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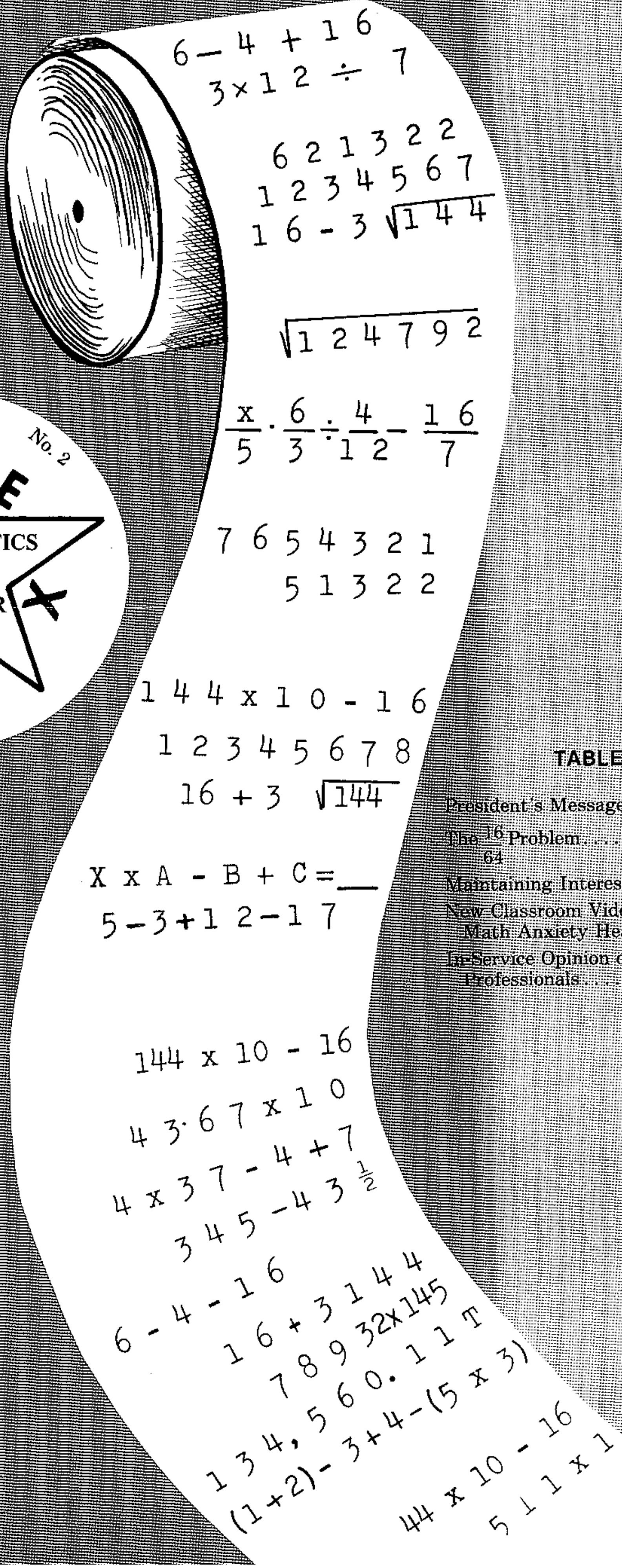

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PRESIDENT'S MESSAGE

How time flies! It seems only yesterday that this school year started and here we are already into the third quarter.

I hope that many of you had the opportunity to attend the Name-of-Site meeting in Dallas, March 6-8. Many thanks to each person who willingly donated his time and expertise in preparing for this outstanding and successful meeting.

Three offices of the TCTM Executive Board are elected each year. This year they are a vice-president, the secretary and the parliamentarian. Mr. William Stanford, the out-going vice-president, is serving as chairman of the nominating committee. If you have suggestions for people to serve as any of the officers please send their names to Mr. Stanford, 6406 Landmark Dr., Waco, Texas 76710.

When you receive your ballot please make your choices known by exercising your voting privilege. The results of the election will be made known during CAMT in Austin this fall.

