MATHEMATICS (IOWA CHAPTER OF THE M.A.A.)

1. PATTERNS IN PROBLEM SOLVING: A REPORT ON AN NSF/AAAS CHAUTAUQUA-TYPE SHORT COURSE. Joseph Schaefer, Loras College.

This paper will be a report on the author's involvement in a Chautauqua-Type Short Course entitled "Patterns in Problem Solving" and his efforts to utilize the material in a course at Loras College. Included will be comments on the unique approach of the course including its interdisciplinary nature and its emphasis on the tools and concepts which prove to be most productive in problem solving, particularly the use of models in problem solving.

2. ELEMENTARY PROOFS OF PHRAGMEN-BROUWER AND RELATED TOPOLOGICAL PROPERTIES IN EUCLIDEAN SPACES. Don Sanderson Ames.

Albrecht Dold recently gave a very simple proof of a special case of the Alexander Addition Theorem ($r = 0$ in the version given in section 8-8 of Hocking and Young, Topology. Reading, Mass.: Addison-Wesley, 1961). From this lemma he obtained simple proofs of the Brouwer Fixed Point Theorem and Jordan Curve Theorem (for "collared" curves) in the plane. It appears to be even easier to prove, using Dold's lemma, the Phragmen-Brouwer properties (see the above reference) for spaces such as E^n and $S^n, n > 1$, which are simply connected and locally arcwise connected. Another simple proof of the Brouwer Fixed Point Theorem follows.

3. UNKNOTTING KNOTS AND LINKS IN S^3 BY MAPS. Howard Lambert, University of Iowa.

Let L be a (PL) link in the Euclidean 3-sphere S^3 (i.e. $L = \bigcup_{i=1}^{n} L_i$ is a polygonal simple closed curve in S^3 and $L_i \cap L_j = \emptyset$, $i = j$). Call a continuous (PL) map $f: X \to X'$ strongly 1-1 on $Y \subset X$ if $f|Y$ is a homeomorphism onto $f(Y)$, $f(X-Y) \cap f(Y) = \emptyset$ and f is locally 1-1 at each point of Y. Gail Johnson asked whether or not it is possible to find a map of S^3 onto itself which is strongly 1-1 on L and each $f(L_i)$, $i = 1, 2, \ldots, n$, is unknotted. If $n_3 = 1$, the answer is yes (see J. Hempel, A surface in S^3 is tame if it can be deformed into each complementary domain, Trans. Amer. Math. Soc., Vol. 111(1964), pp. 273-287). We give a short proof of Hempel's result and then show that the answer is no for $n \geq 2$.

4. HOW CAN ARTICULATION BETWEEN TWO YEAR AND FOUR YEAR COLLEGES BE IMPROVED? Merlin Fischer, Iowa Community College, Fort Dodge, Iowa.

Due to the increasing role of the Community Colleges in Iowa, greater articulation is essential. The American Mathematics Association has a standing subcommittee on two year colleges, and there has been a survey of articulation in various States. The goals and work of the National Committee will be reviewed, and the survey will be summarized. Recommendation will be made for your consideration.

5. BOUNDARY VALUE PROBLEMS AND FUNCTIONS OF MATRICES. Walter Will, Decorah.

Functions of matrices are often encountered in the solution of initial value problems for systems of ordinary differential equations involving constant coeffecients. Two point boundary value problems for second order equations also lend themselves to functions of matrices. The expression

$$G(t,s) = \begin{cases} \dfrac{\sinh as \sinh a(t-T)}{a \sinh aT}, & 0 \leq s \leq t \\ \dfrac{\sinh at \sinh a(s-T)}{a \sinh aT}, & t \leq s \leq T \end{cases}$$

for the Green's function for the equation $y'' = a^2 y$ on the interval $0 \leq t \leq T$ extends to systems. In the latter case, G can be given in terms of eigenvalues and eigenvectors of the coefficient matrix.

6. THE BICENTENNIAL PUZZLE. D. Greenwell, Iowa State University

A theorem of graph theory is used to develop a variety of games similar to the well-known 15-puzzle. One such is a bicentennial puzzle.

7. HISTORICAL DEVELOPMENT AS A GUIDE TO MATHEMATICS EDUCATION. James L. Cornetts, Ames.

It is argued that in the mental growth of a mathematician, he or she should experience mathematics as if unfolded historically, and that the violation of this premise is often the cause of unnecessary difficulties for the student. In teaching an idea, we should attempt to put the student into the position of the person who discovered the idea. The problem is more acute in mathematics, for the deductive nature of mathematical arguments reverses the inductive order of their discovery.

PHYSICS (JOINT SESSION: IA. CHAPTER A.A.P.T. & PHYS. SECTION)

1. **"HEAD START" IN THE FIRST LAB EXPERIMENT.** **Herman C. Schepler, Dubuque.**

Physics Majors are given a "head start" in advanced physics courses by applying many of their general physics fundamentals in the first laboratory period of the advanced course. In the first lab period only, the students are "spoon fed" the equations and relationships that they require for making certain lab measurements on equipment already set up for them. The laboratory accompanying an Optics course is selected as an example. The following measurements and determinations can be made by a student in a two-hour laboratory period: the f/number or "speed" of a lens; index of refraction of a lens; the lens magnification when used as an eyepiece; the lens focal length and lens magnification, by applying the Gaussian form of the lens equation; theoretical resolving power of a lens (assuming the lens to be diffraction limited); the magnifying power of a microscope that is provided; the magnifying power of a telescope that is provided; the index of refraction of the prism of a spectrometer that is provided. In lab experiments that follow, students proceed with confidence and they save time in setting up equipment and in performing experiments.

2. THE PERSONALIZED INTERVIEW METHOD AND ITS USE IN AN INTRODUCTORY RADIATION HEALTH PHYSICS COURSE. Dale Olson, Cedar Falls.

The use of the Personalized Interview Method of instruction in an introductory radiation health physics course will be described. The method involves no formal lectures and the students proceed at their own rate through the course material receiving a grade proportional to the amount of material covered. The student is evaluated on the basis of written exercises evaluated in the student's presence by an advanced undergraduate physics major. Activities in the course are designed to stimulate the student to verbalize the material he is studying, to eliminate passivity on the part of the student sometimes associated with the usual lecture format and to minimize student anxiety associated with exams.

3. METRICATION REVIEW USA
Roy L. Buckrop, US Army Armament Command, Rock Island Arsenal, Rock Island, IL.

A broad brush overview is presented concerning trends toward the increased use of the metric system in the United States. The period covered starts with the 1968 Metric System Study Bill (Public Law 90-472) and progresses to January 1975. The review is presented from the Department of Defense's point of interest concerning National defense.

3. POLLEN ANALYSIS OF A FARMDALE INTERSTADIAL PEAT FROM EASTERN IOWA. Kent Van Zant, George Hallberg, Richard Baker, Iowa City, and Gerald Miller, Ames.

Pollen analysis of an upland buried peat from Muscatine County, Iowa, suggests that a spruce-pine forest covered the area between 28,800 and 22,750 radiocarbon years B.P. Spruce pollen percentages increased through time, indicating that spruce trees were becoming more abundant during the Farmdale interstade. Pine pollen decreased in abundance near the end of the interstade, and larch pollen reappeared. Pollen of thermophilous species occurred intermittently during the interstade. This pollen sequence seems to indicate continuous cooling during the interstade rather than a warm interval. These data are similar to pollen analyses from other Farmdale interstadial sites in the Midwest.