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ABSTRACT

A study was conducted to assess faculty and student preferences regarding the goals and content of Saddleback College's (California) liberal arts mathematics course. Following a review of the literature, an extensive list of course goals, content areas, and prior student preparation needs was formed into a questionnaire, which was administered to 12 full-time mathematics faculty, 52 full-time liberal and fine arts faculty, 25 part-time mathematics faculty, and a sample of 93 liberal arts and fine arts students. Study findings, based on responses from 12 full-time and 23 part-time mathematics teachers, 25 liberal/fine arts faculty, and 65 students, included the following: (1) each group, except the full-time mathematics faculty, agreed that course goals should include the student's learning basic problem-solving steps that could be applied to any career field; (2) all groups felt students should complete some mathematics prior to enrolling in the liberal arts mathematics class, with all faculty groups indicating that arithmetic and beginning algebra should be part of students' prior experience; and (3) the following topics were supported by all groups for inclusion in the class: the fundamentals of mathematical reasoning and logic, functions and graphs, probability and "odds," recent developments and discoveries in mathematics, computer technology, statistics, and methods of organization using sets. The study report includes a bibliography of general references and textbooks available for the course, along with the survey instruments. (LAL)

# DETERMINATION OF THE CORE CURRICULUM FOR THE LIBERAL ARTS MATHEMATICS COURSE AT SADDLEBACK COLLEGE



by

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A Practicum presented to Nova University in partial fulfillment of the requirements for the degree of Doctor of Education

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ABSTRACT

The purpose of this study was to identify the core curriculum for the liberal arts mathematics course at Saddleback College. The appropriateness of existing course goals and content were brought into question in view of recent conflicting recommendations in the mathematics education literature. Following a review of the literature, an extensive list of potential course goals, content, and prior student preparation was formed into a questionnaire. This questionnaire was given to the full-time mathematics faculty, full-time liberal arts and fine arts faculty, part-time mathematics faculty, and a sample of liberal arts and fine arts students. The mean response for each group was calculated for each questionnaire item. The responses from the latter three groups were composed into a single list of preferred topics in preparation for the curriculum review process by the full-time mathematics faculty.

The preferred course goal was for the student to learn the basic problem solving steps that can be applied to any career field. A review of computational skills in the areas of arithmetic, beginning algebra, and beginning geometry was a goal agreed to by all three groups. The faculty groups supported a placement test for entry into this class, but the students did not form an opinion in this area. Those topics desired by at least two of the three groups included the fundamentals of mathematical reasoning, measurement and the metric system, probability, statistics, functions and graphs.

It was recommended that these topics form the core of the curriculum for the liberal arts mathematics class. It was also recommended that entry into the class be restricted to those who have completed courses in arithmetic and beginning algebra and who have successfully completed a placement test covering arithmetic operations and concepts.

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Chapter 1

# INTRODUCTION

## Nature of the Problem

The mathematics education literature has made conflicting recommendations concerning the objectives and content of the course commonly referred to as "liberal arts mathematics." The Mathematics Association of America desires this to be a "mathematics appreciation" class that allows students to understand the historical and contemporary role of mathematics and avoids the teaching of high school mathematics skills (CUPM,1983:45). Contrary to this view, the participants in the conference entitled New Directions in Two-Year College Mathematics resolved that the contents of mathematics courses in two-year colleges should be of immediate use to students. It was felt that the liberal arts mathematics course should include basic mathematical competencies and new technologies (Albers, 1985:373). Because there is no external agency that mediates opposing views in mathematics education and produces course curriculum acceptable to and followed by all colleges, each college must engage in this activity individually. Only in this way can curricular reform result in mathematics courses sufficiently broad and concentrated to satisfy the peculiarities of each institution (Cohen, 1985:59). There were others in the College community besides the full-time mathematics faculty who had an interest in the liberal arts curriculum in general and the liberal arts mathematics course in

particular. Their views were needed to insure the development of a satisfactory liberal arts mathematics course at Saddleback College.

## Purpose of the Study

It was the purpose of this study to determine the contents of the core curriculum for the liberals arts mathematics class desired by the liberal arts and fine arts faculty, those students most likely to take this course, and those faculty most likely to teach it.

## Method of Investigation

A questionnaire was developed that encompassed course objectives, prerequisites, and content. This questionnaire was used as the measurement instrument in the opinion survey of the full-time and part-time mathematics faculty, the full-time liberal arts and fine arts faculty, and a sample of students majoring in the liberal or fine arts or whose major was undecided. The mean response to each questionnaire item from each of these groups was calculated. Using the mean response values from the part-time mathematics faculty, the liberal arts and fine arts faculty, and the student sample, the preferred course objectives, prerequisites, and content were identified.

Chapter 2

# BACKGROUND AND SIGNIFICANCE

## Review of the Literature

In 1977 the Committee on the Undergraduate Program in Mathematics (CUPM) of the Mathematical Association of America established the CUPM Panel on Mathematics Appreciation Courses. The Panel began a six year study of the contents of those college and university courses that treated mathematics appreciation for students in the arts and humanities. The final report from this study was presented in 1983 (CUPM, 1983). The Panel concluded that the ultimate goal of liberal arts mathematics courses is to instill in the student an appreciation of mathematics. For this to occur the Panel (CUPM, 1983:45) believes that

> students must come to understand the historical and contemporary role of mathematics, and to place the discipline properly in the context of other human intellectural achievements.

Fundamental to the understanding of the development and role of mathematics by students is the need to impart the "idea of mathematics as art" (CUPM, 1983:46). The Panel (CUPM, 1983:46-47) recommends that the following areas be stressed in these courses:

1. The relationship between mathematics and our cultural heritage.
2. The role of mathematics in history and the role of history in mathematics.
3. The nature of contemporary mathematics.
4. The recent emergence of several mathematical sciences.
5. The necessity of doing mathematics to learn mathematics.
6. The role of mathematics as a tool for problem solving.
7. The verbalization and reasoning necessary to understand symbolism.
8. The existence of a large body of interesting writing about mathematics.

In addition to the recommended inclusion of these topics, the Panel gives several recommendations for topics, activities, and procedures to be avoided in these courses. The Panel (CUPM, 1983:50) feels that "in-course remediation should be avoided." The teaching of high school mathematics skills should not be part of a liberal arts mathematics course (CUPM, 1983:45). The Panel (CUPM, 1983:51) believes

> it can not be over-emphasized that a mathematics appreciation course can not fulfill its goal if it degenerates into the teaching of arithmetic computations or pre-algebra skills, or if it is limited to a topic such as "consumer mathematics."

Karl Smith (1984) speaking before the Arthur P. Sloan Foundation sponsored conference entitled New Directions in Two-Year College Mathematics presented a contrasting view of the goals and content of liberal arts mathematics courses. Smith is a professor of mathematics at Santa Rosa Junior College (California), the co-author of three mathematics textbooks, the sole author of eight mathematics textbooks including a liberal arts mathematics book in its fifth edition, and President-elect of the American Mathematical Association of Two-Year Colleges. Smith (1984:4) believes that liberal arts mathematics courses aimed at "developing an appreciation of mathematics" and built around the great ideas that revolutionized modern thinking and the mathematical sciences should not be retained unchanged in the community college curriculum. Such mathematics courses fit well into the junior college curriculum of the early 1920's when the liberal arts accounted for three-fourths of the entire college curriculum (Smith, 1984:3). Cohen and Brawer (1982:286) found that the liberal arts held on to this proportion of the community college curriculum well into the 1960's. With the rising student activism of the 1960's came the call for relevance and relevance was interpreted as providing job skills (Cohen

and Brawer, 1983:295). Consumerism characterized the 1970's. Students, as customers, dictated the terms under which they would study, what they would study, and what they expected to obtain from their efforts. This occupational emphasis struck at the very corner stones of the liberal arts as the teaching of values and common heritage lost support among both students and faculty (Cohen and Brawer, 1983:295). These forces took a heavy toll on the enrollment in liberal arts mathematics courses. Nationally the enrollment dropped 74 percent between 1975 and 1980 (Smith, 1984:5). Cohen and Brawer (1982:304) concluded that for any aspect of the collegiate function to remain in the community college curriculum, it must fit into the "career, compensatory, and community education programs" as well as the liberal arts classes that require literacy. Smith (1984:7) supports this analysis in his call for a reorientation of the liberal arts mathematics course. He feels it should serve those who are looking for "basic skill-building mathematics courses." He believes this course should cover arithmetic, algebra, geometry and topics from logic, probability, statistics, and computer technology. Such a course, he believes, would meet the basic skills competency requirements of the 1980's as well as the job oriented demands of today's and tomorrow's students (Smith, 1984:11).