Thank you for your continued support of TCTM.

Anita Priest

MANUSCRIPTS NEEDED!!!!! Send them to 100 S. Glasgow, Dallas, Texas, 75214.

The $\frac{16}{64}$ Problem

Cindy Bennett

Skyline High School
Dallas

This article examines a special type of fraction which can be reduced by eliminating the right digit(s) of the numerator and the left digit(s) of the denominator. The fraction will be represented by an equation and through this equation and conjectures concerning it, the solution sets will be determined.

Introduction

The purpose of this article is to locate the fractional values which can be reduced by eliminating the right digit(s) of the numerator and the left digit(s) of the denominator. An example of this situation is as follows:

$$\frac{1\not{6}}{\not{6}4} = \frac{1}{4}$$

which is a true statement.

This situation will be examined in three ways: elimination of one digit in two-digit numbers, elimination of two digits in three-digit numbers, and elimination of one digit in three-digit numbers. The solutions which will be considered are those in which the variables are equal to non-zero, positive, and one-digit numbers.

ONE DIGIT ELIMINATION: TWO-DIGIT NUMBERS

This type of problem may be represented by the equation

$$\frac{10a + b}{10b + c} = \frac{a}{c}.$$

With algebraic manipulation, the following may be concluded.

$$c(10a + b) = a(10b + c)$$
$$10\,ac + bc = 10\,ab + ac$$
$$10\,ab - bc = 9ac$$
$$(1)\quad b(10a - c) = 9ac$$

If the values of $a = c$ are assigned, then

$$b(10a - a) = 9a^2$$
$$9ab = 9a^2$$
$$a = b\,.$$

From this a trivial solution is developed in which if $a = b = c$, the equation will be satisfied.

Referring to the key equation (1), it is seen that

$$b(10a - c) = \text{multiple of } 9$$

Therefore in order for a and c to be equal to whole numbers, b(10a − c) must contain two factors of three.

$$b(10a - c) = 9ac = \text{whole number.}$$

Either b will contain two factors of three, (10a − c) will contain two factors of three, or b will contain one factor of three and (10a − c) will contain one factor of three. The possibilities are as follows:

$$b = 9 \quad 9(10a - c) = 9ac$$
$$(10a - c) = ac$$
$$10a - ac = c$$
$$a(10 - c) = c$$
$$a = \frac{c}{10 - c}$$

If c = 8, then a = 4, and the solution is $\frac{49}{98}$.

If c = 5, then a = 1, and the solution is $\frac{19}{95}$.

$$b = 3 \quad 3(10a - c) = 9ac$$
$$(10a - c) = 3ac$$
$$10a - 3ac = c$$
$$a(10 - 3c) = c$$
$$a = \frac{c}{10 - 3c}$$

If c = 3, then a = 3, and the solution is $\frac{33}{33}$, however this is included in the trivial solution.

$$b = 6 \quad 6(10a - c) = 9ac$$
$$60a - 6c = 9ac$$
$$60a = 9ac + 6c$$
$$c = \frac{20a}{3a + 2}$$

If a = 1, then c = 4, and the solution is $\frac{16}{64}$.

If a = 2, then c = 5, and the solution is $\frac{26}{65}$.

If a = 6, then c = 6, and the solution is $\frac{66}{66}$.

(trivial solution)

$$b = 1 \quad 10a - c = 9ac$$
$$10a - 9ac = c$$
$$a(10 - 9c) = c$$
$$a = \frac{c}{10 - 9c}$$

If a = 1, then c = 1, and the solution is $\frac{11}{11}$.

(trivial solution)

These, along with the trivial solution, are the only solutions which satisfy the condition that a, b, and c are equal to whole numbers. Therefore the final solutions are the trivial solution, $\frac{49}{98}$, $\frac{19}{98}$, $\frac{16}{64}$, and $\frac{26}{65}$.

