



**DIAMOND ACADEMY**

**MATHEMATICS**

**FOR**

**GRADE 11**

**TERM-2      WEEK-5**

**ACADEMIC YEAR 2021/22**

**BY: Girum Kelemework**



# **Mathematics for Grade 11**

**Term - 2      Week - 5**

## **Lesson-2**

**Introduction to Grouped Data**

**Page: 149-152**

Girum Kelemework



## **Revision about previous lesson:**

- **Statistics**
- **Steps in statistical survey**
- **Variable Vs data**
- **Types of variables/data**
- **Types of quantitative variable/data**



## **Lesson Objective:**

At the end of this lesson students should be able to:

- explain the fundamental reasons for grouping data
- explain the general guidelines in designing frequency distributions
- explain the steps in construction of a grouped frequency distribution



## **Key Terms:**

- **Class**
- **Class width / Class interval**
- **Class limits**
- **Correction factor**
- **Class boundaries**
- **Class mark**





## Introduction to grouped data

### Why we need to group data?

There are two fundamental reasons for grouping data.

- Because it is cumbersome or even impossible to deal with data in raw form.
- Because grouping facilitates effective decision making.

In this section we shall see how to organizing data using tables called frequency distribution.



### **Definition: /Grouped Frequency Distribution/**

A grouped frequency distribution is a table that shows the list of values of a variable arranged in order of their magnitude into classes and the number of data values that occur in each class/ frequency/.

**Example:** Consider the number of cattle per family of 10,000 families

Number of cattle per family	Number of families
0-9	1000
10-19	2500
20-29	3000
30-39	2500
40-49	1000



- The intervals 0-9, 10-19, etc are called classes
- The numbers 1000,2500, etc are called frequencies
- The frequency of a class represents the number of observations included in the given class.
- The smallest values in each class, such as 0, 10, 20, etc are called lower class limits (LL) and the largest values in each class, such as 9, 19, 29 etc are called upper class limits (UL).





## **Definition /class mark/**

The average of the upper and lower class limit is called the class mark or class midpoint.

$$\text{Class mark} = (\text{lower class limit} + \text{upper class limit}) / 2$$

Class marks are representatives of their classes.

## **Definition /correction factor/**

The correction factor is half the difference between the lower class limit of a class and the upper class limit of the preceeding class.

$$\text{Correction factor} = (\text{LL of a class} - \text{UL of the preceeding class}) / 2$$



### **General guidelines in designing frequency distributions**

1. Classes should be complete /Inclusive/
2. Classes should be well defined
3. Classes should be non-overlapping
4. Classes should be continuous, especially for continuous data
5. Number of classes ( $k$ ) should not be too few or too many. As a recommendation  $k$  shall be b/n 5 and 20.
6. Classes should have equal width, except possibly the first and the last classes. As a recommendation, class width shall be an odd integer. This helps class marks to be integers as well.



### Steps in construction of a Continuous Frequency Distribution

1. Determine the number of classes (k).
2. Determine the class width (w): where

$$\text{Class width} = (\text{Largest value} - \text{Smallest value}) / k$$

3. Determine class limits
4. Determine class boundaries

$$\text{Lower class boundary} = \text{Lower class limit} - \text{Correction factor}$$

$$\text{Upper class boundary} = \text{Upper class limit} + \text{Correction factor}$$

5. Tally the data and find frequencies
6. Find cumulative frequencies.

- **Cumulative frequency** of a class is the number of data values that are less than or equal to the UB of that class.



**Example:** The marks obtained by a class of 100 students in statistics final examination (out of 50%) are given below.

Construct a frequency distribution for the data using 8 classes.

	22	47	9	42	31	17	13	15	18	13	2
27	38	15	1	33	10	34	29	26	16	25	33
36	10	24	22	26	19	14	36	18	25	21	33
35	25	18	28	25	17	38	10	3	31	24	3
12	16	33	18	26	29	27	29	28	35	26	27
6	8	15	22	29	5	10	16	23	4	12	17
24	30	36	42	1	14	38	43	21	44	37	31
28	44	2	9	17	25	35	32	40	45	42	5
8	15	23	30								





Solution:

$$n = 8$$

$$L = 47$$

$$S = 1$$

$$k = 7$$

$$w = \frac{L - S}{k} = \frac{47 - 1}{8} = \frac{46}{8} = 5.75$$

Take  $w = 6$

Class limits	Class boundaries	Tally	frequency	Cum. Freq.
1-6	0.5-6.5		10	10
7-12	6.5-12.5		10	20
13-18	12.5-18.5	 	19	39
19-24	18.5-24.5	 	12	51
25-30	24.5-30.5	           /	21	72
31-36	30.5-36.5	 	15	87
37-42	36.5-42.5		8	95
43-48	42.5-48.5		5	100





## Note:

1.  $w = UB - LB$  but not  $w = UL - LL$

2. The class 0.5 - 6.5 can be interpreted as the half closed interval (0.5, 6.5] . Thus a data with value 6.5 will be included in the first class not in the second class.

3. Class mark: - (CM) is a representative of a class and it can be obtained using class limits or class boundaries as

$$CM = (LL + UL) / 2 \quad \text{or} \quad CM = (LB + UB) / 2$$



## Stablization

Use the frequency table that you have constructed to answer the questions that follow.

1. What is the lower class limit of the second class?
2. What is the upper class boundary of the third class?
3. What is the frequency of the fourth class?
4. What is the cummulative frequency of the fifth class?
5. What is the class mark of the sixth class?



## Class Work

The scores of 150 students in mathematics examination (out of 100) is organized as follows. Complete the table.

Class limits	Class boundaries	frequency	Cum. Freq.
11-20		12	
21-30			19
31-40		15	
41-50			55
51-60		32	
61-70			96
71-80		10	
81-90			
91-100		26	

