

# *Vision - Potential*

*Vision Within Every Instructor – Potential Within Every Student*

Newsletter of the HBCU College Algebra Reform Consortium\*

Number 17, January 1999

## **Contents**

- [1] Ungraded Mathematical Assessment:  
Minute Papers, Individual & Group Work
- [2] Small Group, In-class Activity  
Filling a Container
- [3] EXCET Questions
- [4] Small Group, In-class Activity  
Queries on Repackaging Cheese
- [5] Insulating Window Frames
- [6] Just for Fun
- [7] Notices

---

## **[1] Ungraded Mathematical Assessment: Minute Papers, Individual & Group Work**

**Dick Jardine  
U.S. Military Academy**

For most teachers, grades first come to mind with the mention of educational assessment. But there is great value in ungraded assessment in the mathematics classroom. Ungraded assessments provide invaluable feedback for both the teacher and

\* Supported by the EXXON Education Foundation and the U.S. Military Academy.

the learner, enhancing the learning process. Some ungraded assessment methods I've used or learned about in recent years are described below.

One activity that I have had success with is the Minute Paper. The idea of a Minute Paper is to have students answer the following two questions during the last minute (or two or three) of class:

- a. What was the most useful or meaningful thing you learned during this class?
- b. What question(s) remain unanswered as we end this class?

Provide each student the questions on a hand-out at the beginning of the class hour. The idea is that knowing they have to answer the questions at the end of class will increase student attention level during class. Let them know that the exercise is anonymous, reducing student stress. (After doing the activity enough times, it is just as easy to have the students write the answers on a sheet of notebook paper.) I have found the feedback very enlightening, as the student responses always give me better insight to what they feel confident about and what troubles them. (Well, almost always. One student's response to the second question was, "What kind of stone is in your class ring?")

Assessment is meaningless unless the results are used to improve the learning. In reviewing the Minute Papers after class, it is not hard to identify

common concepts about which students remain uncomfortable. Feedback should be given to the students as soon as possible. Examples of appropriate feedback include identifying the specific section of the texts students should review and recommending exercises they should work to build confidence in their understanding of the topic. Additionally the student responses may indicate the appropriate topic for a brief lecture at the start of the next class meeting. Remember that we teach people, not mathematics, and it is important that we respond to our students' needs and help them learn concepts that are within their grasp.

When preparing assessment activities, the key thought should be, "How will this activity increase my students' learning?" Coaching students while they are doing mathematics, as they work individually or in small groups, is an easy way to give students confidence that they are learning mathematics because *they* are doing the mathematics. Reviewing students' ungraded homework is another way to see if they are doing the work. Prior to students beginning their classroom work at their desks, have them place their homework exercises on a corner of their desk. Then during an in-class activity (such as the activities described in this Newsletter), you can quickly check the work. It doesn't take much more than a glance to assess who is getting the work done and who is not, and it is appropriate to give immediate feedback to the students.

There are other ungraded assessment activities that can enhance learning in the mathematics classroom. Many ideas can be found in

Angelo, T.S. & Cross, K.P. Classroom Assessment Techniques: A Handbook for College Teachers, 2<sup>nd</sup> edition. San Francisco: Jossey-Bass, 1993, pp. 183-187.

Try to adapt ideas that work best for you and your students. For example, if the Minute Paper described above doesn't work for you because it takes too much time, adapt it by asking a shorter

question, such as "What point was the least clear to you in today's lesson?" Try not to think only about the grading when it comes to assessment methods. Those that contribute the most to making us effective teachers and our students effective learners, are ungraded.

[2] **Small Group, In-Class Activity:  
Filling a Container**

(This is a 10 minute in-class, small group activity.)

Valarie has three containers: a cylindrical bucket, a cone shape vase, and a spherical ball. Each container has a radius of 10 inches. The cylinder and vase have a height of 20 inches which is equal to the diameter of the sphere. Water is poured into each of the three containers simultaneously at the rate of 10 cubic inches per minute.

Realizing that the containers probably have different volumes, Valarie wonders what the order of filling will be for the three containers. She decides to plot the volume of water against time for each container. The following is her multiplot.

Later Valarie tells her roommate about her query as to the order in which the containers fill up and how she was able to graphically answer the query. In order to convince her roommate, Valarie shows her a copy of the above plot, only to realize that

she had forgotten to label the curves. She turns to you for help and asks you to determine the appropriate labeling and to explain your reasoning to her.

### [3] EXCET Questions

(These questions are taken from the Revised 1997 Preparation Manual for the Examination for the Certification of Educators in Texas (EXCET).)