TWO DIGIT ELIMINATION: THREE-DIGIT NUMBERS

A three-digit problem may be represented by the equation

$$\frac{100a + 10b + c}{100\,b + 10c + c} = \frac{a}{d}.$$

This equation may be further simplified.

$$d(100a + 10b + c) = a(100b + 10c + d)$$
$$100ad + 10bd + cd = 100ab + 10ac + ad$$
$$99ad + 10bd + cd = 100ab + 10ac$$
$$99ad = 100ab + 10\,ac - 10bd - cd$$
$$= 10a(10b + c) - d(10b + c)$$
$$(2) \quad 99ad = (10a - d)\,(10b + c)$$

If a = b = c, then

$$(10a - d)\,(11a) = 99a^2$$
$$110a^2 - 11ad = 99a^2$$
$$-11ad = -11a^2$$
$$a = d.$$

This proves the trivial solution by showing that if a = b = c = d, the equation will be satisfied.

The key equation (2), because it is equal to a multiple of 99, must have two factors of three and one factor of 11 in the factorization of (10a − d) (10b + c) in order for b and c to be equal to one-digit whole numbers. This is explained below:

$$99ad = (10a - d)\,(10b + c)$$
$$\frac{99ad}{(10a - d)} = (10b + c)$$
$$(10b + c) = \text{two-digit number.}$$

NOTE: The factor of 11 must be found in (10b + c) because only positve numbers are being dealt with.

Values of a and d will be assigned in these problems which satisfy the previously stated conditions for (10a − d) (10b + c).

$$a = 1, d = 1 \quad 99 = 9(10b + c)$$
$$11 = 10b + c$$

For a = 1, d = 1, it is shown that b = c = 1. The resulting solution is $\frac{111}{111}$, however this is included in the trivial solution.

$$a = 1, d = 4 \quad 396 = 6(10b + c)$$
$$66 = (10b + c)$$

If a = 1, and d = 4, then b = c = 6.
Solution: $\frac{166}{664}$.

$$a = 1, d = 5 \quad 495 = 5(10b + c)$$
$$99 = (10b + c)$$

If a = 1, and d = 5, then b = c = 9.
Solution: $\frac{199}{995}$.

$$a = 2, d = 5 \quad 990 = 15(10b + c)$$
$$66 = (10b + c)$$

If a = 2, and d = 5, the b = c = 6.
Solution: $\frac{266}{665}$.

$$a = 4, d = 8 \quad 3168 = 32(10b + c)$$
$$99 = (10b + c)$$

If a = 4, and d = 8, then b = c = 9.
Solution: $\frac{499}{998}$.

In these solutions b = c because (10b + c) always contains the factor of 11. These are the only possible solutions because any other combinations of two factors of three and ane factor of eleven will cause (10b + c) to equal a three-digit number. Therefore the final solutions are $\frac{166}{664}$, $\frac{199}{995}$, $\frac{266}{665}$, and $\frac{499}{998}$.

ONE DIGIT ELIMINATION: THREE-DIGIT NUMBERS

This second type of three-digit problem may be represented by

$$\frac{100a + 10b + c}{100c + 10d + e} = \frac{10a + b}{10d + e}$$

It may be simplified with algebraic manipulation.

$$(10d+e)(100a+b10b+c) = (10a+b)(100c+10d+e)$$
$$1000ad+100bd+10cd+100ae+10be+ce =$$
$$1000ac+100ad+10ae+100bc+10bd+be$$
$$900ad+90bd+90ae+9be = 1000ac+100bd-10cd-ce$$
$$900ad+90ae-1000ac = 100bc-10cd-ce-90bd-90be$$
$$100c(10a+b) = 10d(90a+9b+c)+e(90a+9b+c)$$
$$(3) \quad 100c(10a+b) = (10d+e)(90a+9b+c)$$

If the values of a = b = d = e are assigned, the result is the trivial solution.

$$900a^2+90a^2+90a^2+9a^2 = 100ac+100ac-10ac-ac$$
$$1089a^2 = 1089ac$$
$$a = c$$

In this research a conjecture could not be developed. However, the solutions which were obtained by randomly assigning values were directly related to the previous solutions.

