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ABSTRACT

This manual is designed for teachers using the Career Oriented Mathematics units on owning an automobile and driving as a career, retail sales, measurement, and area-perimeter. The volume begins with a discussion of the philosophy and scheduling of the program which is designed to improve students' attitudes and ability in computation by approaching the material in a career-relevant context. Lesson plans and ditto masters for diagnostic tests and worksheets are provided. (SD)

TEACHER'S MANUAL

CAREER ORIENTED MATHEMATICS

FOREWORD

This Career Oriented Mathematics Curriculum was prepared through a contractual agreement between the Berrien County Board of Education and Dr. Michael L. Mahaffey and Dr. William D. McKillip of the University of Georgia. Funding for this effort was provided by a grant from the Georgia State Department of Education, ESEA Title III.

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TEACHER'S MANUAL

MASTERING COMPUTATIONAL SKILL:
A USE-BASED PROGRAM

SECTION 1:

A NEW APPROACH TO

COMPUTATIONAL SKILL

It must be clear to all who have taught in the junior high school and high school that the traditional approach to remedial arithmetic is a failure for a majority of students. Arithmetic is "reviewed" in grades 7 and 8 and, for those students who have not achieved sufficient skill, again in grade 9 and sometimes again in grade 10 or 12. Still, these students rarely improve in computational skill to the extent that they can apply these skills when the occasion arises.

In addition to a lack of success in building the desired skills, the repetative "covering" of the topics of arithmetic contributes to boredom and frustration in students. "More of the same" is obviously not a solution to the problem of building arithmetic skill. Students have studied the multiplication of whole numbers in every grade from third to eighth; if 6 year's work on the topic has not produced the necessary skill, it is not likely that another similar treatment will succeed.

A new approach is needed, one which will have a chance of developing some improvement in computational skills while also improving the attitudes of students toward computation. The Berrien County Career Oriented Mathematics Project takes a new approach to the development in computational skills. It is designed to improve attitudes while helping students to improve their computational skills and to apply the skills to realistic, career-oriented problems. Here are the components of the plan for developing computational skills and the reasons why these components have been selected.

Component 1: Daily verbal drill on the basic facts of arithmetic. Most students in need of remedial help in arithmetic have not learned the 390 basic facts of addition, subtraction, multiplication, and division. They need to do this during the year. Drill will be a daily activity until mastery is achieved, but should take only about 10 minutes of the mathematics period. The drill will be individualized so that students concentrate on the facts they need to learn. The specifics of this drill program are fully described in Section 3.

Component 2: Daily exercises in mental computation. Each day ten problems in mental computation will be given verbally by the teacher to the students. The students will work the problem mentally and record on paper only their answer. This type of problem greatly increases mental arithmetic skill and frees the students from pencil and paper calculation for the simpler sort of problem. The problem type and procedures are described in Section 3.

Component 3: Performing the algorithms of arithmetic. Here is perhaps the most radical departure from the "traditional" general arithmetic course. To cover all the computational procedures of arithmetic in logical order takes, in most classes, half the year. When finished the students are bored and their attitude toward the class has been spoiled, usually beyond recovering. Worse, when the "review of arithmetic" is finished the students have forgotten most of the review and so they are really never ready to start to apply arithmetic to practical or interesting problems.

In the Berrien County Career Oriented Mathematics Project no effort is made to cover computational procedures in logical order. The class starts with a unit, selected by the teacher, on some career and the mathematics problems arising from the career. As this unit* is taught, problems are encountered and the need for some particular computation becomes obvious to the students. At that time, to meet that particular need, that computational skill is taught with as much background of understanding as the students are ready to learn.

This procedure certainly seems to violate our firmly held notions about prerequisites. "How can they do fractions when they can't even do whole numbers?" To this argument there are several answers, none of which is complete but which, taken together, make a case of this procedure:

(1) The approach based on covering prerequisite topics in logical order has not worked to our satisfaction.

(2) The material in the supposed prerequisites is not really unknown to the students. After 8 years of school they have some acquaintence with these topics.

(3) The approach taken here has proved workable in trails to date.

(4) The COMP approach is based on well known principles, for example, teaching a skill in the context of use, which are ignored in the "review of arithmetic" approach.

The COMP approach to computation is based on the teacher explaining the algorithms to the class literally at any moment they may come up. Because of this necessity, a "hand book" of computational skills and how to explain these skills is included in Section 4 to 7. These sections

*To become familiar with the nature and organization of these units, read the introduction of any unit and scan its' contents.

constitute the bulk of this manual. This is a teacher's manual and it is not necessary to provide one for each student. However, some students will be able to use the explanations in this manual as an independent learning aid. Hence a few may be available in the classroom for the students' use.

Component 4: Minor Procedures. Here are some minor procedures and policies which are employed in the Berrien County COMP. Individually their effect may be slight but collectively their contribution to the success of the program is believed to be significant.

(1) Short sets of computational problems, usually only 4 problems, designed to be done in a few minutes during class, help maintain computational skill. They provide the teacher an opportunity to detect topics which need additional explanation. These mixed examples in very short sets provide practice without boredom.

(2) Students are permitted to ask their friends for help in solving problems. They are encouraged to work their own problems, of course, and all students are encouraged to really help their friends when asked, not just to let them copy. There are some fine lines here, but it is worth while to ask for the cooperation of all. In any case, there are no long sets of repetative exercises on which students would most likely wish to copy.

(3) When a problem is realistically long and repetative, such as the calculations involved in an inventory, students are encouraged to form teams and divide up the work. When each student has done a planned segment of the work, mutual copying is a legitimate final step.

(4) If any sort of calculator is available for students to use, let them use it.

Component 5: <u>Evaluating growth in computational skill</u>. Growth in computational skill is an objective of the COMP and should be an expected outcome. Evaluating the growth will be a long term process and, short term gains are not expected to be measurable on any "overall" test of arithmetic. Here are ways in which gains can be observed and measured. Where tests are referred to, they are contained in Section 8.

(1) Knowledge of basic facts of arithmetic should show steady growth. Use the Disgonostic Tests, forms A-M, S, and D to measure these gains. Be careful to observe the time limits exactly on all administrations of the test. Alternative procedures are described in Section 2.

(2) Skill in specific processes which are used in a unit should show gains over the duration of the unit. These skills may be measured on unit tests if desired.

(3) Skill in the processes of arithmetic may be measured in general using the COMP Test of Arithmetic Skills. Scores on this test would not be expected to show significant improvement in intervals of less that one quarter.

(4) If your school system uses a standardized test of arithmetic achievement you may evaluate growth in computational skill by Pre and Post testing to determine gains on this test.

The remainder of this Teacher's Manual is devoted to the specific directions for conducting the COMP computational skills program.

SECTION 2:

MASTERY OF BASIC FACTS*

To promote mastery of basic facts an intensive program of drill will be essential. It will be necessary to determine each student's degree of mastery and to plan class and individual work based on what the students already know and what they need to learn.

Step 1. Tell the students what you are doing and what you want them to achieve. You want, of course, for each student to learn all the basic facts by memory so they won't have to finger count any more. Students must understand that this is your objective! Reexplain as often as necessary.

Step 2. Test the students to see how many facts they know from memory. You can use the tests in Section 8, following the suggested time limits exactly, or you may give a less formal test as follows: Have the students number from 1 to 20 down one side of a sheet of paper and from 1 to 20 down the reverse side. Select a deck of flash cards for one operation. Use only one operation and use only flash cards line $2 + 5 = \square$, not flash cards of the missing addend type, $2 + \square = 5$. Shuffle the deck thoroughly and present the top 20 flash cards in one minute. Students record their answers, recording "x" for any answer they cannot remember. Students turn papers over and you present the next 20 cards in 30 seconds. Again students record an answer or an "x" for each problem. In the course of spending 10 minutes perday on drill for 2 or 3 months you will develop the students computational skills to the extent that they will get 20 correct answers in 30 seconds.

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*For a further discussion of drill, see the Instructional Module "Using Drill Activities," University of Georgia Mathematics Education Department.

Step 3. Analyze the results of this testing. For each student, you should record in your grade book the operations he needs to drill on. A Student needs drill if he missed more than 1 in 20 in the 1 minute test or more than 2 in 20 in the 30 second test. Virtually all students will be found to need drill on at least one operation.

Step 4. Carry out a drill program for ten minutes each day. The following plan is recommended.

WEEKLY DRILL PLAN

MONDAY. Use the first 10 minutes of class for whole class flash card drill. A leader holds up the flash card and the class says the answer in a choral response. Work hard to develop speed in these drills. Control excessive shouting by having the students say the answers softly. First do addition, subtraction, multiplication and division separately and then mix them up. For variety, try these slightly different ways of conducting whole class flash card drill.

(1) Let a student lead.. While he leads, you walk around to make sure every student is responding.

(2) Shuffle the cards and present 10 problems to the boys and then 10 to the girls. Keep score.

(3) Present problems verbally.

TUESDAY. Use the first 10 minutes of class for individual drills. Pair off two students who need to work on the same operation and have them drill each other. Do not put two students together to have one work as the teacher. A set of flash cards is needed for each pair of students. You will need to move around the room encouraging speed and helping pairs to establish speed as a goal. If you don't keep on this, students will become sluggish and fall back on finger counting.

WEDNESDAY. Spend the first 5 minutes on flash card and verbal drill for the whole class. Read again the description of activities for Monday, above.

During the next 5 minutes each student should go through a deck of flash cards for whatever operation he is learning. As he does this, he places the ones he gets correct in one pile and the ones he gets wrong in another. When finished he enters the number correct on the class progress chart. Keep speed up...memorized responses only with no finger counting.

BASIC FACT CHART

	9/6	9/13	9/20	9/27	10/4	10/11	10/18	10/25				
J. Smith	+/58	+/64	+/82	+/81	+/91	+/98	-/51					
S. Jones	-/52	-/81	-/95	-/99	x/27	x/29						

This chart may be kept on display or it may be kept out of sight, depending on the wishes of the students. Keep this chart up to date however, as it provides a visible evidence of progress.

THURSDAY. Use the first 10 minutes of class for individual drills with pairs of students drilling each other. See Tuesday.

FRIDAY. Use a few minutes to do class drills verbally and with flash cards. If you wish you may take the last 15 minutes for drill games. Note that these games are not very effective drill but they are fun and they are a reward for hard work all week.

BASEBALL. Each team "pitches" facts to the other. Right answers advance players around the bases...four consecutive right answers is a homer. A miss is an out.

FOOTBALL. Gaines and looses may be related to the difficulty of the facts...let the student work out how they want to do this; they probably know more about football than we do anyway.

CHALLENGE. Have a "fact down" in which teams present problems as well as answer them. A student who misses or who gives the other team a problem he can't answer has to sit down.

Because "games" are not really very good drill, limit their use to one day per week even though students will request more. Commercially purchased games are available and many drill activities are suggested in the Arithmetic Teacher Magazine.

Feel free to vary these activities as your time and resources permit. As long as the students are responding from memory and at a high rate of speed the objectives of drill will be accomplished.

Step 5. At the end of each quarter, and certainly not any oftener than monthly, given a test the same way you gave the pretest. Compare pretest scores and post test scores and discuss with each student the progress he has made and what he needs to work on. Some students may be phased out of the drill program when their performance shows mastery.

SECTION 3:

MENTAL COMPUTATION

The activity called "mental computation" is closely related to drill and has similar goals. Mental Computation is more extensive than drill on basic facts, however, in the kind of problem treated. Along with the drill program outlined in Section 2, these exercises in mental computation will have a significant effect on the mastery of arithmetic achieved during the year. Teachers who do these exercised daily <u>without fail</u> report excellent results.

Each problem is presented like this. The teacher gives a starting number and then tells the students what operations to perform. The students carry on the operations mentally until the end, and then record the final answer on paper. An example...

Teacher says	Student think
"Start with 37 ______	"37"
Add 5 ______	"37 + 5 = 42"
Subtract 2 ______	"42 - 2 = 40"
Divide by 8 ______	"40 ÷ 8 = 5"
Add 9 ______	"5 + 9 = 14"
Subtract 6 ______	"14 - 6 = 8"
Write your answer ______	(Writes) 8

That was a hard one. You can, of course, make easier ones by using smaller numbers, fewer steps, and not getting into multiplication and division much. The opposite will produce harder ones.

Spend 5 minutes each day, possibly at the end of the period, doing 10 of these problems. Have the students write the answers on paper (answers only, no calculation) and hand them in. Here are some suggestions for getting the most out of these sxercises. Never repeat; if you start repeating problems you encourage inattention. Strive for speed but don't run away from the class. Improve your own skills to the point that you don't need to prepare the problems in advance. You should be able to keep up with your own problems.

In the COMP classroom you should have 10 minutes of drill on basic facts and 5 minutes of mental computation every day. That leaves 30 to 40 minutes for working on COMP units.

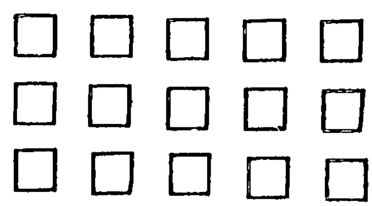
SECTION 4:

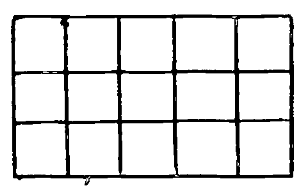
EXPLAINING OPERATIONS WITH

WHOLE NUMBERS

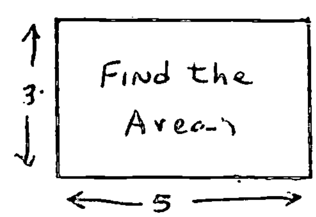
In explaining, re-explaining or re-teaching operations with whole numbers there are several goals. The first is that the student know the "meanings" of each operation. He should, for example, be able to find an answer to 34 + 27 by counting bottle caps, if he has to! He should know that he can count a set of 34 and a set of 27, combine these sets, and count the combined set to find the answer. We hope he can find the answer more efficiently that that, but this is a "meaning of addition" and he should know it!

The more meanings a student knows for an operation the more widely he will be able to apply that operation.
A student should see these three situations as the same or similar and should see that each is a meaning for (or an application of) multiplication so a second and related goal is that a student encounter as many and varied application of each operation as possible within the scope of the course.





It is also highly desirable that students become proficient (fast, accurate) in performing these operations and that they be able to explain the steps they perform.



So we have three goals with reference to computation: That students know the meanings of the operations, that they have experience with a variety of applications and that they perform the operations with speed and accuracy. This section will help you teach meanings and computational procedures for whole numbers.

A. Addition of Whole Numbers

This process is normally one which causes little difficulty for students who know basic addition facts. If re-explanation of column addition is necessary for any students, emphasize the fundamentals of place value in working the problem.

34 + 264 + 92 + 8,539 + 2,764 = ________

T-Th.	Thous	Hund's	tens	ones
		2	2	
			3	4
		2	6	4
			9	2
	8	5	3	9
	2	7	6	4
			9	3

The reason for writing the addends as we do is not to "line up the ends" but to get all the ones in a column, all the tens in a column, etc., for ease in addition.

The sum of ones, 23 ones, is recorded as 3 ones and 20 ones regrouped as 2 tens.

The sum of tens, 29 tens, is recorded as 9 tens and 20 tens regrouped as 2 hundreds.

Performing a few problems on a grid such as the one shown here will usually be all the explaination needed. For a student who has really missed the fundamentals of regrouping, however, work with a place value chart, abacus, or other teaching aid may be necessary . It is important to note here that there is very little difficulty with this process except for motivating the student to want to do it! Pages of practice exercises will not help and the student will get plenty of addition as they work the COMP units.

HUNDS	TENS	ONES

Place Value Pocket Chart

B. Subtraction of Whole Numbers

As in addition of whole numbers, there are few problems in subtraction except those caused by errors in basic facts and regrouping errors.

374 - 95 = ________

$$\begin{array}{rrr} & 16 & \\ 2 & \cancel{6} & 14 \\ \cancel{3} & \cancel{7} & 4 \\ - & 9 & 5 \\ \hline \end{array}$$

The most useful way to explain regrouping is to write the problem on a "grid" like this. Now we need to take 5 ones from 4 ones, inconvenient in whole numbers. So we "regroup" one of the tens as 10 ones. We have now 6 tens and 14 ones. In regrouping one hundred as ten tens, emphasize the balues of the places. From 3 hundreds take one hundred, leaving 2 hundreds; regroup one hundred, as 10 tens making 16 tens in tens place. (Not "From 3 borrow 1 and write it by the six.") Another possible way to show students what is done:

$$\begin{array}{r} 374 \\ -95 \\ \hline 279 \end{array} \rightarrow \begin{array}{r} 300 + 70 + 14 \\ - \quad 90 + \ \ 5 \\ \hline \end{array} \rightarrow \begin{array}{r} 300 + 60 + 14 \\ - \quad 90 + \ \ 5 \\ \hline \end{array} \rightarrow \begin{array}{r} 200 + 160 + 14 \\ - \quad 90 + \ \ 5 \\ \hline 200 + \ \ 70 + \ \ 9 \end{array}$$

More difficult examples are those which involve several zeros in the minuend. Use this problem to stress the values of the places again.

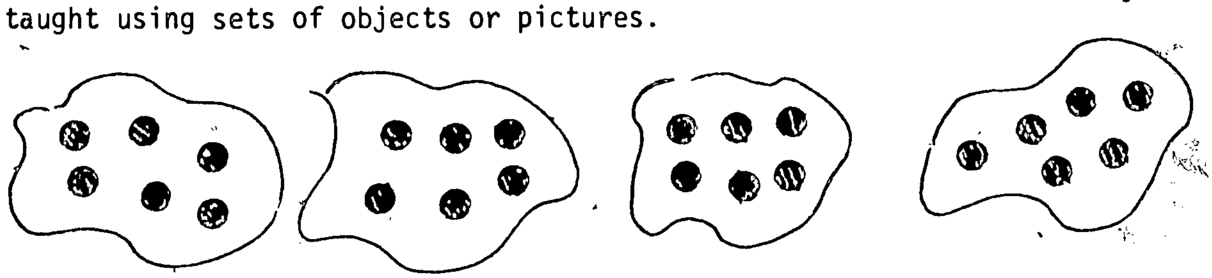
$$\begin{array}{r} 2003 \\ -947 \\ \hline \end{array} \rightarrow \begin{array}{rrrr} 1 & 10 & & \\ \cancel{2} & 0 & 0 & 3 \\ - & 9 & 4 & 7 \\ \hline \end{array} \rightarrow \begin{array}{rrrr} & 9 & & \\ 1 & \cancel{10} & 10 & \\ 2 & 0 & 0 & 3 \\ - & 9 & 4 & 7 \\ \hline \end{array} \rightarrow \begin{array}{rrrr} & 9 & 9 & \\ 1 & \cancel{10} & \cancel{10} & 13 \\ \cancel{2} & 0 & \cancel{0} & 3 \\ - & 9 & 4 & 7 \\ \hline \end{array}$$

One thousand is regrouped as 10 hundreds, etc. As in addition, a few students may be aided by using teaching devices such as an abacus or a place value pocket chart.

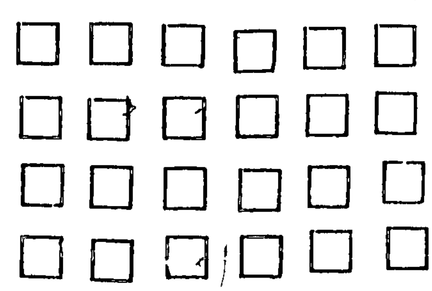
C. Multiplication of Whole Numbers

We first look at several ways to teach students the meaning of multiplication. A few students will be found who have not learned what multiplication means and reteaching will be essential for them. Following that, we look at the way to explain the procedures in the algorithm for multiplication.

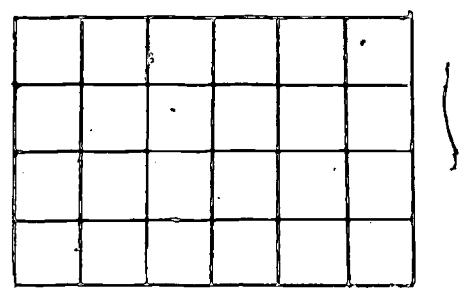
Meaning of Multiplication. The meaning of multiplication is at first taught using sets of objects or pictures.

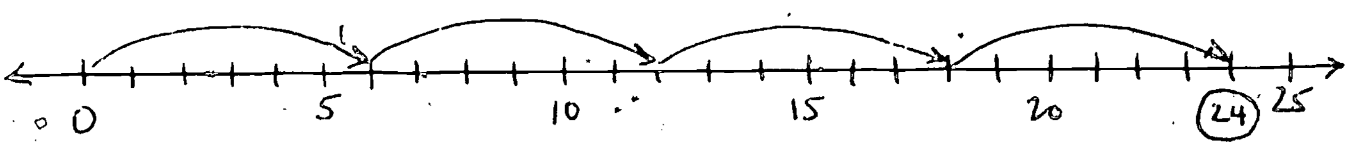


Four sets of six elements each is one interpretation of 4 x 6. Another meaning of 4 x 6 is an array of 4 rows having 6 objects in each row.



Notice that if you imagine sliding these squares together you will have a rectangle 4 squares wide and 6 squares long. Area is one of the most used applications of multiplication and also is a good way to introduce or explain multiplication. Another way to show the meaning of multiplication is to use the number line as shown below.





Here 4 x 6 means 4 "jumps" each 6 spaces long. The number line can be used in this way to show what multiplication means.

Each of the meanings described above related multiplication to a picture or to objects. Multiplication as repeated addition is useful

$$4 \times 6 = 6 + 6 + 6 + 6$$

because it helps to explain division as repeated subtraction and to assist us in teaching operations with fractions. Students would, ideally, know all these menaings; the more meanings students know the more able they will be to apply multiplication to real life situations.

<u>The Multiplication Algorithm</u>. We will cover the points most in need of explanation by a series of examples. The multiplication problems

$6 \times 27 = ?$

$$\begin{array}{r} 27\\27\\27\\27\\27\\\underline{27}\\42\\\underline{120}\\162\end{array} \rightarrow \begin{array}{r} 27\\\underline{6}\\42\\\underline{120}\\162\end{array} \rightarrow \begin{array}{r} 27\\\underline{6}\\162\end{array}$$

done here are related to repeated addition. Also, a short cut involving regrouping makes it easier to do. You should say "write 4 tens in tens column" but expect that the student will think "carry 4." The student should notice that multiplication is done on a grid in the sameway as addition and subtraction. The grid can be used effectively to explain the regrouping process.

24 x 346

"4 x 6 = 24. Write the 4 ones in the ones column but hold on to the 2 tens to see what goes in tens column."

	H	T	O
	1	2	
	3	4	6
		2	4
1	3	8	4

" 4 x 4 tens = 16 tens. We have 2 tens coming from 24, so 16 tens + 2 tens is 18 tens. Write the 8 tens in tens column. Hold on to the 1 hundred to see what goes in hundreds column."

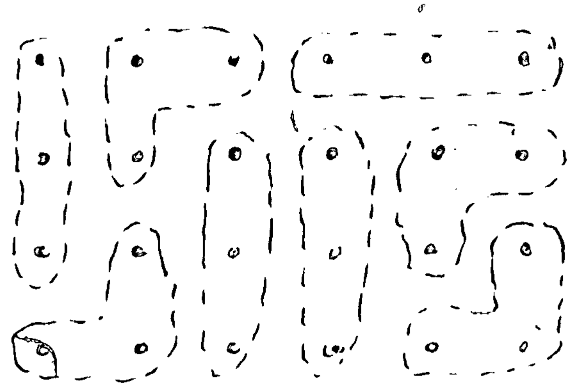
Why indent? Look at 20 x 6, the first step in multiplying by the 20. 20 x 6 = 120, or put differently, 2 tens in tens place, of course, which looks like "indenting."

$$\begin{array}{rrrr} & 3 & 4 & 6\\ & \times & 2 & 4\\ \hline 1 & 3 & 8 & 4\\ & & 2 & \\ \hline \end{array}$$

D. Division of Whole Numbers

Division of whole numbers is now taught in almost the same way in every elementary school text series. The presentation begins with exercises designed to teach the meaning of division, develops the algorithm using subtraction to explain the division, and finally introduces estimation of quotient digits as a short cut.

Meaning of Division. If you begin with a collection of 24 objects you may ask "How many sets of 3 can I make out of my set of 24?" Use sets of objects or pictures to find the answer as done on the right, there are 8 sets of 3 in 24 so 24 ÷ 3 = 8.

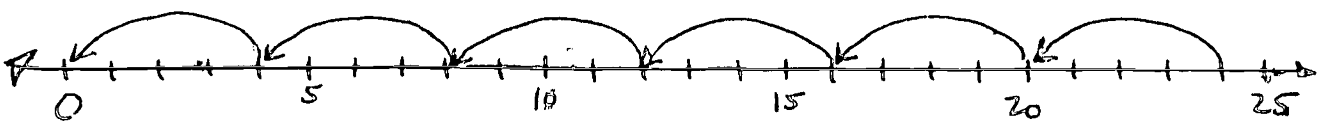


If I divide 24 things among 6 people, how many will each person get? Try it if you like. Of course each person gets 4 things, so 24 ÷ 6 = 4. This and the preceeding example relate division to "dividing" a set into smaller sets and carry the basic meaning of division.

