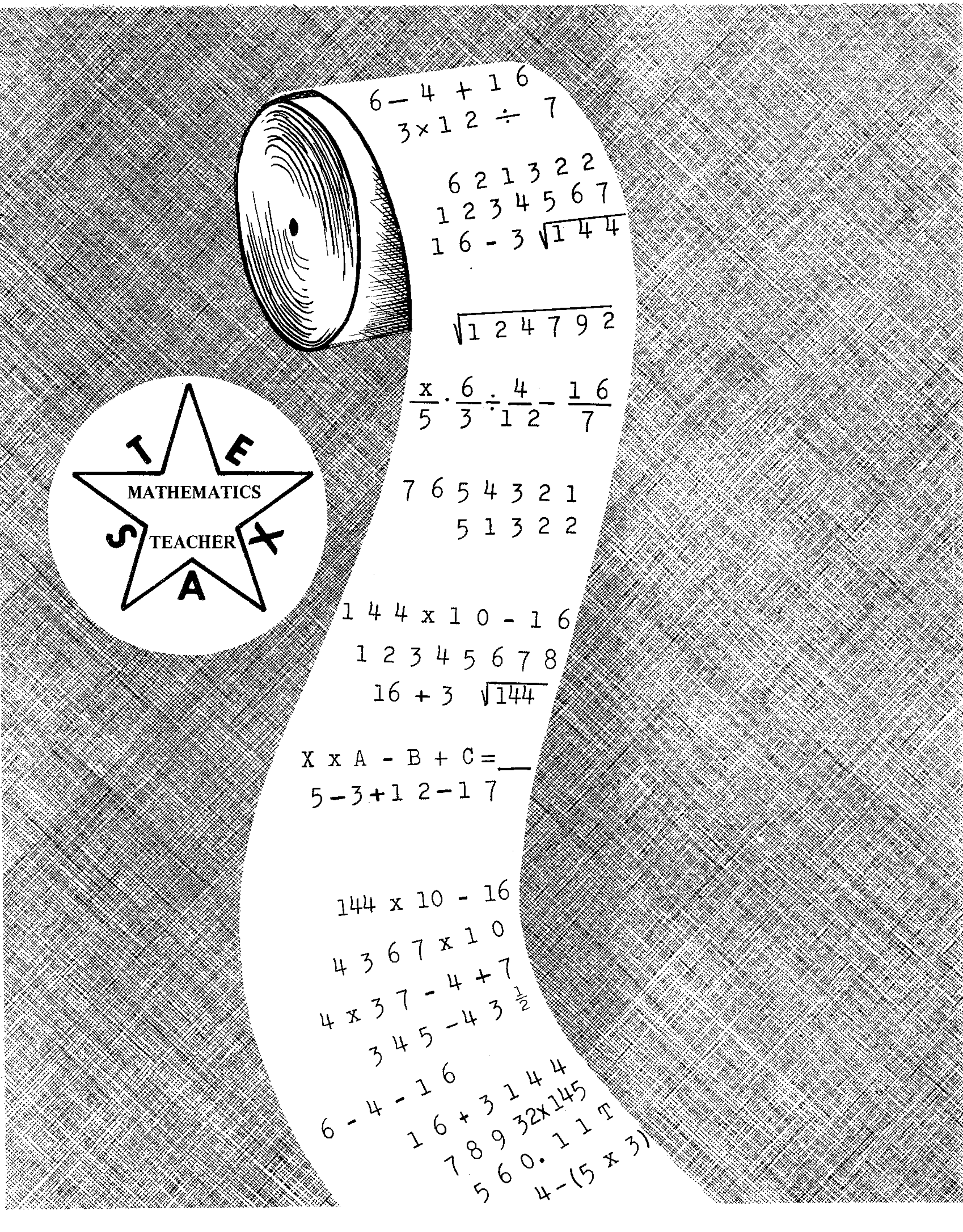
TEXAS MATHEMATICS TEACHER



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TEXAS MATHEMATICS TEACHER

Texas Council of Teachers of Mathematics

Vol. XXX March, 1983 No. 2

PRESIDENT'S MESSAGE

Dear TCTM Members,

One of the most important issues facing Mathematics Education today is the critical shortage of qualified mathematics teachers. Public and political attention is finally being given to this problem and, hopefully, some partial solutions are imminent. Before the United States Senate is a bill addressing this issue. Provisions include the funding for 2700 2--year scholarships, each valued at up to $2500 for pre-service teachers who agree to teach mathematics for at least 3 years after graduation, and a Distinguished Teacher Awards program with awards up to $5000 for a teacher with 5 years teaching service and up to $10,000 for a teacher with at least 10 years service. Recruitment and retraining efforts for unemployed college graduates, teachers in other disciplines and retired teachers are also proposed.

In Texas a meeting was held last June with 120 invited participants from across the state to study the issue and produce a document outlining problems and suggesting solutions. Emphasis was placed not only on the increased teacher salary but also on changing the teaching environment and public perception of teaching. Hopefully, help is on the way!