$$a = 1, b = 6, c = 6 \quad 600(16) = (10d + e)150$$
$$64 = (10d + e)$$

If a = 1, b = 6, and c = 6, then d = 6, and e = 4.
Solution: $\frac{166}{664}$.

$$a = 1, b = 9, c = 9 \quad 900(19) = (10d + e)180$$
$$95 = (10d + e)$$

If a = 1, b = 9, and c = 9, then d = 9, and e = 5.
Solution: $\frac{199}{995}$.

$$a = 2, b = 6, c = 6 \quad 600(26) = (10d + e)240$$
$$65 = (10d + e)$$

If a = 2, b = 6, and c = 6, then d = 6, and e = 5.
Solution: $\frac{266}{665}$.

$$a = 4, b = 9, c = 9 \quad 900(49) = (10d + e)450$$
$$98 = (10d + e)$$

If a = 4, b = 9, and c = 9, then d = 9, and e = 8.
Solution: $\frac{499}{998}$.

After much trial and error, these solutions were the only ones which derived from the original equation (3). Therefore the final solutions are $\frac{166}{664}$, $\frac{199}{995}$, $\frac{266}{665}$, and $\frac{499}{998}$.

CONCLUSION

In the research of these fractions the number three was a key number. Multiples of three were present in each of the equations (1), (2), and (3). All of the solutions were directly related to one another. The terms which were eliminated in each fraction were always either a six or a nine, both of which are multiples of three.

Maintaining Interest in Mathematics

Charles V. Peele
Marshall University

Mathematics students sometimes lose their interest and enthusiasm for the subject as they mature. In an effort to help students maintain their excitement we must challenge our learners.

Numbers expressed in different bases offer a fertile field for challenging all levels of secondary students. Divisibility rules offer students the opportunity to discover patterns, ranging from simple to complex. For example, there exists a divisibility rule for each simple digit numeral expressed in base eight: "A base-eight numeral represents a number divisible by

2 if the last digit is divisible by 2;
3 if the last digit is substrac ed from the number represented by the remaining digits is divisible by 3;
4 if the last digit is 0 or 4;
5 if double the last digit added to the number represented by the remaining digits is divisible by 5;
6 if it is divisible by 2 and by 3;
7 if the sum of the digits is divisible by 7" [Wardrop, 1972].

"Proofs," naturally, vary with the maturity of the students, but all students can succeed and even the most advanced will be fully challenged.

REFERENCE

Wardrop, R. F. "Divisibility Rules for Numbers Expressed in Different Bases." *The Arithmetic Teacher* 19(1972: 218-22).

New Classroom Video Series Meets Math Anxiety Head-on

The best way around math anxiety is a direct route through the rockiest roads in the mathematics curriculum. That's the theory of *Mathways,* a new video series now available for classroom use.

Mathways was designed to help students in grades five through eight avoid the pitfalls of math anxiety. The four 15-minute programs meet head-on common sources of math fear: decimal points, percentages, areas of circles and cylinders, and volumes of prisms, cylinders, and cones.

The series was produced for the Wisconsin Educational Television Network by the University of Wisconsin-Stout Telecommunication Center in cooperation with the Wisconsin Mathematics Council. It is being made available through the Agency for Instructional Television (AIT).

Mathways programs make abstract mathematical problems concrete through colorful animation. Lively dialogue between questioning students and unconventional "teachers" (like the talking decimal point) accompany the visual action.

In the first program, a talkative, fast-moving decimal point explains to a skeptical student what a difference it makes when it moves from place to place within a number.

The second program uses such items as pennies, elephants, pizza pies, and cereal to illustrate "percent" as *per hundred.*

Program three introduces *pi* — what it is and how it is used to compute the circumference of a circle and the lateral area and total surface area of a cylinder (like a can of soda pop).

The final program demonstrates fundamental concepts of volume and illustrates how formulas are used to find the volumes of prisms, cylinders, and cones.

The programs serve as a review fol students who have learned the fundamental concepts dealt with and as a carefully structured introduction for those who have not.

