

Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*
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growth for all students in terms of helping them become confident and competent problem solvers. Our objective must be to help prepare students to think clearly and deeply about quantitative issues in a world that is becoming more complex and more uncertain. Although developing skills in “problem solving in the modeling sense” is difficult to teach and even more difficult to assess, these are the essential life skills our students need.

[1] School Bells are A-Ringing

Something is in the air, much more than a passage from one season to another - blood thickens (or thins), anticipation grows as does apprehension, confidence waxes and wanes like ocean waves, lists are made and then torn up, etc. It is the beginning of another school year and whether we are in our first, second, third, or fourth decade of teaching, it is an exciting time with rolling emotions. Our challenge is awesome! We are developing students to think quantitatively in all fields, rather than leading a narrow, skill oriented training program. College algebra provides

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the springboard to quantitative work in all fields as well as in the workplace. Our challenge, our mission, our goal is to arrange-meaningful experiences resulting in personal

Helping students *learn how to learn* and helping them develop *habits of mind* for learning need to be primary concerns in the preparation of every lesson. Some examples of skills that address these concerns include:

- a. Sketch a picture to illustrate the situation.
- b. Iterate the paradigm “ TRY something (e.g., guess), note the errors, modify the approach to reduce the errors, and try again” until an acceptable conclusion is obtained.
- c. Ask: Does my answer make sense in terms of the original setting?
- d. What-iffing an exercise to obtain a conceptual understanding of the problem underlying the exercise.
- e. Look for examples of similar situations in other settings.

The Contemporary College Algebra program is very much in sync with the recommendations of The Mathematical Association of America (MAA). A recent Report on Introductory Courses to the MAA's Committee on the Undergraduate program in Mathematics states "A clear and dominant focus of all of these courses should include the following goals:"

- a. *Create confident and competent problem solvers*
- b. *Emphasize learning with understanding*
- c. *Support the actual mathematical needs of other disciplines*
- d. *Life-time relevance to students*
- e. *Student-centered pedagogy*

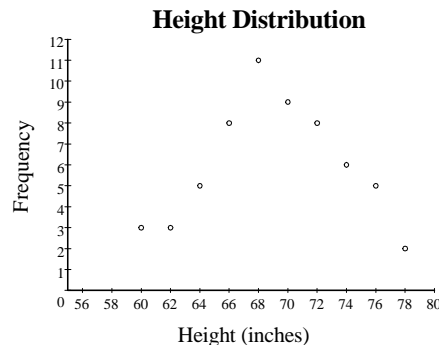
[2] Variability and Distributions

The concept of a variable is central to mathematics and to every discipline that includes quantitative analysis (which includes every discipline). A variable represents a measurable characteristic of an object, such as the height of a person. Looking at a group of people standing in a row, it is easy to gain a visual picture of how the *height* variable changes from one person to the next. This illustrates the meaning of variable - a characteristic that can take on different values. Thus to analyze change, we analyze variables. A reasonable way to summarize the height data of a group of people is to group the people according to their heights. That is, all the people of the same height form a subgroup. Then construct a frequency versus height data-plot. This plot would have the heights for the different subgroups denoted on the horizontal axis and the corresponding frequencies (number of people in a subgroup) denoted on the vertical axis. For example,

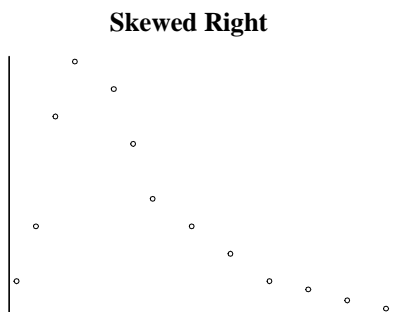
suppose the height data for a group of 60 people is given by the following table.

Ht (inches)	Frequency
60	3
62	3
64	5
66	8
68	11
70	9
72	8
74	6
76	5
78	2

The corresponding data plot is called a *distribution*.



(Note, in some texts, data plots are called dotplots.) A *distribution* is a graphical display of a variable. If this sample of 60 people is representative of a much larger population, we would make a line plot or fit a smooth curve to the data plot to obtain a distribution for the larger population. Statisticians classify distributions by their shapes with the *bell curve* being the most familiar category. The skewness feature of a distribution is described as left, right, or symmetric.