Cornutt (1984) reviewed the mathematics courses taken at community colleges by students who sought transfer to a four year college or university. He feels all bachelor's degree aspirants should complete a course in intermediate algebra. Beyond that he believes that even students whose major field held no obvious applications of mathematics should be exposed to some college level material in mathematics. Although the mathematics appreciation courses were the logical

alternative for these students, he thinks that such courses often underestimate their audiences by concentrating on mathematical fun-and-games or consumer mathematics. Cornutt (1984:5) believes "the real heart of mathematics appreciation courses should be a few grabber ideas, preferably in the form of applications/problems, around which two-week units could be built."

Sons (1976) described the revision of the terminal one semester mathematics course at Northern Illinois University taken by students whose program required no other mathematics. Traditional mathematical systems, computers in society and statistics from a consumer's viewpoint were the topics each given one-third of the semester. The goals of the course were to expose the students to mathematical thinking, to develop an awareness in the student of the nature and power of some elementary mathematical ideas, and to develop the student's mathematical skills and competencies by means of an indirect approach (Sons, 1976:654-655).

Hartzler (1977) discussed the dominance of business and economic topics in the mathematics course sequence reserved for students of business and social science. As a consequence an increasing number of social science students were directed to the liberal arts mathematics courses, because such courses were "usually general enough to accommodate the heterogeneous clientele they attract" (Hartzler, 1977: 736). He found that these courses did little to relate mathematics to the particular interests of social science students and recommended an entirely separate course sequence for such majors.

The contents of the principal textbooks used in liberal arts mathematics courses were reviewed. A complete listing of these books was placed in a separate section of the Bibliography. The approach

of most authors is to cover as wide a range of topics as possible so that the instructor can build a course using the particular topics of interest. The two exceptions to this statement are the books by Growney (1986) and Roethal, Abraham, and Foley (1984). The former text emphasizes the applications of topics from finite mathematics while the latter stresses logic, sets, number systems, probability, and statistics. The remaining textbooks are supported by a fairly similar set of topics. All of them address probability to some extent. All, but Stein (1976), include applications of statistics. All have sections on plane geometry and beginning algebra. All, but Stein (1976) and Wheeler (1979), provide material on mathematical logic. Most include sections on number systems and number theory. Sets are a topic in each text except those by Jacobs (1982) and Langbort and Thomson (1984). Topics concerning computers and calculators are also popular choices for inclusion and appear in each text except those by Jacobs (1982), Stein (1979), Blitzer and Gill (1984), and Graham (1979). Topics involving consumer mathematics, arithmetic, or the metric system are present in several texts. All texts except those by Jacobs (1982), Stein (1984), Blitzer and Gill (1984) include at least one of these topics.

Summary

The dichotomy between the views of the Mathematics Association of America and influential community college educators concerning the liberal arts mathematics course was clearly expressed in two major references. These views were not universally accepted within their respective academic communities. Cornutt (1984), writing for the community college sector of higher education, suggested a much higher level of mathematics background for liberal arts mathematics students

than that implied by the New Directions conference (Smith, 1984). Sons (1976), writing in the Mathematical Association of America's own journal, described a slightly more utilitarian form of the course than was later recommended by the Panel (CUPM, 1983).

The textbooks designed for the liberal arts mathematics courses tend to include a collection of topics more in line with Smith's (1984) recommendations that those of the CUPM (1983). This may be a reason why the list of references provided in the Panel report did not include any textbooks. A desire not to endorse some books over others and the fact that texts go in and out of print much more rapidly that the reference classics were the reasons given for this omission (CUPM, 1983:51).

### Relationship to the Practicum

It was the dichotomy between the views of those active in community college education and the Panel of the Mathematical Association of America that formed the foundation of this study. The questionnaire statements were derived from the references reviewed. They were chosen to represent the opposing goals suggested for the liberal arts mathematics courses as well as the wide range of topics proposed by the literature or supported by the currently available textbooks.

## Relationship Between the Study and the Seminar on Curriculum and Program Planning

This study sought the creation of a meaningful core curriculum for the liberal arts mathematics course that was consistent with the philosophy of liberal arts education at Saddleback College. Curriculum concerns were at the heart of the Seminar.

## Significance of the Investigation to Saddleback College

Conflicting views for the goals and content of the liberal arts mathematics course developed between segments of the faculty and between the faculty and students. This course was a popular component of the general education program taken by students whose major field required no mathematics. It was important that this conflict be resolved to insure meaningful student success and the integrity of the Saddleback College curriculum.

Chapter 3

# PROCEDURES

## Population

The population for this study was composed of all Saddleback College full-time fine arts instructors, full-time liberal arts instructors, full-time mathematics instructors, part-time mathematics instructors and students enrolled in liberal arts or fine arts courses taught on the College campus during the Spring 1986 semester whose most probable major was either undecided or in the liberal or fine arts. During the Spring 1986 semester, Saddleback College employed 26 full-time fine arts instructors, 26 full-time liberal arts instructors, 12 full-time mathematics instructors and 25 part-time mathematics instructors. The number of students in the population was not possible to determine.

## Sample

The sample chosen for this study included all full-time liberal arts and fine arts instructors. It included all 12 full-time mathematics instructors. Seven of these instructors had previously taught the liberal arts mathematics course. None of the eleven instructors who described their preferences were uninterested in teaching the liberal arts mathematics course in the future, but six were unsure of their interest. Three instructors, who had previously taught the liberal arts course, and

two instructors, who had not, were definitely interested in teaching the course in the future. The sample included all 25 part-time mathematics instructors. Eight of these instructors had previously taught the liberal arts mathematics class and three of these were interested in teaching the course again in the future. The remaining five instructors were unsure of their interest. Only two of the 16 instructors who had not taught the course and expressed their preferences were not interested in teaching the course. Of the remaining fourteen instructors, half had an interest in teaching the course and the other half was unsure of their interest.

The sample included 66 students whose most probable major was either undecided or in the fine or liberal arts. There were 12 students with an undecided major, 27 students with a major in the liberal arts and 27 students with a major in the fine arts. Ten of these 66 students had already taken the liberal arts mathematics course. The remaining 56 students had not taken the course. Of this latter group, 12 planned to take the course in the future, 26 students were not sure and 18 planned not to take it in the future.

A cluster sampling technique was used to select students for the sample. Classes offered by the College were grouped according to academic department and discipline and printed in the Saddleback Community College District Schedule of Classes Spring 1986. Following the list of disciplines Friedlanger (1983:19) chose to constitute the humanities, remedial and skills courses such as composition, reading, music -- group lessons -- guitar, and art -- crafts were removed from consideration. Fourteen discipline areas were, consequently, selected to represent the liberal and fine arts. These areas were

art -- fundamentals, art -- design, art -- drawing, art -- history, English literature, fine arts, French, German, humanities, music -- history and appreciation, music -- theory and composition, philosophy, Spanish, and theater arts -- history and appreciation. One course was selected from each of these areas at random. To make the course selection for an area, a numbered slip of paper was drawn at random from a hat (box). If the number on the slip of paper was n, the nth course listed below the area heading in the Schedule of Classes was selected as the course to be sampled. An identical random draw procedure was used to identify a particular class section of that course to be sampled. The desired student sample consisted of those students enrolled in any one of these fourteen class sections whose most probable major was in the fine arts, liberal arts, or undecided. At the time of the distribution of the questionnaire, these fourteen classes had a combined enrollment of 240 students. One hundred twenty-eight questionnaires were returned from nine of these classes with a combined enrollment of 155. Those areas not returning student questionnaires were art -- drawing, art -- history, French, fine arts, theater arts -- history and appreciation. Since the students in these five classes were not given the opportunity to participate in the opinion survey, they were not considered nonrespondents. The student portion of the sample consisted of those students enrolled in one of the nine responding classes whose major was in the liberal arts, fine arts or was undecided. Of the 128 returned questionnaires, 66 were from students with such a major. Because it was possible that each of the 27 enrolled students who did not complete a questionnaire also had a major in one of these areas, the size of the student portion of the sample was taken to be 93. This was,

however, an upper bound for the size of the student group in the sample. It was from the responses of the 66 students that student attitude was measured in this study.