Beginning with the fall issue of the TCTM Journal an effort will be made to referee journal articles. Everyone's participation is welcomed and encouraged.

Sincerely,

Betty Travis

CAMT

PALMER AUDITORIUM
AUSTIN, TEXAS
OCTOBER 6–8, 1983

WHY ARE WE AFRAID TO TEACH MATHEMATICS IN THE CLASSROOM?

Otto W. Bielss
Syline Center
Dallas, Texas

Many mathematics teachers and their supervisors are failing to teach students the necessary mathematical skills. These teachers are making mathematics "Fun". They are playing games in the classroom, enjoying cartoons disguised as mathematical films, and learning to use the hand-held calculator to help with these game activities without teaching the students how to calculate using the calculator. They are enjoying "Calculator Activities", teaching chis-n-hop as a method of calculation without any applications of how to use it in other areas of study, which should be a necessary requirement of any student activity. These teachers do not truly care if the students use these skills, just that the student had fun learning.

Others teachers are using self-paced individualized packet material. These materials are adequate, helpful, and effective for no more than ten percent (10%) of the total school population. Many teachers want to do their own thing. They teach only the sections of the textbook which appeal to them without thinking what they are doing to and for the student. Teachers omit those sections which are hard to teach or the ones they personally dislike; they teach the easy sections. They leave out the stated (word) problems, saying that the objective of mathematics is not to teach reading. I contend that reading is a very integral part of all subjects, particularly mathematics. In the technical areas, vocabulary is a very necessary tool of those students who will use the "Queen of the Sciences" to help in their life's endeavors.

The goal of a good mathematics teacher should be to see that every student learns and understands sufficient mathematics to succeed in life at whatever he chooses to do. This goal is for all students who desire to learn and who are capable of learning the particular course at the particular time. With this goal in mind, it is not necessary to see that every student succeeds or even passes the course. Many students are just too lazy or uninterested to learn at that specific time in their lives, but certainly they should have the opportunity to learn should they desire to do so. Many students are just too lazy to learn even the simpliest mathemathics. However, these students should not force us to lower our standards; theyshould not make us retreat and make mathematics "FUN". This is not to say "DON'T CARE"; but it is to say, "Let's teach mathematics and help those students who want and deserve our help."

The most popular trend is to jump on the band wagon for each new idea that comes along. This is not saying "do not change"; but it is saying be careful of changes for change sake alone. Change, if the change is good, but first investigate its validity. Recently, it has become a fad to talk about compentency testing. Everyone is interested in Sally and Joe being competent in certain skills before graduation from high school. This is an excellent idea, but is being conducted in the wrong manner. Sure, these students are competent just after completing a course or a study session for taking the examination, but just how many students have been retested even six months afterward on the spur of the moment, or better still, two years later. Do they retain their skills? I believe that a drastic failure of the competency test examination would be noted if such tests were performed.

Recently, a move "BACK TO THE BASICS" was started. The first sign of failure here is that "BASICS" has not been defined. I truly believe that the "BASICS" are taught in every classroom where there is a good teacher. Every good mathematics teacher drills the basic operations each day, just as he teaches reading, spelling, writing vocabulary, and using these skills in other areas. No, "BASICS" were never lost by the good teacher; but, they are being lost by the teachers who must use gimmicks to be popular and make the students feel that they must have some fun learning.

There are two basic approaches to teaching mathematics. One is to teach exercise solving. The other is to teach problem solving. The latter is the only one that will ever benefit the student in later life. We must teach problem solving if we are to be successful and produce successful students. It is the basic intent of teaching mathematics in the school curriculum to teach students to use mathematics in their everyday lives and to teach the students to think and better reason out their problems. If we teach only exercise solving, we will never help students solve problems that are different from the isolated examples they have seen.

It is agreed that drill is necessary in order to teach any subject; but, if the students do not learn, then something must be wrong. I do not mean learn for a few days and then forget, but learn and retain these skills over a period of time. It is very necessary to teach the students where certain concepts might be used.

In the year 2000, many new and different jobs will be available. With the uncertainty of what the future will bring how can we train students for a particular job if we do not know what that job will be. Many of the jobs we are now training students for will no longer exist. Therefore, we must teach students to adapt to different situations. We must teach application of thinking and problem solving. It is imperative that students be taught to apply the concepts taught in the classroom to the problems they will encounter in life.

I believe that it is very difficult to have a student understand where MATHO, a bingo type game is going to help him in the future. Even if he wins the daily prizes, he may not be mastering the necessary applicational skills to add or multiply when he encounters the same problems in a different form in real life. Students must know when to add, subtract, multiply or divide as well as how to perform the operation.