A distribution is skewed right if the right-hand tail extends further than the left-hand tail. Sketch a picture of a distribution that is skewed to the left. Analyzing distributions is an important part of data analysis. For example, what information about average or median or mode can be obtained from a distribution?

[3] Essay Topics

- a. Consider your favorite car or truck (make and model). Which is larger for your favorite vehicle, the average (mean) MPG or the median MPG? Write several sentences explaining your reasoning.
- b. The average (mean) and the median of a data set are close together when the data distribution is symmetric. What is the relationship between the average and median in a right skewed distribution? Write several sentences explaining your reasoning.
- c. Discuss the effect that an outlier has on each of the three methods of summarizing data: average, median, and mode. For example which is effected most (least) and why?
- d. Discuss the rationale for describing a graph as a set of ordered pairs.

[4] A Class Activity

Compile a data set of the heights of the students in class and then sketch its distribution on the chalk board. Develop a discussion guided by the following outline:

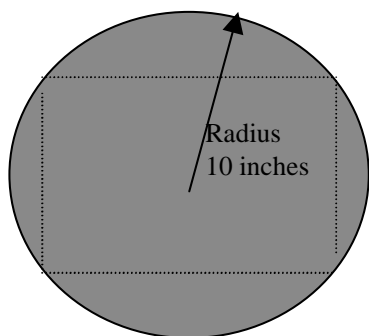
- a. Ask students to describe the distribution as skewed left, symmetrical, or skewed right.
- b. Ask the class to guess the average, median, and mode heights (from the distribution).
- c. Ask some students to compute the actual average, median, and mode heights.
- d. Suppose Yao Ming, the new seven-foot-five Chinese center for the Houston Rockets, joined the class. How would the distribution change? How would the average or median change?
- e. Intentionally make a mistake in recording the data by recording the shortest student as 3 feet tall. What effect does this have on the distribution? How would the average or median change?
- f. Discuss the effect of outliers on averages and medians of a data set.

[5] Small Group Project

There are four parts to this project.

First Part: Determine the dimensions of the largest (area) rectangular yard that can be fenced with 100 feet of fencing. Hint: Develop an area function that is constrained by the fixed perimeter of the yard. Plot your function and graphically determine the value of the independent variable that yields the maximum value of the function. Confirm your graphical result by checking the table values of your function.

Part Two: In a sawmill, a log is cut into a beam (rectangular cross section) by cutting four slabs from the log. Determine the dimensions of the largest beam that can be cut from a circular log of radius 10 inches and length 12 feet. The cross section of the beam is a rectangle.



Cross Section of the Log

Part Three: Lumber is measured in terms of *board feet*. The measurement is the product of the width measured in feet, the thickness measured in inches, and the length measured in feet. Thus a 16 foot 2-by-4 contains $10\frac{2}{3}$ board feet since the width is 4 inches = $\frac{1}{3}$ foot, the thickness is 2 inches, and the length is 16 feet. Therefore we have $(\frac{1}{3})(2)(16) = \frac{32}{3} = 10\frac{2}{3}$.

Determine the number of board feet in the beam in Part Two.

Part Four: Determine the percentage of wood in the log in Part Two that is contained in the largest beam.

[6] Notices

1. The seventh annual Retreat of the HBCU Consortium for College Algebra Reform will be held at Huston-Tillotson

College, Austin, TX, October 10-12, 2002.

2. Laurette Foster, Russ Lundgren, and Don Small will participate in the 28th Annual Conference of the American Mathematical Association of Two-Year Colleges that will be held in Phoenix, AZ, November 14-17, 2002. Laurette

will present a two-hour workshop entitled "Contemporary College Algebra - A Look From the Inside," Russ will participate in a Poster Session, and Don will speak on the panels "What's on the Horizon? Spotlight on Issues in Mathematics Education" and "Redefining the First College Level-Mathematics course."

3. The next issue of the *Vision-Potential* Newsletter will appear in October 2002. Deadline for contributions to the October Newsletter is Monday, October 7, 2002. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed. Please send material to Dr. Della Bell, Chair, Department of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004
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