

MTH 23.5 LECTURE NOTES (Ojakian)

Topic 2: Frequency Tables and Histograms

OUTLINE

References (**Algebra Book**: pages 3,4,9; **Statistics Book**: ch. 2)

1. Frequency Tables
 2. Histograms
 3. Fractions, decimals, percents
 4. Doing Relative Frequency
 5. Doing it in Excel
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1. Basics of Frequency Table

- (a) Required properties:
 - i. Every piece of data in exactly one class
 - ii. Each class is the same width
- (b) What to do if data is on a boundary?
 - i. Who cares!
 - ii. But state your convention and be consistent for all classes: Count data in larger class or smaller class?
- (c) And to avoid:
 - i. First class starts too soon
 - ii. Last class goes too far

(d)

PROBLEM 1. *Make frequency table of one of the quantitative variables of our class data, starting with some fixed class width.*

PROBLEM 2. *Suppose we are considering data which include the following: 23, 5, 67, 40. What is wrong with taking the following as our classes for a frequency table:*

20 - 30, 30 - 40, 40 - 50?

PROBLEM 3. *Suppose we are considering data which include the following: 23, 5, 67, 40. What is wrong with taking the following as our classes for a frequency table:*

20 - 30, 30 - 45, 45 - 60, 60 - 70?

2. Basics of Histograms

Note: We will do simplified version of what the book does!

- (a) Histogram is simply a drawing of the frequency table

- (b) Make sure the axes are to scale (use zig-zag as needed ...)

PROBLEM 4. Make a histogram from the frequency table in Problem 1.

- (c) What does the histogram tell us about our data?

Typical Questions:

- i. Symmetrical, bimodal, skewed left (longer tail on left side), or skewed right (longer tail on right side)?
- ii. Any outliers?

3. Details on How to Begin a Frequency Table

Either start with some **Class Width** or some **Number Of Classes**.

- (a) If start you start with Class Width (what we did above, and less typical):

- i. Start with smallest data.
- ii. Make each class the desired width.
- iii. Go till you include the largest data.

- (b) If you start with the Number Of Classes.

- i. Set Class Width = $\frac{\text{Max} - \text{Min}}{\text{Number of Classes}}$
- ii. Keep the Class Width as a decimal or **increase** its size up to at most the next integer.
- iii. Then proceed as before, starting with the smallest data ...

- (c)

PROBLEM 5. Make a frequency table for our class data from Problem 1, but now make it so it has 4 classes. And make the corresponding histogram.

4. Deviation into Fractions, decimals, percents

- (a) The Fundamental Principle of Fractions

- i. $\frac{a}{b} = \frac{ac}{bc}$ (multiply top and bottom by same number)
- ii. $\frac{a}{b} = \frac{a \div c}{b \div c}$ (divide top and bottom by same number)

PROBLEM 6. Write each fraction as two different, but equivalent fractions:
2/4, 7/3, -1/4, 5.

- (b) Simplified Fraction (or Reduced Fraction)

Definition 1. A fraction a/b is **simplified** if there is no whole number larger than 1 divides evenly into both a and b .

PROBLEM 7. Simplify the fractions: 28/36, 3/13

5. Representating numbers: As fractions, decimals, or percents

- (a) The three ways: Fractions, Decimals, Percents
- (b) Convert: Percent \rightarrow Decimal (just divide by 100)
- (c) Convert: Decimal \rightarrow Percent (just multiple by 100)
- (d) Convert: Fraction \rightarrow Decimal (just divide)
- (e) Convert: Decimal \rightarrow Fraction

- i. Write as “(decimal)/1”
 - ii. Multiply top/bottom by appropriate power of 10 (so decimal point is gone)
 - iii. Then simplify
- (f)

PROBLEM 8. *Look at our class stats and find the fractions of students in various categories. Then reduce this fraction. Then convert the fraction to a decimal and to a percent.*

PROBLEM 9. *Suppose 65% of your neighborhood has an iphone. What fraction of the people have an iphone?*

PROBLEM 10. *Convert the decimal 2.8 to a fraction.*

6. Relative Frequency - Histograms meet Fractions ...

- (a) Everything is the same! Except:
- i. Count the total number of data, say N .
 - ii. Find the percent of total for each class (by dividing the count in each class by N)
 - iii. Keep as a decimal or convert to percent
- (b) To make Relative-Frequency Histogram: Just change y-axis labels on original histogram.

PROBLEM 11. *Convert the frequency table and histogram from Problem 5 into a relative-frequency histogram.*

PROBLEM 12. *What do the percentages from the classes add up to? Is this always the case?*

7. Do it in Excel

PROBLEM 13. *Do exercise 22 from section 2.1 (7th Ed) using Excel.*

- (a) Sort data by selecting then: **Home** → **(Sort and Filter)**
- (b) Create class labels and enter the count for each class.
- (c) Select your two columns
- (d) **Insert** → **Picture of Bars** → **2-D Column**

8. Reading Histograms

PROBLEM 14. *From the book, section 2.1 (7th ed), do problem 7.*