use the <Backspace> key. After correcting the datum press <Enter>.

- (4) If you want to correct a datum after pressing <Enter> key, use <Up> /<Down> key (or, Mouse right button click under the I-Beam Cursor) and/or <Previous Page> / <Next Page> menu so as to set the Caret to the datum that will be corrected. Then, input a new datum. After correcting the datum press <Enter> to fix the datum.

[NOTE] The maximum number of data to be analyzed is 1000.

#### **4. Saving Inputted Data**

- (1) Click <Data Save> menu.
- (2) Set an appropriate filename (and drive, directory) to save the data as Text format with the file structure of section 5.

#### **5. Reading an External Data File**

- (1) Press <Data Read> button, or click <Data Read> menu.
- (2) The External Data File should be in <Text Format> having the following file structure;  
Numerical Value + (Enter) + Numerical Value + (Enter) + ..... + Numerical Value + (Enter)  
This kind of data-file can be created by Text Editor(s) for Windows/DOS, or NotePad for Windows.  
If you want to add comment(s), the following format should be kept;  
;This is a comment. (+Enter)  
[Note] A semicolon is required at the head of a comment line.
- (3) Data files formatted in any other way cannot be read by this software.
- (4) Please refer to an example file, EXAMPLE.TXT.

#### **6. Analyzing Data**

- (1) Press <Analysis> button, or click <Analysis> menu.
- (2) Set appropriate values for <Interval Number in Graph> and <Confidence Probability for mean and standard deviation>, in <Analysis Condition> dialog.
- (3) Then click <OK> button in the dialog.

[Note]

- (a) <Interval Number in Graph> is defined as the number of bars between minimum and maximum values of data.

\* According to statistical data analysis, reasonable number of bars in the graph is estimated by:

$$3.3 \log_{10}(\text{Number of Data}).$$

- (b) It is assumed that the Population has a Gaussian Distribution.

#### **7. Saving a Graph**

- (1) Press <Save As> button, or click <Save As> menu.
- (2) Set an appropriate filename (and drive, directory) to save the data in Bitmap format.

#### **8. Printing a Graph**

- (1) If necessary, set appropriate values for <Printer Setup> and/or <Print Zoom> menus.
- (2) Press <Print> button, or click <Print> menu.
- (3) Follow the instructions for printing which appear on the screen.

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## **10. Supplement**

**If**

**“m” is defined as “mean (unbiased estimator),”**

**“V<sup>2</sup>” is defined as “variance (unbiased estimator),” and**

**“s” is defined as “standard deviation (unbiased estimator),”**

**we can get the following equations.**

$$\mathbf{m} = \frac{\sum_{i=1}^N \mathbf{X}_i}{N}, \quad \mathbf{V}^2 = \frac{\sum_{i=1}^N (\mathbf{X}_i - \mathbf{m})^2}{N-1}, \quad \mathbf{s} = \sqrt{\frac{N-1}{2}} \frac{\Gamma\left(\frac{N-1}{2}\right)}{\Gamma\left(\frac{N}{2}\right)} \sqrt{\mathbf{V}^2},$$

**where,  $\Gamma(\mathbf{x})$  is the Gamma function.**

**(C) Kimio Kanda**