

UNIT 6: BUSINESS DECISION MAKING

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WEEK FOUR
LECTURER: N. QUARRIE

Learning Outcome Two (2)

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- LO2 Understand a range of techniques to analyse data effectively for business purposes

Objective

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- By the end of this lesson you should be able to:
- 2.1 create information for decision making by summarising data using representative values



Overview

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- Last week's session focused on how to designing a questionnaire but what do we do with the information that we collect? That is something very important that you need to understand.
- We will therefore be using today's lesson to look at the some of the tools/procedures that we can use to summary the data collected so that we can analyse.
- We will be looking at representative values: mean, median, mode; calculation from raw data and
- frequency distributions using appropriate software

Group versus ungrouped data

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- Ungrouped data: This is data that is presented in its original form and may or may not be in any particular order (Tutorvista.com, 2016). Eg: the age of the students in Unit Six class- 16, 18, 30, 20, 27, 24, 23
- Grouped data: data that is arranged using class

Age groups	Frequency
16-20	2
20-25	3
26-30	2

Mean

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- Mean: This is the average of a set of numbers.
- To calculate the mean you simply add all the values in the data set and then divide by the number of numbers in the data set.
- It is important to note that the method used to calculate grouped data is different from the data used to calculate the mean for ungrouped data.
- Ungrouped data: the age of the students in Unit Six class- 16, 18, 30, 20, 27, 24, 23. The mean age= $[(16+18+30+20+27+24+23)/7]=22.5$

Mean: Formula Used-Ungrouped data

Source: (Mba-lectures.com, 2010)

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$$\bar{x} = \frac{\sum x}{n}$$

Here,

\bar{x} (Read x bar) is the mean of sample

$\sum x$ (Read summation x) is the sum of total number of observations in a sample

And n is the total number of observations in sample.

Grouped data example

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- Assume that the data below represents the data for terrible failing grades for students in an advanced statistics course:
- 21, 15, 12, 9, 21, 15, 9, 12, 15, 21, 12, 12, 18, 15, 18, 15, 15, 18, 18, 21

Mean: Grouped data example

Source: (Mba-lectures.com, 2010)

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<i>Class Interval</i>	<i>f</i>	<i>x</i>	<i>fx</i>
8 -- 10	2	9	18
11 -- 13	4	12	48
14 -- 16	6	15	90
17 -- 19	4	18	72
20 -- 22	3	21	63
23 -- 25	1	24	24
	20		315

x = Midpoint

$$x = \frac{L.C.L + U.C.L}{2}$$

$$\text{e.g } x = \frac{8 + 10}{2} = 9$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$$\bar{x} = \frac{315}{20} = 15.75$$

Median

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- Median: The median value is really the middle value in an ordered data set.
- To find the median of a given data set you must order the numbers first unlike when calculating the mean.

Median: Eg of ungrouped data

source: (Slideplayer.com, 2016)

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Median – Ungrouped Data

- Median – value of data which divides total observation into 2 equal parts
- Ungrouped data – 2 possibilities
- When total number of data (N) is a) odd or b) even
 - If N is odd ; $(N+1)/2$ th value is median
 - eg. 3 4 5 6 8 $N+1/2=6/2=3$,
3rd no.
 - If N is even
 - eg. 3 5 7 9 $\frac{1}{2}$ of $(5+7)=6$
- NOTE: ORDER THE NUMBERS FIRST!

Median: 1st Eg- grouped data

(Anon, 2016)

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Median Formula
for grouped data



$$\text{Median, } m = L + \left(\frac{\frac{N}{2} - F}{f_m} \right) C$$

L = lower boundary of median class

N = total frequency

F = cumulative frequency
BEFORE median class

C = class size (Upper boundary - Lower boundary)

f_m = frequency of median class

Class Interval	Frequency	Cumulative Frequency	Boundaries			
			C.I	f	c.f	Boundaries
40 -- 44	4	4	39.5 -- 44.5			
45 -- 49	7	11	44.5 -- 49.5			
						44.5 - 39.5 = 5
Median Class	50 -- 54	14	25	49.5 → 54.5		
	55 -- 59	11	36	54.5 - 59.5		
	60 -- 64	8	44	59.5 - 64.5		
	65 -- 69	6	50	64.5 - 69.5		
		50				

Median: 2nd Eg of grouped and 1st ungrouped data

source: (Chapman, 2016)

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Example 3.3 for ungrouped data :-

The median of this data 4, 6, 3, 1, 2, 5, 7, 3 is **3.5**.

Proof :-

- Rearrange the data in order of magnitude becomes 1,2,3,3,4,5,6,7. As $n=8$ (even), the median is the mean of the 4th and 5th observations that is **3.5**.

