Topic: Stem - and - Leaf Diagrams

Level: Key Stage 3

Dimension: Data Handling
Module: Organization and Representation of data
Unit: Construction and Interpretation of Simple Diagrams and Graphs

Student ability: High

Content Objectives:

After completing the activity, students should be able to draw stem-and-leaf diagrams and extract information by interpreting the diagram.

Language Objectives:

After completing the activity, students should be able to:

- understand the English terms used in stem-and-leaf diagrams (e.g., d*ata, organize, present, useful information, stem-and-leaf diagrams, arrange, place value, digits, left column, right column, ascending order, highest, lowest* and *frequency*);
- understand the English expressions for explaining the characteristics of a stem-and-leaf diagram, e.g.,
  - *After collecting data, we need to organize them properly so that they become useful information.*
  - *In a stem-and-leaf diagram the data are arranged by place value.*
  - *The left column represents the "stem". The right column represents the "leaf".*
  - *The "leaf" of a number is usually the last digit in a number, whereas the "stem" is the remaining digit or digits to the left.*
- understand and use the English expressions for explaining the procedures for constructing a stem-and-leaf diagram, e.g.,
  - *Step 1: Group the data*
  - *Step 2: Arrange the data of each group in ascending order*
  - *Step 3: Write down the common digits of each group on the left and the remains digit on the right*
- understand and use the English expressions for discussing the findings from a stem-and-leaf diagram, e.g.,
  - *The group with 80-89 marks has the highest frequency.*
  - *There are 3 students having 100 marks.*
  - *The lowest score is 21 marks.*
  - *There are 2 groups with both frequencies equal to 3.*
  - *There are 5 scores in the group of 90-99 marks.*
- follow English instructions on solving problems concerning this topic and work on related problems written in English.

Prerequisite knowledge:

Students should be able to draw a frequency distribution table from raw data.

Time: 2 lessons (2 x 40 minutes)

Procedure:

Lesson 1:

1. The teacher should first distribute the worksheet to students.
2. The teacher should then remind students of what they have learned before about frequency distribution tables.
3. The teacher should the ask students to study the frequency distribution table in part (a). At the same time, the teacher should introduce the English terms (e.g. tally and frequency).
4. The teacher should then ask students to finish parts (b) – (d).
5. The teacher should discuss the procedures for drawing stem-and-leaf diagrams.
6. Students should then use the scores in the exercise to construct a stem-and-leaf diagram.

Lesson 2:

1. The teacher should first check students' stem-and-leaf diagrams using the diagram on the worksheet for lesson 2.
2. The teacher should then ask each student to think of 5 points related to the stem-and-leaf diagram.
3. The teacher should ask some students to read out their points. Other students should add those points which they had not thought of previously to their own lists.
4. The teacher should then ask follow-up questions and students should answer the questions in English.

Explanatory Notes for Teachers

1. These teaching materials should be used after the teacher has introduced the concepts of collecting data, classifying data and drawing frequency distribution tables.

2. Using the last question of (a), the teacher can stimulate students to think about the disadvantages of frequency distribution tables and how to modify them.

3. Using (b), (c), (d) and (e), the teacher can guide students to understand the steps for constructing a stem-and-leaf diagram. Then, students can write down the steps in the next section by themselves.

4. In (c), the teacher can, if necessary, demonstrate how to do the first row of the table for the students in order to explain the meaning of ascending order.

5. In order to facilitate the rundown of the lesson, the data for constructing the stem-and-leaf diagram in the exercise will be provided. On the other hand, if time allows, the teacher can ask students to collect data themselves. The data to be collected should be what students are familiar with (e.g. the heights of their classmates). Students will then be more interested in the discussion which follows.

6. The teacher can give examples to students if they do not understand how to present their findings from the stem-and-leaf diagram of the exercise in lesson 2.

S.1 Mathematics

Introduction to Statistics Worksheet (1)

Name: _____ Class: _____ ( )

After collecting data, we need to organize them properly so that they become useful information.

The following shows the speed of 30 cars on the highway (in km/h):

110	118	85	92	93	105
112	100	99	106	87	81
86	84	122	117	102	109
120	121	104	81	83	100
95	93	110	94	97	105

(a) Construct a ***frequency distribution table*** (頻數分佈表) to present the above data.