Division is related to both multiplication and subtraction. Division may be thought of as a "missing factor" problem because multiplication and division are inverse operations. 4 x ___ = 24 and 24 ÷ 4 = _____ show this inverse relationship. We do not use that much in developing division because the algorithm for division is based on successive subtraction. When we ask "How many 4's in 24?" we may

$$\begin{array}{r} 24 \\ -4 \\ \hline 20 \\ -4 \\ \hline 16 \\ -4 \\ \hline 12 \\ -4 \\ \hline 8 \\ -4 \\ \hline 4 \\ -4 \\ \hline 0 \end{array}$$

Find the answer by subtracting 4's. Count the subtractions to find that there are 6 fours in 24. Again, $24 \div 4 = 6$. This leads us to a number line picture frequently used to illustrate the division facts. Starting at 24, successively subtract 4 and count the "jumps" to find the



number of 4's in 24. As you teach the material in the last two paragraphs be sure to emphasize that division is first related to sets of objects and the number line and then to subtraction and multiplication.

Division Algorithm. The algorithm is introduced as an extension of the idea of successive subtraction. Knowledge of multiplication facts helps speed the calculation.

$$\begin{array}{r|rr} 6 & \overline{34} & \\ & \underline{-6} & 1 \\ & 28 & \\ & \underline{-6} & 1 \\ & 22 & \\ & \underline{-6} & 1 \\ & 16 & \\ & \underline{-6} & 1 \\ & 10 & \\ & \underline{-6} & 1 \\ & 4 & \\ & & \overline{5} \end{array} \qquad \begin{array}{r|rr} & 5\ r\ 4 & \\ 6 & \overline{34} & \\ & \underline{18} & 3 \\ & 16 & \\ & \underline{12} & \underline{2} \\ & 4 & 5 \end{array} \qquad \begin{array}{r|rr} & 5\ r\ 4 & \\ 6 & \overline{34} & \\ & \underline{30} & 5 \\ & 4 & \end{array}$$

In the first example, division is successive subtraction with no refinement. In the second example the student "subtracts 3 sixes at once" and then finishes the problem by subtracting 2 more sixes. In the third example the student may reason that $4 \times 6 = 24$, $5 \times 6 = 30$, $6 \times 6 = 36$ so I can subtract 5 sixes and no more from 34. In each case 4 is the remainder. Similar reasoning explains each of these problems. Notice how valuable it is to be able to multiply by 10, 20, 30, ...100, 200, 300, etc.

```
                                          582
 6 |3492                             6 |3492
     600      100                       3000    500
    2892                                 492
     600      100                        480     80
    2292                                  12
     600      100                         12      2
    1692                                        582
     600      100
    1099
     600      100     etc.
                   (very long)
```

There will be stages between the very long form on the left and the very short form on the right. Now here are some examples which show how the quotient figure moves from the side of the division problem to its traditional place at the top.

```
      582                        582
        2                          2
       80                         80
      500                        500                        582
 6 |3492                   6 |3492                  6 |3492
     3000        500            3000                       3000
      492                        492                        492
      480         80             480                        480
       12                         12                         12
       12          2              12                         12
        0                          0                          0
```

The last example is almost at the adult stage and can be used efficiently for a long time before the estimation of quotient digits is added as a new skill.

82 |4375

(1) How do we locate the first quotient digit?

82x1 = 82
82x10 = 820
82x100 = 8200

(2) How do we know what digit to put there?

10 x 82 = 820
20 x 82 = 1640
30 x 82 = 2460
40 x 82 = 3280
50 x 82 = 4100
60 x 82 = 4920 (too large)

Because 4920 is too large, we must start with 50 x 82.

Another way: Round off 82 to 8 and 437 to 43. 43 ÷ 8 = 5, so try 5. Rounding will at times give the wrong digit.

Since 8200 is too large, the first quotient digit must go in tens place.

$$\begin{array}{r|l} & 5 \\ \hline 82 & 4375 \\ & 410 \\ \hline \end{array}$$

$$\begin{array}{r|l} & 53 \text{ r } 29 \\ \hline 82 & 4375 \\ & 410 \\ \hline & 275 \\ & 246 \\ \hline & 29 \end{array}$$

Complete the problem in the same manner. Students who are still having trouble with multiplication can get some help by listing the multiples of 82 before starting the problem.

Students now in secondary school will most likely have had the "scaffold" method of writing partial quotients down the right side of the division algorithm. Reteaching of division, which may be necessary, should be done using this form; there is no urgent need to change to the more advanced form. The form above, with estimated quotient digits may be treated as an optional procedure.

SECTION 5

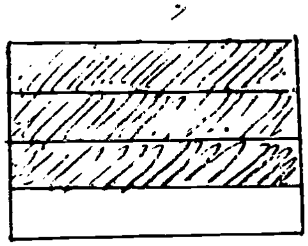
EXPLAINING OPERATIONS WITH FRACTIONS

Operations with fractions and the development of fraction concepts is a very complex subject. A full explanation of these concepts in an organized fashion takes weeks and, for the students who take this course, is generally not interesting or informative. We move immediately to an explanation of how to operate with fractions. At each step the explanation is based on visual or intuitive ideas and not very much on mathematical reasoning. As before, if your class has the background or interest which make it possible to present a more complete explanation you may amplify this material as you see fit.

A. Prerequisites to Fraction Computations

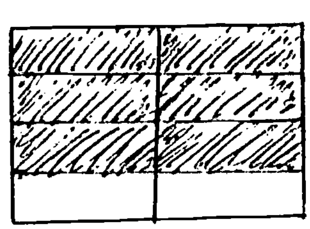
1) Changing to higher terms. Use the following diagrams to convince students that changing to higher terms is sensible. You probably will have to teach the students how to interpret the diagram first.

DIAGRAM 1



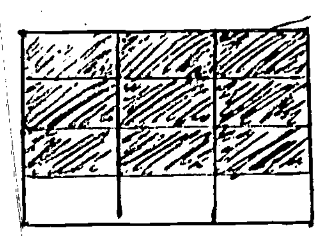
$\frac{3}{4}$

DIAGRAM 2



$\frac{6}{8}$

DIAGRAM 3

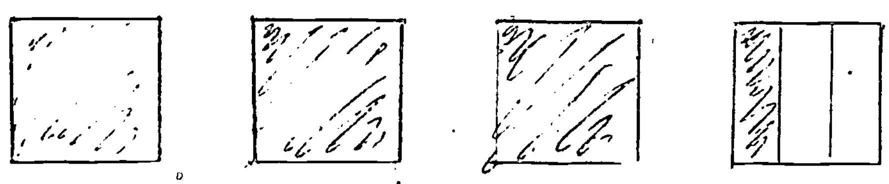


$\frac{9}{12}$

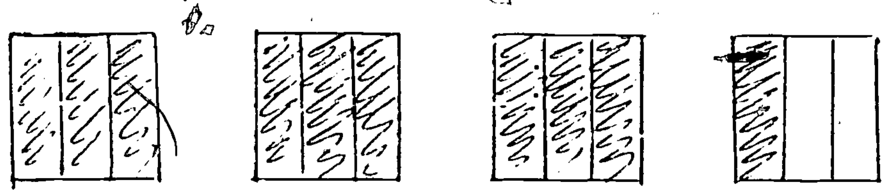
Because in each case the same region or part of the figure is shaded, these 3 fractions stand for the same thing. When you have done several similar examples point out that we can get one fraction from another by multiplying the numerator and denominator by the same number. $\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$

2) Changing to lower terms. Show how to go from diagram 3 to diagram 1 or 2 by erasing lines. In a similar way we may divide the numerator and denominator of a fraction by the same number.

3) Changing a mixed number to an improper fraction. A diagram for a mixed number is easily drawn by having a square be "one." The diagram below represents 3 1/3, each square being one.

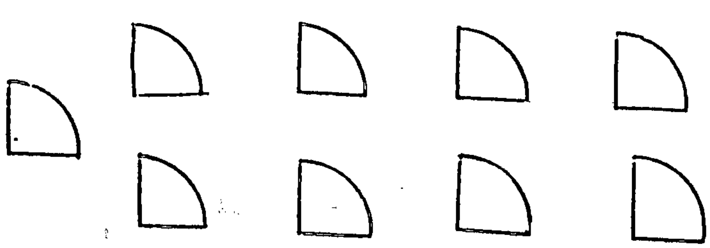


To change an improper fraction, divide each of the "ones" into fractional parts.



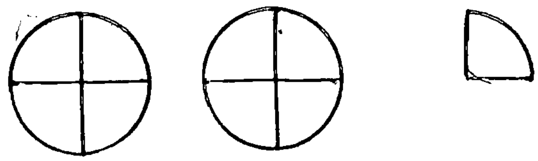
We see that 3 1/3 = $\frac{10}{3}$

4) Changing an improper fraction to a mixed number. Reverse the procedure described above. A diagram showing how that may be done could look like this.



(picture of 9 fourths)

Assemble the fractional parts into wholes. We see that the



nine fourths can be assembled into 2 wholes and 1 fourth, so

$$\frac{9}{4} = 2\,\frac{1}{4}$$

B. Addition and Subtraction of Fractions

1) With the same denominator

$$\begin{array}{r} 2\ \frac{3}{4} \\ +\ 1\ \frac{2}{4} \\ \hline 3\ \frac{5}{4} \end{array} = 4\frac{1}{4}$$

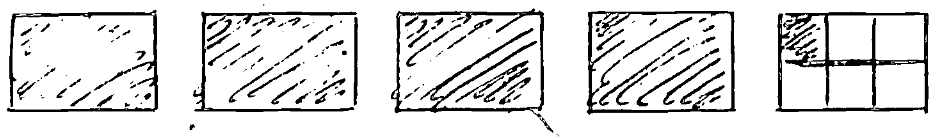
Adding with the same denominator cause few problems.

$$\begin{array}{r} 4\ \frac{5}{6} \\ -\ 1\ \frac{2}{6} \\ \hline 3\ \frac{3}{6} \end{array} = 3\ \frac{1}{2}$$

Subtracting causes few problems but the answer may be reduced to lowest terms.

$$\begin{array}{rcr} 4\ \frac{1}{6} & = & 3\ \frac{7}{6} \\ -\ 1\ \frac{5}{6} & = & 1\ \frac{5}{6} \\ \hline & & 2\ \frac{2}{6} \end{array} = 2\frac{1}{3}$$

In the case of this problem, it was necessary to change $4\,\frac{1}{6}$ to $3\,\frac{7}{6}$ in a way exactly like regrouping for subtraction of whole numbers.

$4\frac{1}{6}$ 

$3\frac{7}{6}$ 

2) The common denominator. The difficulty in adding fractions with different denominators is obvious. There are two procedures for finding a common denominator. The quickest is to multiply the denominators together and use the product as the common denominator. This will always work and is simple. It will not always produce the lowest common denominator and will sometimes complicate the problem considerably. In the first example this procedure produces the lowest common denominator

$$\frac{3}{4} + \frac{2}{3} = \frac{9}{12} + \frac{8}{12} = \frac{17}{12} = 1\frac{5}{12}$$

$$\frac{3}{4} + \frac{7}{12} = \frac{36}{48} + \frac{64}{48} = 1\frac{16}{48} = 1\frac{1}{3}$$

while in the second example it creates some problems with an unnecessarily large denominator.

The second procedure is to begin with the two fractions to be added and write two lists of equivalent fractions. Select from the lists those two fractions in lowest terms which have the same denominator. Working the two problems above in this manner we find:

$$\frac{3}{4}: \quad \frac{3}{4}, \ \frac{6}{8}, \ \underline{\underline{\frac{9}{12}}}, \ \frac{12}{16}, \ \frac{15}{20}$$

$$\frac{2}{3}: \quad \frac{2}{3}, \ \frac{4}{6}, \ \frac{6}{9}, \ \underline{\underline{\frac{8}{12}}}, \ \frac{10}{15}$$

$$\frac{3}{4} + \frac{2}{3} = \frac{9}{12} + \frac{8}{12} \quad \frac{17}{12} = 1\,\frac{5}{12}$$

$$\frac{3}{4}: \quad \frac{3}{4}, \ \frac{6}{8}, \ \underline{\underline{\frac{9}{12}}}, \ \frac{12}{16}$$

$$\frac{7}{12}: \quad \underline{\underline{\frac{7}{12}}}$$

$$\frac{3}{4} + \frac{7}{12} = \frac{9}{12} + \frac{7}{12} = \frac{16}{12} = 1\,\frac{4}{12} = 1\,\frac{1}{3}$$

A "probable best" procedure is to try a few equivalent fractions, say 4 or 5 in each list and if a common denominator is not found then simply multiply the denominators together.

C. Multiplication of Fractions

<u>Meanings of Multiplication</u>. One meaning of multiplication with which students are familiar is that multiplication repeated addition. For example,

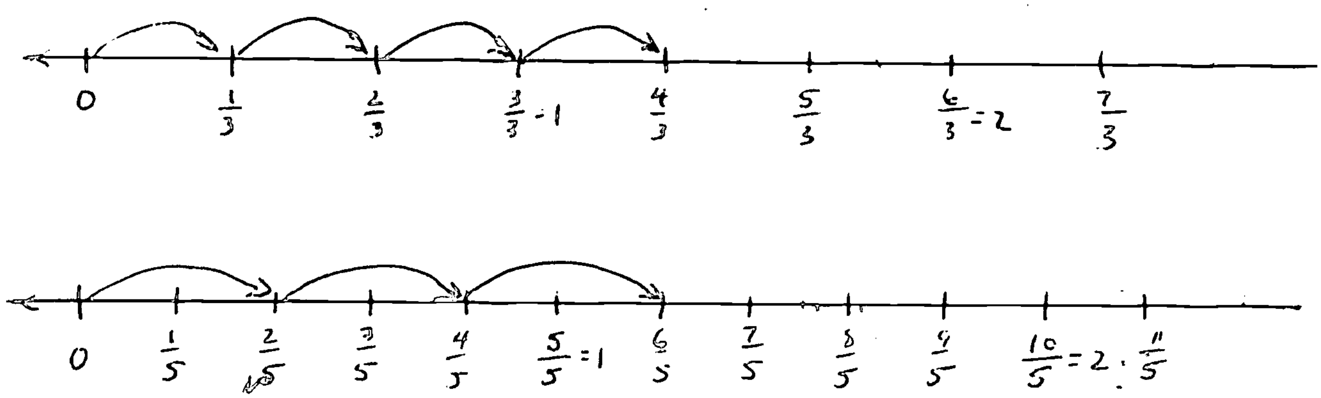
$$4 \times 6 = 6 + 6 + 6 + 6.$$

We can apply the same meaning to some problems in multiplication of fractions.

$$4 \times \frac{1}{3} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{4}{3}$$

$$3 \times \frac{2}{5} = \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{6}{5} = 1\,\frac{1}{5}$$

We can use the number line to illustrate problems as is often done with whole numbers.

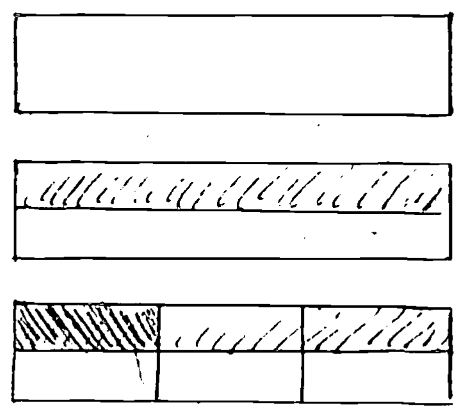


Another menaing which can be attached to multiplication of fractions is as a "part of a part."

Here is one thing:

Here is half of it, shaded:

Here is one-third of that half, shaded:



Now the argument goes like this: Look at the section which is one-third of the half. What fraction is it of the whole rectangle? (Answer: one-sixth) So one-third of one-half is one-sixth. But where is the multiplication in this situation? It is introduced through the statement "of means times" which is true in some situations, and is acceptable here. From cutting up the rectangle we concluded that one-third of one-half is one-sixth.

So we say $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$.

<u>Algorithm</u> <u>for</u> <u>Multiplication</u> <u>of</u> <u>Fractions</u>. This procedure is so "natural" that students usually remember it and do it correctly.

$3\frac{1}{2} \times 5\frac{3}{5} = \frac{7}{2} \times \frac{28}{5}$ Change the factors to improper fractions.

$= \frac{7}{\cancel{2}_{1}} \times \frac{\cancel{28}^{14}}{5}$ Divide common factors out of numerator and denominator.

$= \frac{98}{5}$ Multiply numerators and denominators.

$= 19\frac{3}{5}$ Change to a mixed number if necessary.

D. Divisional of Fractions.

There are few practical reasons for division of fractions but occasionally a problem will come up in which it is necessary. Here is a procedure for the division of fractions and explanatory notes for each step.

(1) $\frac{7}{12} \div \frac{3}{4} = \frac{\frac{7}{12}}{\frac{3}{4}}$ Surprise! A fraction whose numerator and denominator are fractions! The explanation is "Since a fraction is an indicated division (for example $\frac{2}{3}$ means $2 \div 3$) we can use the fraction form to indicate the division problem $\frac{7}{12} \div \frac{3}{4}$." From here on we will assume

that the things we have learned about ordinary fractions apply to this complex fraction.

$$\frac{\frac{7}{12}}{\frac{3}{4}} = \frac{\frac{7}{12} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}}$$

There is a "double barrel" reason for this step. The reason which justifies what has been done is that multiplying the numerator and denominator of a fraction by the same number does not change the "value" of the fraction. But why use $\frac{4}{3}$? Looking ahead, we can see that having 1 (one) in the denominator of this messy fraction will simplify it a great deal. What number can we multiply by $\frac{3}{4}$ to obtain 1? This step is easier if students have previously learned to find the reciprocal of a fractional number.

(3) $\frac{\frac{7}{12} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}} = \frac{\frac{7}{12} \times \frac{4}{3}}{1}$

Because $\frac{3}{4} \times \frac{4}{3} = 1$. Note that here or in the following step a student may observe for himself the "invert and multiply" short cut.

(4) $\frac{\frac{7}{12} \times \frac{4}{3}}{1} = \frac{7}{12} \times \frac{4}{3}$

Dividing by 1 always gives you what you started with.

$$(5)\quad \frac{7}{\underset{3}{\cancel{12}}} \times \frac{\overset{1}{\cancel{4}}}{3} = \frac{7}{9}$$ Proceeding as in multiplication.

It you have several such problems to work the students will possibly see the "invert and multiply" short cut. If not it is probably not worth while to teach it to them as they will soon forget it.

SECTION 6

EXPLAINING OPERATIONS WITH DECIMAL FRACTIONS

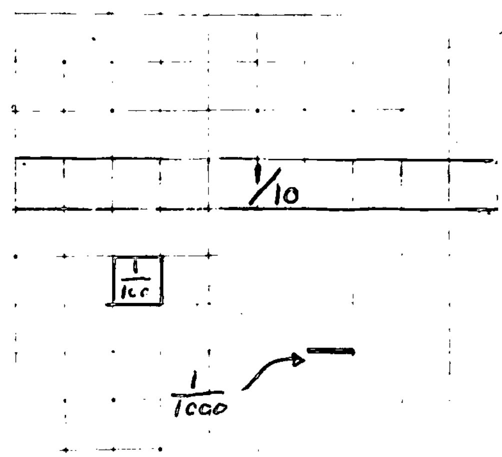
Decimal fractions are likely to become more important in every day calculation. Common fractions arise primarily from measurement and, as the conversation to the metric system takes place, measurement will be done with decimal fractions. Of course, common fractions will still be taught and used in other contexts. Almost all students who can compute successfully with whole numbers can also compute with decimal fractions. The only difference is that the location of the decimal point in the problem and in the answer must be determined. As a practical matter, there are a few simple rules for doing that. In this section we discuss (1) teaching the meaning of decimal fractions to students who have missed that topic and (2) explaining why the decimal point is handled as it is in computation with decimal fractions.

A. The Meaning of Decimal Fractions.

If it is necessary to reteach the meaning of decimal fractions you can use one or two devices to help explain what decimals mean. A place value grid drawn on the board with the places identified by name and by common fractions will be used often to explain computation. It can be introduced here. The number on the grid is read "two hundred thirty four AND five hundred seventy one thousandths." The "and" signals the position of the

HUNDREDS	TENS	ONES	TENTHS	Hundredths	Th'ths
100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
2	3	4	5	7	1

decimal point in reading decimal fractions. A bead abocus, shown on page.37, may be used to represent the number. The relative sizes of these places can be illustrated as shown here. The large square is 1, each strip is .1, the small square .01 and the small strip .001, approximately.



An interesting project for students would be to tape together enough graph paper to have a square 100 squares long and 100 squares wide. Each little square would be $\frac{1}{10,000}$ = .0001 and $\frac{1}{100}$ of a little square would be $\frac{1}{1,000,000}$ = .000001 part of the paper. Such small fractions occur in scientific and technical work but fractional parts beyond thousandths are rare in ordinary occupations.

The following explanations balance the emphasis on meaning, and the reasons <u>why</u> calculations are done as they are with the need for fairly simple explanations emphasizing <u>how</u>. If your students can understand more complete explanations of the reasons for the procedures do not hesitate to employ them.

B, Addition and Subtraction of Decimal Fractions

When we add a column of whole numbers we write them with the right sides in a line. This simple arrangement serves to get all the ones in a column, all tens in a column, etc. In adding decimal fractions we write the numbers with the decimal points in a vertical line. Why? We do this, as we do in whole numbers, to get each place value in a column. We thus add a column of thousandths, hundredths, etc.

$$23\ .\ 8 + 5\ .\ 79 + 62\ .371 + 5\ .\ 2 = \underline{\hspace{6cm}}$$

(10)	(1)	.	$(\frac{1}{10})$	$(\frac{1}{100})$	$(\frac{1}{1000})$
2	3	.	8		
	5	.	7	9	
6	2	.	3	7	1
	5	.	2		

We proceed to add <u>as though</u> there were zeros in the places where no numeral stands. That is, we add the above problem as though it looked like the problem on the right.

$$\begin{array}{r} 23.800 \\ 5.790 \\ 62.371 \\ \underline{5.200} \end{array}$$

The students are not likely to be bothered by this difference but you should be aware that, for example, 5.2 and 5.200 are quite different if they stand for measured quantities. If an object is measured as 5.2 inches long its actual length is between 5.15 and 5.25 inches. If an object is measured as 5,200 inches its actual length is between 5.1995 and 5.2005 inches. The second measurement is far more precise than the first.

Subtraction problems are set up the same way, with the decimals aligned so that place values are in columns. When subtracting, fill in missing places with zeros, subject to the same reservations described above for numbers which arise from measurement.

$$\begin{array}{r} 27.3 \\ \underline{-\ 12.571} \end{array}$$

$$\begin{array}{r} 27.300 \\ \underline{-\ 12.571} \end{array}$$

C. Multiplication of Decimal Fractions

A problem in multiplication of decimal fractions is done in exactly the same way as a problem in multiplication of whole numbers.

```
   34.62
    27.8
   27696
  24234
 6924
 962436
      *
```

The placing of the decimal point is the only operational difference. If we ask, "what place is the last digit in the answer?" we will be able to find the place values in the answer and thus place the decimal point. The last place in the answer is a 6. Where did it come from? Well, 8 x 2 is 16, so we wrote down 6 and carried 1. Is that really 8 x 2? Look at the place values involved: The 2 is hundreds and the 8 is 8 tenths. The 16 is $\frac{2}{100} \times \frac{8}{10} = \frac{16}{1000} = \frac{10}{1000} + \frac{6}{1000} = \frac{1}{100} + \frac{6}{1000}$, 16 <u>thousandths</u> which we regroup as 1 hundredth + 6 thousandths. So we see that the 6 in the last digit in the answer stands for 6 thousandths. Moving left, the 3 is 3 hundredths, the 4 is 4 tenths and the 2 is 2 ones. Hence the decimal point is placed between the 2 and the 4.

Students will shortly discover the rule which uses the decimal points in the factors to locate the decimal point in the product. If they don't discover the rule you should show them how it works but let them locate the decimal point by using place value for a few days first. When you work on the board you should <u>always</u> use place value logic to locate decimal points. This will provide many short lessons on place value.

D. Division of Decimal Fractions

In considering division of whole numbers we arrived at two procedures which were "workable" in the sense that a student could compute with them with reasonable speed. In one the quotient was "accumulated" down the right side as a series of partial quotients. Place values were handled automatically and estimation skill was helpful but not crucial. In the other procedure for division the quotient appears, one digit at a time, in the convential position. Placing quotient digits requires knowledge of place value. Both of these procedures can be used for division of decimals, but first we make the usual change in the position of the decimals in the divisor and dividend. Here is one way to explain why that change is permissible. Problem: $23.4\overline{)792.36}$

$$\frac{792.36}{23.4} = \frac{792.36 \times 10}{23.4 \times 10} = \frac{7{,}923.6}{234}$$

The point of these explanations is that one can multiply divisor and dividend by the same number and not change the quotient which results from division.

The problem which results from this always has a whole number divisor. $234\overline{)7{,}923.6}$

Here this problem is solved two ways with explanations which you might use when the problem is done in class.