## Questionnaire Development

Following a review of the literature dealing with recommendations for the goals and content of liberal arts mathematics courses and a review of the contents of liberal arts mathematics textbooks, items were selected for inclusion in a questionnaire. Because of the general nature of these items, it was decided to give the same questionnaire to all faculty members of the sample. Statements were added concerning the respondent's major field of interest and experience with the liberal arts mathematics course at Saddleback College to create the questionnaire for the student members of the sample. Statements dealing with course goals, prerequisites and content were intermingled. Response options were 0 -- "I do not wish to respond to this statement", 1 -- "I strongly disagree with this statement", 2 -- "I disagree with this statement", 3 -- "I am indifferent to this statement", 4 -- "I agree with this statement", 5 -- "I strongly agree with this statement." A photographically reduced copy of the student version of this two sided 8½ inch by 14 inch questionnaire was placed in Appendix A. The last three items of this questionnaire did not appear on the faculty version.

A three member panel of experts was called upon to review the questionnaire. Each member of the panel was a full-time instructor at Saddleback College with teaching experience in both mathematics and nonmathematics courses. They were a professor of mathematics with experience in teaching philosophy, a professor of music with experience

in teaching mathematics and a professor of psychology with experience in teaching mathematics. Their review of the questionnaire shown in Appendix A lead to the grouping of related items together. The questionniare items were grouped into the three categories of goals, extent of prior learning, and course content. Concern was expressed about the response 0 -- "I do not wish to respond." Because some of the questionnaire items were of a technical nature, it was felt that the person completing the questionnaire might want to respond but not feel sufficiently knowledgeable to do so. Consequently, another indicator was sought for responses in this category. Further, it was suggested that the response 3 -- "I am indifferent to this statement." be removed. The panel felt that respondents should be asked to clearly indicate their leanings toward agreement or disagreement on each questionnaire item. In view of these suggestions, the response options were changed. They became NF -- "I am not familiar with the mathematical content implied by this statement. Consequently, I am unsure of my feelings.", SD -- "I strongly disagree with this statement.", D -- "I disagree with this statement.", A -- "I agree with this statement.", SA -- "I strongly agree with this statement.", NR -- "I do not wish to respond to this statement." The panel felt that some unnecessary educational and mathematical jargon was present in a few questionnaire items. Suggestions were made that would make these items more readable for students and nonmathematics faculty. A revised questionnaire was the result of this committee review. A photographically reduced copy of the student version of this two sided 8½ inch by 14 inch questionnaire was placed in Appendix B. The last three items of this questionnaire did not

appear on the faculty version. The panel approved the use of this questionnaire for the pilot stage of the development process.

A pilot of the faculty version of the revised questionnaire was run using the College counseling staff. The counselors had varied academic backgrounds, knowledge of the overall College curriculum and close dealings with students involving many curriculum considerations. Consequently, it was felt that the counselors would be interested enough in a curriculum revision study to respond to the pilot questionnaires and expert enough to suggest improvements to the questionnaire itself. A questionnaire attached to a personal, handwritten note that asked them to complete the questionnaire and suggest improvements to its form was placed in each counselor's campus mail slot together with a preaddressed return envelope. A friendly, handwritten reminder was placed in the campus mail slot of each counselor who had not responded one week later. All seventeen counselors returned a questionnaire. They appeared to have no difficulty reading the questionnaire items or selecting from among the response options. One respondent felt uneasy about participating in the survey because he felt it was inappropriate to tell the Mathematics Department what to teach. Several suggestions of improvement were made. Two respondents suggested that the reasons for conducting the survey be clearly stated on the questionnaire. One suggestion was made for another course goal. The suggested goal was "This course teaches basic problem solving steps that can be applied to any career field/future job."

A pilot of the student version of the questionnaire shown in Appendix B was run using the students enrolled in a beginning algebra class. Because this course was a prerequisite for the liberal arts

mathematics class at Saddleback College, it was felt that the educational level and mathematical sophistication of these students would be comparable to liberal arts students contemplating completion of their mathematics general education requirement. The questionnaire was given to a single class of 27 students whose instructor volunteered the class for the pilot. All fifteen students in class on the day of the pilot completed and returned the quesionnaire. Eight of these students had majors in the liberal or fine arts. Two students had yet to settle on a major field of study. The remaining students had a major in another area. Th first questionnaire was returned after 5 minutes work by the student. Eighty percent of the questionnaires were returned within 9 minutes after the student was given a questionnaire. All questionnaires were returned within 12 minutes after the student was given a questionnaire. The students appeared to have no difficulty reading the questionnaire items or selecting among the response options. During a general class discussion immediately following completion of the pilot survey, three students suggested that the purpose of the questionnaire be stated more clearly. They felt it was a quiz on their knowledge of the current liberal arts mathematics course curriculum. They recommended that the questionnaire introduction specifically indicate that their views as students were being sought.

The panel of experts reviewed the results of the faculty and student pilots. It was decided that the purpose of the study needed to be more clearly stated, but any such statement would have to be consistent with the position of the reader in the sample. The desire-ability of a common questionnaire was reaffirmed. It was decided to remove all reference to the purpose of the survey from the questionniare.

A separate cover letter was drafted for each distinct segment of the sample. It would be attached to each questionnaire. A copy of the cover letter for the mathematics faculty was placed in Appendix D. A copy of the cover letter for the liberal and fine arts faculty was placed in Appendix E. A copy of the cover letter for the students in the sample was placed in Appendix F. The questionnaire itself was modified slightly. A third course goal was added as suggested by a counseling staff respondent. It was felt that this particular goal would give respondents, who were specifically interested in the occupational value of the course material, a clear way to express this opinion. Several cumbersome English phrases were also modified. A photographically reduced copy of the two sided 8½ inch by 11 inch final questionnaire was placed in Appendix C. This questionnaire was the survey instrument for this study.

## Collection of the Data

A questionnaire with attached cover letter was placed in the Campus mail slot of each faculty member in the sample, along with a preaddressed return envelope for their convenience. Two weeks after the questionnaire distribution, those mathematics instructors who had not returned a questionnaire were given a handwritten note in their campus mail slot expressing a gentle reminder of the Mathematics Department's hope for their participation in the survey. Ultimately all mathematics faculty returned a completed questionnaire. Two weeks after the questionnaire distribution, a process of phoning each liberal arts and fine arts instructor who had not yet returned a completed questionnaire was begun. The calls were placed during that instructor's

College office hours and had the purpose of reinforcing the importance their views were to the Mathematics Department and the study. This process was discontinued after three contacts. The responses received indicated that it was not in the Department's political best interest or the contacted faculties emotional best interest to continue these personal contacts. Ultimately 16 of the 26 liberal arts faculty and 11 of the 26 fine arts faculty returned a questionnaire for analysis.

In the campus mail slot of each instructor of a class selected for participation in the student survey was placed a package of questionnaires with attached student cover letters, a memorandum to the instructor explaining the purpose of the survey and a preaddressed return envelope. A copy of this memorandum was r ced in Appendix G. Two weeks after the distribution of these stude stionnaire packets, a gentle reminder in the form of a handwritten note expressing the hope of the Mathematics Department that they would take time to conduct the survey was placed in the campus mail slot of each instructor who had not yet returned their questionnaire package. Ultimately nine of the fourteen instructors asked to conduct the student survey returned the completed student questionnaires.

## Analysis of the Data

A numerical value was assigned to each of the six possible responses to a questionnaire statement. These values were 0 for response NF, 1 for response SD, 2 for response D, 4 for response A, 5 for response SA, and 0 for response NR. The questionnaires were gathered together into groups. The groups were part-time mathematics faculty, full-time mathematics faculty, full-time liberal arts and fine

arts faculty, and students. On each item for which at least half of a group had responded SD, D, A, or SA, the group mean response for those giving one of these four responses was calculated. Otherwise a "no response" was recorded on that item for that group. Mean responses above 3.5 implied a group's opinion was in agreement with that questionnaire statement. Mean responses below 2.5 implied a group's opinion was in disagreement with that questionnaire statement. Any other mean response implied the group had not formed an opinion on that questionnaire statement.

## Assumptions of the Investigation

It was assumed that liberal arts and fine arts students enrolled during the Spring 1986 semester had interests similar to students with these majors over the next few years. It was assumed that the instructors, who did not return a questionnaire, had little interest in the curriculum content of the liberal arts mathematics class and would thus not be concerned with any changes instituted due to this study. It was assumed that respondents expressed their true opinions on the questionnaire.

## Limitations of the Investigation

The results of this study were limited to the faculty and students of Saddleback College, because it was not known if the College population was representative of any larger group of faculty or students. The results of this study were limited to those students whose most probable major was either undecided or in the areas of liberal arts and

fine arts and who were enrolled in at least one liberal arts or fine arts course during the last month of the Spring 1986 semester.