- a. Two lawn sprinklers installed at coordinates (4,4) and (11,4) produce circular sprays of water of radius 4. Draw a picture illustrating the situation and then determine, by inspection, the  $x$ -coordinates of the two points where these circular sprays intersect. Then analytically determine the coordinates of the points on the ground at which these two circular sprays intersect.
- b. In an electric circuit, voltage is equal to the product of current and resistance. The relationship is represented by the equation  $V = IR$  where  $V$  represents voltage measured in volts,  $I$  represents current measured in amps, and  $R$  represents resistance measured in ohms. A hobbyist who builds radios finds that when a 20-ohm resistor is used in a circuit that has a 24-volt battery, the current is 1.2 amps. When the first resistor is replaced with an unlabeled resistor, the current in the circuit is 2 amps. If the same 24-volt battery was used in both trials, what is the value of the unlabeled resistor?

### [4] Small Group, In-Class Activity: Queries on Repackaging Cheese

These queries can be used for a ten minute in-class, small group activity. The queries were inspired by problem 20 in the Revised 1997 Preparation Manual for the Examination for the Certification of Educators in Texas (EXCET).

A cheese company packages its cheese spread in a triangular prism shaped package as shown below.

Query 1: If the company repackages its cheese into cubic packages, what should be the dimensions of the cube for it to contain the same volume as the triangular prism package?

Query 2: If the company repackages its cheese into rectangular solids in which the length is three times the width and the width = height, what should be the dimensions for it to contain the same volume as the triangular prism package?

Query 3: If the company repackages its cheese into spherical packages, what should be the dimensions of the sphere for it to contain the same volume as the triangular prism package?

Query 4: If the company repackages its cheese into circular tube packages in which the length is twice the radius, what should be the dimensions of the tube for it to contain the same volume as the triangular prism package?

### [5] Insulating Window Frames

Don recently installed window channels in order to “tighten up” the drafty windows in his house. The windows were old and operated with weights enclosed in compartments on either side of the window frame. A cord attached to the window weight, runs over a pulley near the top of the compartment, and is attached to the sash. The weight acts as a counter balance to the sash holding the sash in place when it is raised. Each compartment is 4 inches square and is as high as the window. (Each compartment holds two weights.) When window

channels are installed, the weights are taken out and the compartments filled with insulation.

The bag of cellulose insulation that Don bought contained the following table of R values and Thicknesses (of insulation).

<i>Rvalue</i>	<i>Thickness(in)</i>
50	17.1
40	13.7
30	10.3
24	8
19	6.5
11	3.8

The R value (R stands for resistance to heat flow) of insulation is usually determined by the thickness of the insulation. The R value of a one inch thick piece of wood used for insulating purposes is one. Oftentimes the floor of the attic of a house is insulated with eight inches of insulation giving an R value of 24. The larger the R value, the more resistance there is to heat flow and thus a greater insulating factor.

Plot the data in the above table (R value on the horizontal axis and thickness on the vertical axis), fit a curve to the data points, and then determine the R insulating value that Don obtained when he filled the weight compartments in his windows.

[6] **Just for Fun**

1. This question was taken from the November/December 1998 issue of Quantum, published by the National Science Teachers Association in cooperation with Springer-Verlag New York, Inc.) (B2461, p.13)

Twelve days of rest. Each of three successive months has exactly four Sundays. Prove that one of these months is February.

2. A frozen turkey is taken out of a freezer ( $0^{\circ}$  F.) and placed in a refrigerator ( $35^{\circ}$  F.).

- a. Sketch a temperature versus time curve for the temperature of the turkey. Explain why your graph makes sense.
- b. Does the weight of the turkey effect the temperature curve? Explain your reasoning.
- c. The label on a frozen turkey recommends thawing the turkey by leaving it in the refrigerator one day for each five pounds of weight. Sketch the temperature curve of a frozen, 20 pound turkey that is left in the refrigerator for four days.

[7]

**Notices**

1. The Deadline for contributions to our February Newsletter is

Friday, February 5, 1999

Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, CBL activities, announcements, and so on are all welcomed. Please send material to Dr. Della Bell, Chair, Dept.of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.

2. To subscribe to this Newsletter, send your name and address to Dr. Della Bell, Department of Mathematics, Texas Southern University, 3100 Cleburne St.,Houston, TX. 77004

-----

Permanence is an aspect of the beauty of mathematics. Herman Hankel, a nineteenth-century mathematician said:

In most sciences one generation tears down what another has built, and what one has established another undoes. In mathematics alone each generation adds a new story to the old structure.”