The Agency for Instructional Television is a nonprofit American-Canadian organization established in 1973 to strengthen education through television and other technologies. AIT develops joint program projects involving state and provincial agencies, and acquires and distributes a wide variety of television and related printed materials for use as major learning resources. It makes many of the television materials available in audiovisual formats. AIT's predecessor organization, National Instructional Television, was founded in 1962.

The AIT main offices and Midwestern office are in Bloomington, Indiana; there also are regional offices in the Washington, D.C., Atlanta, and San Francisco areas.

Each *Mathways* program can be purchased for audiovisual use on any videocassette format. The price for individual programs is $110 on videocassette. Free previews will be provided to prospective purchasers at no charge except for return postage. Purchasers of ten programs within a fiscal year receive a free bonus print.

Mathways can be leased for broadcast use and video duplication by schools, public television stations, and other educational agencies. Rates are available on request.

Further descriptive information plus details about preview, purchase, and leasing arrangements can be obtained from AIT, Box A, Bloomington, Indiana 47402, (812) 339-2203, or from any AIT Regional Office.

In-Service Opinions of Texas Professionals

Vera R. King

Prairie View A&M University

Margaret C. Hahn

Lamar Consolidated School District

The mathematics education curriculum has evolved through two major eras: pre-1900, and 1900 to 1950; now a third era is in progress. During these eras, the emphases of mathematics education have changed to respond to many needs within society. During the post-1950 era, curriculum emphases were placed on "why" as well as "how", structure and sequencing, understanding, introduction of new topics, introduction of topics at lower levels, and provisions for individual differences.

The purposes in this study were threefold: to determine public school professional staff members' perceptions of:

1. The impact of post-1950 mathematics education recommendations of selected influential groups,

2. The merits of the recommendations, and
3. The regular classroom use of the recommended changes.

When one traces the development of the mathematics education curriculum, the philosophies of mathematics learning, and recommendations of influential groups, one can better understand how to plan future mathematics programs. The most influential groups of the post-1950 eras are the National Advisory Committee on Mathematics Education, the Committee on Undergraduate Programs in Mathematics Educations, state education agencies, the National Council of Teachers of Mathematics, the Cambridge Conference on School Mathematics, the School Mathematics Study group, and the University of Illinois Committee on School Mathematics.

One must view numerous aspects of pre-service and in-service programs to determine the relationship between recommendations and the extent to which they have been implemented. Study of this relationship helps one identify existing problems, propose solutions, and determine the degree to which future recommendations may be implemented. These are critical concerns, for the improvement of the competencies of mathematics teachers is vital to the continued improvement of mathematics thinking and learning.

Method

Two hundred twenty-five administrators, counselors, teachers, and curriculum specialists from fifteen school districts within a 200 mile radius of Houston were surveyed with a questionnaire developed by the investigators. The school districts' enrollments ranged from 665 to 250,000, with a mean enrollment of approximately 33,850. More than fifty per cent of the school districts' enrollments exceeded 10,000. The number of personnel from a given district who responded to the questionnaire ranged from 1 to 35.

The questionnaires were mailed to school principals in packet form for distribution to the appropriate personnel. Each packet contained 5 to 10 questionnaires, a cover letter, and a stamped self-addressed envelope. Alsto twenty-five questionnaires were distributed at the TSTA November 1976 Convention, and 65 others were personally distributed. These personal contacts with colleagues and friends were made during job related activities of the investigator's and investigator's advisor.

Instrumentation. A 20-item instrument was developed which represented a syntheses of (1) a 1976 pilot study, and (2) recommendations for pre-service and in-service programs by several influential mathematics education study groups (NACOME, 1975; CUPM, 1966; TEA, 1976; NCTM, 1971).

Sample. Of the one hundred persons who responded to the questionnaire, 79% were teachers and 21% were administrators. Approximately 66% of the teachers were secondary and 34% were elementary. Thirty-seven personnel had 1-5 years of teaching experience, thirty-seven had 6-15 years of teaching experience, and twenty-six had over 15 years of teaching experience.