I will concede that the hand-held calculator is an excellent tool for the classroom and should be used there to help remove the difficult calculations necessary in many real life problems; but, use of the calculator must be preceded by a mastery of basic mathematical concepts. The calculator is an aid, not a replacement. Most students do not learn to approximate their answers and, therefore, do not know when the calculator is wrong. They are using the calculator as a fancy guessing machine, and this does not improve their mathematical ability. Let's take trigonometry as an example. A student can learn the basic concepts of the course and then use the hand-held calculator as a table finder, as well as an aid to computations. This allows the teacher greater latitude in preparing problems and test questions since larger numbers may be used and thus disguise the question because the student has an aid to compute his answer. If the student does not remember that the sum of the lengths of two sides of a triangle must be greater than the length of the third side, then an answer can be found; but it will be incorrect and the student will never know why. When hand-held calculators are allowed in the room, the teachers can use more realistic problems with larger numbers without fear of the computation being too difficult and time-consuming.

It seems that many teachers have set themselves up as an individual team of experts to decide what is best for their classes and what they wish to teach in the classroom. They ignore textbooks, sometimes rightfully so, or change sequences of materials to suit their own desires. This is not always done for the betterment of the students. Teachers replace materials that they do not know well; they delete stated problems and use other such methods to do "THEIR OWN THING." This is bad in the sense that the authors of adopted textbooks have spent years in developing and revising the material presented in their texts. Then along comes a young bachelor degree holder who changes the material to his past experiences, no matter how narrow. The material is usually in an arrangement in the text and many times changes in the material can defeat the text and its presentation. This is not to say, "DO NOT SUPPLEMENT;" but, it is to say, "DO NOT REPLACE OR DELETE."

Games and such should be used as a supplement and incentive to reward students for working hard and doing more and better work; they should not be used to replace necessary learning. Games can not teach transferable skills to most students. Transferable skills and applications should be the main focus of any mathematics program.

It is very important that we motivate each student, but some students are impossible to motivate under any circumstances to learn, and learning is the name of the game we as teachers must play. If a student is not learning for the future, no matter what he sees there, then we are failing in our task. We can be baby sitters, or we can be teachers.

I realize that it is important to interest students in the subjects that we teach; but, again, we have those students who will not find an interest in anything, at any time, for any reason. Therefore, we must reach those who will learn, fun or not. We must combine all efforts to motivate, interest, and challange students; but, most important, we must teach students mathematics and give them some insights in learning to think for themselves.

If we do not teach a transferable skill and if we do not help the students to learn to think, then all the games, computers, calculators and other gimmicks that make mathematics fun, interesting and enjoyable, are going to be worth nothing.

Sometimes the use of games and other fun items can cause teachers to forget the real reason they are in the classroom. These games make learning fun for the day, but often they do not really instruct mathematical concepts. The student can have much more fun, learn a lot more mathematics at a local pool hall and have a much more challenging time playing for say ten cents a point/ball difference. If a student should find himself in a local crap (dice) game, he can learn a lot more about points, sums, differences, odds, probabilities, and winning–losing strategies than any game which is allowed in the classroom. We seem too interested in gadgets which might interest, motivate and do our job for us than we are in real student learning. Thus, we fail in our task of instructing mathematics.

Instruction should begin in grade one with the basic counting skills, then add to these skills, as soon as possible, the multiplication tables, memorized. Next, add decimal numbers to those acquired skills, then commons fractions. If these skills were taught and reinforced as they should be, then games could be used to help expand and extend these skills.

Many educators are discussing the use of computers as an instructor. This, again, is merely an expensive toy which allows the student to guess answers without learning the necessary skills to apply to other areas of learning.

We are so concerned with gadgets that learning is taking a back seat in education. Let's get up on our feet and do some teaching! Let's get back to making students do homework and carry books home so that parents have a part in the educational process.

BOOKS

DEVELOPING THE MATHEMATICS CURRICULUM

Marlow Ediger
Northeast Missouri State University

Which objectives should students achieve? There are understandings, skills, and attitudinal goals for learners to achieve as general objectives. Or, cognitive, affective, and psychomotor ends may be stated as specific, measurable aims.

Which learning opportunities need to be provided to guide achievement of objectives? A textbook and workbook philosophy could provide major experiences for students with a few audio-visual activities to clarify meanings in the mathematics curriculum. A multi-media method might also be implemented to provide for individual differences. Thus, a variety of experiences may then be in the offing.

How should student progress be appraised? The teacher may do all or most of the evaluation of learner progress. Toward the other end of the continuum, students with teacher guidance might appraise growth of the former in mathematics.

Objectives in the Mathematics Curriculum

Understandings ends may receive primary emphasis in teaching and learning. These subject matter learnings in increasing levels of complexity may include:

1. commutative and associative properties of addition and multiplication.
2. distributive property of multiplication over addition.
3. identity elements of addition and multiplication.
4. property of closure.
5. diverse number systems.
6. axioms, postulates, definitions, and proofs.
7. ratio and proportion.
8. statistics, probability, and graphs.

Instead of emphasizing understandings objectives rather heavily in teaching and learning, a teacher could place major stress on skills goals. A learning by doing approach might then be implemented. Which skills or abilities may be salient to accrue?