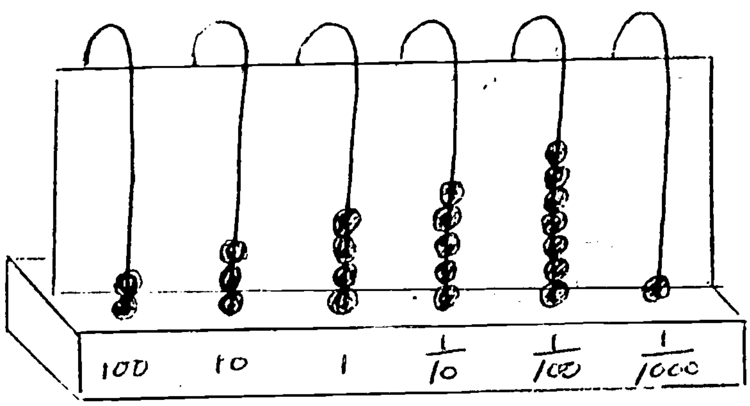
As in whole numbers, think first of subtracting 234 form 7,923 30 times and then 3 times. At this step 201.6 is the "remainder."	234	7,923.6	
		7,020.0	30.
		903.6	
		702.0	3.
		201.6	
		187.2	.8
		14.40	
		14.04	.06
		.36	(etc.)

We can subtract .8 x 234 from 201.6. This leaves 14.4 as a remainder; from 14.40 we subtract .06 x 234 leaving .36. If we continue to annex zeros we can continue the division process.

answer 33.86 (approx)

Working this problem in the more traditional way, we would begin by saying 234 divided into 7,923.6 goes more than 10 but less than 100 times, so the first quotient digit must be in tens place. The decimal places in the quotient are, for convenience, located directly above the corresponding digits in the dividend.

```
234 |7,923.6
     702.
      903
      702
      2016
      1874
        36   (etc)
```



Bead abacus illustrating the number 234.571

SECTION 7

EXPLAINING PERCENTAGE

PROBLEMS

There are generally thought to be "3 cases" of percent problems. All three can be worked through the same formula. Let us look at the problem of finding 25% of 40, a problem selected because it is simple. We begin with a general explanation "percent is a short way to write hundredths." So 25% = 25/100 = .25

25% of 40 = → .25 x 40 =

$$\begin{array}{r} 40 \\ \underline{.25} \\ 200 \\ \underline{80} \\ 10.00 \end{array}$$

.25 x 40 = 10

25% of 40 = 10

Now let us look at a second problem, 25% of what number is 10?

25% of $\square$ = 10 → .25 x $\square$ = 10

Divide both sides of this equation by .25.

$$\frac{.25 \times \square}{.25} = \frac{10}{.25}$$

.25 divides into .25 one time

$$\frac{\overset{1}{\cancel{.25}} \times \square}{\cancel{.25}} = \frac{10}{.25}$$

$$\begin{array}{r} 40. \\ .25 \overline{)10.00} \\ \underline{100} \\ 0 \end{array}$$

$$\square = \frac{10}{.25}$$

$$40 = \frac{10}{.25}$$

25% of 40 = 10

Finally a third problem, what percent of 40 is equal to 10?

(what percent) of 40 = 10 → $\square \times 40 = 10$

Divide both sides of this equation by 40

$$\frac{\square \times 40}{40} = \frac{10}{40}$$

40 divides into 40 one time

$$\frac{\square \times \overset{1}{\cancel{40}}}{\cancel{40}} = \frac{10}{40}$$

$$40 \overline{)10.00} = .25$$

80
200
200

$$\square = \frac{10}{40}$$

$$.25 = \frac{10}{40}$$

$$.25 = 25\%$$

25% of 40 is 10.

This shows that any percent problem can be solved starting with one formula. The only difference is in the item which is to be found.

SECTION 8:

1. Diagnostic tests

   Teacher's Directions

   Student's Directions

   Recording Forms

   Forms AM, S, and D

2. C.O.M.P. Computational Skills test

Diagnostic Test

Form A-M

Teacher's Directions

This diagnostic test is given to determine the speed and accuracy with which students can recall the "basic facts" of addition or multiplication. There are 5 pages with 20 exercises on each page. Time limits are very important. Because of this, each student is to follow the directions exactly and you will need a watch or clock with a sweep second hand.

Work the test pages in order. Note that the time limits get shorter, then longer. Watch the students work. Record any finger counting or other kinds of work which will not show on the paper on the Recording Form under "observations."

This test is used with both multiplication and addition facts so be sure the students know what operation to do. Write on the chalk board "Addition" or "Multiplication" as the case may be.

Read over the "Directions" which appear on the front of each envelope. Be sure the students understand these directions.

Diagonostic Test

Form A-M

Directions

This is a timed test. Work as fast as you can. If you remember an answer, write it down. If not, you may figure out the answer any way you can.

Start when the teacher tells you to start and stop when she tells you to stop. When the teacher says "START" take page 1 out of the envelope and do as many problems as you can. When she says "STOP" replace the page in the envelope behind the other pages. Do the same for each of the other pages.

Time Limits

Page 1	2 minutes
Page 2	1 minute
Page 3	30 seconds
Page 4	4 minutes
Page 5	8 minutes.

Class Identification:

Teacher:______________________________

Period________School____________________

Diagnostic Test

Form A-M ☐

Form S ☐

Form D ☐

Recording Form

Student's Name	Page 3	2	1	4	5	Observations

Name ______________________________

Page 1: 2 minutes

4	1	6	2
8	4	3	8
6	7	3	5
6	3	0	1
1	8	9	0
6	5	9	9
2	5	9	8
4	9	3	2
4	0	7	3
0	4	4	4

Diagnostic Test
Form A-M

Name ________________________________

Page 2 : 1 minute

3	2	4	0
7	9	6	2
7	8	0	9
7	7	6	7
1	9	8	4
5	2	1	1
7	2	5	6
6	3	4	0
3	5	6	1
2	7	9	0

Name ____________________

Diagnostic Test
Form A-M

Page 2 : 30 seconds

1	5	2	4
2	5	5	3
3	7	8	9
8	2	6	4
4	0	0	3
5	8	3	5
2	6	5	1
2	4	3	7
6	7	9	8
7	5	5	3

NAME: ____________________

Diagnostic Test
Form A-M

Page 4 : 4 minutes

5	0	4	1
6	7	7	9
1	6	7	5
3	2	8	2
7	2	8	3
0	0	8	1
2	8	6	0
7	4	1	5
9	3	4	9
1	9	2	8

Name ____________________

Diagnostic Test
Form A-M

Page 5: 8 minutes

$\begin{array}{r}5\\ \underline{0}\end{array}$	$\begin{array}{r}0\\ \underline{0}\end{array}$	$\begin{array}{r}4\\ \underline{9}\end{array}$	$\begin{array}{r}2\\ \underline{1}\end{array}$
$\begin{array}{r}8\\ \underline{9}\end{array}$	$\begin{array}{r}3\\ \underline{3}\end{array}$	$\begin{array}{r}6\\ \underline{8}\end{array}$	$\begin{array}{r}7\\ \underline{1}\end{array}$
$\begin{array}{r}1\\ \underline{8}\end{array}$	$\begin{array}{r}5\\ \underline{8}\end{array}$	$\begin{array}{r}6\\ \underline{5}\end{array}$	$\begin{array}{r}1\\ \underline{1}\end{array}$
$\begin{array}{r}4\\ \underline{4}\end{array}$	$\begin{array}{r}7\\ \underline{9}\end{array}$	$\begin{array}{r}3\\ \underline{6}\end{array}$	$\begin{array}{r}8\\ \underline{0}\end{array}$
$\begin{array}{r}2\\ \underline{6}\end{array}$	$\begin{array}{r}9\\ \underline{0}\end{array}$	$\begin{array}{r}9\\ \underline{6}\end{array}$	$\begin{array}{r}0\\ \underline{1}\end{array}$

Class Identification:

Teacher: ______________________

Period ____ School ______________________

Diagnostic Test

Form S

Recording Form

	← Page →					
Student's Name	3	2	1	4	5	Observations

Diagnostic Test
Form S

Name ______________________________

Page 1: 2 minutes

14 - 8	11 - 4	6 - 3	12 - 8
6 - 6	7 - 3	3 - 0	5 - 1
11 - 6	8 - 5	9 - 9	10 - 9
12 - 4	15 - 9	9 - 3	8 - 2
4 - 0	10 - 4	7 - 4	13 - 4

Diagnostic Test
Form S

Name ______________________________

Page 2 : 1 minute

13 - 7	12 - 9	14 - 6	10 - 2
7 - 7	8 - 7	10 - 6	9 - 7
11 - 5	9 - 2	8 - 1	4 - 1
7 - 6	12 - 3	5 - 4	6 - 0
3 - 2	15 - 7	16 - 9	1 - 0

Diagnostic Test
Form S

Name ______________________________

Page 3 : 30 seconds

11	5	12	4
- 2	- 5	- 5	- 3
13	7	8	9
- 8	- 2	- 6	- 4
14	10	10	13
- 5	- 8	- 3	- 5
2	6	5	11
- 2	- 4	- 3	- 7
16	7	9	8
- 7	- 5	- 5	- 3

Diagnostic Test
Form S

Name ______________________________

Page 4 : 4 minutes

$\begin{array}{r} 15 \\ -\ 6 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -\ 7 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ -\ 7 \\ \hline \end{array}$	$\begin{array}{r} 11 \\ -\ 9 \\ \hline \end{array}$
$\begin{array}{r} 11 \\ -\ 3 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -\ 2 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ -\ 8 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ -\ 2 \\ \hline \end{array}$
$\begin{array}{r} 7 \\ -\ 0 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ -\ 0 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -\ 8 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ -\ 1 \\ \hline \end{array}$
$\begin{array}{r} 12 \\ -\ 7 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -\ 4 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -\ 1 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -\ 5 \\ \hline \end{array}$
$\begin{array}{r} 9 \\ -\ 1 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ -\ 9 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ -\ 2 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -\ 8 \\ \hline \end{array}$

Diagnostic Test
Form S

Name ______________________________

Page 5: 8 minutes

$\begin{array}{r} 5 \\ -\ 0 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ -\ 0 \\ \hline \end{array}$	$\begin{array}{r} 14 \\ -\ 9 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ -\ 1 \\ \hline \end{array}$
$\begin{array}{r} 18 \\ -\ 9 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ -\ 3 \\ \hline \end{array}$	$\begin{array}{r} 16 \\ -\ 8 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ -\ 1 \\ \hline \end{array}$
$\begin{array}{r} 11 \\ -\ 8 \\ \hline \end{array}$	$\begin{array}{r} 15 \\ -\ 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -\ 5 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ -\ 1 \\ \hline \end{array}$
$\begin{array}{r} 4 \\ -\ 4 \\ \hline \end{array}$	$\begin{array}{r} 17 \\ -\ 9 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ -\ 6 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -\ 0 \\ \hline \end{array}$
$\begin{array}{r} 12 \\ -\ 6 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -\ 0 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -\ 6 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -\ 1 \\ \hline \end{array}$

Class Identification:

Teacher:________________________

Period____ School_________________

Diagnostic Test

Form D

Recording Form

	← Page →					
Student's Name	3	2	1	4	5	Observations

Name ______________________________

Page 1: 2 minutes

$8\overline{)32}$	$4\overline{)4}$	$3\overline{)18}$	$8\overline{)16}$
$6\overline{)36}$	$3\overline{)21}$	$\overline{)\quad}$	$1\overline{)5}$
$6\overline{)6}$	$5\overline{)40}$	$9\overline{)81}$	$9\overline{)0}$
$4\overline{)8}$	$9\overline{)45}$	$3\overline{)27}$	$2\overline{)16}$
$4\overline{)0}$	$\overline{)\quad}$	$4\overline{)12}$	$4\overline{)12}$

Diagnostic Test
Form D

Name ____________________

Page 2: 1 minute

$7\overline{)21}$	$9\overline{)18}$	$6\overline{)24}$	$2\overline{)0}$
$7\overline{)49}$	$7\overline{)56}$	$6\overline{)0}$	$7\overline{)63}$
$5\overline{)5}$	$2\overline{)18}$	$1\overline{)8}$	$1\overline{)4}$
$6\overline{)42}$	$3\overline{)6}$	$4\overline{)20}$	
$2\overline{)6}$	$7\overline{)35}$	$9\overline{)54}$	

Diagnostic Test
Form D

Name ______________________

Page 3 : 30 seconds

$2\overline{)2}$	$5\overline{)25}$	$5\overline{)10}$	$3\overline{)12}$
$8\overline{)24}$	$\overline{)}$	$6\overline{)48}$	$4\overline{)36}$
$5\overline{)20}$	$8\overline{)0}$	$3\overline{)0}$	$5\overline{)15}$
$\overline{)}$	$4\overline{)24}$	$3\overline{)15}$	$7\overline{)7}$
$7\overline{)42}$	$5\overline{)35}$	$5\overline{)45}$	$3\overline{)24}$

Diagnostic Test
Form D

Name ______________________________

Page 4 : 4 minutes

$6\overline{)30}$	$7\overline{)0}$	$7\overline{)28}$	$9\overline{)9}$
$3\overline{)3}$	$2\overline{)12}$	$8\overline{)56}$	$2\overline{)10}$
$\overline{)}$	$\overline{)}$	$8\overline{)64}$	$1\overline{)3}$
$7\overline{)14}$	$4\overline{)32}$	$1\overline{)6}$	$5\overline{)0}$
$1\overline{)9}$	$9\overline{)27}$	$2\overline{)8}$	$8\overline{)72}$

Name________________________

Page 5: 8 minutes

$2\overline{)14}$		$9\overline{)36}$	$1\overline{)2}$
$9\overline{)72}$	$3\overline{)9}$	$8\overline{)48}$	$1\overline{)7}$
$8\overline{)8}$	$8\overline{)40}$	$5\overline{)30}$	$1\overline{)1}$
$4\overline{)16}$	$9\overline{)63}$	$6\overline{)18}$	
$6\overline{)12}$	$2\overline{)4}$	$6\overline{)54}$	$1\overline{)0}$

BERRIEN COUNTY

C.O.M.P.

Computational Skills Test

1. $\begin{array}{r} 43,596 \\ +\ 39,238 \\ \hline \end{array}$

2. $\begin{array}{r} 9839 \\ +\ 1584 \\ \hline \end{array}$

3. $\begin{array}{r} 5963 \\ 8742 \\ +\ 3760 \\ \hline \end{array}$

4. $\begin{array}{r} 48,392 \\ 97,861 \\ 58,423 \\ +\ 25,718 \\ \hline \end{array}$

5. $\begin{array}{r} 925 \\ -\ 389 \\ \hline \end{array}$

6. $\begin{array}{r} 5293 \\ -\ 3625 \\ \hline \end{array}$

7. $\begin{array}{r} 84,965 \\ -\ 19,982 \\ \hline \end{array}$

8. $\begin{array}{r} 36,278 \\ -\ 24,679 \\ \hline \end{array}$

9. $\begin{array}{r} 96 \\ \times\ 48 \\ \hline \end{array}$

10. $\begin{array}{r} 459 \\ \times 36 \\ \hline \end{array}$

11. $\begin{array}{r} 982 \\ \times\ 253 \\ \hline \end{array}$

12. $29\overline{)52,364}$

13. $36\overline{)23,576}$

14. $242\overline{)276,384}$

15.
$$\begin{array}{r} 8\frac{11}{12} \\ \div\ 8\frac{7}{12} \\ \hline \end{array}$$

16.
$$\begin{array}{r} 29\frac{2}{5} \\ \div\ 12\frac{4}{15} \\ \hline \end{array}$$

17.
$$\begin{array}{r} 7\frac{5}{6} \\ 8\frac{3}{4} \\ +\ 8\frac{2}{9} \\ \hline \end{array}$$

18.
$$\begin{array}{r} 8\frac{1}{2} \\ 5\frac{2}{3} \\ +\ 4\frac{5}{8} \\ \hline \end{array}$$

19.
$$\begin{array}{r} 18\frac{11}{12} \\ -\ 8\frac{5}{24} \\ \hline \end{array}$$

20.
$$\begin{array}{r} 7\frac{5}{6} \\ -\ 4\frac{3}{8} \\ \hline \end{array}$$

21.
$$\begin{array}{r} 12\frac{2}{3} \\ -\ 8\frac{7}{10} \\ \hline \end{array}$$

21.
$$\begin{array}{r} 12\frac{2}{3} \\ -\ 8\frac{7}{10} \\ \hline \end{array}$$

22. $27\frac{1}{4}$
$-13\frac{4}{5}$

23. $2\frac{5}{7} \times 4\frac{2}{3}$

24. $3\frac{1}{8} \times 1\frac{4}{5}$

25. $8\frac{5}{9} \div 5\frac{1}{3}$

26. $8\frac{5}{8} \div 3\frac{3}{4}$

27. $2\frac{1}{2} \div 1\frac{3}{4}$

28. 9.45
+ 3.76

29. 8.622
+ 7.589

30. .5982
.36
+ .007

31. 3.925
.62
+12.804

32. 18.5
- 3.7

33. 18.482
- 9.736

34. 25.
- 9.06

35. 22.01
- 2.853

36. .88
x .9

37. $\begin{array}{r} 82.6 \\ \underline{\times\ .04} \end{array}$

38. $\begin{array}{r} 30.5 \\ \underline{\times\ .712} \end{array}$

39. $.6\overline{)8.24}$

40. $.09\overline{)16.1}$

41. $.025\overline{)1.95}$

42. 25% of 35 = ______

43. 18% of 56 = ______

44. 135% of 26 = ________

45. 32% of _____ = 48

46. 55% of _______ = 38

47. _____% of 74 = 37

48. _____% of 15 = 30

TEACHER'S MANUAL

OWNING AN AUTOMOBILE
AND
DRIVING AS A CAREER

General Instructions

The material in this career/consumer unit is designed to be given to the students one lesson at a time. Each lesson is short so that during one class period you can have discussion of a career-consumer question, explanation of the mathematical operation and 20 to 30 minutes for students to work the problems which accompany the lesson. Here are the general instructions for using the unit.

1. Each of the lessons comes with specific instructions and suggestions for that lesson. Read those instructions before starting the lesson.

2. There is some reading for the students to do in each lesson, either word problems or for information or both. The reading should be done as a part of class activity, not silently. You read a sentence then call on a student to read the next sentence. Use this activity to help students improve their reading skills. Always read the word problems aloud before assigning them and encourage students to request another reading if necessary.

The mathematics class should lead to improved reading skills!

3. The "Mission Incredible" problems are extra credit problems and students should volunteer for these assignments, particularly those which involve work outside the school. Explain each Mission Incredible problem to the class as it comes up and encourage students to volunteer.

Each of these problems contributes to the unit and should lead to a bulletin board display. Students who do one of these activities should present their project to the class. This will consist of showing and explaining the information they collected and also explaining the calculations they did. For this purpose 1/2 day of class time is allowed for each Mission Incredible assignment.

4. Have a file folder for each student to keep his work. Do not expect work to be done at home...allow 20 to 30 minutes of each class for the students to work on problems. At the conclusion of class the students papers are returned to the folders.

During the developmental stage of this project, save the students papers. They will be used to analyze and evaluate the success of the unit.

Materials Needed

State highway maps:

20 Georgia Maps

10 Florida Maps

10 Regional Maps, Southeast U. S. Region.

Normally these maps are easy to get and easy to replace. If you want to use them more or less permanently, cover the map side with clear contact paper. Students can write on this with a grease pencil and wipe it off.

Local Bank and Insurance Information. Contact a local bank and an insurance firm. Ask for current rates and payment schedules. A representative of an insurance company may be invited to explain insurance rates.

Topics

Daily Lesson #1 : Lesson Plan

Objective: The students are to discuss and list the reasons for and against a student owning a car.

1. The students will listen to a tape which will introduce the units.
2. The teacher will lead a discussion of the tape.
   a. Ask the students to recall the father's reasons and the son's reasons.
   b. As the students recall them, list the reasons in brief form on the chalk board. You may replay parts of the tape if necessary.
   c. Now discuss the question ..."should the son have a car?" Stimulate discussion with the following questions,
      (1) Were the father's objections correct?
      (2) Did Dan's arguments convince you?
      (3) What other reasons are there, for or against having a car?
      (4) Who owns a car? (hands) What do you think about the arguments the father used?
3. Turn on the tape again (Side 2) for an explanation of the assignment.
4. The "Mission Incredible" assignment should be explained at this time. This is an <u>optional</u>, <u>extra credit</u> assignment. Try to get several people to accept each mission incredible assignment.

THE PURPOSE OF THIS LESSON IS TO GET THE STUDENTS TO CONSIDER THE QUESTION OF OWNING A CAR: IF NO TAPE IS AVAILABLE TO START THE DISCUSSION YOU MAY ASK THE STUDENTS FOR REASONS THEY CAN THINK OF. YOU MIGHT ALSO DIVIDE THE CLASS INTO "FOR" AND "AGAINST" AND HAVE A DEBATE. LIST REASONS ON THE CHALKBOARD.

THIS SHEET IS TO BE GIVEN TO THE STUDENTS AFTER THE DISCUSSION ON OWNING A CAR:

COMP (automobile)

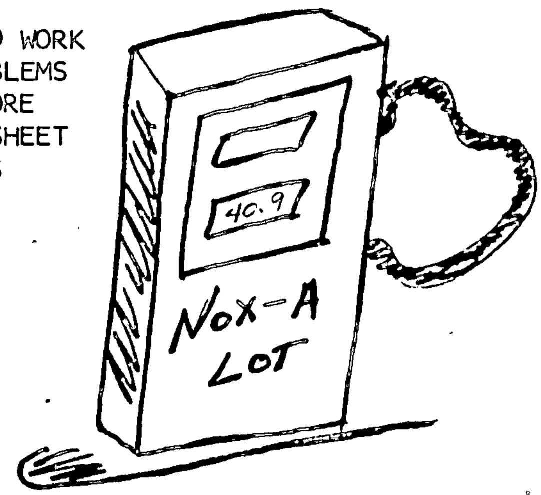
Lesson 1

Copy the reasons for and against a high school student having a car.

Reasons Against	Reasons For
BE SURE YOU MAKE A LIST ON THE CHALKBOARD OF THE REASONS FOR AND AGAINST A STUDENT OWNING A CAR	THE STUDENTS SHOULD COPY THE REASONS IN THESE SPACES

Work these problems. If you have trouble ask a friend to help you.

YOU MAY WISH TO WORK ONE OR TWO PROBLEMS LIKE THESE BEFORE YOU GIVE THIS SHEET TO THE STUDENTS



Gas costs 40.9 cents per gallon. What is the cost of ...

10 gallons? $4.09

1 gallon ? $ .41

3 gallons? $1.23

12 gallons? $4.91

4.5 gallons? $1.84

(ROUNDED TO NEAREST CENT)→

"Put in a dollar regular, please." How much gas do you get for your dollar?

For $1.00 I get about 2½ gal. Exactly? 2.44 or 2.45 gal.

For $2.50 I get about 6 gal. Exactly? 6.11 gal.

THIS IS A COMMON WAY TO BUY GAS. USE THIS PROBLEM TO GET THE STUDENTS TO ESTIMATE OR GUESS AN APPROXIMATE ANSWER BEFORE DOING THE DIVISION. IF YOU HAVE ANY KIND OF CALCULATOR THE STUDENTS MAY USE IT TO DO THE PROBLEMS ON THIS PAGE.

When class is over put this sheet in your folder.

MISSION INCREDIBLE

This is your assignment, should you choose to accept it. Go to at least five gas stations, more if you can. At each station write down the price of each kind of gas. Also write down the name of the station.

When you return to class the leader will help you do the calculations at the bottom of the page.

Be polite at all times or the leader will disavow any knowledge of your assignment.

Station Name	Regular	Middle Grade	High Test
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

1. What is the average price of a gallon of regular? Middle Grade? High test?

THIS ASSIGNMENT SHOULD BE GIVEN IN A SPIRIT OF FUN AND SHOULD BE FOR EXTRA CREDIT. WHEN A GROUP HAS GATHERED THE INFORMATION YOU MAY USE IT FOR A LESSON ON THE MEANING OF "AVERAGE" AND THE WAY AN AVERAGE IS CALCULATED. THE COMPLETED SHEETS AND THE CALCULATIONS MAY BE USED FOR BULLETIN BOARD DISPLAY FOR A WEEK.

Daily Lesson #2: Lesson Plan

Objective: The students are to discuss and list the expenses involved in owning and operating a car.

1. Replay the section of the tape in which the father mentions the items of expense which come up in operating a car. IF NO TAPE IS AVAILABLE, DISCUSS THIS QUESTION YOURSELF. A LIST IS GIVEN IN THE NEXT PARAGRAPH.
2. Ask the students to remember these items and, as they do, list them on the board. Ask the students for any other items they know about; add these to the list. (The list should include: Gas, oil, repairs, lubrication, filters, tires, insurance, and any other the students wish to add.) Leave the list on the board until the end of class but erase it before the next class.
3. Propose this question: <u>How much gas does it take to drive 100 miles</u>? This question is <u>intentionally</u> vague. The students will need to discuss the problem and get at the background needed to solve it. Give the students time to mull over the question, try things, put their attempts on the board, etc.

   The key to solution is to see that it depends on how many <u>miles per gallon</u> the car gets. The students, when they see this fact, may <u>decide</u> how many miles per gallon they want to use. Estimates between 7 and 30 are realistic. Higher or lower estimates are <u>not</u> wrong, but they are not realistic.
4. When this problem has been worked, hand out the problem sheet for lesson 2.