Results

To respond to the issues in this study, results of the 20-item questionnaire are reported in the next three sections.

The School Mathematics Curriculum and Teaching Practices. For each item in Table I, the respondents were asked to rate their strengths. Most of those questioned felt competent to deal with content and curriculum developments. However, on teaching techniques such as individualized instruction and use of mathematics laboratories respondents gave themselves low ratings.

Table I

Descriptive Statistics on Professionals Self-Ratings on Competencies in Dealing with Curriculum and Teaching Practices

	Very Strong		Strong		Weak		Total Responding
	n	%	n	%	n	%	
Content	51	53.7	44	46.3	0	0	95
Individualized instruction	8	8.6	62	66.7	23	24.7	93
Open concept	8	9.0	25	28.1	56	62.9	89
Team teaching	11	12.1	18	19.8	62	68.1	91
Classroom use of computers	11	12.7	23	26.4	53	60.9	87
Programmed instruction	5	6.0	19	22.6	60	71.4	84
Math lab	11	11.4	30	30.9	56	57.7	97
Use of teaching aids, media, etc.	15	15.3	69	70.4	14	14.3	98
Curriculum development	37	41.1	47	52.2	6	6.7	90
Development of positive self concept	33	37.5	44	50.0	11	12.5	88
Development of positive attitude about mathematics	31	36.0	41	47.7	14	16.3	86

Table II depicts the number of districts mathematics offerings. Fundamentals of Mathematics (FOM), introductory algebra, algebra, geometry, trigonometry, and elementary analysis were offered in all the eleven districts responding to this question. Seventy-four per cent of the respondents indicated that their mathematics courses were divided into levels: basic, general, advanced; eighty-nine per cent of the secondary schools' mathematics programs were designed to meet the needs of both college and non-college bound students, and seventy-six per cent of the administrators who responded said that less than fifty per cent of the students in their schools take more than the minimum (2 units) mathematics requirement for graduation; more than fifty per cent of these are minority students.

School and Community Facilities. Fifty-seven per cent of the teachers had access to a computer terminal. However, sixty-one per cent were not frequently called upon to provide basic instruction in the principles of computers. Approximately sixty-seven per cent of the elementary schools did not have

Table II

Descriptive Statistics on Secondary Mathematics Courses Offered in Schools Sampled

Course	Number of Districts Offering	Per cent
FOM (Related Math)	11	100
Introductory Algebra	11	100
Algebra 1	11	100
Geometry	11	100
Algebra 2	11	100
Trigonometry	11	100
Elementary Analysis	11	100
Probability and Statistics	7	63.6
Analytical Geometry	7	63.6
Pre-calculus	0	0
Calculus	7	63.6
Computer Math	7	63.6
Introductory Computer Science	0	0

a mathematics laboratory, while fifty-two per cent of the secondary schools made some use of the laboratory.

Opinions on Teacher Preparation. Table III depicts that seventy per cent of the secondary teachers felt a vital need for those courses specifically oriented toward the secondary level. Eighty-five per cent of the elementary teachers (Table IV) wanted additional concepts in algebra, plane geometry, structure of number systems, mathematics methods, experiences with classroom devices, displaying bulletin boards and other elementary mathematics concepts.

Table III

Descriptive Statistics on Recommendations for Secondary Mathematics Preparation by Secondary Respondents

	Number	Per Cent
Algebra	70	100
Geometry	69	98.5
Trigonometry	67	95.7
Analytical Geometry	63	90.0
Calculus	61	87.1
Abstract Algebra	32	45.7
Probability and Statistics	43	61.4
Point Set Theory	16	22.8
Analysis	41	58.6
Differential Equations	29	41.4
Logic	40	57.1
Student Teaching	59	84.2
History of Mathematics	45	64.2
Math Methods	64	91.4
Math lab experience	53	75.7
Computer experience	46	65.7
Trends In Math Education	35	50.0
Curriculum Models (SMSG, UICSM, SSMCIS)	23	32.8
Number of secondary personnel responding — 70		