Speed (km/h)	Tally (劃記)	Frequency (頻數)
80 - 89		
90 - 99		
100 -109		
110 -119		
120 -129		
	Total	

What information is lost in the frequency distribution table?

_____

Actually, we can organize the data and at the same time keep all the information.

(b) Complete the following table. Put the data in the correct groups. (The data from the first column above has been entered for you as an example)

Speed range (km/h)	Speed (km/h)
80-89	86,
90-99	95,
100-109	
110-119	110, 112,
120-129	120,

(c) The table can be improved by arranging the data of each group in ***ascending order*** (遞增).

Speed range (km/h)	Speed (km/h)
80-89	
90-99	
100-109	
110-119	
120-129	

(d) The table can be simplified by writing the tens and hundreds digits once only.

tens & hundreds digit	units digit
8	
9	
10	
11	
12	

(e) The above table can be presented as follows:

Stem (tens and hundreds km/h)	Leaf (1 km/h)
8	
9	
10	
11	
12	

This is called a ***Stem-and-leaf Diagram*** (幹葉圖).
The left column represents the stem of a tree branch, the right column represents the leaves.

From (a) to (d), we can write down the procedures for creating a stem-and-leaf diagram.

Step 1: Group the data

Step 2: _____

Step 3: _____

Exercise:

The Mathematics test result for S.1A of ABC school is shown below:

100	50	67	75	89	48
47	76	67	51	95	81
90	91	100	96	88	21
33	84	84	64	72	98
69	70	72	38	89	53
45	100				

Draw a stem-and-leaf diagram to present the above data.

S.1 Mathematics
Introduction to Statistics Worksheet (2)

Name: _____ **Class: _____ ( )**

Interpreting the diagram

Here is the stem-and-leaf diagram for the previous exercise:

Stem (tens & hundred marks)	Leaf (unit marks)
2	1
3	3, 8
4	5, 7, 8
5	0, 1, 3
6	4, 7, 7, 9
7	0, 2, 2, 5, 6
8	1, 4, 4, 8, 9, 9
9	0, 1, 5, 6, 8
10	0, 0, 0

(a) Using the stem-and-leaf diagram, write down 5 findings from the data.

1. _____

2. _____

3. _____

4. _____

5. _____

(b) Answer the following questions by referring to the above diagram.

(i) How many students' scores are greater than or equal to 50 marks?
_____

(ii) If the passing mark is 50, what is the passing percentage?
_____

(iii) If the passing mark is 60, what is the passing percentage?
_____

(c) Write down 2 questions about the above diagram for your classmates. (You should provide the answers to your questions.)

(i) _____

_____

(ii) _____

_____

Suggested answers

Introduction to Statistics Worksheet (1)

(a)

Speed (km/h)	Tally (劃記)	Frequency (頻數)
80 – 89	𝍸 //	7
90-99	𝍸 //	7
100-109	𝍸 ///	8
110-119	𝍸	5
120-129	///	3
	Total	30

<u>The original data is lost.</u>

(b)

Speed range (km/h)	Speed (km/h)
80-89	86, 84, 85,81, 87,83,81
90-99	95, 93, 99, 92,94, 93,97
100-109	100,104, 106, 102, 105,109, 100, 105
110-119	110, 112, 118, 110,117
120-129	120, 121, 122

(c)

Speed range (km/h)	Speed (km/h)
80-89	81, 81, 83, 84, 85, 86,87
90-99	92, 93, 93, 94, 95, 97, 99
100-109	100, 100,102, 104, 105, 105,106, 109
110-119	110, 110, 112, 117, 118
120-129	120, 121, 122

(d)

tens & hundreds digit	Units digit
8	1, 1, 3, 4, 5, 6, 7
9	2, 3, 3, 4, 5, 7, 9
10	0, 0, 2, 4, 5, 5, 6, 9
11	0, 0, 2, 7, 8
12	0, 1, 2

Step 2: Arrange the data of each group in ascending order
Step 3: Write down the common digits of each group on the left and the remains digit on the right

Introduction to Statistics Worksheet (2)
(a) e.g.
1. The group from 80-89 marks has the highest frequency.
2. There are 3 students having 100 marks.
3. The lowest score is 21 marks.
4. There are 3 groups with frequency equal to 3.
5. There are 5 scores in the group of 90-99 marks.

(b)
(i) There are 26 students' scores greater than 50 marks.
(ii) 26/32x100% = 81.25%
(iii) 23/32x100% = 71.875%