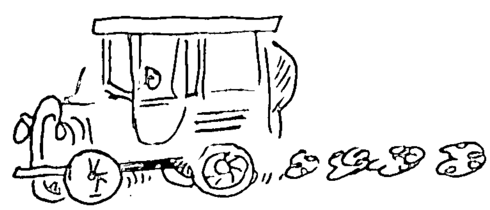
THIS SHEET IS TO BE GIVEN TO THE STUDENTS AFTER THE DISCUSSION ON THE EXPENSES OF OPERATING A CAR AND AFTER WORKING THE PROBLEM IN LESSON TWO.

COMP (automobile)

Lesson 2

Make a list of the expenses you would have if you owned a car. Look at the list on the board and add others if you think of some.

1. THE STUDENTS SHOULD USE THE LIST ON THE BOARD TO FILL IN THIS SECTION OF THEIR	6.
2. NOTES: VERY SHORT OR ONE WORD STATEMENTS ARE FINE.	7.
3.	8.
4.	9.
5.	10.



My car gets 15 miles per gallon of gas.

1. How many gallons will it take to go 255 miles? 17 gallons.
2. How many gallons will it take to go 80 miles? About: 5 gal. Exactly: 5.33 gal.
3. How far can I go on 11 gallons of gas? 165 miles.
4. I am planning a trip. 105 miles to Brunswick and the same back. Gas costs 42.9¢ per gallon. How much money for gas on the trip? #6.01
5. How many gallons will it take to go 125 miles? 8.33 gal.
6. If I buy gas at a discount station it costs 37.9 cents per gallon. At a regular station it costs 41.9 cents per gallon. How much do I save <u>per gallon</u>?
$.04 or 4¢ How much will I save on a trip of 300 miles? $.80 or 80¢

THE STUDENTS MAY WORK THESE PROBLEMS TOGETHER: SEEKING HELP FROM A FRIEND IS NOT CHEATING. HOWEVER, THEY SHOULD BE ENCOURAGED TO ATTEMPT TO WORK THEM ALONE FIRST. IF ANY SORT OF CALCULATOR IS AVAILABLE, STUDENTS MAY USE IT TO WORK THESE PROBLEMS:

Daily Lesson #3: Lesson Plan

Objective: The students are to work problems involving miles, gallons, miles per gallon, and cost.

1. In the first few problems simple numbers will be used to get at the meaning of miles per gallon. Present this problem verbally: My car goes 100 miles on 5 gallons. How many "miles per gallon?" Ask a student to work the problem on the board. Ask a student to tell the class what "miles per gallon" means and why it is important.

2. How do we compute "miles per gallon?" If we go 100 miles on 5 gallons, how far could we go on one gallon? Looks like division:

Write this on board	$5\overline{)100}$ = 20	So 20 miles on 1 gallon means 20 miles per gallon.

3. Do 2 or 3 more easy ones: 150 miles on 15 gallons, 40 miles on 2 gallons, etc. Then do some which are harder. These might be: 46 miles on 4 gallons, etc.

4. Pass out the assignment sheet for lesson 3.

COMP
(automobile)

Lesson 3

WARNING The problems on this sheet are not all the same.
WARNING
WARNING Read each one and <u>think</u> before you compute.

1. John bought 12 gallons of gas at 40.9 cents per gallon. How much did he pay for one gallon? 40.9 cents or 41 cents

2. My car went 168 miles on 21 gallons of gas. How many miles per gallon did I get? 8 MPG

3. Long trip. 1290 miles. 60 gallons. MPG* = 21.5 MPG

4. Mary bought 12 gallons at 40.9 cents per gallon. How much did she pay for the 12 gallons? $4.91

5. George's car got only 11 miles per gallon. He got a tune up and now he gets 16 miles per gallon. How far can John go on 20 gallons of gas now? 320 MILES

6. I get $22\frac{1}{2}$ miles per gallon. How far can I go on a tank of gas? My tank holds 16 gallons. 360 MILES

7. George went 438 miles on 32 gallons of gas. How many MPG did George get? 13.7 MPG

8. Sam's car needs a tune up. He went 195 miles on 21 gallons of gas. How many MPG did Sam get? 9.3 MPG

---

*can you guess what MPG stands for?

Daily Lesson #4: Lesson Plan

Objective: The students will collect information and will begin a graph of used car prices.

Material: You will need the used car adds from several newspapers from local towns and from Atlanta. Ten papers should be enough.

1. Open this discussion with the question "Where would you look for a used car?" Let the students discuss this and select one student to keep track of suggestions on the board.

2. Next question, How much do you expect to pay for a car? What will you get for that much? Try to stimulate discussion on this point and list on the board what the students think car prices will be.

3. Hand out the newspapers. Explain to the students that these will be used by another class so they should not mess them up. Teach the students how to find the classified adds and how to find used cars. Then they will use the information given in the adds to fill in the table on their assignment sheet.

4. There are two "Mission Incredible" optional assignments. One is to make a graph using information from classified adds. This is a good one for students who can't get to gas stations or used car lots. It may be done in the library during a study period or at home. A group of 3 or 4 should work on it.

   The second is an assignment to visit a used car lot and get information on used cars.

   Try to get at least one group to do each of these assignments.

MISSION INCREDIBLE

This is your assignment, should you choose to accept it. Assemble a Mission Incredible Team of two or three.

(1) Go to a used car dealer or to the used car section of a new car dealer. Select a time when he is not busy with a customer.

(2) Introduce yourself and tell him you are studying in school a unit on owning a car. Ask his help in getting the following information. For 10 or more cars get 1) The make (ford, chevy, etc.), 2) The year, 3) The mileage and 4) The price. Fill out the table below:

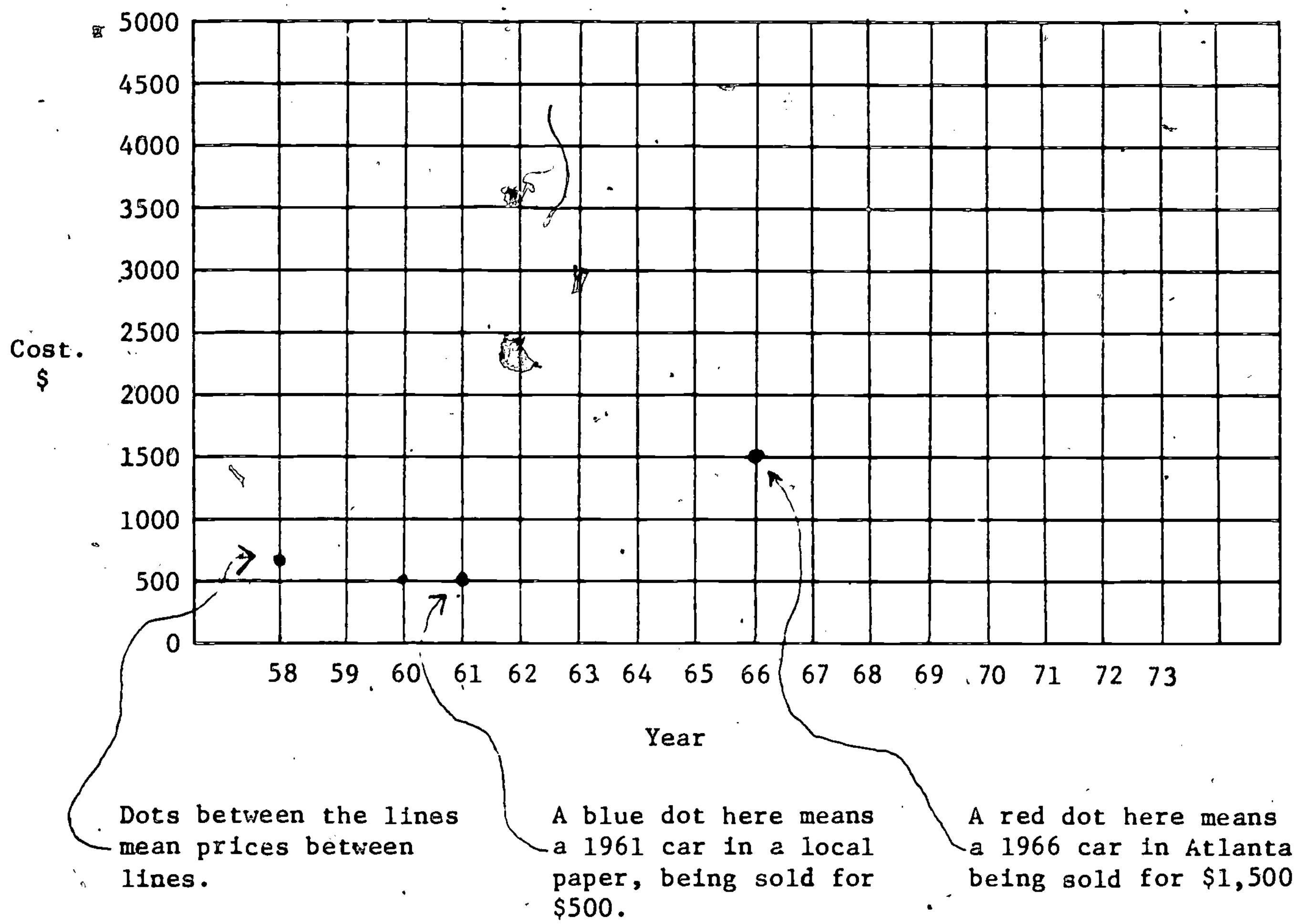
Dealer Visited ____________________

Auto	Make	Year	Miles	Price
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

(3) Remember, you must be polite at all times or the leader will disavow any knowledge of your mission.

MISSION INCREDIBLE

This is your assignment, should you choose to accept it. You will need a Mission Incredible Team of three or four people. From Atlanta papers and local papers get information on at least 150 used cars and make a graph like this one. Use large paper so your graph can be displayed in class.



Use red dots for 100 cars advertised in the Atlanta newspaper and blue dots for 50 used cars advertised in local papers. When you complete this assignment you will be asked to pass the graph in the classroom and to tell the class about it.

Daily Lesson #5: Lesson Plan

Objective: The students are to discuss and work problems dealing with the interest charged on automobile loans.

Materials: You will need rate charts from a bank or loan company.

1. The discussion may begin with the question "Where would you look for a car loan?" Keep track of all selections on the board.

2. Next, how much interest does a bank charge to loan money for a car? Banks will differ and this should be explained to the students. This may lead them to the idea that we can "shop" for a loan as we do for anything else.

3. Loans can be made for 6 months, 12 months, 15 months, 18 months, 21 months, 24 months, 30 months and 36 months. Of course, the longer the loan is for, the more it is going to cost. For example:

   Before working these problems on board, pass out the <u>Payment tables</u> to each student. As you calculate show them where the figures were obtained.

   If we borrow $400 for 24 months we would figure as follows:

   24 payments of $21.25 each.
   (from the table)

$$\begin{array}{r} \$21.24 \\ \underline{\times\ 24} \\ 8496 \\ \underline{4248\ } \\ \$509.76 \end{array}$$

We pay $509.76 for a $400 loan, for 24 months.

Thus, the loan cost us

$$\begin{array}{r} \$509.76 \\ \underline{-\ 400.00} \\ \$109.76 \end{array} *$$

If we borrow $400 for 15 months we would figure as follows:

```
 $28.86
   x 15
  14430
  2886
$432.90
```

We pay $432.90 for a $400 loan for 15 months.

Thus, the loan cost us

```
 $432.90
- 400.00
 $ 32.90 *
```

Therefore, the 15 month loan cost us how much less than the 24 month.

```
 $109.76
-  32.90
 $ 76.86
```

Thus, the 15 month loan is $76.86 cheaper than the 24 month loan.

4. Using the payment table furnished, you work some problems of the above type with the students.

5. Pass out assignment sheet for lesson 5.

NOTE: This lesson plan is to be used in the event you are unable to have an insurance representative speak to your classes regarding insurance for cars.

Daily Lesson #6: Lesson Plan

Objective: The students are investigating the cost of car insurance and to work problems associated with its cost.

1. The cost of automobile insurance differs with the make of cars and age of the driver. Also, if the car is being financed it will require more insurance. For example:

   1967 Mustang — Principle operator 16 year old male'

   Financed

   Liability -
   Major Medical
   Full comprehensive — $308.30 per six months
   Collision
   Uninsured motorist

   Not Financed

   Liability
   Medical — $189.80 per six months
   Uninsured motorist

2. The above is a mere example and could be explained more fully by an insurance representative. Assign a student or group of students to invite an insurance representative to come speak to the class about such matters.

3. If the parents purchase the car in their name, the insurance can be obtained for approximately 30% less. For example:

   The above insurance would cost $308.30 if the student purchased it, however the parents would pay 30% less.

30% of $308.30	$308.30	$308.30
	x .30	- 92.49
	$92.4900	$215.81
		Parents cost

4. Discuss the rate reduction with the students and work other examples if needed.

5. Another rate reduction may be obtained, if more than one car is insured with the same company. This discount is usually about 10% of the premium.

   For example:

Premium	$308.30	$308.30	
	.10	- 30.83	
	$30.8300	$277.47	Total cost

   $30.83 discount

6. After this discussion hand out assignment for lesson 6.

Lesson 5

For each of the following problems use the payment tables that your teachers will furnish.

James is going to purchase a 1967 Mustang for $800 from a used car dealer. He has decided to borrow the money from the bank.

1. How much would his monthly payments be if he borrowed the money for 21 months? $42.50

2. How much will he pay back over the 21 months? $898.50

3. How much did the loan cost him? $92.50

4. If he had made the loan for 30 months, how much more would it have cost him?

   $31.11 × 30 = $933.30 $933.30 − 800.00 = $133.30 $133.30 − 92.50 = $40.80

5. Find the difference in the cost for a $600 loan for 12 months and 21 months.

   $53.28 × 12 = $639.36 $31.87 × 21 = $669.27 $69.27 − 39.91 = $29.91

6. If we borrow $575 for 30 months we have to figure our payments as follows:

   (a) $575 is not listed in the table as such, we must do some addition.

   (b) The payment for $500 is $19.44.

   (c) The payment for $75 is $2.91.

   (d) Thus the payment for $575 is

   payment for $500.00 + payment for

   $75.00 or $19.44 + 2.91 = $22.35 per month.

Now see if you can find the monthly payment for a loan of $1480 for 12 months.

$124.32 + $7.10 = $131.42

Lesson 6

Mary is 17 years old and has a 1970 Mercury Cougar. If she borrows the money to buy the car she must pay $187.30 for the insurance for six months.

1. If she doesn't have to finance the car the insurance will cost $91.80. How much will she save? $187.30 - $91.80 = $95.50

2. If her parents own the car it will cost 30% less. How much will the insurance cost now?

   30% of 91.80 = $27.54

   $91.80 - discount ($27.54) = $64.26

3. If her parents also have their car insured with the company there will be another 10% discount. What would the cost of the insurance be now? $64.26 - $6.42 = $57.84

4. What would the cost of the insurance be for a full year? (use problem number 3)

   $57.84
   x 2
   $115.68

5. John is 18 years old and has purchased a 1974 Dodge Challenger. The insurance is going to cost him $417.00 per six months. If his parents buy the insurance it would be 30% less. What would it cost if his parents buy the insurance?

   $417.00 x .30 = $125.10

   $417.00 - 125.10 = $291.90

Career: Taxi Driver

George Allen is going to a driver training school in Atlanta. He is learning to handle large tractor-trailer rigs. To support himself while taking the course he works part time as a taxi driver. George works 10 hours per day, 3 days per week. The company pays him 45% of the fares he takes in. Why does George work only 30 hours each week? ENCOURAGE STUDENTS TO DISCUSS THIS QUESTION. HE NEEDS HIS TIME FOR DRIVING SCHOOL AND SO HE MUST LIMIT HIS WORKING HOURS.

George's total fares for his first week on the job were $137.95. How much did George get paid that week?

$ 62.08 .

George gets 45% of $137.95. Figure here:

$$\begin{array}{r} 137.95 \\ \times\ .45 \\ \hline 68975 \\ 55180 \\ \hline 62.0775 \end{array}$$

$\approx \$62.08$

YOU MAY WISH TO DO SEVERAL PROBLEMS LIKE THIS ONE BEFORE STARTING THE STUDENTS ON THIS EXERCISE. EMPHASIZE THE CHANGE OF A PERCENT TO A DECIMAL, MULTIPLYING BY THE DECIMAL, AND ROUNDING OFF.

AFTER THAT, GIVE THE STUDENTS TIME TO WORK ON THIS EXERCISE AND END THE CLASS BY GIVING OUT THE FIRST PAGE OF PROBLEMS.

HE COULD INCREASE HIS EARNINGS WITHOUT WORKING MORE HOURS BY WORKING THE BEST TIMES AND LEARNING WHERE THE MOST CUSTOMERS ARE LIKELY TO BE.

How could George increase his earnings? He can't work more than 30 hours per week and still go to school!

The 6th week on the job George earned $90.00 <u>himself</u>. About how much did the company get? About what were his total fares for that week?

45% of George's Fares is $90.00. How much were George's Fares?

$$.45_{\wedge}\overline{)90.00_{\wedge}} = 200 \quad (90)$$

YOU WILL CERTAINLY WANT TO DO SEVERAL PROBLEMS LIKE THIS ONE BEFORE ASSIGNING THE STUDENTS TO WORK THIS EXERCISE.

$$.45 \times n = 90.00,\ n = \frac{90.00}{.45},\ n = 200.$$

The meter on George's taxi works like this: It registers 50 cents for the first 1/5 mile and 25 cents for each 1/5 mile after that.

How much would it cost to ride one mile in George's taxi?

Work it out:

First 1/5 mile .50
2/5, 3/5, 4/5, 5/5 1.00
TOTAL 1.50

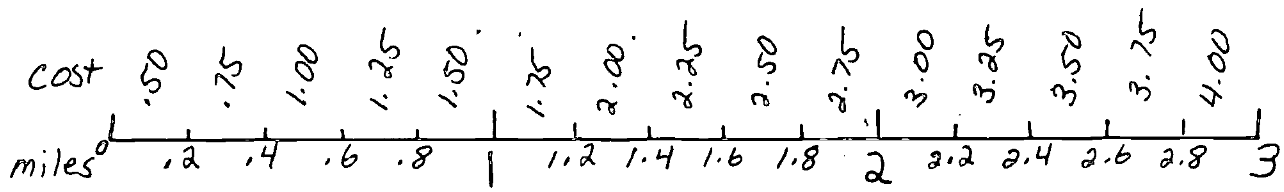
GIVE THE STUDENTS TIME TO WORK THIS ONE AND HAVE SEVERAL STUDENTS PUT THEIR WORK ON THE BOARD AND EXPLAIN TO THE CLASS WHAT THEY DID.

YOU MAY WISH TO TAKE 10 OR 15 MINUTES TO HAVE THE STUDENTS WORK SOME OTHER PROBLEMS LIKE THIS ONE.

AT THIS TIME EXPLAIN AND DESCRIBE THE MISSION INCREDIBLE ASSIGNMENT ABOUT THE COST OF RIDING IN A CAB.

END OF CLASS. ASSIGN THE THIRD SET OF PROBLEMS.

A GOOD WAY TO EXPLAIN HOW A TAXI METER WORKS IS TO DRAW A DISTANCE AND COST CHART LIKE THE ONE HERE ON THE BOARD: THE METER RECORDS THE NEXT 25 CENTS AT THE BEGINNING OF EACH SECTION SO YOU ALWAYS PAY FOR A FULL FIFTH OF A MILE EVEN IF YOU DON'T RIDE THE FULL FIFTH.



*Ask your teacher for a "Mission Incredible" assignment if you want extra credit!!

George usually gets a tip, particularly if he helps passengers with luggage. After a few weeks George found that his tips averaged 12% of his fares.

ANOTHER WAY TO INCREASE EARNINGS IS TO PROVIDE EXTRA SERVICE AND INCREASE THE TIPS.

During one week George's fares came to $211.00.

(a) How much did George make from his percentage of the fares? $94.95

(b) How much did he make on tips? $25.32

THIS QUESTION IS VAGUE. HE AVERAGES 12 PER CENT BUT IN ANY WEEK THE ACTUAL FIGURE MIGHT BE DIFFERENT. IT IS BEST TO ASSUME 12 PER CENT.

(c) What was his total income that week? $120.27

(a) George gets 45% of the fares.

$$\begin{array}{r} \$211 \\ \times .45 \\ \hline 1055 \\ 844 \\ \hline \$94.95 \end{array}$$

(b) Tips run about 12% of fares

$$\begin{array}{r} \$211 \\ \times .12 \\ \hline 422 \\ 211 \\ \hline \$25.32 \end{array} \qquad \begin{array}{r} 94.95 \\ +25.32 \\ \hline 120.27 \end{array}$$

(c) Total

AT THIS TIME YOU MAY WISH TO DISCUSS THE MISSION INCREDIBLE ASSIGNMENT RELATING TO THE CAB COMPANYS COST OF OPERATION AND PROFIT.

END OF CLASS. ASSIGN THE SECOND SET OF PROBLEMS.

Mission Incredible

The accountants problem: The taxi company estimates that it costs them $27.50 per week in overhead to keep each cab running. This figure does not include operating expenses which are 21.5 cents per mile the cab runs. During one week George Allen turned in this report:

Operator's Report

Operator: George Allen	
Miles with meter on	142.5 miles
Miles with meter off	63.5 miles
Fares collected	$192.75

The accountant must now calculate (1) George's wages, (2) the cab company's share, (3) the cost of operating the cab, and (4) the cab company's profit.

If you were the accountant, could you find these figures?

(1) $86.74 (45% of 192.75)

(2) $106.01 (192.75 − 86.74)

(3) $71.79

(4) $34.22 (106.01 − 71.79)

142.5
+ 63.5
206.0 Miles
x .215
1030
206
412
$44.290

$44.29
+ 27.50
71.79

COMP

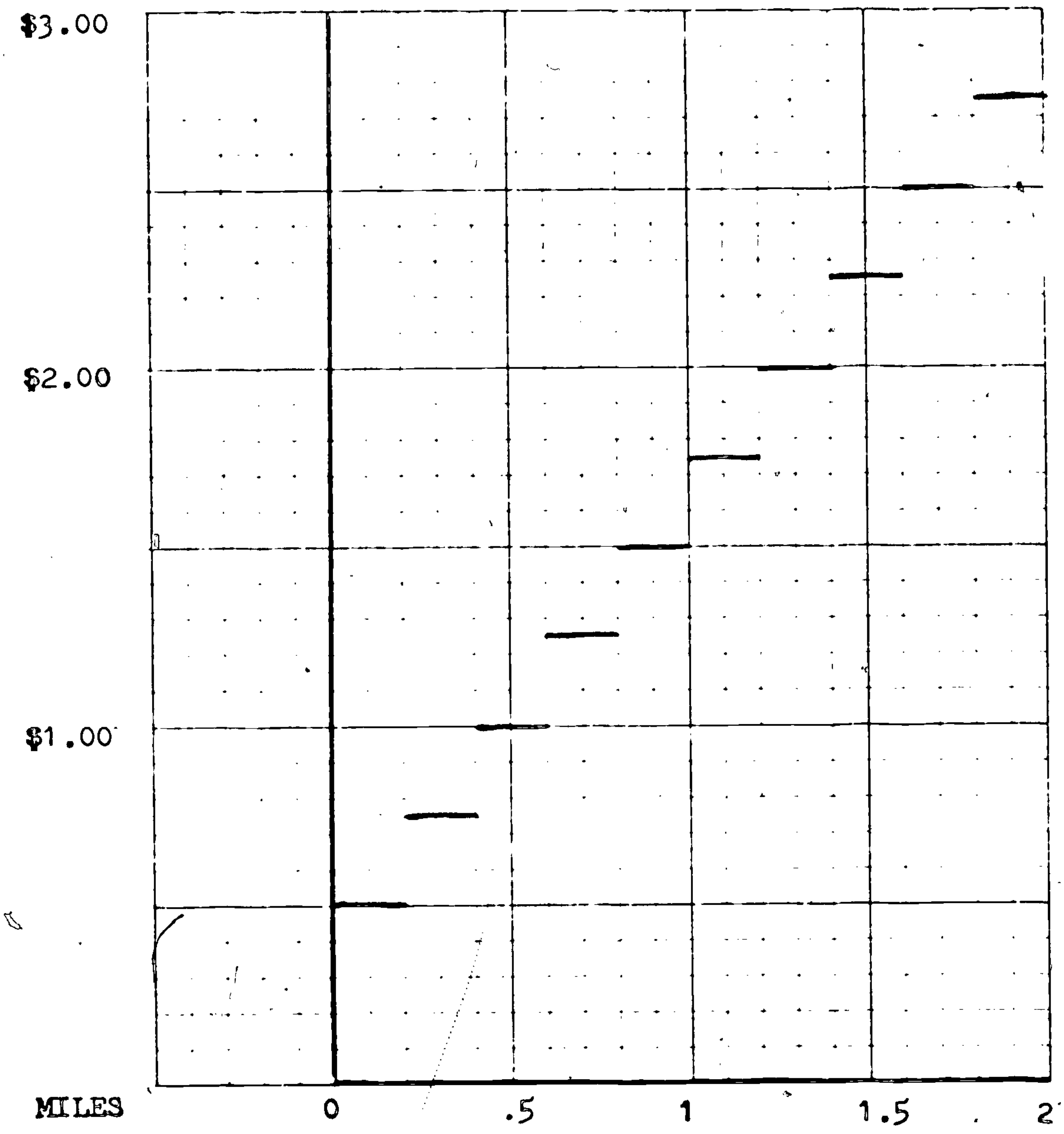
Mission Incredible

This is your assignment and you may do it by yourself for extra credit.