## Definition of Terms

Part-time mathematics instructors were those certificated employees of Saddleback College who were not regular employees and who were assigned to teach at least one class in mathematics for the Spring 1986 semester. Full-time mathematics instructors were those certificated employees of Saddleback College who were regular employees and members of the Mathematics Department during the Spring 1986 semester. Similarly the full-time liberal arts instructors, full-time fine arts instructors and counselors were regular employees of Saddleback College and members, respectively, of the Liberal Arts Division, Division of Fine Arts and Communications, and Division of Counseling Services and Special Programs during the Spring 1986 semester.

## Differences Between the Final Practicum Report and the Proposal

A few changes from the practicum proposal were included in the final practicum report. The title was changed to more clearly reflect the purpose of the study. The full-time mathematics faculty was included in the survey so they would have a frame of reference for evaluating the responses of the other segments of the sample. The fine arts faculty was added to the sample because many fine arts majors use this course in the same way as the liberal arts students. For this reason, fine arts students were also added to the sample.

The classes for the student survey were not selected using a random number table and the order of appearance of the course in the Schedule of Classes. When this process was attempted, a high concentration of courses in a few particular disciplines resulted. To insure a more representative sample, a single random course selection was made from each of the fourteen disciplines identified for inclusion in the study.

The recommendations of the panel of experts changed the questionnaire statement response scale slightly. Originally proposed to be a numerical scale with integer values from 0 to 5, the response options emerged as an alphabetic scale. This scale had, transparent to the respondents, a numerical conversion to the integer values from 0 to 5 excluding 3. It was also decided that a common questionnaire and separate cover letters could be used for each segment of the sample. It was felt this procedure would improve the validity of the comparisons sought between population groups.

## Chapter 4

## RESULTS

Based on the responses to the questionnaire, the attitudes toward the liberal arts mathematics class of the full-time mathematics faculty, part-time mathematics faculty, full-time liberal and fine arts faculty and students whose most probable majors were undecided, fine arts, or liberal arts were compared in the areas of course goals, extent of prior learning, and subject matter content.

### Goals for this Course

Each group, except the full-time mathematics faculty, agreed that the goal of the course was for the student to learn the basic problem solving steps that can be applied to any career field or future job. The full-time mathematics faculty was not able to form an opinion on this goal but agreed with the goal that would have students gain an appreciation of mathematics. While the other two faculty groups agreed also with the inclusion of this goal, the students found this the least desireable goal. The students were actually not able to form an opinion on it. No goal was agreed to by all groups. The group mean responses for each goal were placed in Table 1.

Table 1

Mean Group Response for the Goals of the
Liberal Arts Mathematics Course

| Group | Sample Size | Number of Respondents | Goal #3 "Problem Solving" Mean | #3 Interpretation | Goal #2 "Basic Skills" Mean | #2 Interpretation | Goal #1 "Appreciation" Mean | #1 Interpretation |
|---|---|---|---|---|---|---|---|---|
| Full-time Math Faculty | 12 | 12 | 2.9 | No opinion | 3.2 | No Opinion | 4.8 | Agree |
| Part-time Math Faculty | 25 | 23 | 4.7 | Agree | 4.3 | Agree | 4.2 | Agree |
| Full-time Liberal and Fine Arts Faculty | 52 | 25 | 4.6 | Agree | 4.4 | Agree | 4.3 | Agree |
| Students | 93 | 65 | 4.3 | Agree | 4.0 | Agree | 3.3 | No Opinion |

Note: 1 to 2.5- is Disagree; 2.5 to 3.5 is No Opinion; 3.5+ to 5 is Agree

## Extent of Learning Necessary Before Taking This Course

All four groups felt that some prior mathematics should have been completed before the student enrolls in the liberal arts mathematics class. Each of the three faculty groups agreed that arithmetic and beginning algebra should be part of the student's prior experience and that intermediate algebra should not. The full-time mathematics faculty felt that geometry should also be part of the student's prior course work while the other two faculty groups could not form an opinion on the inclusion of geometry in a student's course preparation. The students in the sample were able to form an opinion only on arithmetic. They felt a student should have completed a course in arithmetic before taking the liberal arts mathematics class. The group mean responses for each of the possible prerequisite courses were placed in Table 2.

All three faculty groups felt passing a placement test should be required for a student to gain entry into this class. The part-time mathematics faculty felt the strongest in this regard while the student group was not able to form an opinion. The faculty groups generally were consistent in their belief that the student should be required to pass a placement test covering the material from courses that group felt the student should have completed before enrolling in the liberal arts mathematics class. The one exception involved the liberal arts and fine arts faculty who were not able to form an opinion on the inclusion of testing for beginning algebra. The group mean responses for each level of mathematics that could be part of placement test for this course were placed in Table 3.

Table 2

Mean Group Responses for the Extent of Prior Course Work Necessary for Liberal Arts Mathematics Students

| Group | Sample Size | Number of Respondents | Prior Course Work: None | | Arithmetic | | Beginning Algebra | | Geometry | | Intermediate Algebra | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | Opinion | Mean | Opinion | Mean | Opinion | Mean | Opinion | Mean | Opinion |
| Full-time Math Faculty | 12 | 11 | 1.2 | Disagree | 5.0 | Agree | 4.6 | Agree | 4.3 | Agree | 2.1 | Disagree |
| Part-time Math Faculty | 25 | 23 | 1.7 | Disagree | 4.7 | Agree | 4.4 | Agree | 3.0 | No Opinion | 2.1 | Disagree |
| Full-time Liberal and Fine Arts Faculty | 52 | 17 | 1.9 | Disagree | 4.2 | Agree | 3.6 | Agree | 3.2 | No Opinion | 2.2 | Disagree |
| Students | 93 | 54 | 2.4 | Disagree | 4.0 | Agree | 3.9 | Agree | 3.4 | No Opinion | 2.9 | No Opinion |

Note: 1 to 2.5- is Disagree; 2.5 to 3.5 is No Opinion; 3.5+ to 5 is Agree

Table 3

Mean Group Responses for the Level of Mathematical Topics
That Could Appear on a Placement Test for the
Liberal Arts Mathematics Course

| Group | Sample Size | Number of Respondents | Level of Mathematics Present in the Placement Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No Test | | Arithmetic | | Beginning Algebra | | Geometry | | Intermediate Algebra | |
| | | | Mean | Opinion | Mean | Opinion | Mean | Opinion | Mean | Opinion | Mean | Opinion |
| Full-time Math Faculty | 12 | 10 | 2.0 | Disagree | 4.8 | Agree | 4.5 | Agree | 3.9 | Agree | 1.6 | Disagree |
| Part-time Math Faculty | 25 | 21 | 1.7 | Disagree | 4.8 | Agree | 4.2 | Agree | 3.0 | No Opinion | 2.4 | Disagree |
| Full-time Liberal and Fine Arts Faculty | 52 | 19 | 2.1 | Disagree | 4.4 | Agree | 3.3 | No Opinion | 2.8 | No Opinion | 1.8 | Disagree |
| Students | 93 | 54 | 2.9 | No Opinion | Not applicable since no opinion was reached on placement testing | | | | | | | |

Note: 1 to 2.5- is Disagree; 2.5 to 3.5 is No Opinion; 3.5+ to 5 is Agree

## Subject Matter Content for this Course

Although there was a considerable amount of variation among the groups concerning the topics each preferred to be offered, the presence of some topics was agreed to by all. It was agreed by all groups that among the topics for the liberal arts mathematics course should be included a discussion of the fundamentals of mathematical reasoning and logic, a discussion of funtions and graphs, a discussion of probability and "odds", a discussion of recent developments and discoveries in mathematics, a discussion of computer technology, a discussion of statistics, and a discussion of the methods of organization using sets.

None of the subject matter items were rejected by all four groups. The faculty groups universally rejected the idea of offering the class in an open form where students work on mathematical projects of their own choosing with guidance from the instructor. In addition, the full-time mathematics faculty rejected the inclusion of a discussion of the techniques of arithmetic operations using whole numbers, decimals and fractions. The part-time mathematics faculty could not form an opinion on this item but both the arts faculty and students felt it should be part of the course. The student group only rejected the item dealing with the inclusion of term papers, book reports, and library research assignments as a means of making students aware of the large body of interesting writings about mathematics. Both full-time faculty groups felt this item should be included, while the part-time mathematics faculty formed no opinion. For each group the subject matter content

items were listed in Appendix II in descending order according to the value of the mean response.

## Free Responses

Each of the three qestionnaire divisions contained an opportunity for the respondent to describe an appropriate item not included in the existing list. If used at all, respondents most often used these free response opportunities to justify or elaborate on another response somewhere else in the questionnaire. A few responses, however, suggested additional areas of interest within each division.