1. estimating distances, perimeters, areas, volumes, and amounts.
2. solving word problems, as well as problematic situations in society involving the use of mathematics.
3. computing effectively and accurately in addition, subtraction, multiplication, and division.
4. developing and testing hypotheses.
5. making models, diagrams, charts, and graphs to portray mathematical data.

An affective domain orientated mathematics teacher may wish to stress the following attitudinal goals:

1. students increasingly learning to like mathematics.
2. learners desiring intrinsically to acquire increased proficiency in mathematics in ongoing units of study.
3. developing a positive attitude toward the curriculum, teachers, and school life in general.
4. volunteering to complete additional work.

Teachers desiring to utilize measurable ends (cognitive, affective, and psychomotor) rather than general objectives (understandings, skills, and attitudes) believe that:

1. students know rather precisely what is to be learned from a given lesson, if the specific objective is announced prior to instruction.
2. the teacher can select learning activities which match the measurable objective being emphasized. Only what is contained in the precise end needs to be stressed within a given learning experience.
3. student progress is measurable if a specific objective has/has not been attained.

A teacher may wish to emphasize one domain of measurable objectives more than the others. Thus, cognitive ends (use of the intellect may be emphasized, e.g. the student will solve nine of ten story problems correctly). Or, affective goals may predominate, e.g. the student will voluntarily find the correct perimeters of ten geometrical figures. Affective objectives stress attitudinal development within students. The third domain - psychomotor - involving the use of the muscles or physical skills, could also receive major emphasis, e.g. three students in a committee will develop accurate models pertaining to ten different figures in geometry.

Learning Activities in Mathematics

There are numerous kinds of experiences for learners to achieve objectives. Each activity needs to guide students to achieve in an optimal manner. Which activities might then benefit students?

1. using the basal textbook. Each student may be pretested to ascertain a starting point which may then stress, as learnings accrue, sequential progress. Progress for each learner may be monitored by the teacher in emphasizing mastery learning. Students need to perceive meaning in each ongoing experience.
2. using workbooks. Reputable workbooks may be utilized to supplement those activities experienced by learners in basal textbooks. Rote learning is not to be encouraged. Rather, students individually need to understand that which is emphasized in teaching-learning situations. Content contained in a workbook may reinforce what students have experienced in basal textbooks.
3. using concrete materials. Each student needs ample concrete experiences using objects which can be manipulated by students. Concrete materials may include sticks, corn seeds, bean seeds, beads, marbles, checkers, disks, pencils, crayons, and coins. To understand addition, subtraction, multiplication, and division, concrete experiences need to be in the offing.
4. using semi-concrete materials. One step removed from reality involves the utilization of pictorial visuals. The semi-concrete materials may include slides, films, filmstrips, pictures, transparencies, study prints, and drawings.
5. using abstract materials. These include listening, speaking, reading, and writing learning opportunities. Thus, reputable mathematics textbooks, related workbooks, and duplicated materials may be utilized in teaching-learning situations.

Appraisal Procedures

There are numerous means available to assess student progress.

1. Teacher observation. On a daily basis, the teacher may observe the quality of each student's achievement. A teacher can then observe if answers are correct or incorrect as given by learners from a discussion or from written work in completing an assignment. The teacher can guide a student to diagnose <u>why</u> an answer is incorrect. For example, a learner may not understand the

concept of "carrying" in addition or multiplication. Or, the involved student may lack understanding of what is meant by borrowing in subtraction, or where to place the first quotient figure in division.

2. Anecdotal statements. The teacher may wish to record representative behavior of each student in mathematics achievement. Loaded words or vague terminology should not be utilized in the anecdotal sentences. Each entry needs to be dated. The mathematics teacher may review statements written sequentially for each student as the school year progresses. It is difficult to remember each student's progress unless observations are recorded. If brief statements are written each day for two learners, it does not take a long length of time to record the achievement in mathematics for thirty students in a class.

   Which patterns of behavior might be observed from a learner whose behavior has been recorded during diverse intervals of time?
   (a) difficulties in determining perimeters and areas of selected geometric figures.
   (b) problems in understanding structural ideas of closure and identity elements.
   (c) inability to solve word problems correctly.

   Equally salient is to record positive behavior of students, e.g. completing all work on time and doing well in the completed products.

   Deficiencies in mathematics revealed by learners need appropriate remediation strategies.
3. Self-evaluation by students. Each student needs guidance to appraise the personal self in mathematics achievement. Thus, a teacheer appraising a learner's written products may write at the top of the page the number of errors made. The involved student then needs to locate that which has been worked incorrectly. Accuracy in final products completed by the student is of utmost importance.
4. Instructional management systems (IMS). Student progress is measured against the specific objectives which are being emphasized by teachers in teaching-learning situations. If a specific end has been attained by the involved learner, he/she may then progress to achieve the next sequential behaviorally stated objective. If unsuccessful in goal attainment, a learner might need a different teaching strategy in order to be successful in learning.
5. Standarized tests also called norm referenced tests. At selected intervals in a school year, students may complete standardized mathematics tests. Results from students will vary considerably within any grade level. Thus, for example, within the fourth grade, the highest achiever may register on the 8.5 grade level while the slowest achiever might register a 2.5 grade level achievement. Other students in the class will come between the highest and lowest grade equivalent scores.