Table IV

Descriptive Statistics on Recommendations for Elementary Mathematics Preparation by Elementary Respondents

	Number	Per Cent
Algebra	27	100
Plane Geometry	25	92.6
Analytical Geometry	6	22.5
Transformational Geometry	0	0
Trigonometry	10	37.0
Probability	8	29.6
Graphs and Statistics	9	33.3
Structure of Number Systems	23	85.2
Computer experience	11	40.7
Math Methods	27	100
History of Mathematics	17	63.0
Experience in using classroom devices	27	100
Experience in displaying bulletin boards	25	92.6
Elementary Math Concepts	26	96.3
Curriculum Models (SMSG, UICSM, SSMCIS)	6	22.2
Number of elementary personnel responding — 27		

Seventy per cent of the respondents felt the colleges were doing an adequate job of preparing teachers. In each item in Tables V and VI, respondents were asked to give their opinion, by rating areas of pre-service needs. Techniques of motivating students was listed as the area of greatest pre-service need in teacher education curricula. Over fifty per cent of the respondents expressed need for stronger pre-service emphasis on laboratory learning, mathematical applications, manipulatives, and problem solving. They felt that in-service needs were similar.

Table V

Descriptive Statistics on Experiences Where More Pre-Service Preparation is Needed

	Very Strong		Strong		Little Need		Total Responding
	n	%	n	%	n	%	
Motivation	53	63.8	21	25.4	9	10.8	83
Lab learning	16	19.2	48	57.8	18	21.7	82
Slow learners	44	55.0	31	38.8	5	6.2	80
Math games	12	15.4	37	47.4	29	37.2	78
Mathematics applications	35	39.3	44	49.5	10	11.2	84
Problem solving	41	51.9	28	35.4	10	12.7	79
Classroom use of computers	13	16.5	42	53.2	24	30.3	79
Math models	13	16.7	40	51.2	25	32.1	78
Math curriculum models	11	13.3	39	47.0	33	39.7	83
Manipulative	30	36.2	47	56.6	6	8.0	83

English, physics, and general science were the courses selected most often as first choices by ad-

Table VI

Descriptive Statistics on Experiences Where More In-Service Preparation is Needed

	Very Strong		Strong		Little Need		Total Responding
	n	%	n	%	n	%	
Motivation	45	62.5	22	30.6	9	6.9	72
Lab learning	23	31.1	37	50.0	14	18.9	74
Slow learners	46	61.3	23	30.7	6	8.0	75
Math games	11	14.5	36	47.4	29	38.1	76
Mathematics applications	28	33.7	39	47.0	16	19.3	83
Problem solving	31	37.3	33	40.0	19	22.7	83
Classroom use of computers	19	27.1	23	32.9	28	40.0	70
Math models	14	15.9	40	45.5	34	38.6	88
Math curriculum models	12	16.7	37	51.4	23	31.9	72
Manipulative	33	45.8	27	37.5	12	16.7	72

Table VII

Subjects in Which Respondents Felt Secondary Mathematics Teachers are Weakest

	Number	Per Cent
FOM/Related Math	22	20.0
Algebra	0	0
Geometry	13	11.8
Math lab	21	19.1
Computer science	43	39.1
Structure of number systems	11	10.0
Based on 110 responses		

ministrators as second teaching fields for mathematics majors. In Table VII respondents were asked to select areas in which mathematics teachers are weakest. Computer science, fundamental of mathematics and use of mathematics laboratories were selected most frequently by the respondents.