In the area of goals for this course, a liberal arts instructor felt that students should acquire some insight into mathematical short cuts. A full-time mathematics instructor felt the student should gain computer sense and a part-time mathematics instructor supported this with the belief that the student should learn to use software on a computer.

In the area of the subject matter content for this course, several suggestions were made. A liberal arts student felt a discussion of investments, banks, interest rates, and how they work should be included. Another liberal arts student suggested that topics be covered briefly. In this way the student could gain a general overview of many areas of mathematics. A liberal arts instructor felt that logical translations from natural to symbolic languages should be included in the course content. In addition, truth theories, number theory and a few famous paradoxes should be discussed. A part-time mathematics instructor suggested that problem solving techniques be included. A full-time

mathematics instructor felt that applications of material in this course should be introduced to the students through use of computer software in the computer laboratory.

## Course Core Curriculum

The core content for the curriculum of the liberal arts mathematics course was found by incorporating any item that received a mean response value of 4.0 or higher from any two of the three groups remaining after the full-time mathematics faculty was removed from the sample. This was done to allow the full-time mathematics faculty a clear view of the feelings of the other segments of the sample during their official review of the curriculum for this course.

The core curriculum should contain:

* A discussion of the fundamentals of mathematical reasoning and logic
* A discussion of measurement and the metric system
* A discussion of probability and "odds"
* A discussion of statistics
* A discussion of functions and graphs
* This course should fulfill the "mathematics proficiency" portion of the Associate Degree graduation requirements.

Chapter 5

# DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

## Discussion

Following a review of the topics of most interest to students as shown in Appendix H, it was clear that students desired a very practical orientation for this class. Of almost unquestioned importance was the need for this course to satisfy the Associate Degree graduation requirement. They showed interest in topics related to the metric system, consumer mathematics, mathematical reasoning, arithmetic, beginning algebra, beginning geometry, computer technology, probability and statistics. This applied emphasis was consistent with Smith's (1984) suggestions for the directions of this course and well supported by the available textbooks. The full-time mathematics faculty assumed an almost opposing view to that of the students. They rejected the inclusion of topics from arithmetic and could not agree to include any of the student selected topics listed above except the discussions of probability, statistics, mathematical reasoning, and computer technology. The full-time mathematics faculty seemed to most closely support the CUPM's (1983) position that the purpose of the course was to give the student an appreciation of mathematics and not an opportunity to do remedial work in mathematics. The part-time mathematics faculty took the middle ground between these two positions. They supported topics including consumer mathematics, beginning algebra, and beginning

geometry, but could not agree on the inclusion of arithmetic material. This group of faculty, however, was most strongly in support of an entrance examination covering arithmetic and beginning algebra. The liberal arts and fine arts faculty also supported an entrance test covering arithmetic. It was clear, from a faculty point of view, that the ability to demonstrate competency in arithmetic should be required for entry into the liberal arts mathematics class. The liberal arts and fine arts faculty agreed to the inclusion of every content item available except two. They rejected the open classroom format, but could not form an opinion on the inclusion of topics in consumer mathematics.

## Implications

A wide disparity existed between the interests of the students who may take the liberal arts mathematics course and the full-time mathematics faculty who determine the course curriculum. Caught between these two groups were the interests of the instructors most likely to teach this class, the part-time mathematics faculty. They neither determined the curriculum or entirely supported it. They were, however, required to present it to the students. There was thus the potential for severe frustration on both the part of the faculty and students which could severely damage the ability to attract students or instructor to the course. If this situation was left unresolved the reputation of the College could be severely damaged with that segment of the community oriented toward liberal or fine arts education.

## Recommendations

The following recommendations are made to the Saddleback College Mathematics Department for their consideration during the process of curriculum review for the liberal arts mathematics course.

It is recommended that entry into the liberal arts mathematics course be restricted to those students who have previously completed courses in arithmetic and beginning algebra, and who have demonstrated proficiency with arithmetic operations and concepts on a Departmentally sponsored test.

It is recommended that the content of the course be built around a core curriculum composed of the following topics:

* A discussion of the fundamentals of mathematical reasoning and logic
* A discussion of measurement and the metric system
* A discussion of probability and "odds"
* A discussion of statistics
* A discussion of functions and graphs.

It is recommended that the liberal arts mathematics course fulfill the "mathematics proficiency" portion of the Associate Degree graduation requirements.

BIBLIOGRAPHY

## General References


Albers, Donald J. "New Directions in Two-Year College Mathematics." Mathematics Teacher, 78:373-375. May, 1985.

Carnutt, Larry. Let's Keep the College in Our Community Colleges: Mathematics for College Transfer. ERIC ED 246 928, 1984.

Cohen, Arthur M. "Mathematical Instruction at the Two-Year College: An ERIC Review." Community College Review, 12:54-61. Spring, 1985.

Cohen, Arthur M. and Florence B. Brawer. The American Community College. San Francisco: Jossey-Bass Publishers, 1982.

Committee on the Undergraduate Program in Mathematics (CUPM). "Mathematics Appreciation Courses: The Report of a CUPM Panel." The American Mathematical Monthly, 90:45-51. January, 1983.

Friedlander, Jack. "Increasing Student Participation in the Liberal Arts." New Directions for Community Colleges, 42:17-29. June, 1983.

Hartzler, J.S. "Mathematics for Social Science Students." The American Mathematical Monthly, 84:736-737. November, 1977.

Saddleback Community College District. Saddleback Community College District Schedule of Classes Spring 1986, Mission Viejo, California: Saddleback Community College District, 1985.

Smith, Karl J. Liberal Arts Mathematics: Cornerstone or Dinosaur? ERIC ED 245 721, 1984.


## Textbooks Available for the Liberal Arts Mathematics Course


Angel, Allen R. and Stuart R. Porter. A Survey of Mathematics with Applications. 2nd ed. Menlo Park, California: Addison-Wesley Publishing Company, 1985.

Bennett, Albert B. Jr. and Leonard T. Nelson. Mathematics: An Informal Approach. 2nd ed. Boston: Allyn and Bacon, Inc., 1985.

Billstein, Rick and Johnny W. Lott. Mathematics for the Liberal Arts: A Problem Solving Approach. Menlo Park, California: The Benjamin/ Cummings Publishing Company, 1986.

Biltzer, Robert and Jack C. Gill. College Mathematics Review. 2nd ed. Clearwater, Florida: H and H Publishing Company, 1984.

Gill, Jack C. and Robert Blitzer. Competency in College Mathematics. 4th ed. Clearwater, Florida: H and H Publishing Company, 1986.

Graham, Malcolm. Modern Elementary Mathematics. 3rd ed. New York: Harcourt Brace Jovanovich, Inc., 1979.

Growney, Joanne Simpson. Mathematics in Daily Life: Making Decisions and Solving Problems. New York: McGraw-Hill Book Company, 1986.

Jacobs, Harold R. Mathematics: A Human Endeavor. 2nd ed. New York: W. H. Freeman and Company, 1982.

Langbort, Carol R. and Virginia H. Thompson. Building Success in Mathematics. New York: Wadsworth Publishing Company, 1984.

Miller, Charles D. and Vern E. Heeren. Mathematics: An Everyday Experience. 2nd. ed. Glennview, Illinois: Scott, Foresman and Company, 1980.

Miller, Charles D. and Vern E. Heeren. Mathematical Ideas. 5th ed. Glennview, Illinois: Scott, Foresman and Company, 1986.

Roethel, Louis F., Abraham Weinstein, and Robert Foley. Logic, Sets and Numbers. 3rd ed. New York: Wadsworth Publishing Company, 1984.

Setek, William M. Jr. Fundamentals of Mathematics. 4th ed. New York: Macmillian Publishing Company, 1986.

Smith, Karl J. Mathematics: Its Power and Utility. 2nd ed. Monterey, California: Brooks/Cole Publishing Company, 1986.

Smith, Karl J. The Nature of Mathematics. 5th ed. Monterey, California: Brooks/Cole Publishing Company, 1986.

Stein, Sherman K. Mathematics: The Man-Made Universe, An Introduction to the Spirit of Mathematics. 3rd ed. New York: W. H. Freeman and Company, 1976.

Wheeler, Ruric E. Modern Mathematics: An Elementary Approach. 6th ed. Monterey, California: Brooks/Cole Publishing Company, 1984.

Wheeler, R.E. and E.R. Wheeler. Mathematics: An Everyday Language. New York: John Wiley and Sons, Inc., 1979.