Example 3.4 for grouped data :-

CGPA (Class)	Frequency, f	Cum. frequency
2.50 – 2.75	2	2
2.75 – 3.00	10	12
3.00 – 3.25	15	27
3.25 – 3.50	13	40
3.50 – 3.75	7	47
3.75 – 4.00	3	50
Total	50	

$$\tilde{x} = L + c \left[\frac{\frac{\sum f}{2} - F_{j-1}}{f_j} \right]$$

$$\text{Median}, \tilde{x} = 3.00 + 0.25 \left[\frac{25 - 12}{15} \right] = 3.217$$

Table 3.3

Mode

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- Mode: This is the most frequently occurring value in a data set.
- Ungrouped:
- Data set 1: 9, 9, 2, 3, 6. What is the mode in this case?
- Ans=9.

- Data set 2: 20, 20, 18, 20, 22, 1, 20. What is the mode in this case?
- Ans=20. So a data set can have more than one mode
-

Formula: Grouped data-Mode

Source: (Mba-lectures.com, 2010)

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$$\text{Mode} = l + h \left(\frac{f_m - f_1}{2f_m - f_1 - f_2} \right)$$

Where,

l = Lower Boundary of modal class

h = size of model class

f_m = Frequency corresponding to modal class

f_1 = Frequency preceding to modal class

f_2 = Frequency proceeding to modal class

Example-Mode-Grouped data

Source: (Mba-lectures.com, 2010)

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<i>x</i>	<i>f</i>	<i>Class Boundaries</i>
2 -- 4	2	1.5 - 4.5
5 -- 7	6	4.5 - 7.5
8 -- 10	11	7.5 - 10.5
11 -- 13	4	10.5 - 13.5
14 -- 16	1	13.5 - 16.5
	24	

Class 7.50 – 10.5 has maximum frequency; therefore it is our modal class.

$$\text{Mode} = l + h \left(\frac{f_m - f_1}{2f_m - f_1 - f_2} \right)$$

$$\text{Mode} = 7.50 + 3 \left(\frac{11 - 6}{2(11) - 6 - 4} \right)$$

$$\text{Mode} = 7.50 + 3 (0.416667)$$

$$\text{Mode} = 7.50 + 1.25$$

$$\text{Mode} = 8.75$$

Video Tutorials: Re Using Software (EXCEL) to calculate representative values

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- Ungrouped data-mean, mode, median:
https://www.youtube.com/watch?v=qI9e_7GGvr8
- <https://www.youtube.com/watch?v=6dw3KNnodYw>
- <https://www.youtube.com/watch?v=2rEhWFhSqnI>
- Grouped data-mean, mode, median:
- Median :
https://www.youtube.com/watch?v=bE6ePI8SC_I
- Mean:
<https://www.youtube.com/watch?v=M7oON5Yvq-c>
- Mode:
<https://www.youtube.com/watch?v=A18sw421aJY>

Videos related

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Grouped data: Mean, median, mode :

https://www.youtube.com/watch?v=lXPvC8D_ptE

Grouped data: Mean, median, mode :

<https://www.youtube.com/watch?v=81zcjULlh58>

Review Questions

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- 1. Explain whether or not it is important to order the data set when calculating the mean, median, mode for ungrouped data.
- 2. Discuss how to calculate the mean, median, mode.
- 3. Use the following data set to calculate the mean, mode and median: 4, 7, 9, 3, 8, 4
- 4. Use the following data set to calculate the mean mode and median using the data below that represents data for the age of patients waiting at a hospital in Jamaica:

Age	Frequency
16-20	4
21-25	8
26-30	2
31-35	9
36-40	5
41-45	3
46-50	20

References/Additional Reading List

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- 1. Anon, (2016). [online] Available at: <http://spmstraighta.tumblr.com/post/99470829958/median-formula-for-grouped-data> [Accessed 20 Jan. 2016].
- 2. Chapman, R. (2016). *Presentation "Chapter 3 : Descriptive Statistics: Numerical Measures (Statistics)"*. [online] Slideplayer.com. Available at: <http://slideplayer.com/slide/8851089/> [Accessed 19 Jan. 2016].
- 3. Mathsfun.com, (2016). *How to Find the Median Value*. [online] Available at: <https://www.mathsisfun.com/median.html> [Accessed 19 Jan. 2016].

References/Additional Reading List

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- 4. Mba-lectures.com, (2010). *How to Calculate Arithmetic Mean.* [online] Available at: <http://mba-lectures.com/statistics/descriptive-statistics/57/arithmetic-mean.html> [Accessed 19 Jan. 2016].
- 5. Mba-lectures.com, (2010). *How to Calculate Mode.* [online] Available at: <http://mba-lectures.com/statistics/descriptive-statistics/146/mode.html> [Accessed 20 Jan. 2016].
- 6. Slideplayer.com, (2016). *Presentation "Chap 2 Introduction to Statistics This chapter gives overview of statistics including histogram construction, measures of central tendency, and dispersion.".* [online] Available at: <http://slideplayer.com/slide/4990900/> [Accessed 19 Jan. 2016].
- 7. Tutorvista.com, (2016). *Grouped and Ungrouped Data | TutorVista.com.* [online] Available at: <http://www.tutorvista.com/math/grouped-and-ungrouped-data> [Accessed 19 Jan. 2016].