Remember, George's taxi meter charges 50¢ for the first 1/5 mile and 25¢ for each 1/5 mile after that.

Make a graph showing how much it costs to ride in this taxi for trips from 0 miles to two miles.

When you have finished making the graph you will be asked to show it to the class and tell why it looks like it does.



Taxi Driver's Problems, #1

1. In one week George took in $187.50 in fares. The company pays him 45% of his fares as his wages. How much does he earn that week?

   .45 x 187.50 = $ 84.37

2. George estimates that his tips run between 10 and 15 percent of his fares. How much would his tips be that week?

   .10 x 187.50 = #18.75
   .15 x 187.50 = #28.12

   Between #18.75 and #28.12

3. Find 45% of $217.40. 97.83

4. What is 32% of $58.75? 18.80

5. 12% of $235.00 = $ 28.20

6. What is 71% of $85.22? $60.51

7. Find 55% of $187.95. $103.37

8. What is 85% of $395.22? $335.94

Taxi Driver's Problems #2

1. In one week George earned $81.00. How much did he take in during that week in fares?

   $186.00

2. In one week George got $25.20 in tips. This was 12% of his fares. How much did George take-in in fares that week?

   $210.00

3. 12% of a number is $24.00
   What is the number? $200.00

4. 55% of a number is $137.50
   What is the number? $250.00

5. 10% of a number is $13.00
   What is the number? $130.00

6. 45% of a number is $36.00
   What is the number? $80.00

7. 15% of a number is $9.00
   What is the number? $60.00

8. 85% of a number is $170.00
   What is the number? $200.00

Taxi Driver's Problems #3

1. One day George's meter broke and he had to figure his fares from the odometer of his car. One man went 2.2 miles in George's cab. What should George charge him?

$3.00

HINT: two tenths (.2) of a mile is the same as 1/5 of a mile.

2. A ride of .8 miles costs $1.25
3. A ride of 1.6 miles costs $2.25
4. A ride of .7 miles costs $1.25
5. A ride of 3.1 miles costs $4.25
6. A ride of .3 miles costs $.75
7. A ride of 4.5 miles costs $6.00
8. A ride of 1.2 miles costs $1.75

Career: Routeman

After finishing his training course for handling trucks, George got a job as a routeman for a bakery. He wanted to be a long distance trucker but no jobs were open. As a "routeman" George had a light panel truck which was stocked each morning with baked goods. George's route goes through 7 towns and has 23 food stores as established customers. At each stop, George fills out a sales slip like this one showing what the store bought from him. He collects the money, delivers the baked goods from his truck and places them in the store.

AAA Bakery Delivery

Routeman: ______________________

Sold to: ______________________

Quan.	Item	Price

Because George handles a lot of money, he is "bonded." Do you know what that means?

TAKE TIME TO ENCOURAGE THE STUDENTS TO TALK ABOUT THE NEED TO HAVE SOME EMPLOYEES BONDED. YOU KNOW THAT THIS KIND OF A BOND IS A GUARANTEE BY AN INSURANCE COMPANY THAT THE EMPLOYEE WILL NOT STEAL.

AT THIS TIME HAND TO THE STUDENTS PAGES 1, 2, AND 3 ON THE CAREER OF ROUTEMAN: READ THESE WITH THE STUDENTS, ENCOURAGING DISCUSSION OF THE CAREER AND THE QUESTIONS ON EACH PAGE: AS YOU COME TO EACH PROBLEM GIVE THE STUDENTS SOME TIME TO WORK ON IT AND THEN DISCUSS IT AND LET SEVERAL STUDENTS DEMONSTRATE HOW THEY DID IT.

At the first store, the Adel Superette, George sold the following items:

20 loaves white bread, .18 cents each

10 loaves whole wheat, .21 cents each

15 packages rolls, .13 cents each

20 packages Hot Dog buns, .25 cents each

20 packages Hamburger buns, .25 cents each

How much did George collect at that store?

GIVE THE STUDENTS A FEW MINUTES TO WORK ON THIS PROBLEM: CIRCULATE AROUND THE ROOM AND OBSERVE THEIR WORK: WHEN MOST HAVE FINISHED CHOOSE A STUDENT WITH WELL ORGANIZED WORK TO SHOW ON THE CHALKBOARD WHAT HE HAS DONE.

$$\left\{\begin{array}{lr} 20 \times .18 = & 3.60 \\ 10 \times .21 = & 2.10 \\ 15 \times .13 = & 1.95 \\ 20 \times .25 = & 5.00 \\ 20 \times .25 = & \underline{5.00} \\ & 17.65 \end{array}\right.$$

TAKE TIME TO DISCUSS THIS QUESTION. THE IDEA HERE IS THAT BY THINKING ABOUT A JOB A MAN OR WOMAN CAN DO A BETTER JOB AND EARNMORE MONEY!

YOU MAY END CLASS HERE AND HERE AND HAND OUT ROUTEMAN'S PROBLEMS 1.

(Now fill out ticket 1 on the next page)

George is paid $125.00 per week plus 5% of his sales. If you were George, how would you plan to increase your pay for that job?

During his third week on the job George's sales were $935.15. How much did he earn that week?

How much did he earn?

GIVE THE STUDENTS TIME TO WORK ON THIS PROBLEM THEN SHOW THEM ON THE CHALKBOARD HOW TO WORK IT OUT:

$$\begin{array}{lr} .05 \times 935.15 = & 46.76 \\ \text{SALARY} = & \underline{125.00} \\ & \$171.76 \end{array}$$

END CLASS HERE: HAND OUT ROUTEMAN'S PROBLEMS 2.

---

(1)

AAA Bakery

Routeman: George Allen

Sold to: Adel Superette

Quant.	Item	Price
20	White Bread	3.60
10	Whole Wheat	2.10
15	Pkg. Rolls	1.95
20	Hot Dog Buns	5.00
20	Hamb. Buns	5.00
	TOTAL	17.65

(2)

AAA Bakery

Routeman: George Allen

Sold to: Adel Kroger

Quant.	Item	Price
50	White bread	9.00
30	Whole Wheat br.	6.30
20	Pkg. Rolls	2.60
42	Hot dog buns	10.50
36	Hamb. Buns	9.00
	Total	37.40

(3)

AAA Bakery

Routeman: George Allen

Sold to: Nashville Quik Stop

Quant.	Item	Price
10	White Bread	1.80
5	Whole Wheat Br	1.05
10	Pkg. Rolls	1.30
12	Hot Dog Buns	3.00
10	Hamb. Buns	2.50
	TOTAL	9.65

(4)

AAA Bakery

Routeman: George Allen

Sold to: A and P

Quant.	Item	Price
30	White Bread	5.40
15	Whole Wheat Br.	3.15
20	Pkg. Rolls	2.60
17	Hot Dog Buns	4.25
25	Hamb. Buns	6.25
	TOTAL	21.65

Routeman's Problems #1

1. Here is the information from the next three stores that George went to. Use this information to fill out sales slips 2, 3, and 4.

Item	Cost Each	Number Purchased by Adel Kroger	Nashville Quick Stop	A & P
White Bread	.18	50	10	30
Whole Wheat Bread	.21	30	5	15
Rolls	.13	20	10	20
Hot Dog Buns	.25	42	12	17
Hamburger Buns	.25	36	10	25

ANSWERS TO THESE PROBLEMS ARE ON ROUTEMAN PAGE 3.

2. George started out with $25.00 in change. After these four stops he counts his cash. How much should he have? $111.35

3. $.27
x 35
($9.45)

4. $1.82
x 12
($21.84)

7. $4.35
2.93
18.14
6.51
3.27
+ 5.81
($41.01)

5. $.72
51
($36.72)

6. $.13
x 92
($11.96)

THESE PROBLEMS MAY BE WORKED USING A CALCULATOR IF ONE IS AVAILABLE. WHILE STUDENTS MAY NORMALLY GET HELP FROM THEIR FRIENDS, THEY SHOULD ATTEMPT TO DO THESE PROBLEMS ALONE FIRST.

Routeman's Problems #2

1. In his best week with the bakery, George sold $1,352.85 in baked goods. How much did he earn that week?

$1,352.85
× .05
67.6425
≈ $67.64

$125.00
+ 67.64
$192.64

2. George's sales during February of that year were: First week $987.50, Second week $1,056.20, third week $827.50, fourth week $1,175.80. How much did George earn during February?

TOTAL EARNINGS = $702.35

TOTAL SALES = $4047.00
5% SALES = $202.35
4 weeks @ 125.00 = $500.00

3. $3.21
x 15
($48.15)

4. $ .84
x 32
($26.88)

5. $ .95
x 17
($16.15)

6. $ 3.42
6.21
.59
11.82
1.76
+ 19.95
$43.75

7. $8.27
4.32
.21
9.61
.43
8.52
$31.36

READ THIS MATERIAL AND FOLLOW THE SUGGESTIONS FOR DISCUSSION. READ THE "MISSION INCREDIBLE" PROBLEM AND GET SOME STUDENTS TO TRY IT.

Career: Local Truck driver

To get experience driving a larger truck George Allen took a job as a local truck driver for an auto parts firm. Each day George makes out a delivery schedule and loads his truck with the parts ordered by automobile mechanics. He may also pick up items. When he has many deliverys to make or when he has large items to handle he will have a helper. GEORGE IS STILL TO BE A LONG DISTANCE TRUCKER. DISCUSS CAREER AMBITION AND PREPARATION.

George got this job even though four other men had applied for the job. If you were the employeer, what would you want to know about George before you hired him? ENCOURAGE THE STUDENTS TO DISCUSS THIS QUESTION. HONESTY, SAFE DRIVING RECORD, GOOD RECOMMENDATIONS AND OTHER THINGS MAY BE MENTIONED.

George earns $4.20 per hour. He will work at least a 40 hour week. How much will George earn for a 40 hour week?

---

40 hours work at $4.20 per hour.

GIVE THE STUDENTS 5 MINUTES TO WORK OUT THIS PROBLEM. THEN HAND OUT LOCAL TRUCK DRIVER'S PROBLEMS #1.

$4.20
x 40.
$168.00

END CLASS HERE

When George works longer than 40 hours in one week he earns "time and a half" for all hours over 40. This provision is a part of the contract which George's union has with his employeer. What does "time and a half" mean? How much will George earn per hour for time over 40 hours?

YOU MAY ENCOURAGE THE STUDENTS TO EXPRESS THEIR FEELINGS ABOUT UNIONS. THESE FEELINGS WILL BE BOTH PRO AND CON, NO DOUBT. ASK IF ANY ONE KNOWS WHAT "TIME AND A HALF" MEANS. LET THEM EXPLAIN IT.

Regular time pay: $4.20 per hour.

GIVE THE STUDENTS A FEW MINUTES TO WORK ON THIS PROBLEM.

Overtime pay: ____________________.

OVERTIME PAY IS 1 1/2 TIMES REGULAR PAY HENCE 1 1/2 X 4.20

$$\begin{array}{r} \$4.20 \\ \times\ 1.5 \\ \hline 2100 \\ 420\ \\ \hline \$6.300 \end{array} \quad \text{OR} \quad \frac{3}{2} \times \frac{4.20}{1} = \frac{12.60}{2} = \$6.30$$

(EITHER WAY IS O.K.)

What is the reason for the "time and a half" provision? Why should a person earn more for working longer hours? DISCUSS IN CLASS.

One week George worked 45 hours. How much did he get paid for that week?

Regular pay = $4.20 per hour for a 40 hour week. Overtime pay at time and a half for hours over 40. How much pay for a 45 hour week?

$$\begin{aligned} \$4.20 \times 40 &= \$168.00 \\ \$6.30 \times 5 &= \underline{\ \ 31.50} \\ \text{total} &= 199.50 \end{aligned}$$

END CLASS HERE. HAND OUT LOCAL TRUCK DRIVERS PROBLEMS #2.

Local Truck driver's Problems #1

1. George's helper earns $2.85 per hour. He is employed for a 40 hour week. How much does he earn per week?

$$\$2.85 \times 40 = \$114.00$$

2. In determining the cost of delivery service, both George and his helper must be paid. How much does it cost the company for George and his helper for a 40 hour week?

$$\$114.00 + \$168.00 = \$282.00$$

3. Complete the following problems

Rate of pay	Hours worked	Pay
a. $1.95/hour	15	$29.25
b. $2.21/hour	40	$88.40
c. $1.57/hour	35	$54.95
d. $4.65/hour	20	$93.00
e. $3.52/hour	40	$140.80
f. $1.75/hour	12	$21.00

Local Truck driver's Problems #2.

1. George's helper earns $2.85 per hour. How much will he get per hour for "time and a half?"

$\$ 2.85 \times 1.5 = \$4.27$

$(4.275 \approx 4.27)$

2. George's helper worked 50 hours in one week. How much did he earn that week?

$40 \times 2.85 = 114.00$
$10 \times 4.27 = 42.70$
156.70

3. Work these problems on another sheet. Put answers here.

Hourly Rate	Overtime Rate	Hours	Pay
a. 2.40	$ 3.60	42	96+7.20= 103.20
b. 1.80	$ 2.70	54	72+37.80= 109.80
c. 3.95	$ 5.92	44	158+23.68= 181.68
d. 2.75	$ 4.12	52	110+49.44= 159.44
e. 1.50	$ 2.25	38	57.00

*4. In one week George worked 52 hours and his helper worked 48 hours. They drove the truck 578 miles @$.28 per mile. How much did this delivery operation cost the company that week?

George (40 hrs)	$ 168.00
Overtime	75.60
Helper	114.00
Overtime	34.16
Truck	161.84
	553.60

MISSION INCREDIBLE

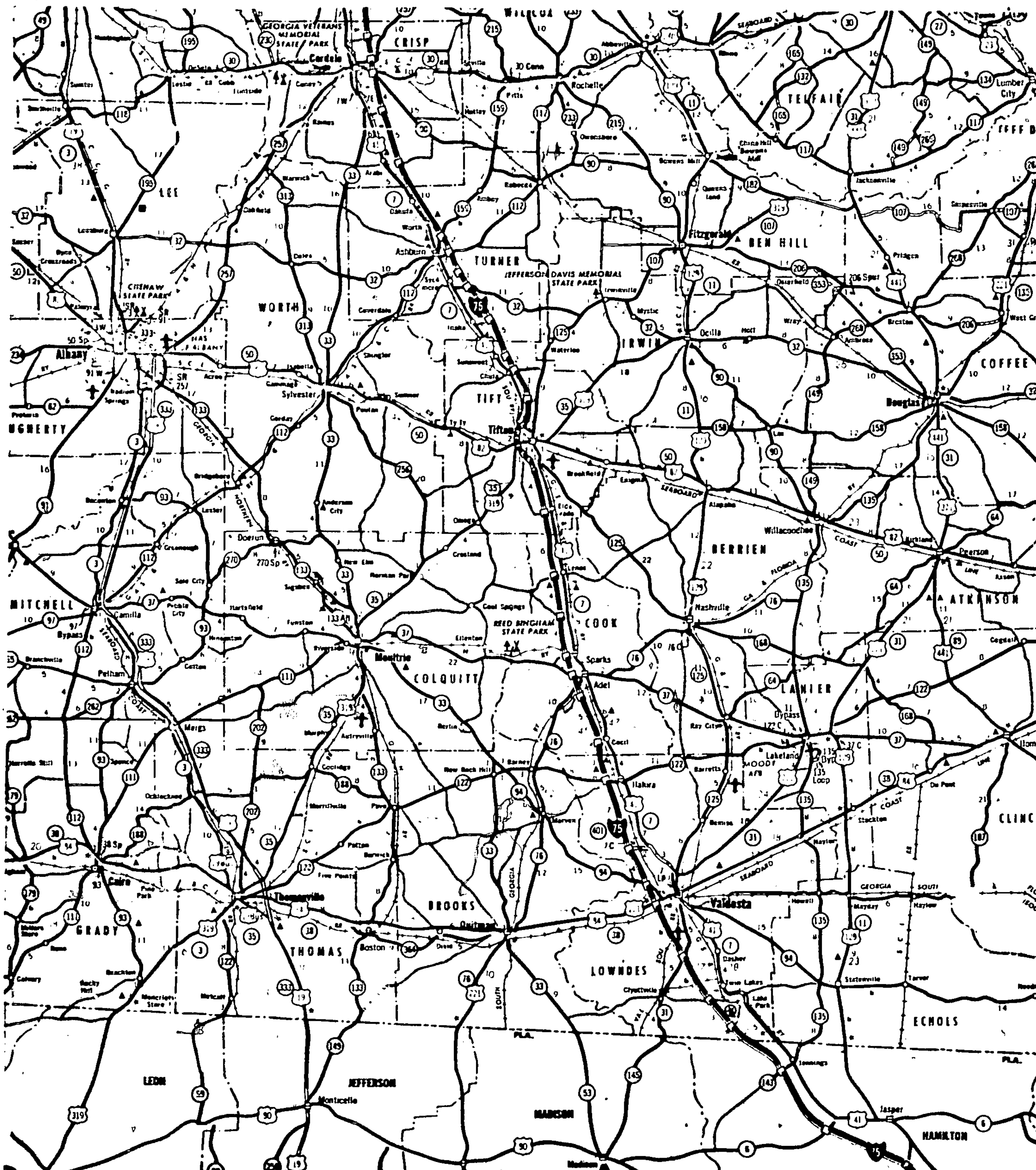
George's company has a warehouse of auto parts in Valdosta and makes deliveries to the following towns: Hahira, Lakeland, Nashville, Willacoochee, Douglas, Camilla, Thomasville, Moultrie, Norman Park, Pelham, and Homerville.

Get a Georgia map and plan a route which will include each of these towns. It costs the company $.28 per mile to operate the truck, so try to find the shortest route.

Get a Georgia map (several if you can) from a gas station and use it to plan various routes which will get to each of those towns. Try to find the shortest route!

COMP
Driving Occupations
Local Truck driver

MISSION INCREDIBLE



READ THIS MATERIAL WITH THE STUDENTS. REMEMBER TO WORK ON READING SKILLS WHILE HAVING STUDENTS READ PARTS OF THIS.

Inter-city Driver

After careful screening and passing tests George Allen has a job as an inter-city or "long haul" truck driver. All companies are extremely careful in hiring drivers: The trucks are worth $35,000.00 and the cargo may be worth $200,000.00.

George finds that his pay is more difficult to figure out on this kind of job. He is paid 18 cents per mile for driving and $6.75 per hour for time during which he is not driving. Suppose that in one day George drives 282 miles and spends 3 hours unloading cargo. How much will George earn that day?

George is concerned about the 55 miles per hour speed limit for trucks. Why will this reduce his earnings per hour? If 55 MPH is his TOP speed, how many miles can he go in an hour? REMEMBER, STOPS AND HILLS REDUCE THE AVERAGE SPEED BELOW THE TOP SPEED. IN YOUR EXPERIENCE, WHAT CAN YOU AVERAGE IF YOUR TOP SPEED IS 55 MPH?

---

282 Miles at $.18 per mile + 3 hours at $6.75 per hour. GIVE THE STUDENTS PLENTY OF TIME TO WORK THIS PROBLEM. THEN CHOOSE STUDENTS TO PUT THE DIFFERENT PARTS OF THE PROBLEM ON THE BOARD.

How much? $71.01

$$\begin{array}{r} 282 \\ \underline{.18} \\ 2256 \\ \underline{282} \\ \$50.76 \end{array} \qquad \begin{array}{r} 6.75 \\ \underline{3} \\ 20.25 \end{array} \qquad \begin{array}{r} 50.76 \\ \underline{20.25} \\ \$71.01 \end{array}$$

YOU MAY END CLASS HERE. ASSIGN PROBLEMS #1.

Inter-city Driver's Problems #1

1. During one day, George drives 465 miles and spends no time loading or unloading. How much does he earn that day?

$465 \times \$.18 = \$\ 83.70$

2. George can average 62 miles per hour while driving on I-75. How much does he earn per hour when driving at that rate?

$62 \times \$.18 = \$\ 11.16$

3. Calculate George's Earnings for each day and week:

Day	Miles		Hours @ 6.75		Earnings
Mon.	137	(24.66)	4	(27.00)	51.66
Tues.	385	(69.30)	0	(0)	69.30
Wed.	0	(0)	8	(54.00)	54.00
Thurs.	422	(75.96)	0	(0)	75.96
Fri.	275	(49.50)	3	(20.25)	69.75
			Total Weekly Earnings		$320.67

4. $\begin{array}{r} 421 \\ \underline{\times\ .18} \\ 75.78 \end{array}$

5. $\begin{array}{r} 352 \\ \underline{.4} \\ 140.8 \end{array}$

6. $\begin{array}{r} 265 \\ \underline{1.3} \\ 344.5 \end{array}$

7. $\begin{array}{r} 162 \\ \underline{2.3} \\ 372.6 \end{array}$

8. $\begin{array}{r} 321 \\ \underline{3.5} \\ 1123.5 \end{array}$

9. $\begin{array}{r} 265 \\ \underline{.36} \\ 95.40 \end{array}$

George's company has assigned him to a regular Atlanta-Miami run. Using a regional map of the Southeastern U.S., plan a route for George to use on this run. Consider two things: (1) George is paid by the <u>mile</u> for driving the truck so the company wants the shortest route, (2) the company also wants the cargo delivered quickly so they might add a few <u>miles</u> if they could gain time.

Using the regional maps and the Georgia and Florida state maps, plan a route for George to use going from Atlanta to Miami and back. <u>Please do not write on the maps</u>. When you have planned your route, answer these questions:

Inter-city Driver's Problems #2.

1. On the route you have planned, what is the distance in miles from Atlanta to Miami?

2. Estimate the driving time required in this way:
   a. On the Interstate, figure 60 MPH, average.
   b. On highways which are <u>not</u> Interstate, figure 50 MPH, average.
   c. For each town you go through on a highway which is <u>not</u> an Interstate, add 10 minutes.

   How many hours and minutes driving time will be required for the run from Atlanta to Miami?

3. How much money will George earn for one round trip from Atlanta to Miami and back?

The Interstate Commerce Commission limits the driving time for truck drivers. The regulations are, briefly, that no driver may drive for more than 10 hours without an off duty period of at least 8 hours. The regulations also state that no driver may drive more than 60 hours in any 7 day period or more than 70 hours in any 8 day period. Why should the I.C.C. be concerned about the time truck drivers work?

Under the I.C.C. regulations, how long will it take George to get from Atlanta to Miami? How would you now plan the trip?

a. How many rest periods would be needed?

b. Where would you plan to stop? Remember, no more than 10 hours of driving at any time.

c. How many times during a week could George make this trip? How many times during one 8 day period could he make the trip?

George has reached the top of his profession. He has great responsibility and, for a person who likes to travel, see new places, a very desirable job. He can earn a large salary because he has prepared himself for this job.

Discussion Questions

"George Allen is not a real person. I could never do that." Do you agree or disagree?

What did George Allen do to get where he wanted to be? Could you do that?

Would you like more information on how to become a truck driver?