In Summary

There are numerous issues needing resolving in the mathematics curriculum. These include:

1. general versus precise objectives for student achievement.
2. a subject centered curriculum versus using multi-media in ongoing units of study.
3. teacher centered versus student centered means of appraising learner performance.

Teachers and supervisors need to study, analyze, and ultimately synthesize diverse schools of thought resulting in a quality mathematics program. Each learner should achieve optimally in ongoing lessons and units.

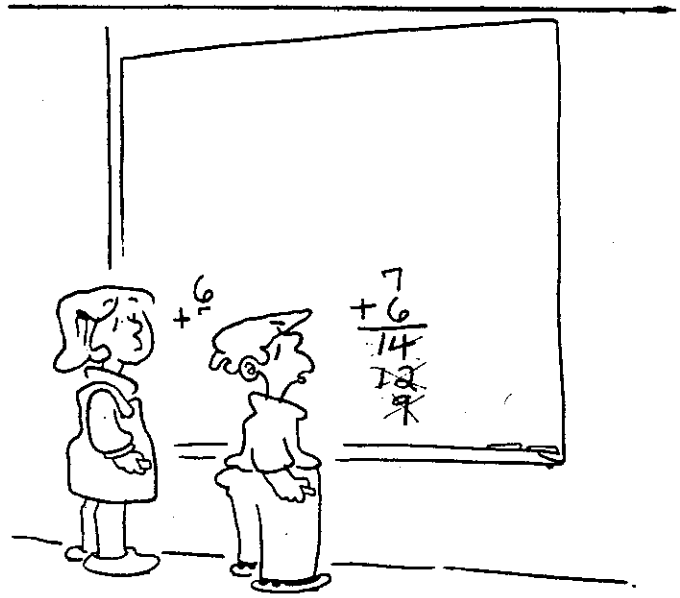
PROBLEM DEPARTMENT

Edited by Dr. John C. Huber and Donald P. Skow
Pan American University

This department offers its readers an opportunity to exchange interesting problems and their solutions through their students. Please observe the following:

1) **In each issue of the Journal, there will be three problems presented. One for grades 6–7, 8–9, and 10–12.**
2) **A problem may be submitted by either a teacher or a student for the above grade levels. It may be handwritten or typed. The problem should be challenging, and unique or original. Ordinarily problems from textbooks are generally not acceptable.**
3) **A solution to a particular problem can only be submitted by a student in the particular grade level or below that grade level. The solution may be handwritten or typed. A student's solution must be signed by their particular math teacher to be accepted. The math teacher's signature simply means the student solved the problem by him/her self and is in the right grade level.**
4) **A solution to a problem should have the problem written down exactly as it appears in the Journal and the solution directly below it signed by the student and teacher. Below each signature, have your name printed so that it is legible.**

Problem proposals and solutions should be sent to Donald P. Skow, Mathematics Department, Pan American University, Edinburg, Texas 78539.



"This would be a lot easier if they didn't require such pinpoint accuracy."

A BRIEF HISTORY OF PI

Alexander Mehaffey, Jr.
University of South Dakota, Vermillion, South Dakota
from: Illinois Math Teacher, May, 1981

People not seriously involved with mathematics are usually quite surprised to find that a number can have a history. Pi is a very special number and has a long and interesting history which provides an overview of the growth of mathematics as an intellectual endeavor and as an important tool in the advancement of technology.

Efforts to obtain better and better approximations of pi were conducted by many different civilizations and involved many of the great names in mathematics over the centuries. Although there are exceptions, the best approximations of a particular era were made in countries which were world leaders in other arenas at that time. The fact that countries with great military and economic power did not always provide support for research is evident in that little was done to better approximate pi by the "scientists" of the Roman Empire. Evidence of deterioration in the capabilities of the scientific community of a nation can also be noted in that some approximations are less accurate than earlier efforts made by the same civilization.

No one knows when man first began to ponder the relationship between the circumference and diameter of a circle. The first approximations we have of pi are often lifted from the writings of an ancient mathematician who was trying to find the area of a circle. Such examples will appear in later paragraphs.

Around 240 B.C. Archimedes made the first known scientific attempt to approximate pi. Assuming a circle with unit diameter he computed the perimeter of circumscribed and inscribed polygons of 96 sides and obtained 223/71 (3.140845) and 22/7 (3.142857) as bounds. His technique is a relatively simple procedure in terms of mathematical formulation, but it was not until the work of the Dutch physicist, Willebrord Snell in 1621, that a significant improvement in the technique was discovered. By the time Snell's procedure was proved correct the calculus had been developed. Once the theory of infinite series was established, the thinkers went to work turning out all sorts of formulas for the crankers and the race was on. With the discovery of the modern electronic computer, the thinkers wrote programs and the crankers become anyone who could afford computer time. The following brief chronology of pi should provide some support for the previous remarks.