Nonparametric Statistical Analysis of Data

Six null hypotheses were tested relative to specific items. (1) An equal number of experts, based on years of experience (experience groups), favored all areas listed as a needed part of secondary teacher preparation. At least fifty per cent of the seventy per cent of personnel responding recommended College Algebra, Probability and Statistics, Analysis, Logic, Geometry, Trigonometry, Analytic Geometry, Calculus, Student Teaching, History of Mathematics, Math Lab experiences and Fundamentals in Math Education as a necessary part of secondary mathematics teacher preparation. Abstract Algebra, point set theory, differential equations, and curriculum models were recommended by fewer than fifty per cent of those making recommendations. (2) There was agreement among experience groups on pre-service programs emphasizing courses specifically taught as oppose to greater emphasis on advance preparation. (3) There was agreement between the progressive versus non-progressive view that pre-service preparation should emphasize courses specifically taught at the pre-college level(s). (4) There was agreement among experience groups relative to the quality of teacher education programs. (5) There was agreement among experience groups relative to in-service and pre-service needs being basically the same. (6) There was significant difference among experience groups relative to perceived pre-service needs. These differences were between all experience pairs, the 1-5 years and 6-15 years, 6-15 years and over 15 years, and 1-5 and over 15 years experience groups, with: $z = 4.37, p < .005$; $z = 3.66, p < .005$; $z = 1.74, p < .005$, respectively.

Conclusions

Mathematics teachers are rather satisfied with their teacher preparation. They do, however, have some problems. Primarily these problem areas center about teaching techniques.

Although most respondents (71%) indicated the presence of a progressive atmosphere within their respective schools, few indicated that they felt secure in dealing with recent innovations in teaching mathematics. Most respondents indicated that they use the same methods which were used before the fifties.

The respondents did not feel that the higher standards recommended by the Committee on Undergraduate Programs in Mathematics (CUPM) were absolutely necessary, this was especially true among respondents who were elementary teachers.

The post-1950 mathematics education recommendations of emphases on understanding, structure, and provisions for individual difference have merit as indicated by the respondents. At least 68% of them expressed need for math lab experiences, computer experiences, newer topics to the school curriculum such as elementary analysis, calculus, and probability and statistics, emphasis on logical reasoning, structure and historical topics. Transformational geometry was not recommended for elementary student experiences.

Such experiences as classroom use of computers, probability and statistics, use of manipulatives, and utilization of community resources do not appear to be regular features of the respondents classroom.

Recommendations for Pre-Service and In-Service Needs

Recommendations for pre-service and in-service needs are discussed relative to limitations of this study. Limitations include: (1) the validity of professionals' response by observing, (2) small sample size and not randomly selected, and (3) no measure of actual degree to which recommendations of study groups have been implemented, or no measure of student learning.

Based on the conclusions of this study:

(1) Colleges need to continue with their minimum

mathematical requirements in order to maintain the satisfactory level of knowledge indicated by the survey.

(2) Because of the response from those surveyed, more emphasis must be placed on the teaching techniques.

(3) Areas such as motivation, slow learners, applications of mathematics, manipulative, and problem solving need to be stressed more in pre-service and in-service programs.

(4) In order that teachers may be aware of developments in their profession, more emphasis needs to be placed on study groups' recommendations and policies.

(5) Based on some of the comments made, there seems to be a need for more communication and less hostility between elementary and secondary teachers.

References

Committee on the Undergraduate Program in Mathematics. *Recommendations on Course Content for the Training of Teachers of Mathematics.* Washington, D.C.: MAA, 1966.

Dessart, D. J., "Mathematics in Secondary School; Evolution of Curriculum and Trends," *Review of Educational Research,* XXXIV (1964), 298-300.

Gibney, T. C., "Comparison of the Number of Mathematics Courses Taken by Elementary Teachers and Their Mathematical Understanding,: *School Science and Mathematics,* CXX (1970, 35-38.)

National Advisory Committee on Mathematicl Education. *Overview and Analysis of School Mathematics Grades K-12.* Washington, D. C.: Conference Board of the Mathematical Sciences, 1975.

National Council of Teachers of Mathematics. *Summary of a Survey of Mathematics Teachers.* Reston, Virginia: NCTM, 1971.

Skinner, B. F. *Verbal Behavior.* New York: Appleton-Century-Crofts, 1966.

Willoughby, Stephen S. *Contemporary Teaching of Secondary School Mathematics.* New York: John Wiley and Sons, 1967.

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