Write to American Trucking Associations
1616 P Street, N.W.
Washington, D. C. 20036

END OF UNIT

NEW CAR LOANS PAYMENT TABLE 6.5

UN-PAID BAL.	6 MOS.		12 MOS.		15 MOS.		18 MOS.	
	PAY'T	NOTE	PAY'T	NOTE	PAY'T	NOTE	PAY'T	NOTE
$ 1	$ .17	$ 1.02	$ .08	$ .96	$ .07	$ 1.05	$ .06	$ 1.08
2	.34	2.04	.17	2.04	.14	2.10	.12	2.16
3	.51	3.06	.26	3.12	.21	3.15	.18	3.24
4	.68	4.08	.35	4.20	.28	4.20	.24	4.32
5	.85	5.16	.44	5.28	.36	5.40	.30	5.40
6	1.03	6.18	.53	6.36	.43	6.45	.36	6.48
7	1.20	7.20	.62	7.44	.50	7.50	.42	7.56
8	1.37	8.22	.71	8.52	.57	8.55	.48	8.64
9	1.54	9.24	.79	9.48	.64	9.60	.54	9.72
10	1.72	10.32	.88	10.56	.72	10.80	.60	10.80
20	3.44	20.64	1.77	21.24	1.44	21.60	1.21	21.78
25	4.30	25.80	2.21	26.52	1.80	27.00	1.52	27.36
30	5.16	30.96	2.66	31.92	2.16	32.40	1.82	32.76
40	6.88	41.28	3.55	42.60	2.88	43.20	2.43	43.74
50	8.60	51.60	4.43	53.16	3.60	54.00	3.04	54.72
60	10.32	61.92	5.32	63.84	4.32	64.80	3.65	65.70
70	12.04	72.24	6.21	74.52	5.04	75.60	4.26	76.68
75	12.90	77.40	6.65	79.80	5.40	81.00	4.57	82.26
80	13.76	82.56	7.10	85.20	5.76	86.40	4.87	87.66
90	15.48	92.88	7.98	95.76	6.48	97.20	5.48	98.64
100	17.20	103.20	8.87	106.44	7.20	108.00	6.09	109.62
200	34.41	206.46	17.75	213.00	14.41	216.15	12.19	219.42
300	51.62	309.72	26.62	319.44	21.62	324.30	18.29	329.22
400	68.83	412.98	35.50	426.00	28.83	432.45	24.38	438.84
500	86.04	516.24	44.37	532.44	36.04	540.60	30.48	548.64
600	103.25	619.50	53.25	639.00	43.25	648.75	36.58	658.44
700	120.45	722.70	62.12	745.44	50.45	756.75	42.68	768.24
800	137.66	825.96	71.00	852.00	57.65	864.90	48.77	877.86
900	154.87	929.22	79.87	958.44	64.87	973.05	54.87	987.66
1,000	172.08	1,032.48	88.75	1,065.00	72.08	1,081.20	60.97	1,097.46
1,100	189.29	1,135.74	97.62	1,171.44	79.29	1,189.35	67.06	1,207.08
1,200	206.50	1,239.00	106.50	1,278.00	86.50	1,297.50	73.16	1,316.88
1,300	223.70	1,342.20	115.37	1,384.44	93.70	1,405.50	79.26	1,426.68
1,400	240.91	1,445.46	124.25	1,491.00	100.91	1,513.65	85.36	1,536.48
1,500	258.12	1,548.72	133.12	1,597.44	108.12	1,621.80	91.45	1,646.10
1,600	275.33	1,651.98	142.00	1,704.00	115.33	1,729.95	97.55	1,755.90
1,700	292.54	1,755.24	150.87	1,810.44	122.54	1,838.10	103.65	1,865.70
1,800	309.75	1,858.50	159.75	1,917.00	129.75	1,946.25	109.74	1,975.32
1,900	326.95	1,961.70	168.62	2,023.44	136.95	2,054.25	115.84	2,085.12
2,000	344.16	2,064.96	177.50	2,130.00	144.16	2,162.40	121.94	2,194.92
2,100	361.37	2,168.22	186.37	2,236.44	151.37	2,270.55	128.04	2,304.72
2,200	378.58	2,271.48	195.25	2,343.00	158.58	2,378.70	134.13	2,414.34
2,300	395.79	2,374.74	204.12	2,449.44	165.79	2,486.85	140.23	2,524.14
2,400	413.00	2,478.00	213.00	2,556.00	173.00	2,595.00	146.33	2,633.94
2,500	430.20	2,581.20	221.87	2,662.44	180.20	2,703.00	152.43	2,743.74
2,600	447.41	2,684.46	230.75	2,769.00	187.41	2,811.15	158.52	2,853.36
2,700	464.62	2,787.72	239.62	2,875.44	194.62	2,919.30	164.62	2,963.16
2,800	481.83	2,890.98	248.50	2,982.00	201.83	3,027.45	170.72	3,072.96
2,900	499.04	2,994.24	257.37	3,088.44	209.04	3,135.60	176.81	3,182.58
3,000	516.25	3,097.50	266.25	3,195.00	216.25	3,243.75	182.91	3,292.38
3,100	533.45	3,200.70	275.12	3,301.44	223.45	3,351.75	189.01	3,402.18
3,200	550.66	3,303.96	284.00	3,408.00	230.66	3,459.90	195.11	3,511.98
3,300	567.87	3,407.22	292.87	3,514.44	237.87	3,568.05	201.20	3,621.60
3,400	585.08	3,510.48	301.75	3,621.00	245.08	3,676.20	207.30	3,731.40
3,500	602.29	3,613.74	310.62	3,727.44	252.29	3,784.35	213.40	3,841.20
6.5A35	11.05%		11.78%		11.91%		11.97%	

6.5 PAYMENT TABLE

UN-PAID BAL.	21 MOS.		24 MOS.		30 MOS.		36 MOS.	
	PAY'T	NOTE	PAY'T	NOTE	PAY'T	NOTE	PAY'T	NOTE
$ 1	$ .05	$ 1.05	$ .04	$ .96	$ .03	$ .90	$ .03	$ 1.08
2	.10	2.10	.09	2.16	.07	2.10	.06	2.16
3	.15	3.15	.14	3.36	.11	3.30	.09	3.24
4	.21	4.41	.18	4.32	.15	4.50	.13	4.68
5	.26	5.46	.23	5.52	.19	5.70	.16	5.76
6	.31	6.51	.28	6.72	.23	6.90	.19	6.84
7	.37	7.77	.32	7.68	.27	8.10	.23	8.28
8	.42	8.82	.37	8.88	.31	9.30	.26	9.36
9	.47	9.87	.42	10.08	.34	10.20	.29	10.44
10	.53	11.13	.47	11.28	.38	11.40	.33	11.88
20	1.06	22.26	.94	22.56	.77	23.10	[illegible]	23.76
25	1.32	27.72	1.17	28.08	.96	28.80	.82	29.52
30	1.59	33.39	1.41	33.84	1.16	34.80	.99	35.64
40	2.12	44.52	1.88	45.12	1.55	46.50	1.32	47.52
50	2.65	35.65	2.35	56.40	1.93	57.90	1.65	59.40
60	3.18	66.78	2.82	67.68	2.32	69.60	1.99	71.64
70	3.71	77.91	3.29	78.96	2.71	81.30	2.32	83.52
75	3.97	83.37	3.53	84.72	2.90	87.00	2.48	89.28
80	4.24	89.04	3.76	90.24	3.10	93.00	2.65	95.40
90	4.77	100.17	4.23	101.52	3.48	104.40	2.98	107.28
100	5.30	111.30	4.70	112.80	3.87	116.10	3.31	119.16
200	10.60	222.60	9.41	225.84	7.75	232.50	6.63	238.68
300	15.91	334.11	14.12	338.88	11.62	348.60	9.95	358.20
400	21.21	445.41	18.83	451.92	15.50	465.00	13.27	477.72
500	26.51	556.71	23.54	564.96	19.37	581.10	16.59	597.24
600	31.82	668.22	28.25	678.00	23.25	697.50	19.91	716.76
700	37.12	779.52	32.95	790.80	27.12	813.60	23.23	836.28
800	42.42	890.82	37.66	903.84	31.00	930.00	26.55	955.80
900	47.73	1,002.33	42.37	1,016.88	34.87	1,046.10	29.87	1,075.32
1,000	53.03	1,113.63	47.08	1,129.92	38.75	1,162.50	33.19	1,194.84
1,100	58.33	1,224.93	51.79	1,242.96	42.62	1,278.60	36.51	1,314.36
1,200	63.64	1,336.44	56.50	1,356.00	46.50	1,395.00	39.83	1,433.88
1,300	68.94	1,447.74	61.20	1,468.80	50.37	1,511.10	43.15	1,553.40
1,400	74.24	1,559.04	65.91	1,581.84	54.25	1,627.50	46.47	1,672.92
1,500	79.55	1,670.55	70.62	1,694.88	58.12	1,743.60	49.79	1,792.44
1,600	84.85	1,781.85	75.33	1,807.92	62.00	1,860.00	53.11	1,911.96
1,700	90.16	1,893.36	80.04	1,920.96	65.87	1,976.10	55.43	2,031.48
1,800	95.46	2,004.66	84.75	2,034.00	69.75	2,092.50	59.75	2,151.00
1,900	100.76	2,115.96	89.45	2,146.80	73.62	2,208.60	63.06	2,270.16
2,000	106.07	2,227.47	94.16	2,259.84	77.50	2,325.00	66.38	2,389.68
2,100	111.37	2,338.77	98.87	2,372.88	81.37	2,441.10	69.70	2,509.20
2,200	116.67	2,450.07	103.58	2,485.92	85.25	2,557.50	73.02	2,628.72
2,300	121.98	2,561.58	108.29	2,598.96	89.12	2,673.60	76.34	2,748.24
2,400	127.28	2,672.88	113.00	2,712.00	93.00	2,790.00	79.66	2,867.76
2,500	132.58	2,784.18	117.70	2,824.80	96.87	2,906.10	82.98	2,987.28
2,600	137.89	2,895.69	122.41	2,937.84	100.75	3,022.50	86.30	3,106.80
2,700	143.19	3,006.99	127.12	3,050.88	104.62	3,138.60	89.62	3,226.32
2,800	148.49	3,118.29	131.83	3,163.92	108.50	3,255.00	92.94	3,345.84
2,900	153.80	3,229.80	136.54	3,276.96	112.37	3,371.10	96.26	3,465.36
3,000	159.10	3,341.10	141.25	3,390.00	116.25	3,487.50	99.58	3,584.88
3,100	164.41	3,452.61	145.95	3,502.80	120.12	3,603.60	102.90	3,704.40
3,200	169.71	3,563.91	150.66	3,615.84	124.00	3,720.00	106.22	3,823.92
3,300	175.01	3,675.21	155.37	3,728.88	127.87	3,836.10	109.54	3,943.44
3,400	180.32	3,786.72	160.08	3,841.92	131.75	3,952.50	112.86	4,062.96
3,500	185.62	3,898.02	164.79	3,954.96	135.62	4,068.60	116.18	4,182.48
6.5A35	12.01%		12.02%		12.00%		11.95%	

TEACHER'S MANUAL

RETAIL SALES

General Instructions

1. The "read it in class" feature. The students pages are presented as a connected narrative. Problems grow out of the narrative. This story is to be read in class and, as problems come up, the students stop and work them out. Each day normally will end with a problem set. There are also discussion questions within the story and these should be treated during class time as described in item 2 below. This "read it in class" procedure should be used to contribute to the students growth in reading skill, also.

The narrative is designed to bring up mathematical problems as they might arise on the job, to foster desirable attitudes toward employment, to present realistic employment information, and to give the students a focus for discussion of questions related to careers.

2. The "discussion question" feature. There are a number of questions for discussion. These are marked by an * on the dividing line. These questions point up ideas related to mathematics and careers. When you reach each such question spend some time getting students to think and tell their ideas and opinions.

3. The "Daily Problem" feature. Almost every day a verbal problem or "story problem" will be encountered in the material. This contact with verbal problems on a daily basis will help to overcome students fear and dislike of such problems. Time should be taken in class for (1) students to work independently on the problem and (2) for group discussion and presentation of various solutions.

4. The "It's a Rip Off" feature. Many students enjoy puzzles and problems of a mathematical nature. They may enjoy this aspect of mathematics more than the regular class work. A problem such as that is presented every two or three days, located at the bottom of the page so the student can "rip it off" and take it home. Class time should be spent on these problems after students have worked on them, taking about one half hour for each such problem.

5. General Review of Underlying Mathematical Processes. (GRUMP). Grump's are short computational assignments given twice each week to prevent forgetting of learned material.

BEGINNING A CAREER IN RETAIL SALES

John Wilson

MATERIAL: SIX NEWSPAPERS, 2 LOCAL 1 VALDOSTA, 1 WAYCROSS, 2 ATLANTA.

1. DISCUSSION OF THE JOB MARKET.

John Wilson graduated from high school in 1972 and went to look for a job. Where could he look for a job? What help is available for people who want to find a job?

Make a list on the right of the places you might go to get help in finding a job.

DISCUSS THESE QUESTIONS WITH THE CLASS. BE SURE THAT NEWSPAPER "HELP WANTED" ADS, STATE EMPLOYMENT SERVICE, PRIVATE EMPLOYMENT AGENCIES, FRIENDS, ETC., ARE MENTIONED.

John wanted a job but, not everybody wants a job. Why would John Wilson want a job? What kind of job should he look for? What kind of job would you look for if you were John Wilson?

DISCUSS REASONS FOR WANTED A JOB AND THE KIND OF JOB HE MIGHT WANT. DON'T LECTURE: ENCOURAGE THE STUDENTS TO TALK ABOUT THESE QUESTIONS.

When you have had a chance to discuss this in class, make a list of what you would want your job to be like.

DISCUSSION OF THESE QUESTIONS SHOULD TAKE AN HOUR.

END CLASS HERE

2. "HELP WANTED" AND PROBLEMS.

Get newspapers and look in the "help wanted" ads to find what jobs are available at this time. From the available jobs select one which you like best. Copy the ad here, on the right. Make a list of the things you like best about this job. What would you ask the employer when you went to talk to him?

DIVIDE THE STUDENTS INTO GROUPS OF 3 OR 4 AND LET EACH GROUP READ AND COMPARE JOBS FROM 2 PAPERS. ASK EACH GROUP TO READ ITS FAVORITE AD AND TELL WHY THEY LIKED IT. ALSO ASK EACH GROUP TO TELL WHAT OTHER THINGS THEY WOULD ASK ABOUT WHEN THEY WENT TO SEE THE EMPLOYER.

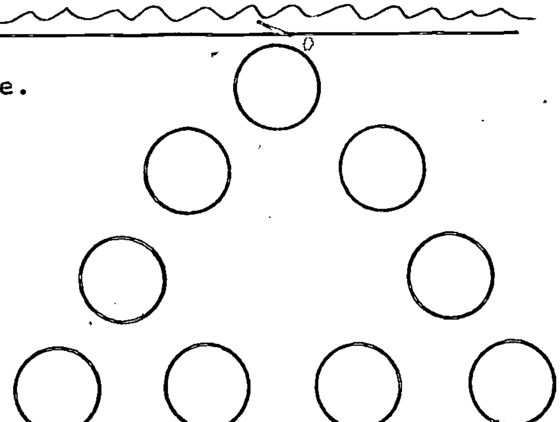
John compared a job paying $2.85 per hour for a 40 hour week and a job paying $3.25 per hour for a 30 hour week. Which one should he select? Why do you think so?

ASK SEVERAL STUDENTS TO READ THIS WORD PROBLEM. GIVE ALL STUDENTS A FEW MINUTES TO WORK THEN HAVE THE PROBLEM PUT ON THE BOARD AND DISCUSS THE QUESTIONS.

It's a rip off #1

Tear this problem off and work it in your spare time.

Put numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 in the circles so the sum of each line of 4 circles is the same. Use all 9 numbers. Don't use any number twice!



\$ 342.26	\$ 4.38	\$ 235.82
29.58	x 37	- 71.68
651.22		
83.27		
9.52		
+ 386.21		

THIS SHOULD END THE SECOND DAY. HAVE THE STUDENTS WORK THESE PROBLEMS.

3. STOCK PROBLEMS.

John Wilson has a job in a Woolworth store. His first job was working with stock. He checks deliveries against the "bill of lading," the paper the truck driver has showing what is to be delivered. He counts the cases of merchandise and stores them in the stock room.

Ball point pens come in boxes of 12, 12 boxes to a carton, 12 cartons in a case. In one order, 5 cases of ball point pens arrived. How many pens was that?

GIVE THE STUDENTS 5 MINUTES TO WORK IT OUT. THEY MAY WORK IN THIS MARGIN

12 PENS IN A BOX
12 X 12 = 144 IN A CARTON
12 X 144 = 1728 IN A CASE
5 CASES = 5 X 1728 = 8640.

The store manager told John that he can count on selling 4 cartons of pens each week to other businesses. He also knows that he will sell about 50 pens to individuals. How long will the supply of pens last? Can you be sure that your answer is exactly right? Why or why not?

TEACHER NOTE: THE ANSWER 13 IS NOT EXACT BECAUSE IT IS BASED ON AN ESTIMATE OF FUTURE SALES. HAVE A STUDENT PUT THE WORK ON THE BOARD, THEN DISCUSS THE QUESTIONS.

GIVE THE STUDENTS 10 MINUTES OR SO TO WORK ON THIS ONE. BE SURE THEY HAVE THE CORRECT ANSWER TO THE LAST PROBLEM OR THEY CAN'T GET THIS ONE RIGHT.

PENS SOLD EACH WEEK:
4 X 144 = 576 TO BUSINESS
+ = 50 TO INDIVIDUALS
626

```
       13
626 ) 8640
      626
      2380
      1878
       502
```

Practice Problems

39 x 8 =	312
48 x 37 =	1776
296 x 82 =	24,272

THE STUDENTS MAY NOW HAVE THE REMAINDER OF THE PERIOD TO WORK OUT THESE PROBLEMS. A CALCULATOR MAY BE USED IF ONE IS AVAILABLE.

469 x 327 =	153,363
6,192 x 5 =	30,960
8,961 x 12 =	107,532
247 x 321 =	79,287
487 x 297 =	144,639

END CLASS HERE

4. TAKING INVENTORY.

John takes inventory of the stock at the end of each month. One of his inventory sheets looks like the next page. His last job is to find out how many of each item is in stock and estimate whether a re-order is needed.

Look at the first line in the inventory. How many black pens are in stock? Record your answer in the proper blank on the inventory sheet.

THIS IS LIKE THE PROBLEM DONE YESTERDAY. GIVE THE STUDENTS ABOU 5 MINUTES AND THEN ASK SOMEONE TO PUT THEIR WORK ON THE BOARD.

For each item, the manager wants between a 2 and 3 month supply on hand. If there is one month supply or less the item should be re-ordered. If there is a 3 month supply or more a "sale" should be run to move the excess stock. Why is it bad to be understocked? Why is it bad to be overstocked?

IF YOU ARE UNDERSTOCKED YOU MAY RUN OUT AND MISS SALES. IF A STORE IS OVERSTOCKED VALUABLE ROOM IS USED FOR STORAGE AND THE CASE FOR THE OPERATION OF THE BUSINESS IS "TIED UP" IN THE STOCK.

For each item on the inventory sheet figure out how many are in stock and how long the stock should last. Mark "reorder" on items which are short and "sale" on items where there is more than a 3 month supply.

AGAIN, THIS IS A PROBLEM SIMILAR TO PROBLEMS ALREADY WORKED. YOU NEED NOT HAVE EVERY STUDENT WORK EVERY LINE. EVERY STUDENT SHOULD WORK AT LEAST 10 LINES.

It's a GRUMP! What's a Grump? A GRUMP is a general review of underlying mathematical processes. That's just another way of saying, "problems to work," but not many, only 6. #1:

READ THIS AND HAVE THE STUDENTS WORK THE PROBLEMS INDEPENDENTLY, AS QUICKLY AS POSSIBLE.

(a)
```
  342
 x 97
```

(b)
```
   2,356
     172
   5,918
     463
+ 23,591
```

ANSWERS ARE:
(A) 33,174
(B) 32,500

Stationery and School Supplies

				Total	Estimated Sales	Reorder?
Pens:	case=12 cartons and cost/case	carton=12 boxes	box=12 pens	(pens)		
Black	3 $181.44	4	2		626/week	No
Blue	4 $181.44	3	5		255/week	Have Sale
Red	1 $181.44	4	15		87/week	Have Sale
Pads:	case=15 boxes	box=8 pads	single pads	(pads)		
Typing	8 $58.80	2	3		105/week	No
Ruled	13 $10.20	21	5		180/week	No
Graph	1 $15.30	7	18		10/week	Have Sale
Tape:	case=8 boxes	box=20 rolls	single rolls	(rolls)		
1/2 in.	2 $18.40	3	18		40/week	No
3/4 in.	0 $20.80	23	15		25/week	Have Sale
Masking	2 $15.20	1	0		15/week	Have Sale
Mailing	0 $104.00	0	3		10/week	Re-order
Pencils:	case=5 cartons	carton=12 boxes	box=12 pen.	(pen.)		
#2	3 $34.56	5	11		650/week	Re-order
#3	2 $34.56	1	18		200/week	No
#4	0 $36.72	0	23		100/week	Re-order
Red	1 $67.68	2	1		25/week	Have Sale
Blue	1 $67.68	4	2		25/week	Have Sale
Crayons:	case=7 cartons	carton=5 boxes	single boxes	(boxes)		
8's	2 $5.25	0	12		10/week	No
16's	0 $9.80	9	3		5/week	No
32's	4 $16.10	1	15		2/week	Have Sale
Glue:	case=9 cartons	carton=15 boxes	box=8 bottles	(botls.)		
Model	2 $57.24	3	9		235/week	No
Elmers	0 $232.20	0	5		50/week	Re-order
Powdered	1 $108.00	6	4		10/week	Have Sale

(c) $\begin{array}{r} 3046 \\ -\ 1239 \\ \hline \end{array}$

(d) $47\overline{)9156}$

(e) $\begin{array}{r} 2\frac{3}{5} \\ +\ 3\frac{4}{5} \\ \hline \end{array}$

(f) $\begin{array}{r} 5\frac{3}{4} \\ -\ 1\frac{1}{2} \\ \hline \end{array}$

(C) 1,807
(D) 194 R.38
(E) $6\frac{2}{5}$
(F) $4\frac{1}{4}$

END CLASS HERE

5. COST OF ITEMS TO STORE.

John was stacking a shipment of ball point pens in the stock room when the store manager asked him to bring the bill for the pens into the office. The bill looked like this.

Punk Pen Co.

TO: Woolworth

5 cases black ball point pens @ 181.44	$ 907.20
2 cases red ball point pens @ 181.44	$ 362.88
1 case blue ball point pens @ 181.44	$ 181.44
TOTAL	$1,451.52

John asked Mr. Jones, the manager, how much the store made from selling one pen. Mr. Jones told John that he had not figured that out but each pen sells for 29¢, and John could figure the cost from the bill. John said that he didn't think he could do it. "How could you figure the cost of one pen from that bill, anyway?"

Help John work this one. "How much does one pen cost the store?" You will need to find some information to work that problem. Now, how much does the store make on the sale of one pen?

WE ARE LEADING UP TO A PROBLEM WHICH THE STUDENTS SHOULD WORK. IT IS "WHAT IS THE COST TO THE STORE OF ONE PEN?" WE GO BACK A FEW PAGES TO FIND THAT THERE ARE 1728 PENS IN ONE CASE AND FROM THE BILL WE SEE A CASE COSTS $181.44. WORKING IT OUT IN CENTS:

$$\begin{array}{r} 10.5 \\ 1728\overline{)18144} \end{array}$$

WORKING IT IN DOLLARS:

$$\begin{array}{r} .105 \\ 1728\overline{)181.44} \end{array}$$

EITHER WAY, $10\frac{1}{2}$ CENTS PER PEN.

TEACHER NOTE: HAVE THE STUDENTS WORK OUT THESE PROBLEMS IN CLASS THEN HAVE VARIOUS STUDENTS EXPLAIN WHAT THEY DID. IF THERE IS COMMENT ABOUT HOW MUCH THE STORE MAKES REMIND THEM THAT THIS IS NOT "PROFIT" BECAUSE THE COST OF RUNNING THE STORE AND PAYING SALARIES MUST BE CONSIDERED. MORE ON THIS LATER.

THE "RIP OFF" BELOW SHOULD BE READ IN CLASS. TO MAKE SURE ALL UNDERSTAND IT, DRAW A PICTURE ON THE BOARD. DON'T TELL ANSWER! ANSWER TO "RIP OFF":

HOP	DIST	TOTAL
1	16	16
2	8	24
3	4	28
4	2	30
5	1	31
6	$\frac{1}{2}$	$31\frac{1}{2}$
7	$\frac{1}{4}$	$31\frac{3}{4}$
8	$\frac{1}{8}$	$31\frac{7}{8}$

ETC.

THIS SERIES WILL NEVER REACH 32, BUT IT HAS FUN TRYING.

STUDENTS MAY WORK IN GROUPS. EAC STUDENT SHOULD DO TWO OR THREE, BUT NEED NOT DO ALL LINES ON THE TABLE.

END CLASS HERE

John became interested in the cost of the items which the store was selling. Mr. Jones gave him time to figure out the cost of each item on the inventory sheet. He used the cost per case given on the inventory sheet to find the cost per item.

Find the cost per item of the items on the inventory sheet. Use the table on the next page, fill in only the first two columns at this time.

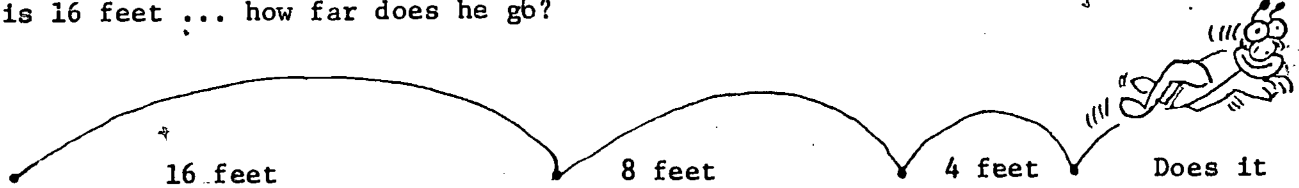
6. DOLLAR AMOUNT AND PERCENT PROFIT.

One way to tell how much profit is made on a sale is to tell the amount in dollars or cents. John did this (you helped) and now knows how much money the store makes on the sale of pens and a variety of other items. Is 18.5¢

* THIS DISCUSSION QUESTION WILL

It's a rip off #2

A bug hops, but as he hops he gets more and more tired! Each time he hops he goes half as far as he hopped the last time. He hops forever! His first hop is 16 feet ... how far does he go?



Does it bug you?