One of the earliest values for pi is found in the Ahmes Papyrus (ca. 1560 B.C.). It is a copy of previous works and some of the knowledge it contains may date from around 3000 B.C. This work, the oldest mathematical document known to exist, consists of 84 problems and their solutions. The one of interest to us is number 50. Here Ahmes assumes that the area of a circular field with a diameter of 9 units is the same as the area of a square field with sides of 8 units. This yields pi = 3.1604938.

Another early approximation was found on a Sumerian clay tablet dating from 2000 B.C. On this tablet it is stated that the ratio of the perimeter of a regular hexagon to the circumference of the circumscribed circle is equal to $57/60 + 36/(60)^2$ (the Babylonians used a base 60 system). This gives pi = 3.125.

In the Bible (IV Kings vii, 23) we find the following: "Also, he made a molten sea of 10 cubits from brim to brim, round in compass, and 5 cubits the height thereof; and a line of 30 cubits did compass it round about." The implied value of pi is 3. The passage dates from about 550 B.C. and presented a problem for those who wished to state a more accurate value. The Hebrew Rabbi, mathematician Nehemiah neatly sidestepped the difficulty when he wrote his geometry in about 150 A.D. He said that the circumference of the cistern has been measured on the inside while the diameter was measured across the walls. With this explanation of the Biblical "error" he gave the value as 3 1/7 (3.142857). About the time of Nehemiah, Claudius Ptolemy (Alexandrian Greek) gave pi as 377120 or 3.1417.

In 480 A.D., a Chinese mathematician gave 3.1415926 V pi V 3.1415927. This accuracy was not matched in the western world until the 16th century. In 718 A.D., the Chinese gave pi as 92/29 or 3.1724 which is very poor compared to the earlier result.

In 499 A.D., the Hindu Aryabhata writes, "add 4 to 100, multiply by 8, and add 62,000. The result is approximately the circumference of a circle of which the diameter is 20,000." This gives pi = 3.1416. Baskara in 1150, gave 3927/1250 (3.1416) as an accurate value, 22/7 (3.142857) as inaccurate and 10(3.162278) for ordinary work.

In 1220, Fibonacci (Italian) found pi = 3.141818 using the Archimedean method with polygons of 96 sides. His "better value" was obtained with the same number of sides as Archimedes has used because of the advantage of Hindu-Arabic notation and some "fearless" rounding.

In 1593, the Frenchman Francois Viete represented pi by an analytical expression of an infinite sequence of algebraic operations. His formulation was much too cumbersome for numerical computation and the convergence of this "formula" was not proved until 1891. Undaunted by his "failure" Viete used the classical method with polygons have 393,216 sides and obtained 9 place accuracy. Viete worked during the period when much of our present symbolism and terminology was developed. He was the first to use the word "analytical" as a mathematical term and also introduced the words "negative" and "coefficient."

In 1593, Adriaen Van Rooman of Holland found pi to 15 places using polygons have 2^{30} sides. In 1610, Ludolph Van Ceulen used polygons of 2 † ± sides to get 35 places. He spent most of his life on the task and the number was engraved on his tombstone. In Germany pi is still called the "Ludolphine Number." The Dutch physicist Willebrord Snell devised a genuine improvement of the Archimedean procedure in 1621 which gave 35 places using polygons of 2 ÷ ° sides. His procedure was not proven correct until 1654 by the famous Dutch mathematician and physicist Christiaan Huygens and by this time the calculus was ready.

In 1844, Johann Dase, the famous German "idiot savant," using a formula developed by Strassnitzky, calculated pi to 200 places in less than 2 months. Dase was an extraordinary calculator who could multiply two 20-digit numbers in his head in 5 minutes. He calculated to 7 decimal places during his spare time during the years 1844-1847. He had a nearly photographic memory but made little academic progress, remaining ignorant of geometry and learning no language but his native German. By 1853, Rutherford of England had calculated pi to 400 places. His work was then superseded by William Shanks of England who got 707 places. For a long time this was considered the most fabulous piece of calculation ever performed. Unfortunately, there was an error in the 527th place. This was not discovered until 1946 when the American Ferguson published 620 places.

After the development of the electronic computer, the problem became one of writing a clever program and finding the computer time to grind out digits. In 1949, the United States obtained 2037 using the ENIAC. The most prodigious effort to date has been made by the French, who in 1973, using a CDC computer, ground out 1,000,000 places. The printout is

(Continued on Page 9)

WHAT THREE–DIGIT DECIMAL PALINDROMES ARE PRIME NUMBERS?

by Donald P. Skow
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Edinburg, Texas

This question was asked at one of the sessions at the 29th Annual Conference for the Advancement of Mathematics Teaching (CAMT). First of all, what is a palindrome number? A palindrome number is a number that reads the same forward and backwards. Numbers like 121, 202, 313, 434, 555, 656, 747, 858, and 919. But words can also be palindrome like mom, dad, and wow.