# APPENDIX A

## INITIAL VERSION OF THE QUESTIONNAIRE FOR STUDENTS

### MATHEMATICS CURRICULUM REVIEW

A Questionnaire Concerning the Math 5 Course

Mathematics For Liberal Arts Students

The Mathematics Department at Saddleback College is currently reviewing the goals and content of Math 5 — "Mathematics For Liberal Arts Students". This course is generally taken by students seeking to meet the "mathematical concepts" portion of the general education certification for transfer to the California State University System and whose major fields require no other mathematics. Often students in the arts and humanities take Math 5 for this reason. Many students also take Math 5 to fulfill the "mathematics proficiency" portion of the Associate Degree graduation requirements.

We are very interested in your views on this course and would be most appreciative if you could take time to consider the following statements. Please circle the number to the right which best corresponds to your feelings concerning that statement. The number scale is described below:

0 — I do not wish to respond to this statement.
1 — I strongly disagree with this statement.
2 — I disagree with this statement.
3 — I am indifferent to this statement.
4 — I agree with this statement.
5 — I strongly agree with this statement.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | A discussion of statistics should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. | The relationship between mathematics and our cultural heritage should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 3. | A Discussion of consumer mathematics should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 4. | There should be no prior mathematics courses required for entry into this course. | 0 | 1 | 2 | 3 | 4 | 5 |
| 5. | A discussion of mathematical logic should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 6. | The role of mathematics in history and the role of history in mathematics should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 7. | A discussion of computer technology should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 8. | Competency in intermediate algebra (i.e. two years of high school algebra) should be required for entry into this course. | 0 | 1 | 2 | 3 | 4 | 5 |
| 9. | A discussion of arithmetic should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 10. | The nature of contemporary mathematics should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 11. | If an instructor interested in teaching a section of this course can not be found, it should be cancelled. | 0 | 1 | 2 | 3 | 4 | 5 |
| 12. | A discussion of measurement and the metric system should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 13. | Competency in arithmetics should be required for entry into this course. | 0 | 1 | 2 | 3 | 4 | 5 |
| 14. | The recent emergence of several mathematical sciences should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 15. | A discussion of algebra should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 16. | Term papers or other essay assignments should be included. | 0 | 1 | 2 | 3 | 4 | 5 |
| 17. | Competency in plane geometry (i.e. high school geometry) should be required for entry into this course. | 0 | 1 | 2 | 3 | 4 | 5 |

Please continue on the reverse side.

| | | |
|---|---|---|
| 18. | The necessity of doing mathematics to learn mathematics should be included. | 0 1 2 3 4 5 |
| 19. | A discussion of probability should be included. | 0 1 2 3 4 5 |
| 20. | If an insufficient number of interested instructors exist for this course, it should be offered in a large class format by the available staff. | 0 1 2 3 4 5 |
| 21. | A discussion of sets should be included. | 0 1 2 3 4 5 |
| 22. | The role of mathematics as a tool for problem solving should be included. | 0 1 2 3 4 5 |
| 23. | A competency in beginning algebra (i.e. one year of high school algebra) should be required for entry into this course. | 0 1 2 3 4 5 |
| 24. | A discussion of number systems should be included. | 0 1 2 3 4 5 |
| 25. | There should be a standard course content used for all sections of this course. | 0 1 2 3 4 5 |
| 26. | The verbalization and reasoning necessary to understand symbolism should be included. | 0 1 2 3 4 5 |
| 27. | A discussion of geometry should be included. | 0 1 2 3 4 5 |
| 28. | The building of basic mathematical skills should be included. | 0 1 2 3 4 5 |
| 29. | A discussion of functions and graphs should be included. | 0 1 2 3 4 5 |
| 30. | The existance of a large body of interesting writing about mathematics should be included. | 0 1 2 3 4 5 |
| 31. | The course should be offered in an "open" format where students work on individually determined investigations concerning mathematics. | 0 1 2 3 4 5 |

32. Other:_____

_____

_____

Please circle the correct answer for questions numbered 33 and 34.

33. Have you already completed a Math 5 class? Yes No

34. Will you be taking Math 5 in the future? Yes No Maybe

Please indicate your major field of interest (such as art, music, literature, language, chemistry and so on) in the space below:

_____

# APPENDIX B

## REVISED VERSION OF THE QUESTIONNAIRE FOR STUDENTS (PILOT QUESTIONNAIRE)

**MATHEMATICS CURRICULUM REVIEW**

**A Questionnaire Concerning the Math 5 Course**

**Mathematics For Liberal Arts Students**

The Mathematics Department at Saddleback College is currently reviewing the goals and content of Math 5 — "Mathematics For Liberal Arts Students". This course is generally taken by students seeking to meet the "mathematical concepts" portion of the general education certification for transfer to the California State University System and whose major fields require no other mathematics. Often students in the arts and humanities take Math 5 for this reason. Many students also take Math 5 to fulfill the "mathematics proficiency" portion of the Associate Degree graduation requirements.

We are very interested in your views on this course and would be most appreciative if you could take time to consider the following statements. Please circle the abbreviation to the right which best corresponds to your feelings concerning that statement. The abbreviations are described below:

NF — I am not familiar with the mathematical content implied by this statement. Consequently, I am unsure of my feelings.
SD — I strongly disagree with this statement.
D — I disagree with this statement.
A — I agree with this statement.
SA — I strongly agree with this statement.
NR — I do not wish to respond to this statement.

GOALS:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. Through this course, the student will gain an appreciation of mathematics. | NF | SD | D | A | SA | NR |
| 2. Through this course, the students will improve their basic computational skills in the areas of arithmetic, algebra and geometry. | NF | SD | D | A | SA | NR |
| 3. Other: _____ | | | | | | |

EXTENT OF PRIOR LEARNING:

| | | | | | | |
|---|---|---|---|---|---|---|
| 4. Before taking this course, the student should have already completed a course (at sometime in the past) in: | | | | | | |
| a) Prior completion of course work in mathematics should not be required. | NF | SD | D | A | SA | NR |
| b) Arithmetic | NF | SD | D | A | SA | NR |
| c) Beginning Algebra (first year high school algebra) | NF | SD | D | A | SA | NR |
| d) Geometry (one year of high school geometry) | NF | SD | D | A | SA | NR |
| e) Intermediate Algebra (second year high school algebra) | NF | SD | D | A | SA | NR |
| 5. To qualify for entry into this class, the student should pass a test covering material from: | | | | | | |
| a) No such test should be required | NF | SD | D | A | SA | NR |
| b) Arithmetic | NF | SD | D | A | SA | NR |
| c) Beginning Algebra | NF | SD | D | A | SA | NR |
| d) Geometry | NF | SD | D | A | SA | NR |
| e) Intermediate Algebra | NF | SD | D | A | SA | NR |

6. Other: _____

_____

CONTENT:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7. | The relationship between mathematics and our cultural heritage should be included. | NF | SD | D | A | SA | NR |
| 8. | The role of mathematics in history and the role of history in mathematics should be included. | NF | SD | D | A | SA | NR |
| 9. | A discussion of recent developments and discoveries in mathematics should be included. | NF | SD | D | A | SA | NR |
| 10. | Through term papers, book reports, and library research assignments, students should become aware of the existence of a large body of interesting writing about mathematics. | NF | SD | D | A | SA | NR |
| 11. | A discussion of functions and graphs should be included. | NF | SD | D | A | SA | NR |
| 12. | A discussion of the fundamentals of mathematical reasoning and logic should be included. | NF | SD | D | A | SA | NR |
| 13. | A discussion of computer technology should be included. | NF | SD | D | A | SA | NR |
| 14. | A discussion of the methods of organization using sets should be included. | NF | SD | D | A | SA | NR |
| 15. | A discussion of probability and "odds" should be included. | NF | SD | D | A | SA | NR |
| 16. | A discussion of statistics should be included. | NF | SD | D | A | SA | NR |
| 17. | A discussion of beginning geometry should be included. | NF | SD | D | A | SA | NR |
| 18. | A discussion of measurement and the metric system should be included. | NF | SD | D | A | SA | NR |
| 19. | A discussion of beginning algebra should be included. | NF | SD | D | A | SA | NR |
| 20. | A discussion of alternative ways of numbering (as opposed to our base 10 system) should be included. | NF | SD | D | A | SA | NR |
| 21. | A discussion of mathematical topics of interest to consumers (such as checking accounts, installment buying) should be included. | NF | SD | D | A | SA | NR |
| 22. | A discussion of the techniques of arithmetic (adding, multiplying and so on of whole numbers, decimals and fractions) should be included. | NF | SD | D | A | SA | NR |
| 23. | The course should be offered in an "open" form where students work on mathematical projects of their own choosing with guidance from the instructor. | NF | SD | D | A | SA | NR |
| 24. | This course should fulfill the "mathematics proficiency" portion of the Associate Degree graduation requirements. | NF | SD | D | A | SA | NR |

25. Other:_____

Please circle the correct answer for questions 26 and 27.