	Selling Price	Cost Each	Profit (Loss)	Expenses = 41% of selling price	% Profit (Loss)
Pens: Black	29	10.5	6.61	11.89	22.8%
Blue	29	10.5	6.61	11.89	22.8%
Red	29	10.5	6.61	11.89	22.8%
Pads: Typing	1.08	49	14.72	44.28	13.6%
Ruled	21	8.5	3.89	8.61	18.5%
Graph	29	12.75	4.36	11.89	15.0%
Tape: 1/2 in.	25	11.5	3.25	10.25	13.0%
3/4 in.	32	13	5.88	13.12	18.4%
Masking	41	9.5	14.69	16.81	35.8%
Mailing	1.03	65	(4.23)	42.23	(4.1%)
Pencils: #2	12	4.8	2.28	4.92	19%
#3	12	4.8	2.28	4.92	19%
#4	15	5.1	3.75	6.15	25%
Red	20	9.4	2.4	8.20	12%
Blue	20	9.4	2.4	8.20	12%
Crayons: 8's	23	15	(1.43)	9.43	(6.2%)
16's	45	28	(1.45)	18.45	(3.2%)
32's	1.02	46	14.18	41.82	13.9%
Glue: Model	12	5.3	1.78	4.92	14.8%
Elmers	35	21.5	(.85)	14.35	(2.4%)
Powdered	15	10	(1.15)	6.15	(7.7%)

a good profit on a sale? Is it good profit on the sale of a 29 cent ball point pen? Is 18.5¢ a good profit on the sale of a $2,000 car?

"Well," Mr. Jones said, "what you think is "profit" is not really what we make on a sale. This store has to run, and all the salaries have to be paid, then what's left over is 'profit.' Last year we took in $127,468.35. We spent $62,528.27 on stock and $52,350.00 in expenses and salaries. The rest was "profit."" How much profit did the store make last year?

Compare the "profit" and the total sales to obtain a percent of profit. Before doing this, let's work some examples with simpler numbers.

LEAD US TO PERCENT OF PROFIT AS A BETTER MEASURE OF PROFIT THAN THE ACTUAL DOLLAR AMOUNT.

THIS PARAGRAPH SHOULD LEAD TO A DISCUSSION OF "PROFIT."

(ANSWER: $12,590.08 PROFIT)

GIVE THE STUDENTS A MINUTE OR TWO TO WORK ON THIS AND HAVE A STUDENT PUT HIS WORK ON THE BOARD.

YOU MAY NEED TO REVIEW THE WAY IN WHICH THIS PERCENT PROBLEM IS SOLVED: "5 IS WHAT PERCENT OF 20?"

FRACTION	DIVISION	DECIMAL	PERCENT
$\frac{5}{20}$	$20\overline{)5.000}$	.25	25%

HERE ARE SOME EXAMPLES YOU MAY USE FOR PRACTICE. THE ANSWERS ARE GIVEN IN 4 STEPS, AS ABOVE AND ROUNDED TO THE NEAREST TENTH OF ONE PERCENT.

(a) 8 is what percent of 50?

(b) 35 is what percent of 68?

(c) 206 is what percent of 182?

(d) $1.58 is what percent of $2.37?

(e) $295.30 is what percent of $856.80?

← ← work over there!

Wasn't that fun? Well, maybe not so much fun, but now we can go back to this one:

A) $\frac{8}{50}$, $50\overline{)8.000}$
.16 = 16%

B) $\frac{35}{68}$, $68\overline{)35.000}$
.515 = 51.5%

C) $\frac{206}{182}$, $182\overline{)206.000}$
1.132 = 113.2%

D) $\frac{1.58}{2.37}$, $2.37\overline{)1.58000}$
.667 = 66.7%

E) $\frac{295.30}{856.80}$, $856.80\overline{)295.30000}$
.345 = 34.5%

Total sales = $127,468.35

Profit = ____________

Profit is what percent of sales?

SHOULD BE $12,590.08

GIVE THE STUDENTS TIME TO COMPUTE THIS. ANSWER: 9.9%

GRUMP

$$\begin{array}{r} 261 \\ \times\ 183 \\ \hline 47,763 \end{array} \qquad \begin{array}{r} 3507 \\ -\ 968 \\ \hline 2539 \end{array} \qquad \begin{array}{r} 12\frac{1}{4} \\ -\ 5\frac{3}{4} \\ \hline 6\frac{1}{2} \end{array}$$

$$63 \overline{)\,29,482} = 467.97 \qquad \begin{array}{r} 3\frac{4}{7} \\ +\ 9\frac{5}{7} \\ \hline 13\frac{2}{7} \end{array}$$

(ROUNDED TO NEAREST HUNDREDTH)

GIVE THE STUDENTS A FEW MINUTES TO WORK THESE. ALL STUDENTS WORK INDEPENDENTLY AND AS FAST AS POSSIBLE.

END CLASS HERE

7. PROFIT

"Now," John said to himself, "I can get an idea how much we make on an item. Our expenses last year were $52,350.00 and total sales were $127,468.35. What percent of the sales goes for expenses?"

ANOTHER PERCENT PROBLEM, ALL NECESSARY DATA GIVEN. GIVE STUDENTS A FEW MINUTES TO WORK ON IT. ANSWER: 41% (41.07% IS MORE ACCURATE, BUT WE WILL USE 41%).

"Take the ball point pen: We sell it for 29¢. How much of that goes for expenses? Well, it would have to be 41% of 29¢. I wonder how much that is?" Work it out.

REVIEW THE COMPUTATIONAL PROCEDURE: 41% OF 29¢
.41 X 29 = 11.89

How much profit does the store make on a 29¢ ball point pen? What is the percent of profit on that sale?

THIS IS A LITTLE TRICKY BECAUSE MUCH DATA MUST BE RECOVERED FROM EARLIER LESSONS.

COST OF A PEN:	10.5	CENTS	PRICE:	29.00
EXPENSES	11.89	CENTS		22.39
	22.39			6.61

6.61 IS WHAT PERCENT OF 29? ANSWER: 22.8%

John checked another item on the inventory sheet to see if the profit was about the same. He checked on the profit for selling one can of powdered glue. You check this now. What is the profit and percent of profit for powdered glue?

WORK OUT THIS PROBLEM AS ABOVE. YOU WILL FIND THAT

COST	10.00
EXPENSES	6.15
	16.15
SELLING PRICE	15.00
	(1.15)

PARENTHESIS SHOW A LOSS ON THIS ITEM.

For each of the items on the inventory sheet, find the amount of profit and the percent of profit (or loss).

EACH STUDENT SHOULD WORK A FEW OF THESE, BUT NOT NECESSARILY ALL.

END CLASS HERE

8. DISCOUNTING FOR SALE

When the manager wanted to sell the items which were overstocked he asked John to arrange the merchandise and discount the price to the "break even" point. John decided to start with blue ball point pens because the supply in the stock room would last over 6 months, with normal sales.

If you were John, what would you do to promote the sale of blue ball point pens?

What percent discount should be given on the ball point pens? What should the selling price be?

For the nine items which are over stocked (look back on the inventory page) decide whether to have a sale and decide what the sale should be. What is the discount to be offered, the number of "cents off" and the sale price. Fill out the table below:

MANY COMMON AND NOT SO COMMON IDEAS MAY COME UP HERE. ADVERTISING, ATTRACTIVE DISPLAY, PLACING PENS AT CHECK-OUT COUNTER, ETC. MAY BE MENTIONED.

A 22.8% DISCOUNT COULD BE GIVEN. THAT WOULD BE CUTTING THE PRICE TO THE BREAK EVEN POINT. BUT WHO EVER SEES A "22.8%" DISCOUNT?

POSSIBLE "REASONABLE" DISCOUNTS WOULD BE

10% = 2.9 $\approx$ 3¢ 26¢

20% = 5.8 $\approx$ 6¢ 23¢

THE STUDENTS DO NOT HAVE TO WORK EACH OF THESE. EACH STUDENT SHOULD WORK 3 TO 5 OF THESE.

"IT'S A RIP OFF" ANSWER: MAN #1 SHAKES WITH 9 OTHERS; MAN #2 WITH 8 OTHERS; MAN #3 WITH 7 OTHERS...ETC.

1 - 9	6 - 4
2 - 8	7 - 3
3 - 7	8 - 2
4 - 6	9 - 1
5 - 5	10 -
	45 HANDSHAKES.

It's a rip off #3

Ten men meet, all for the first time. Each man shakes hands with every other man. How many hand shakes will there be?

Whew, I'm tired!

Does that shake you up?

Item	%Discount	"Cents off"	Sale Price
Blue Pens			
Red Pens			
Graph paper			
3/4in.tape			
Mask. tape			
Red Pencils			
Blue Pencils			
32's Crayons			
Powder Glue			

THERE IS NO SINGLE ANSWER TO THE TABLE ABOVE. ANSWERS WILL HAVE TO BE CHECKED INDIVIDUALLY.

QUICKIE

$$\begin{array}{r} 4,735 \\ \times \quad 961 \\ \hline 4,550,335 \end{array}$$

Get

This

Right

And Win One Gold Star!

END CLASS HERE

9. CASHIER, TAX CALCULATIONS

After working in the stockroom for several months, John was asked to work as a cashier. Most of the time he had very little arithmetic to do because the cash register added up a customers purchases. He had several things to do which his register would not do for him. One was to figure tax on each purchase. He used a tax table to figure the tax on each purchase:

Amount	Tax	Amount	Tax	Amount	Tax
. 0 - .10	.00	.11 - .35	.01	.36 - .95	.02
.96 - 1.10	.03	1.11 - 1.35	.04	1.36 - 1.95	.05
1.96 - 2.10	.06	2.11 - 2.35	.07	2.36 - 2.95	.08
2.96 - 3.10	.09	3.11 - 3.35	.10	3.36 - 3.95	.11
3.96 - 4.10	.12	4.11 - 4.35	.13	4.36 - 4.95	.14
4.96 - 5.10	.15	5.11 - 5.35	.16	5.36 - 5.95	.17
5.96 - 6.10	.18	6.11 - 6.35	.19	6.36 - 6.95	.20
6.96 - 7.10	.21	7.11 - 7.35	.22	7.36 - 7.95	.23
7.96 - 8.10	.24	8.11 - 8.35	.25	8.36 - 8.95	.26
8.96 - 9.10	.27	9.11 - 9.35	.28	9.36 - 9.95	.29

For amounts larger than 10.00, tax = .30 for each 10.00 + additional shown by table.

After working with this table for a few days he asked Mr. Jones, "How does this work, anyway? I can't tell what the tax should be." What is the rate of tax we pay and how does it work out in the tax table?

John said "Yes, I see that now. But on some purchases a person pays 0% tax. (Which purchasers pay 0% tax?) I wonder what the <u>largest</u> percent of tax would be?" Help John locate the largest percent tax on a purchase. Hint: find it on the first line of the table.

Purchase	tax	Purchase	tax
49¢	.02	24.95	.74
1.08	.03	137.65	4.13
2.69	.08	4.12	.13
34¢	.01	453.87	13.66
10.58	.32	9.62	.29

OF COURSE, THE TAX IN GEORGIA IS 3% (4% IN SOME CITIES). THE TABLE IS BASED ON "EXPECTED PURCHASES" AND <u>OVER THE LONG RUN</u> WILL WORK OUT CLOSE TO 3%.

PERSONS WHO MAKE A PURCHASE UNDER 11¢ PAY NO TAX.
1¢ ON 11¢ = 9% TAX, LARGEST TAX PAID ON ANY PURCHASE.

FOR EXAMPLE, A $25.40 PURCHASE WOULD BE FIGURED AS:

TAX ON 20.00	.60
TAX ON 5.40	.16
TOTAL TAX =	.76

IT'S A GRUMP #3

(a) 25 is what percent of 135: 18.5%

(b) 43% of 256 is 110.08

(c) $ 348.65 x 8 = $2,789.20 $8,023.46 - 947.81 = $7,075.65

WORK THIS GRUMP AS QUICKLY AS POSSIBLE, EACH STUDENT WORKING INDEPENDENTLY.

END CLASS HERE

10. SALES RECEIPTS.

When another company buys things from Woolworth an itemized receipt is usually required. This must show the items purchased, the cost per item, total cost of each kind of item tax and total. Of course, John's register will not do this so he makes out these receipts by hand. Why would the company buying from Woolworth need this record? Why would an individual normally not need this kind of record?

TRY TO STIMULATE DISCUSSION ON THIS POINT. COMPANIES MUST HAVE RECORDS TO VERIFY THEIR EXPENDITURES. INDIVIDUALS DO NOT USUALLY NEED THIS KIND OF RECORD.

On the next page you will find several receipts partially filled out. Complete the arithmetic required for each receipt. Try this one first?

GIVE THE STUDENTS A FEW MINUTES TO FILL IN THE COST OF EACH ITEM AND ADD TO FIND THE TOTAL. THEN HAVE ONE OR MORE STUDENTS PRESENT THEIR RESULTS. DISCUSS THIS AS TIME AND INTEREST INDICATES.

Woolworth & Co.

#	Item	Unit cost	
3	Boxes, Pens	3.48	10.44
5	Pads, typing paper	1.08	5.40
8	Boxes, #2 pencils	1.44	11.52
2	Boxes, #4 pencils	1.80	3.60
4	Rolls 1/2 in. tape	.25	1.00
1	Rolls, Masking tape	.41	4.51
4	Cartons #4 pencils	21.60	86.40
	Total		122.87
	Discount (2%)		2.46
	NET		120.41

NOTE THAT THE PENS WERE PURCHASED IN BOXES AND THE PENCILS IN CARTONS, NOT INDIVIDUALLY. STUDENTS MUST FIND THE COST OF A BOX OF PENS AND A CARTON OF PENCILS TO FILL THIS OUT PROPERLY.

When you have done this example in class you may turn to the next page and finish the four sales slips on that page. Where will you find the information on boxes and cartons that you will need?

STUDENTS SHOULD DO AS MANY AS POSSIBLE OF THE FOLLOWING EXERCISES.

END CLASS HERE

11. QUANTITY DISCOUNTS.

The manager was quite happy to supply other firms with their office materials. In fact, he gave a discount to firms on a scale which was based on the size of their order. Why would the manager give a discount to firms placing large orders? John asked "Wouldn't you make more money if you held this stuff and sold it at the regular price?

THE STUDENTS MAY NEED TIME TO FINISH THE SALES SLIPS. IF SO, ALLOW SOME TIME FOR THAT PRIOR TO BEGINNING CLASS ACTIVITIES TODAY.

DISCOUNTING IS COMMON AND, IN THE CASE OF LARGE ORDERS PROBABLY NECESSARY. THE "REGULAR" SALES WILL GO ON ANYWAY SO THESE LARGE ORDERS ARE ABOVE AND BEYOND NORMAL SALES.

The manager allowed the following discounts:

any commercial account	1%
over $100.00 on an order	2%
over $500.00 on an order	4%
over $1000.00 on an order	6%.

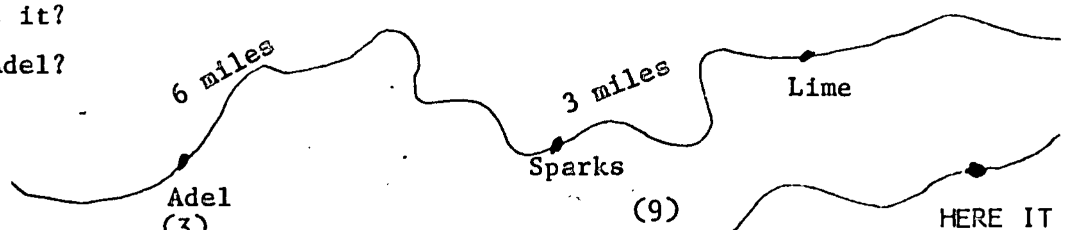
Go back to the sales slips you have done and fill in the percent discount, the dollar amount of the discount and the net charge.

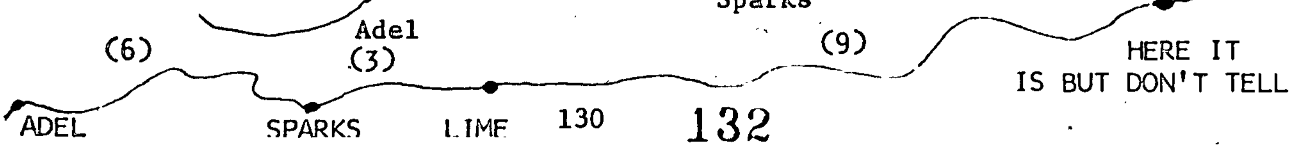
END CLASS HERE

It's a rip off #4

Three towns, Adel, Sparks, and Lime are on this road. Sparks is twice as far from Adel as from Lime. There is another town which is twice as far from Adel as from Lime. Where is it?

How far is it from Adel?





#	Item	Unit cost	
Woolworth & Co.			
[illegible]	Boxes,Pens	3.48	13.92
2	Boxes,typing pads	8.64	17.18
1	Box,3/4in. tape	6.40	6.40
1	Box,Mailing tape	20.60	20.60
1	Carton,#4 pen.	21.60	21.60
5	Bottles,Elmer's	.35	1.75
	Total		81.55
	Discount (1 %)		.82
	Net		80.73

#	Item	Unit cost	
Woolworth & Co.			
1	Case,Pens	501.12	501.12
5	Boxes,typing paper	8.64	43.20
1	Box,Ruled paper	1.68	1.68
15	Rolls,1/2in. tape	.25	3.75
5	Rolls,Masking tape	.41	2.05
3	Boxes,#2 pencils	1.44	4.32
	Total		556.12
	Discount (4 %)		22.25
	Net		533.87

#	Item	Unit cost	
Woolworth & Co.			
5.	Cartons,Pens	41.76	208.80
2	Boxes,Ruled paper	1.68	3.36
1	Box,Graph paper	2.32	2.32
1	Box,1/2in. tape	5.00	5.00
2	Cartons,#2 pencils	17.28	34.56
1	Box,Crayon "8"	.23	.23
1	Box,Elmers	.35	2.80
	Total		257.07
	Discount (2 %)		5.14
	Net		251.93

#	Item	Unit cost	
Woolworth & Co.			
1	Case,Block pens	501.12	501.12
1/2	Case,Blue pens	501.12	250.56
1	Case,typing pads	129.60	129.60
5	Boxes,Ruled pads	1.68	8.40
10	Rolls,3/4in. tape	.32	3.20
2	Cases,#3 pencils	86.40	172.80
	Total		1,065.68
	Discount (6 %)		63.94
	Net		1,001.74

12. PERCENT DISCOUNTS.

The Woolworth Company normally gives a discount to its employees. This discount is the percent of profit plus one half the percent of expenses. This figure is then rounded off to the nearest 5%.

What would the discount be for the store in which John works? Look back in this unit to find the profit and expense figures the manager gave to John. Use these to figure the percent discount.

EXPENSES = 41% OF SALES

PROFIT = 9.9% OF SALES

$\frac{1}{2}$ EXP. = 20.5% OF SALES

30.4% ≈ 30%

THE STORE WILL GIVE A 30% DISCOUNT TO ITS EMPLOYEES.

John figures the discount on several purchases made by employees. He deducted the discount and then registered the amount, rounded off to the next largest cent.

Purchase	Discount	Net
\$ 3.47	\$ 1.04	\$ 2.43
\$ 9.50	2.85	6.65
\$ 8.95	2.68	6.27
\$ 1.46	.43	1.03
\$ 35.20	10.56	24.64
\$ 17.95	5.38	12.57
\$132.50	39.75	92.75
\$ .47	.14	.33

GIVE THE STUDENTS A FEW MINUTES TO DO THESE PROBLEMS.

It's A Grump (#4)

(a)
$$\begin{array}{r} \$\ 27.65 \\ 8.40 \\ 13.51 \\ +\ 7.95 \\ \hline \$\ 57.51 \end{array}$$

(b) 42 is what percent of 96? 43.8% (NEAREST $\frac{1}{10}$ OF 1%)

(c) $4.95\overline{)37.68}$ = 7.612 (NEAREST $\frac{1}{1000}$)

(d)
$$\begin{array}{r} 3.61 \\ \times\ 5.8 \\ \hline 20.938 \end{array}$$

(e)
$$\begin{array}{r} \$93.05 \\ -\ 7.95 \\ \hline \$85.46 \end{array}$$

13. HARDER PERCENT PROBLEMS.

Everybody makes mistakes...John made a few. One day Mr. Jones showed John this sales slip for an employee sale.

Woolworth & Co. Employee Discount Sale	
One framed picture	
(30% discount)	$18.00
Net	

John said, "Well, Mr. Jones I must have done this in my head. I have forgotten how much that picture cost and how much I charged but I think I can work it out. Give me a few minutes and I will try."

HAVE THE STUDENTS DISCUSS AND STATE JOHN'S PROBLEM. "TO FIND A NUMBER SUCH THAT 30% OF IT IS 18."

Let's help John, but first let's work a few simpler problems to get the idea.

I am thinking of a number. Half of it is 4. What is the number? (8)

I know a number. 25% of it is 10. What is the number? (40)

WORK A VARIETY OF SIMPLE PROBLEMS LIKE THIS. THIS KIND OF PROBLEM IS BEST EXPLAINED AS A "THINKING OF A NUMBER" PROBLEM.

WHEN THE STUDENTS "GET THE IDEA" YOU CAN GIVE THEM THE RULE. EXPLAIN AT THE BOARD AS YOU USUALLY DO AND HAVE THE STUDENTS WORK THESE PROBLEMS.

32% of a number is 16.
1% of that number is .5 .
100% of that number is 50 .

15% of a number is 4.50.
1% of that number is .30 .
100% of that number is 30 .

30% of a number is $9.00.

The number is $30.00.

2% of a number is $1.96.

What is the number? $98.00

Now look back to John's problem. The framed picture was sold for an amount we don't know. But the discount was $18.00. So 30% of what is $18.00? Go back and finish filling in the sales slip.

30% OF THE NUMBER IS $18.00

1% WOULD BE .6

100% WOULD BE $60.00.

37% of a number is 59. 159.46

19% of a number is $38.57. $203.00

42% of a number is 18.3. 43.57

74% of a number is 74. 100

WHEN THE STUDENTS HAVE COMPLETED THE SALES SLIP THEY SHOULD WORK THESE PROBLEMS.

END CLASS HERE

14. ADVANCEMENT IN THE COMPANY.

John was surprised when the manager called him to his office. "John, you can have a better job if you want it." John was offered a job as an assistant manager of a large store in Atlanta. He would also receive training to help him advance to store manager.

ENCOURAGE DISCUSSION ON THIS POINT. HE WOULD HAVE TO LEAVE FAMILY AND FRIENDS, MOVE TO ATLANTA AND WORK LONGER HOURS. HIGHER PAY WOULD BE PARTLY USED IN HIGHER LIVING EXPENSES.

John could not decide whether to go to Atlanta. What things would you have to think about if you were offered that job?

John compared the job he had and the job in Atlanta: Local job, $2.78 per hour and a 40 hour week with very little overtime work. Assistant Manager, $850.00 per month and works 50 to 60 hours per week.

COMPARE TOTAL MONTHLY AND HOURLY RATES. THE ASSISTANT MANAGER WORKS FOR HIS EXTRA PAY!

Which job do you like?

The job John had working with stock and as a cashier was it. No further room for advancement. Even if the manager quit, another man with manager training would be given the job. "But," John asked himself, "do I want to be a manager and worry all the time like Mr. Jones? Now I just draw my pay and go home."

MANAGEMENT HAS BOTH PROBLEMS AND REWARDS. ENCOURAGE THE STUDENTS TO DISCUSS THIS. DO YOU WANT ADDED RESPONSIBILITY?

What do you say?

Up to now John has been living at home, paying a share of the expenses. He drives a nice car and has money in the bank. "I went up there and looked at apartments, and they want $150.00 to $200.00 per month for a small one. Of course, I looked at some nice places. They have pools and stuff!"

What will happen to John's increased salary if he lives in Atlanta? Will he come out money ahead?

MUCH OF IT WILL GO FOR INCREASED LIVING EXPENSES. HE WILL PROBABLY NOT BE MONEY AHEAD!

As John thought about these factors he also felt that it would be fun to try big city living.

What would you do?

Grump #5

(a) What is 25% of $437.20? ($109.30)

(b) $2\frac{3}{4} + 5\frac{1}{2} = 8\frac{1}{4}$

(c)
$$\begin{array}{r} 2{,}596 \\ 821 \\ 42{,}765 \\ 348 \\ \underline{5{,}926} \\ 52{,}456 \end{array}$$

(d)
$$\begin{array}{r} 42.3 \\ \underline{\times\ 5.1} \\ 215.73 \end{array}$$

(e) 68 of what number is 427? 627.94

END CLASS HERE

Retail Sales

HOUR EXAMINATION #1

1.
$$\begin{array}{r} 346 \\ 82 \\ 9{,}721 \\ +\ 534 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 43{,}062 \\ -\ 5{,}938 \\ \hline \end{array}$$

3. $642\overline{)\,9{,}382}$

4.
$$\begin{array}{r} 3{,}958 \\ \times\ 467 \\ \hline \end{array}$$

5. Mechanical pencils cost $.49 and are packed 12 in a carton. How much will a box of pencils cost?

6. A store usually sells about 50 mechanical pencils per week. In stock the store has 30 cartons of these pencils. How long will this stock last?

7. A carton of pens costs the store $3.48. What is the cost of one pen?

8. How much does the store make on the sale of one carton of pens?

9.
$$\begin{array}{r} 2\frac{2}{3} \\ +\ 5\frac{2}{3} \\ \hline \end{array}$$

10.
$$\begin{array}{r} 5\frac{3}{4} \\ -\ 2\frac{1}{2} \\ \hline \end{array}$$

Conduct a review of fraction arithmetic before giving this test.