To answer the question what three-digit numbers are palindrome and prime, you need to know some divisibility rules.

(1) A number is divisible by 3 if and only if the sum of the digits is divisible by 3 (sum is a multiple of 3).

(2) A number is divisible by 7 if and only if it satisfies the following:
- (a) Double the units digit
- (b) Subtract this product from the remaining digits and
- (c) If the difference is divisible by 7, then the original number is divisible by 7. If the difference is large, repeat the process until it is evident that the difference is divisible by 7 or not by 7.

(3) A number is divisible by 11 if and only if the sum of the odd digits subtracted by the sum of the even digits is divisible by 11.

There are 90 three-digit palindromes. Notice that all palindromes of the 200, 400, 500, 600, and 800 range are not prime. So we are really looking at numbers in the 100, 300, 700, and 900 range.

Thus, the possible numbers are the following:

101	303	707	909
111	313	717	919
121	323	727	929
131	333	737	939
141	343	747	949
151	353	757	959
161	363	767	969
171	373	777	979
181	383	787	989
191	393	797	999

Using the divisibility rules, the palindromes are reduced to the following set:

101	313	727	919
131	323	757	929
151	353	767	949
181	373	787	989
191	383	797	

It looks like that there are 19 three-digit decimal palindromes that are prime numbers by using only three bsic divisibility rules.

But look a little closer, the numbers 767 and 949 are divisible by 13, the number 323 is divisible by 17, and the number 898 is divisible by 23.

Therefore, to answer the question, there are only 15 three-digit decimal palindromes that are prime numbers. They are:

101	313	727	919
131	353	757	929
151	373	787	
181	383	797	
191			

A BRIEF HISTORY OF PI
(Continued from page 8)

regarded as the most boring 400 page book ever written.

Although a mathematical Mount Everest has been climbed, there are still records to be made. You might consider getting your name in the Guinness Book of World records by memorizing places of pi. In 1977 Michael John Poultney of England demonstrated that he had memorized pi to 5050 places. Records are made to be broken, and his certainly was. On June 4th, 1979, an electronics company worker from Yokohama, Japan, Hideaki Tomoyari, recited 15,151 places of pi from memory.

A less enviable but nevertheless astonishing feat is that of an Indiana physician, Edwin J. Goodwin. Dr. Goodwin authored a bill, which was introduced to the Indiana Legislature in 1897, to "legislate" the value of pi. Dr. Goodwin was an amateur mathematician who claimed to have trisected the angle and squared the circle, feats which would have immediately cast his work as suspect in the eyes of any mathematician. Not only did he claim that he had found the "true" ratio upon which to calculate the area of a circle, but he said he had copyrighted his formula for pi free for use by Indiana schools while all others would have to pay royalties.

His paper, which describes this "marvelous" result, is a mathematical horror. At one point, if one considers his gibberish correct, the value of pi is 3.2, at another pi is 4 which has to be one of the biggest misses of all time.

The bill, House Bill No. 246, did pass the House and was recommended for Senate passage by the temperance Committee. The Senators somehow became suspicious of the bill, whether on their own or from someone better versed in mathematics is unclear, and postponed the bill indefinitely. It has not been on the agenda since.

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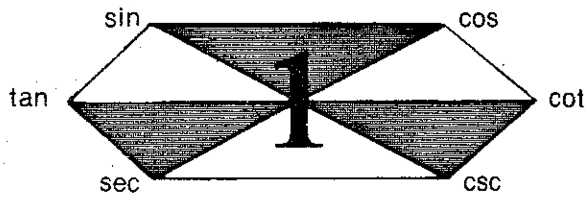
THE MAGIC TRIGONOMETRIC HEXAGON

by Ardiene C. Tilly
THE MATHMATE
Newsletter of South Carolina CTM

This device is an aid to some students in helping them remember the basic trigonometric identities. It is particularly useful when trying to remember the Pythagorean identities a year or two after having trigonometry formally.

To construct it:

1. Draw two horizontal parallel lines.
2. Put two pointed sides on each side, connecting the parallel lines, making a hexagon. **Note:** I could have said, "Construct a hexagon," but I often end up with octagons or pentagons then.
3. Connect opposite vertices.
4. Shade the three "flat-topped" triangles formed.
5. Starting at the upper left and continuing in a standard left-to-right fashion, label the vertices sin, cos, tan, cot, sec, csc.
6. Put a big "1" in the center.



Now notice that:

1. Reciprocal identities occur along the diagonals; i.e., sin = 1/csc or sin csc = 1 and so on.
2. Ratio identities are found in this manner: the ratio formed by any vertex divided by a neighbor equals the other neighbor. Thus sin/cos = tan or sin/tan = cos. It works in either direction all the way around the hexagon.
3. Pythagorean identities are found by recognizing that the tum of the squares of the top vertices of the shaded triangles equals the square of the bottom vertex. Thus:

$\sin^2 + \cos^2 = 1 \qquad \tan^2 + 1 = \sec^2 \qquad 1 + \cot^2 = \csc^2$

Dr. Bernhardt introduced me to this trigonometric hexagon when I was a graduate student in one of his classes at Oklahoma University. He did not know who first devised it but thought it was useful. I agree.

