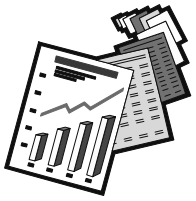

Exemplar 9：

Analysis and Interpretation of Data

Objectives： (1) To compare the distributions of two sets of data by constructing a back-to-back stem-and-leaf diagram
(2) To construct data set with a given mean, median and mode.

Learning Unit：Measures of Central Tendency

Key Stage：3

Material Required：Statistical software - *Winstats*

Prerequisite Knowledge： (1) Construction of stem-and-leaf diagram by using paper and pencil
(2) Calculations of mean, mode and median

Description of the Activity：

1. The teacher distributes the worksheet to students.

2. The teacher guides students to construct a stem-and-leaf diagram by using *Winstats* on the data in Test 1 of the worksheet.

3. The teacher helps students to recall how to read the mode and the median from a stem-and-leaf diagram.

4. Students are divided into groups.

5. Students are asked to construct a back-to-back stem-and-leaf diagram by using *Winstats* on the data given in Test 1 and Test 2.

6. Students compare the similarities and differences on the information obtained from the diagram.

7. Some representatives are invited to present their findings to the class. The teacher can make comments at appropriate times.

8. Each student is asked to construct a data set of any size with the same mean, same median and same mode as the two given data sets. Students are reminded that there is no need to keep the number of terms at 20.

9. Students are asked to compare the data set obtained with those of their group members. They describe briefly what they observe.

10. Some representatives are invited to present their findings to the class. The teacher can make comments at appropriate times.

Worksheet : Analysis and Interpretation of Data

1. The marks of twenty students in a mathematics test (Test 1) are :

72	24	67	35	64
53	41	42	61	42
52	39	56	58	42
36	27	16	73	80

(a) Use *Winstats* to construct a stem-and-leaf diagram for these data.

(b) Which measure(s) of central tendency can you read from the diagram directly? Write down its (their) value(s).

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(c) Find the mean of the data by using a calculator or the computer software *Excel*.

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2. The marks of the same class in another mathematics test (Test 2) are:

74	26	37	28	59
42	42	39	42	54
47	67	48	47	55
38	48	14	75	98

(a) Use *Winstats* to construct a back-to-back stem-and-leaf diagram for the data in Test 1 and Test 2.

(b) Complete the following table.

	Test 1	**Test 2**	**Comparison of the measures under the columns "Test 1" and "Test 2"**
Mean			
Mode			
Median			

(c) By comparing the appearance of the diagram in 2(a), what can you say about the distributions of the two data sets?

_____

_____

3. Construct a data set with the same mean, same median and same mode as the data sets given in Test 1 and Test 2.

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4. Compare the data set constructed above with those from your group members. Describe briefly what you observe from them.

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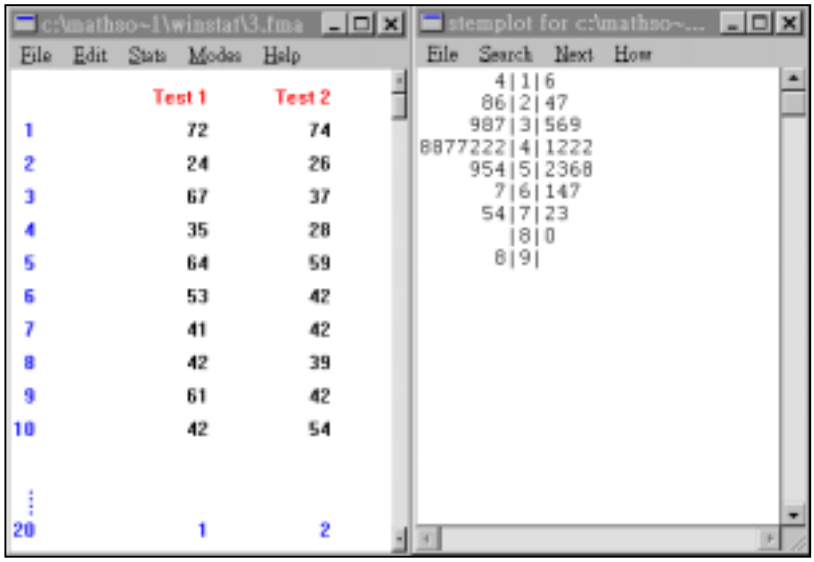
Notes for Teachers:

1. The freeware Winstats can be downloaded from the web site *http://math.exeter.edu/rparris/*.

2. From the stem-and-leaf diagram, we can read the median and the mode of the data directly. The appearance of the diagram shows the distribution of the data. However, we cannot find the mean from the diagram directly.

3. The back-to-back stem-and-leaf diagram for the data in Test 1 and Test 2 is given in figure below.



4. Answers for point 2 in the worksheet:

	Test 1	**Test 2**	**Comparison of the measures under the columns "Test 1" and "Test 2"**
Mean	49	49	the same
Mode	42	42	the same
Median	47	47	the same

The data set in Test 1 is symmetric while that in Test 2 is clustered slightly towards smaller values.

5. Answers for point 3 in the worksheet:
   Some suggested data sets having median 47, mean 49 and mode 42 are listed below. These answers are not exhaustive.
   (a) 42, 42, 47, 49, 65
   (b) 2, 42, 42, 46, 48, 49, 50, 113
   (c) 19, 26, 42, 42, 47, 52, 59, 70, 87

6. Answer for point 4 in worksheet 1:
   Data sets with same median, same mode and same mean may not be identical.

Operation Procedure：

(I) Input data:

1. Choose **Window | 1-var**.
2. Choose **Edit | Dimension** to set the input format. Enter '**20**' for rows and '**2**' for columns if you want to input 2 sets of data with 20 entries in each set.
3. Choose **Edit | Format** to set the number of digits and decimal places. Enter '**3**' for field width and **'0'** for decimal places if the data have at most 3 digits and no decimal places.
4. Click the word '**unnamed**' to name the column and enter the name, say 'Test 1'.
5. Choose **Edit | Autofeed** to enter the data. Click the **0**s in the column and enter the data. Press **Enter** to move the cursor to the next row.

(II) Draw the stem-and-leaf diagram:

1. Click **Stats | Column 1 only**. Enter a value in the box under the question 'data from which column?'. If you want to draw the stem-and-leaf diagram for the data from column 1, then enter '**1**' in this box.
2. Click **OK**.
3. Click **Stats | Stemplot**.

(III) Draw the back-to-back stem-and-leaf diagram:

1. Firstly, draw a stem-and-leaf diagram for the data in column 1 (See II above).
2. Click **Stats | Column 1 only**. Enter a value '**2**' in the box under the question 'data from which column?'. Click **OK**.
3. Click **Stats | Double stemplot**.
4. Click **Stats | Stemplot**.