26. Have you already completed a Math 5 class? Yes No

27. Will you be taking Math 5 in the future? Yes No Maybe

Please indicate your major field of study (such as English literature, chemistry, German, etc.) in the space below:

# APPENDIX C

## FINAL VERSION OF THE QUESTIONNAIRE USED IN THIS STUDY

**SADDLEBACK COLLEGE DEPARTMENT OF MATHEMATICS**

**Questionnaire Concerning the Course**

**"Mathematics for Liberal Arts Students"**

Please consider each statement below. In each case circle the abbreviation to the right which best corresponds to your feelings concerning that statement. The abbreviations are described below:

NF — I am not familiar with the mathematical content implied by this statement. Consequently, I am unsure of my feelings.
SD — I strongly disagree with this statement.
D — I disagree with this statement.
A — I agree with this statement.
SA — I strongly agree with this statement.
NR — I wish to give no response to this statement.

GOALS FOR THIS COURSE:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | The student should gain an "appreciation" of mathematics. In other words, the atudent should come to underatand the historical and contemporary role of mathematics, and to place mathematics properly in the context of other human intellectual achievements. | NF | SD | D | A | SA | NR |
| 2. | The student should review and complete their study of basic computational skills in the areas of arithmetic, beginning algebra and beginning geometry. | NF | SD | D | A | SA | NR |
| 3. | The student should learn the basic problem solving steps that can be applied to any career field or future job. | NF | SD | D | A | SA | NR |
| 4. | Other:_____ | | | | | | |

EXTENT OF LEARNING NECESSARY BEFORE TAKING THIS COURSE:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5. | Before taking this course, the student should have completed a course (or its equivalent) in: | | | | | | |
| | a) NO prior course work in mathematica should be necessary for success in this class. | NF | SD | D | A | SA | NR |
| | b) Arithmetic | NF | SD | D | A | SA | NR |
| | c) Beginning Algebra (first year high school algebra) | NF | SD | D | A | SA | NR |
| | d) Geometry (high school geometry) | NF | SD | D | A | SA | NR |
| | e) Intermediate Algebra (second year of high school algebra) | NF | SD | D | A | SA | NR |
| 6. | For entry into this class, the student should be required to pass a placement test with material taken from: | | | | | | |
| | a) NO placement test should be required for entry into this class. | NF | SD | D | A | SA | NR |
| | b) Arithmetic | NF | SD | D | A | SA | NR |
| | c) Beginning Algebra (first year high school algebra) | NF | SD | D | A | SA | NR |
| | d) Geometry (high achool geometry) | NF | SD | D | A | SA | NR |
| | e) Intermediate Algebra (second year high school algebra) | NF | SD | D | A | SA | NR |
| 7. | Other:_____ | | | | | | |

(PLEASE COMPLETE THE REVERSE SIDE ALSO)

SUBJECT MATTER CONTENT FOR THIS COURSE:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8. | The relationship between mathematics and our cultural heritage should be included. | NF | SD | D | A | SA | NR |
| 9. | The role of mathematics in history and the role of history in mathematics should be included. | NF | SD | D | A | SA | NR |
| 10. | A discussion of recent developments and discoveries in mathematics should be included. | NF | SD | D | A | SA | NR |
| 11. | Through term papers, book reports, and library research assignments, students should become aware of the existence of a large body of interesting writings about mathematics. | NF | SD | D | A | SA | NR |
| 12. | A discussion of functions and graphs should be included. | NF | SD | D | A | SA | NR |
| 13. | A discussion of the fundamentals of mathematical reasoning and logic should be included. | NF | SD | D | A | SA | NR |
| 14. | A discussion of computer technology should be included. | NF | SD | D | A | SA | NR |
| 15. | A discussion of the methods of organizsti[illegible] using sets should be included. | NF | SD | D | A | SA | NR |
| 16. | A discussion of probability and "odds" shou[illegible]cluded. | NF | SD | D | A | SA | NR |
| 17. | A discussion of statistics should be included. | NF | SD | D | A | SA | NR |
| 18. | A discussion of beginning geometry should be included. | NF | SD | D | A | SA | NR |
| 19. | A discussion of measurement and the metric system should be included. | NF | SD | D | A | SA | NR |
| 20. | A discussion of beginning algebra should be included. | NF | SD | D | A | SA | NR |
| 21. | A discussion of alternative ways of numbering (as with "clock" arithmetic in base 12) should be included. | NF | SD | D | A | SA | NR |
| 22. | A discussion of mathematical topics related to the interests of consumers (such as checking accounts, installment buying) should be included. | NF | SD | D | A | SA | NR |
| 23. | A discussion of the techniques of arithmetic operations using whole numbers, decimals and fractions should be included. | NF | SD | D | A | SA | NR |
| 24. | The course should be offered in an "open" form where students work on mathematical projects of their own choosing with guidance from the instructor. | NF | SD | D | A | SA | NR |
| 25. | This course should fulfill the "mathematics proficienty" portion of the Associate Degree graduation requirements. | NF | SD | D | A | SA | NR |

26. Other:_____

THANK YOU!

Saddleback College

MEMORANDUM

The Mathematics Department is currently reviewing the goals, prerequisites and content of Mathematics 5 -- "Mathematics for Liberal Arts Students". We are willing to leave the course in its current form, modify it selectively or completely overhaul it. We seek the form for this course that will best serve the needs of the students of Saddleback College and are most interested in your opinions concerning what Math 5 should be.

"Mathematics for Liberal Arts Students" is often taken by students seeking to meet the "mathematical concepts" portion of the general education certification for transfer to a branch of the California State University system and whose major fields require no other mathematics. Many students in the arts and humanities take Math 5 for this reason. Some students also take Math 5 to satisfy the "mathematics proficiency" portion of the Associate Degree graduation requirements.

As a member of the Mathematics Department with a great deal of knowledge of and experience with mathematics your opinion is critically important to this curriculum review. Please take time to answer the following questions and respond to the attached statements. This is not a test of your knowledge of the current make up of the Math 5 course. Let us know what you would like the transfer level "general education" mathematics course at Saddleback College to be.

When you are finished, please return this questionnaire to:

Steve Sworder
Mathematics Department
Saddleback College

Thank you,

Please circle the appropriate answer for each of the following two questions.

a) Have you taught Math 5 in the past? Yes No

b) Would you be interested in teaching Math 5 in the future? Yes No Maybe

APPENDIX E

QUESTIONNAIRE COVER LETTER FOR LIBERAL ARTS AND FINE ARTS FACULTY

Saddleback College

MEMORANDUM

The Mathematics Department is currently reviewing the goals, prerequisites and content of Mathematics 5 — "Mathematics for Liberal Arts Students". We are willing to leave the course in its current form, modify it selectively or completely overhaul it. We seek the form for this course that will best serve the needs of the students of Saddleback College and are most interested in your opinions concerning what Math 5 should be.

"Mathematics for Liberal Arts Students" is often taken by students seeking to meet the "mathematical concepts" portion of the general education certification for transfer to a branch of the California State University system and whose major fields require no other mathematics. Many students in the arts and humanities take Math 5 for this reason. Some students also take Math 5 to satisfy the "mathematics proficiency" portion of the Associate Degree graduation requirements.

Because Math 5 is an integral component of the "general education" core taken by many students at Saddleback College, we feel the course should conform to the general education philosophy of the College and be a valuable part of the students' overall education. In an effort to gain a better appreciation for the direction this course should take, we plead with you to take a few moments and share your expertise in the arts and humanities with us by completing the attached questionnaire. This is not a test of your knowledge of the current make up of the Math 5 course. Let us know what you would like the transfer level "general education" mathematics course at Saddleback College to be.

When you are finished, please return this questionnaire to:

Steve Sworder
Mathematics Department
Saddleback College

Thank you,

APPENDIX F

QUESTIONNAIRE COVER LETTER FOR
THE STUDENTS IN THE SAMPLE

Saddleback College

MEMORANDUM

Students of Saddleback College,

The Mathematics Department is currently reviewing the goals, required background and content of Math 5 -- "Mathematics for Liberal Arts Students". We seek the form for this course that will best serve your needs and are most interested in your opinions concerning what Math 5 should be.