THE TENTH ANNUAL CONFERENCE on DIAGNOSTIC AND PRESCRIPTIVE MATHEMATICS

APRIL 9-11, 1983
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

The Research Council for Diagnostic and Prescriptive Mathematics is committed to stimulate, generate, coordinate and disseminate research efforts that focus on the learning of mathematics with particular emphasis on those factors which inhibit maximal learning.

COME SHARE WITH US.

Bowling Green is located just 70 miles south of Detroit with easy access by air (Toledo) and highway (I-75), for those wishing to attend NCTM following the RCDPM conference. Make plans now to attend both meetings.

For information, contact—
William R. Speer
EDCI-BGSU
Bowling Green, OH 43403

The mission of RCDPM is to stimulate, generate, coordinate, and disseminate research efforts designed to understand and/or overcome factors that inhibit maximal mathematics learning. This years' conference promises to be an exciting one with speakers, research reports, and workshops to meet the interests of all who are concerned with the teaching/learning of mathematics. This years. featured speakers include:

Dr. Timothy Teyler, N.E. Ohio Medical College
Brain Functioning and Mathematics Learning

Dr. John Eliot, University of Maryland
Mathematics and Spatial Abilities

Dr. Jerry Johnson, University of the Pacific
Microcomputer Use and Mathematics Learning

Dr. Glenadine Gibb, University of Texas
Challenges in Diagnostic and Prescriptive Teaching

In addition to these, 45 other experts in mathematics education will be presenting topics of interest that relate directly to diagnostic/prescriptive techniques in teaching/learning.

Membership in RCDPM includes receipt of a quarterly newsletter, selected ancillary publications and an annual conference of superb quality. The newsletter keeps members informed on important events, current research and activities of interest. It encourages personal correspondence and the sharing of ideas among members with similar interests.

***** CALL FOR PAPERS *****

Prospective authors are invited to submit manuscripts for the SPECIAL ISSUE of the journal, "FOCUS ON LEARNING PROBLEMS IN MATHEMATICS", entitled "The Mathematics Learning Problems of the Gifted and/or the Talented in Mathematics".

In general, the objective of the journal is to bring the research and useful ideas from the area of educational psychology, neurology and mathematics education to the attention of regular and special education teachers, resource teachers, curriculum planners/designers and administrators. The journal is new and growing in readership and founded to disseminate and stimulate discussions among people concerned with the mathematics education of elementary and secondary students.

With-ever increasing emphasis being placed upon educators' responsibilities to meet the needs and expectations of GIFTED youngsters, FOCUS ON LEARNING PROBLEMS IN MATHEMATICS wants to provide a forum for professionals from diverse levels of the educational enterprise to contribute toward a solution of a socially important concern to America's educators. Many collegues around the country are involved in studies which are of interest to persons involved with the education of GIFTED CHILDREN, whether or not talented in mathematics. This special issue of FOCUS wants to publish reports of imperical investigations as well as theoretical or field-obtained accounts, viewpoints and ideas which are designed to expand our understanding of how to meet the needs of the GIFTED CHILD.

Jargon should be kept to a minimum, given the wide range of readership. When the use of technical terms is unavoidable, the author should take care to clearly explain such terms. Papers are solicited from the following areas related to the Gifted child:

1) The mathematics curriculum for the Gifted Student, but not talented in mathematics. (OR and talented in mathematics)
2) Identifying the Gifted and/or Talented in mathematics
3) Mathematics and the Gifted Young Woman (girl)
4) Enrichment and/or Acceleration in mathematics
5) Models of Effective Programs for the Gifted and/or Talented in math
6) Models of Curriculum Materials for the Gifted and/or Talented in math
7) The classroom teacher and the Gifted child in mathematics
8) The Resource Room and the Gifted and/or Talented in mathematics
9) Classroom Activities for the Gifted and/or Talented in mathematics (K-8)
10) Teachers of Gifted children (training, responsibilities. . .)
11) Parents of Gifted children (involvement, responsibilities. . .)
12) Mainstreaming Gifted children in mathematics
13) The microcomputer and the Gifted and/or Talented child in mathematics

Manuscripts should be prepared in accordance with the guidelines used by the AMERICAN PSYCHOLOGICAL ASSOCIATION or UNIVERSITY OF CHICAGO PRESS. Figures and tables, where necessary, should be prepared in accordance with A.P.A. and sent in triplicates, no later than May 1, 1983, to:

William E. Lamon, Ph.D.
College of Education
University of Oregon
Eugene, Oregon 97403

34 JANUARY 1983/The Oregon Mathematics Teacher

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