"Mathematics for Liberal Arts Students" is often used by a student, whose major course of study requires no other mathematics, to satisfy the "mathematical concepts" portion of the general education certification for transfer to a branch of the California State University (e.g. Fullerton, Long Beach, San Diego State, etc.) or certain branches of the University of California depending on the student's major. Many students in the arts and humanities take Math 5 for this reason. Math 5 is also used by a number of students to satisfy the "mathematics proficiency" portion of the Associate Degree graduation requirements.

In an effort for us to gain a better appreciation for the direction this course should take, we plead with you to take a few moments to answer the questions below and complete the attached questionnaire. This is not a test of your knowledge of the current make up of the Math 5 class. Rather, we would like to know what you would like the transfer level "general education" mathematics course at Saddleback College to be.

Thank you,

Mathematics Department
Saddleback College

Please circle the appropriate response for each of the following questions:

a) Have you already taken Math 5? YES NO

b) Will you be taking Math 5 in the future? YES NO MAYBE

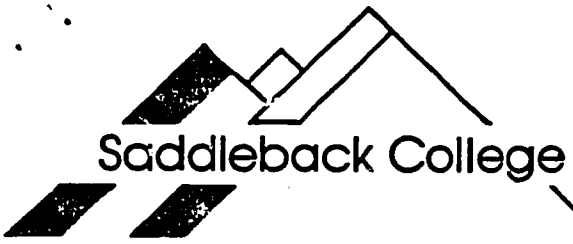
c) In what general area does your most probable major course of study lie?

| | | | |
|---|---|---|---|
| Social Science | Physical Science | Fine Arts | Liberal Arts |
| Natural Science | Applied Technology | Business | Humanities |
| Foreign Language | Undecided | Other: _____ | |

Please Specify

APPENDIX G

MEMORANDUM FOR INSTRUCTORS WHO CONDUCTED THE STUDENT SURVEY




MEMORANDUM

The Mathematics Department is currently reviewing the goals, prerequisites and content of Math 5 -- "Mathematics for Liberal Arts Students". We desperately need the views of students and plead for your help. Because most Math 5 students take no other mathematics classes, we have no way of sampling the general population of possible students within our own curriculum. We have consequently selected, in an as unbiased manner as possible, 20 class sections in the Liberal Arts, Humanities and Fine Arts to be polled. If there is any possible way you could give your students in
a few moments to complete the enclosed questionnaire we will be forever in your debt.

If you are able to give the survey to your class, could you note the number of students receiving a questionnaire in the space below (we need to monitor our nonresponse bias) and return them to:

Steve Sworder
Mathematics Department
Saddleback College

Thank you,

_____: Number of students given a questionnaire.

APPENDIX H

COURSE CONTENT GROUP MEAN RESPONSES
IN DESCENDING ORDER

Table 4

Course Content Mean Responses
Full-time Mathematics
Faculty

| Statement Number | Descriptive Phrase | Number of Respondents | Mean Response |
|---|---|---|---|
| 9 | History | 12 | 4.58 |
| 8 | Cultural Heritage | 12 | 4.58 |
| 17 | Statistics | 11 | 4.36 |
| 13 | Math Reasoning | 11 | 4.36 |
| 16 | Probability | 12 | 4.25 |
| 10 | Recent Developments | 11 | 4.18 |
| 11 | Term Papers | 12 | 4.17 |
| 15 | Sets | 11 | 4.00 |
| 14 | Computer Technology | 11 | 3.91 |
| 12 | Graphs | 10 | 3.90 |
| 21 | Numbering | 9 | 3.67 |
| 25 | Math Proficiency | 11 | 3.45 |
| 19 | Measurement | 12 | 3.33 |
| 20 | Algebra | 12 | 3.00 |
| 18 | Geometry | 12 | 3.00 |
| 22 | Consumer Math | 12 | 2.67 |
| 23 | Arithmetic | 8 | 2.13 |
| 24 | Open Format | 9 | 1.78 |

Table 5

Course Content Mean Responses
Part-time Mathematics
Faculty

| Statement Number | Descriptive Phrase | Number of Respondents | Mean Response |
|---|---|---|---|
| 13 | Math Reasoning | 23 | 4.35 |
| 16 | Probability | 23 | 4.30 |
| 12 | Graphs | 23 | 4.26 |
| 14 | Computer Technology | 24 | 4.25 |
| 17 | Statistics | 23 | 4.13 |
| 25 | Math Proficiency | 21 | 4.05 |
| 19 | Measurement | 22 | 4.05 |
| 18 | Geometry | 24 | 4.00 |
| 20 | Algebra | 23 | 3.74 |
| 9 | History | 23 | 3.74 |
| 22 | Consumer Math | 22 | 3.73 |
| 15 | Sets | 22 | 3.68 |
| 10 | Recent Developments | 22 | 3.68 |
| 8 | Cultural Heritage | 19 | 3.47 |
| 23 | Arithmetic | 23 | 3.35 |
| 11 | Term Papers | 20 | 3.00 |
| 21 | Numbering | 19 | 2.79 |
| 24 | Open Format | 20 | 2.10 |

Table 6

Course Content Mean Responses
Full-time Liberal Arts and
Fine Arts Faculty

| Statement Number | Descriptive Phrase | Number of Respondents | Mean Response |
|---|---|---|---|
| 13 | Math Reasoning | 23 | 4.60 |
| 10 | Recent Developments | 22 | 4.36 |
| 16 | Probability | 23 | 4.13 |
| 19 | Measurement | 23 | 4.09 |
| 23 | Arithmetic | 24 | 4.08 |
| 17 | Statistics | 24 | 4.08 |
| 12 | Graphs | 22 | 4.05 |
| 9 | History | 24 | 3.96 |
| 25 | Math Proficiency | 20 | 3.95 |
| 20 | Algebra | 20 | 3.90 |
| 14 | Computer Technology | 23 | 3.87 |
| 8 | Cultural Heritage | 23 | 3.87 |
| 15 | Sets | 13 | 3.85 |
| 21 | Numbering | 19 | 3.68 |
| 18 | Geometry | 22 | 3.59 |
| 11 | Term Papers | 23 | 3.52 |
| 22 | Consumer Math | 24 | 3.42 |
| 24 | Open Format | 18 | 2.33 |

Table 7

Course Content Mean Responses
Liberal and Fine Arts
Students

| Statement Number | Descriptive Phrase | Number of Respondents | Mean Response |
|---|---|---|---|
| 25 | Math Proficiency | 59 | 4.10 |
| 19 | Measurement | 63 | 4.02 |
| 22 | Consumer Math | 62 | 4.00 |
| 13 | Math Reasoning | 60 | 4.00 |
| 20 | Algebra | 63 | 3.94 |
| 23 | Arithmetic | 63 | 3.90 |
| 12 | Graphs | 57 | 3.89 |
| 18 | Geometry | 61 | 3.79 |
| 14 | Computer Technology | 58 | 3.76 |
| 16 | Probability | 57 | 3.75 |
| 10 | Recent Developments | 55 | 3.75 |
| 17 | Statistics | 61 | 3.61 |
| 15 | Sets | 49 | 3.55 |
| 9 | History | 61 | 3.20 |
| 21 | Numbering | 49 | 3.14 |
| 8 | Cultural Heritage | 60 | 2.97 |
| 24 | Open Format | 53 | 2.87 |
| 11 | Term Papers | 55 | 2.16 |

Table 8

Course Content Mean Responses
Full-time Counseling
Staff

| Statement Number | Descriptive Phrase | Number of Respondents | Mean Response |
|---|---|---|---|
| 13 | Math Reasoning | 13 | 4.46 |
| 19 | Measurement | 13 | 4.38 |
| 10 | Recent Developments | 13 | 4.38 |
| 12 | Graphs | 11 | 4.27 |
| 25 | Math Proficiency | 12 | 4.25 |
| 17 | Statistics | 13 | 4.23 |
| 8 | Cultural Heritage | 12 | 4.17 |
| 14 | Computer Technology | 13 | 4.08 |
| 9 | History | 13 | 4.00 |
| 15 | Sets | 10 | 3.80 |
| 16 | Probability | 13 | 3.69 |
| 18 | Geometry | 13 | 3.31 |
| 22 | Consumer Math | 12 | 3.25 |
| 20 | Algebra | 13 | 3.23 |
| 21 | Numbering | 9 | 3.11 |
| 23 | Arithmetic | 12 | 2.75 |
| 11 | Term Papers | 12 | 2.59 |
| 24 | Open Format | 11 | 1.82 |