Give this test following lesson 5.

Retail Sales

HOUR EXAMINATION #2

1.
```
    436
  2,971
    852
+ 3,467
```

2.
```
  9,856
-   249
```

3. $341\overline{)286,471}$

This test is to be used following lesson 9.

4.
```
  4,273
x   853
```

5. A hardware store buys hammers for $22.20 per dozen. The store has expenses of operation of 25% of sales. What profit do they make on one hammer sold for $3.00?

6. A store makes a profit of 35 cents on an item sold for $2.00. What is the percent profit on that sale?

7. An item which usually sells for $4.00 is to be discounted 35 percent. What will it sell for at that discount?

8. What is the tax on a purchase of $23.95 if the tax rate is 3%?

Retail Sales

HOUR EXAMINATION #3

1. $346.9 + 27.84 + 43.8 + 291.7 =$

2. $\begin{array}{r} 347.92 \\ \underline{-\ 16.84} \end{array}$

3. $27.1\overline{)265.82}$

4. $\begin{array}{r} 83.61 \\ \underline{\times\ 57.3} \end{array}$

5. Complete this sales slip:

Ajax Co.

Quantity	Item	Unit cost	
5	hammers	2.53	
2	saws	10.50	
8 lb.	nails	76¢/lb.	
1	plane	9.95	
	Total		

6. What is the cost of a $47.20 hair dryer, allowing for an employee discount of 37%?

7. If an employees 35% discount comes to $7.35, what was the amount purchased?

Give this test following lesson 14

TEACHER'S MANUAL

MEASUREMENT

MEASUREMENT

1. To measure the classroom

Each person is to measure one dimension of your classroom. Your teacher will assign you to measure one of the following:

_____length of the room

_____width of the room

_____height of the room

(Place a check above, by your assignment.)

a. Use a ruler. As carefully as you can place the ruler at one edge of your measurement you are to make, mark the end, move in a straight line, count the number of feet in your measure. At the end, if your measure is not exactly an even foot, measure the number of inches. Write your answer here.

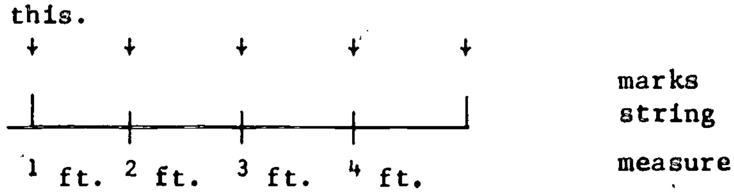
_____feet and _____inches

ASSIGN EACH STUDENT ONE DIMENSION OF THE ROOM TO MEASURE. THIS SHOULD BE RECORDED BY EACH STUDENT FOR LATER USE.

b. Use a "string ruler." Decide how long you want to make your string ruler. Do you want it to be 3 feet, 4 feet, 5 feet, or 6 feet?

My string ruler will be _____feet.

Now take a piece of string and use the foot ruler to mark your string ruler, one foot at a time. Use a pen, pencil, or crayon to mark your string. If you are going to make a 4 foot string ruler, it may look like this.



THIS EXERCISE IS TO BE USED TO SHOW HOW TO FIND A LENGTH USING A MULTI-UNIT SCALE. THAT IS, IF THE STRING IS 4 FEET LONG AND YOU USE 3 X 4 FEET OR 12 FEET. SINCE, STRINGS WILL BE DIFFERENT LENGTH, THERE WILL BE AMPLE OPPORTUNITY TO DISCUSS THE MULTIPLICATION PROCESS.

Now use your string ruler to make your measurement of the room again. You will have to guess (estimate) at how many inches are in your measure if it does not come out in an even number of feet.

How many times did your string ruler fit?

_____

Multiply this number of times the string fit times the number of feet in your string ruler.

________	X	________	=	__________
number of times string fit		number of feet in string ruler		number of feet in your measure

Did your string ruler fit evenly? _____

If not, add the number of feet and inches to be added.

Total measure ____________________

c. Use a yardstick or a tape measure to measure the room.

Did you use?	What is your answer?
___a yardstick	___feet and ___ inches
___a tape measure	___feet and ___inches

CHECK THESE MESUREMENTS FOR ACCURACY, IT WOULD BE GOOD TO MEASURE THE ROOM BEFORE THIS LESSON BEGINS.

d. Are there tiles in the floor or cinder blocks on the wall? Measure them. (Are there one foot square tiles? Are the cinder blocks 8 inches?) If so, count the tiles or blocks and estimate your measure.

_____feet _____inches

DISCUSS HOW DIFFERENT OBJECTS IN THE ROOM CAN BE USED TO ESTABLISH THE DIMENSION OF THE ROOM.

e. Summary

When you are done, fill in this summary.

I measured: _____ length of the room

(check one) _____ width of the room

_____ height of the room

My answers were:

Using a ruler: _____feet _____inches

IT IS NECESSARY THAT YOU DISCUSS THE CORRECT DIMENSION OF THE ROOM. ALSO, BRING OUT THE FACT THAT REGARDLESS OF WHAT UNIT WAS USED THE DIMENSIONS OF THE ROOM SHOULD BE ABOUT THE SAME. ALSO, TALK ABOUT THE SMALL DIFFERENCES THAT MAY OCCURR DUE TO UNAVOIDABLE ERROR.

Using a string ruler: ______feet ______inches

Using a yardstick ___ ______feet ______inches
or tape measure___

Using tile measures___ ______feet ______inches
or cinder blocks ___

If one measure is very different from the others, you may want to try it again.
When you finish, help one of your classmates finish his Job Card.

2. Class meeting.
When everyone has finished, your teacher will work with the whole class. A table of data will be placed on the board like this: You can copy the data onto your worksheet.

(Data table to be found on following pages.)

PLACE A TABLE ON THE BOARD SIMILAR TO THE ONE OF THE FOLLOWING PAGE. HAVE EACH STUDENT GIVE HIS MEASUREMENT FOR THE LENGTH OF THE ROOM, WITH THE APPROPRIATE INSTRUMENT (RULER, STRING RULER ETC.) AFTER RECORDING ALL THE ANSWERS DISCUSS HOW TO FIND THE AVERAGE OR THE MEAN OF SEVERAL NUMBERS. YOU MAY NEED TO USE SEVERAL OTHER EXAMPLES BEFORE YOU GO ON. NOW HAVE THE STUDENT COMPLETE THE TABLE.

TOPICS 3 AND 4 SHOULD FOLLOW THE SAME PROCEDURE AS NUMBER 2. TO FOLLOW UP YOU CAN GIVE AN ASSIGNMENT THAT REQUIRES THE USE OF AVERAGE.

Table of Data: <u>LENGTH</u>

Student	By Ruler:	By String Ruler:	By Yardstick:	By Tape Measure	By Tiles or Cinder
1.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
2.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
3.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
4.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
5.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
6.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
7.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.

Now look over the data. Are any of the answers very different from the others? Draw a line through any which the class decides are in error. Now we need to get our best estimate of the length. We will find the <u>mean</u> or average.

How many measures? ______ ______ ______ ______ ______

What is the total? ___ft. ___in. ___ft. ___in ___ft. ___in. ___ft. ___in.
___ft. ___in.

Mean: ___ft. ___in. ___ft. ___in. ___ft. ___in. ___ft. ___in.
(divide total by number of measures) ___ft. ___in.

What do you think is the best estimate of the length?

___ft. ___in.

TABLE OF DATA: WIDTH

Student	By Ruler:	By String Ruler:	By Yardstick:	By Tape Measure	By Tiles or Cinder
1.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
2.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
3.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
4.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
5.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
6.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
7.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.

Now look over the data. Are any of the answers very different from the others? Draw a line through any which the class decides are in error. Now we need to get our best estimate of the width. We will find the <u>mean</u> or average.

How many measures? ______ ______ ______ ______ ______

What is the total? ___ft. ___in. ___ft. ___in. ___ft. ___in. ___ft. ___in.
___ft. ___in.

Mean: ___ft. ___in. ___ft. ___in. ___ft. ___in. ___ft. ___in.
(divide total by number of measures) ___ft. ___in.

What do you think is the best estimate of the width?

___ft. ___in.

Table of Data: HEIGHT

1.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
2.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
3.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
4.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
5.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
6.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.
7.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.	___ft. ___in.

Now look over the data. Are any of the answers very different from the others? Draw a line through any which the class decides are in error. Now we need to get our best estimate of the height. We will find the <u>mean</u> or average.

How many measures? ______ ______ ______ ______ ______

What is the total? ___ft. ___in. ___ft. ___in. ___ft. ___in. ___ft. ___in.
___ft. ___in.

Mean: ___ft. ___in. ___ft. ___in. ___ft. ___ing. ___ft. ___in.
(divide total ___ft. ___in.
by number of
measures)

What do you think is the best estimate of the height?

___ft. ___in.

Summary

Copy the best estimates of the measures here:

length ____feet ____inches

width ____feet ____inches

height ____feet ____inches

Now, we will estimate these measures to the nearest foot.

length ____feet

width ____feet

height ____feet

5. To make a scale drawing of the classroom.

1. Select a scale for your final drawing. The scale you select will be used to make the drawing. You must select a scale so that your drawing will fit on the paper. Also, you will want to select a scale which is easy to use. For example, an easy scale to use is to let 1 inch in your drawing represent 1 foot of measure. We could write 1 inch: 1 foot. If your room is 28 feet long, then you would have to draw a 28 inch line to represent 28 feet. But if your paper is only 11 inches long, a 28 inch line will not fit. Thus, you may select a scale that lets 1 inch represent 4 feet. (1 inch: 4 feet). Then a measure of 28 feet would be drawn

28 ft. ÷ 4 ft. per inch = 7 inches.

Following are some scales and some measures. Fill in the length of a line to represent the measures.

SINCE ALL THE "BEST" MEASUREMENTS OF THE ROOM HAVE ALREADY BEEN MADE, THIS WILL REQUIRE MAINLY SEAT WORK. HOWEVER, THERE WILL BE SOME MEASURE THAT WILL NEED TO BE FOUND. THESE MEASURES WOULD BE THINGS LIKE CLOSETS, DOORS, ETC. BEFORE ACTUALLY HAVING THE STUDENTS BEGIN THE SCALE DRAWING, DISCUSS THE PROBLEMS ON THE TOP OF THE FOLLOWING PAGE BY HAVING DIFFERENT STUDENTS SUPPLY THE ANSWER. WHEN THE STUDENTS UNDERSTAND, HAVE THEM WORK THE 12 PROBLEMS ON THE BOTTOM OF THE PAGE.

scales	measures	length of lines to represent measures
1 inch : 1 foot	27 feet	________
1 inch : 2 feet	30 feet	15 inches
1 inch : 5 feet	30 feet	________
1 inch : 10 feet	40 feet	________
1 inch : 8 feet	40 feet	________
1 inch : 5 feet	40 feet	________
1 inch : 4 feet	40 feet	________

Now think about your drawing. How do you want it to fit on the paper? How big do you want the picture to be?

1 inch : ___feet.

Using this scale, complete the following table:

1 inch on the drawing will represent	____ feet in the room.
2 inches	____ feet
4 inches	____ feet
10 inches	____ feet
1/2 inch	____ feet
1/4 inch	____ feet
____inches	12 feet
____inches	10 feet
____inches	1 foot
____inches	5 feet
____inches	6 feet
____inches	4 feet

6. Final Drawing.

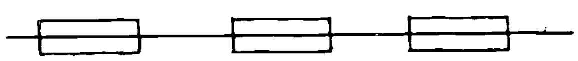
a. Draw an outline, to scale, of the room. Label the sides with the measure of the length and width. Try to plan your work so your drawing is neat and accurate, near the center of the paper, and is large enough to see easily. (It is a good idea to work in pencil at first so you can erase unnecessary lines. Also, sharpen your pencil often so your lines are sharp and clear.)

HAVE THE STUDENTS MADE A ROUGH SCALE LENGTH OF EACH OF THE DIMENSIONS. ONCE THEY HAVE COMPLETED THE ABOVE, DISCUSS THE DRAWINGS AND MAKE SURE THEY HAVE THE CORRECT LENGTH ON THEIR DRAWING. NOW THEY SHOULD MAKE AN OUTLINE OF THE ROOM USING THE SCALE MEASURE.

b. Now add some of the important features of your classroom to your drawing. Doors can be drawn like this:

You will have to measure the width of the door and how far it is from a corner.

Windows can be drawn like this:



Again, measure the width of the window and the distance from a corner.

You may want to indicate bookcases, worktables, the teacher's desk, etc.

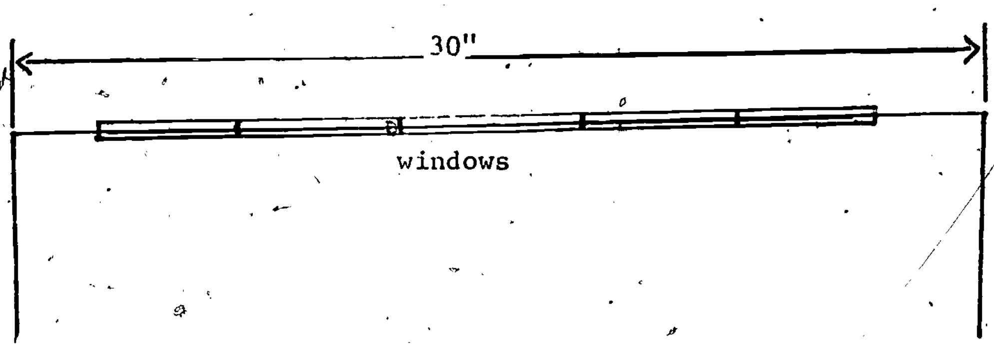
Make sure you label your drawing and place your name on it.

YOU CAN DETERMINE HOW MUCH DETAIL GOES INTO THE SCALE DRAWING. IT WOULD BE GOOD TO HAVE THEM, AT LEAST, PUT IN THE MAJOR ITEM, SUCH AS DOORS, WINDOWS, ETC.

7. To make a scale drawing of one wing of the school. OPTIONAL

Your teacher will assign one wing of the school for you to investigate. Each student should work with a partner. Together you can make a rough sketch of the wing, take all the measurements you will need and write them on your sketch.

Return to your classroom and make a scale drawing of the wing. Remember to pick your scale carefully, include windows and doors, label your drawing and include your names, with the dimensions on the drawing. Architects and builders often put the dimensions on drawings like this (notice we write the measure not the scale.)



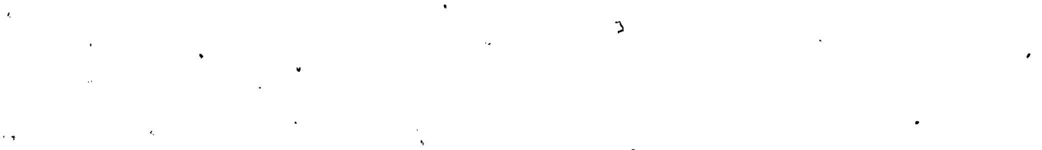
8. To make large measurements outside.

OPTIONAL

(1) Measure your stride:

Find an area outside where you can walk 10 paces. Put your feet together, make the point of your Right heel, and walk 10 steps starting with your left foot. Step 10 should be your right foot. Bring your left foot up and mark your right heel. Try to pace naturally so each step is comfortable and about the same distance.

THIS IS A GOOD LESSON TO USE FOR PRACTICING FINDING AN AVERAGE OR MEAN. RATHER THAN HAVE ALL STUDENTS DO THEIR "STEPS" AT ONE TIME YOU MAY FIND IT EASIER TO DEMONSTRATE WITH ONE OR TWO PEOPLE FIRST.



- Measure the distance with a tape measure or marked string from your starting right heel to your ending right heel. Divide by 10 and you have your pace. Do this about twice or until you obtain about the same pace.

10 steps		Pace
____ feet	÷ 10 =	____ feet (are decimals on feet and inches)
____ feet	÷ 10 =	____ feet
____ feet	÷ 10 =	____ feet

your pace

____

9. Calculate how much fencing material you would need to enclose the school yard. Work with a partner. Locate the school yard boundaries and pace them off. Make a sketch of the yard and write the distances in it. How many feet of fence will you need? How many gates and what sizes?

Feet of fencing: ______________ feet.
(enter feet in each side)
____
____
____
____
____
____

Total fencing ______________ feet.

Gates:	Location	Size (feet)
	________	________
	________	________
	________	________
	________	________
	________	________
	________	________

OPTIONAL

THIS IS A GOOD LESSON OR ACTIVITY TO UTILIZE ACTIVITY NUMBER 8. THIS COULD BE BEST HANDLED BY ASSIGNING THE TASK TO A SMALL GROUP. OTHER SIMILAR ACTIVITIES CAN BE PROVIDED FOR OTHER GROUPS.

TEACHER'S MANUAL

AREA-PERIMETER

GENERAL INSTRUCTIONS

1. The "read it in class" feature. The students pages are presented as a connected narrative. Problems grow out of the narrative. This story is to be read in class and, as problems come up, the students stop and work these out. Each day normally will end with a problem set. There are also discussion questions within the story and these should be treated during class time as described in item 3 below. This "read it in class" procedure should be used to contribute to the students growth in reading skill, also.

The narrative is designed to bring up mathematical problems as they might arise on the job, to foster desirable attitudes toward employment to present realistic employment information, and to give the student a focus for discussion of questions related to careers.

2. The "discussion question" feature. There are a number of questions for discussion. These are marked by an * on the dividing line. These questions point up ideas related to mathematics and careers. When you reach each such question spend some time getting students to think and tell their ideas and opinions.

3. By no means should you consider the unit an exhaustive study of area. It should be used as a guide for suggested activities you as the teacher are expected to develop more exercise when necessary to establish a concept.

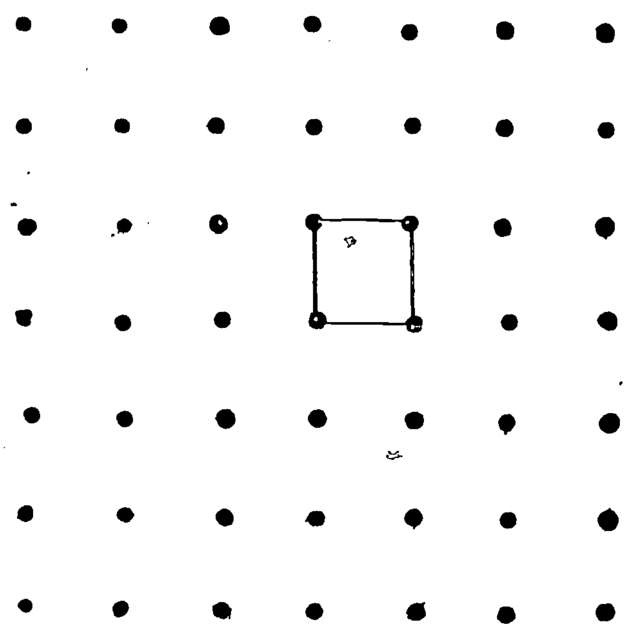
1. AREA

The idea of this lesson is to use a geo-board, or a grid made of dots, to look at the properties of area and perimeter also, you will have a chance to discuss some patterns through the activities presented here.

* IF GEOBOARD ARE NOT AVAILABLE MAKE "GRID" PAPER FOR EACH STUDENT. (USE THE SHEET LABELED DITTO MASTER I AS A GUIDE.)

Figures are formed on the geó-board by stretching rubber-bands around nails or by drawing lines from dot-to-dot if you are using a picture of a geo-board. We can then use these figures in finding area or perimeter. For example the figures below is a square that has an area of 1 square unit.

* ILLUSTRATE SEVERAL RECTANGLE, SQUARES AND TRIANGLES FOR THE STUDENTS ON GRID PAPER. BE SURE THE STUDENTS UNDERSTAND HOW THE FIGURES ARE DRAWN ON THE PAPER.



Using the grid paper provided draw a rectangle that would have an area of 2 square units.

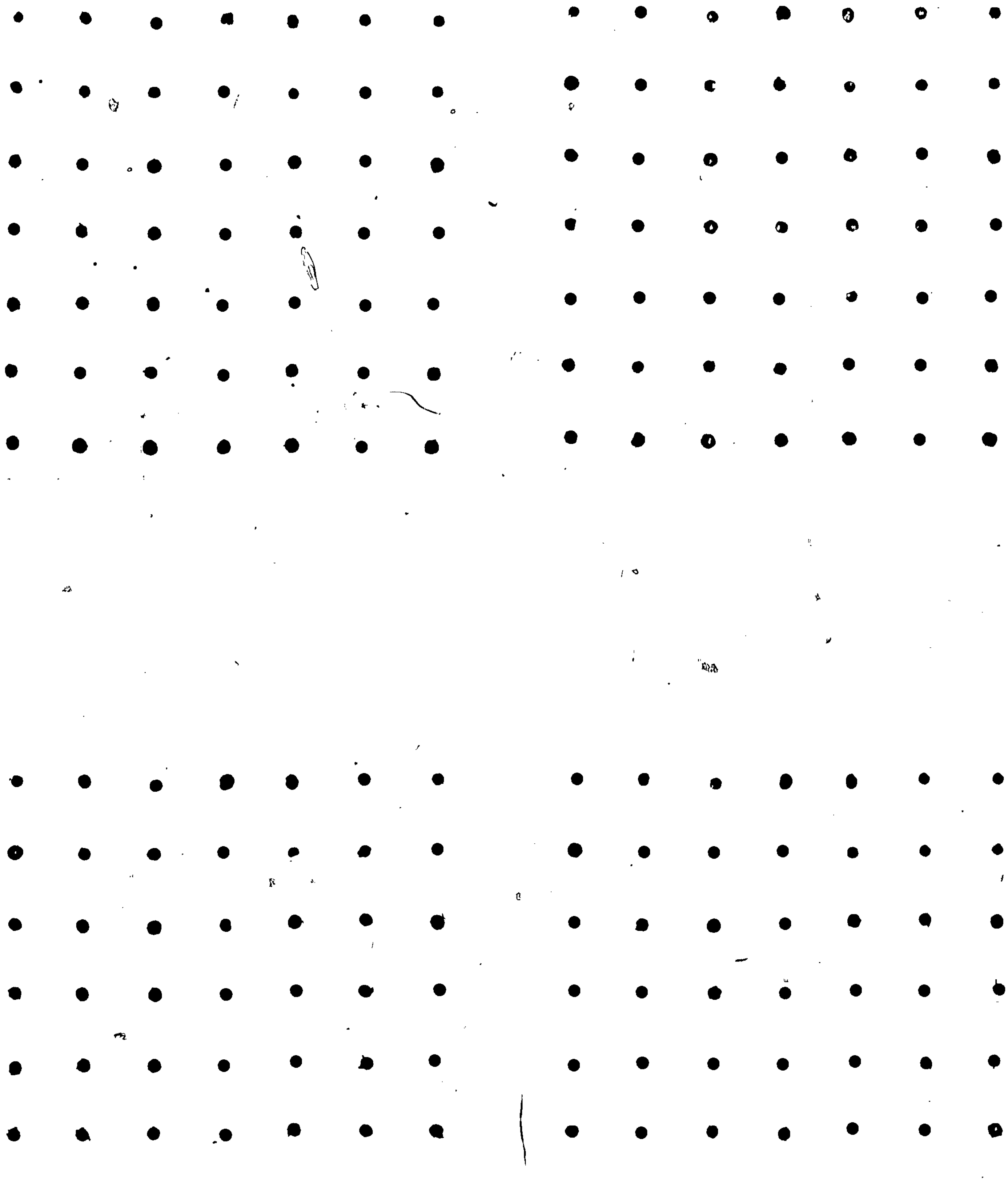
* CHECK TO MAKE SURE EACH STUDENT HAS COMPLETED THE TASK CORRECTLY.

Now that you have done this draw a square that has an area of 4 square units.

At this point your teacher will give you some other examples to work. Complete these before continuing.

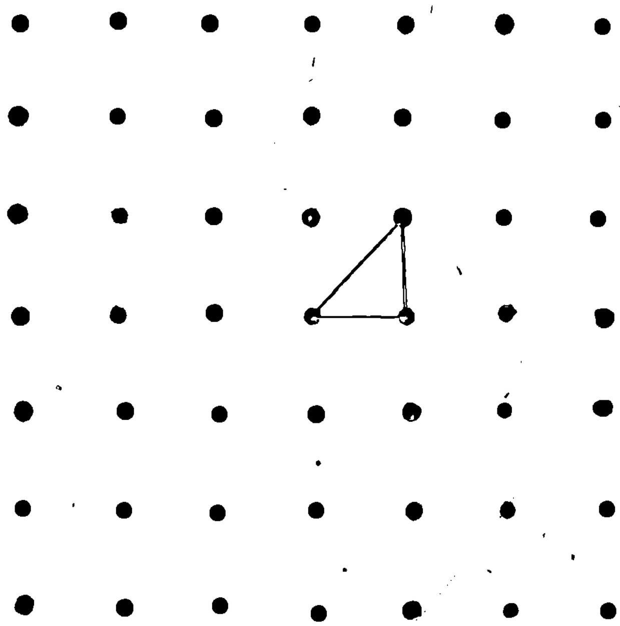
* MAKE SURE THAT THE STUDENTS HAVE * THE AREA CORRECT AND THAT THE FIGURE IS A SQUARE. AT THIS

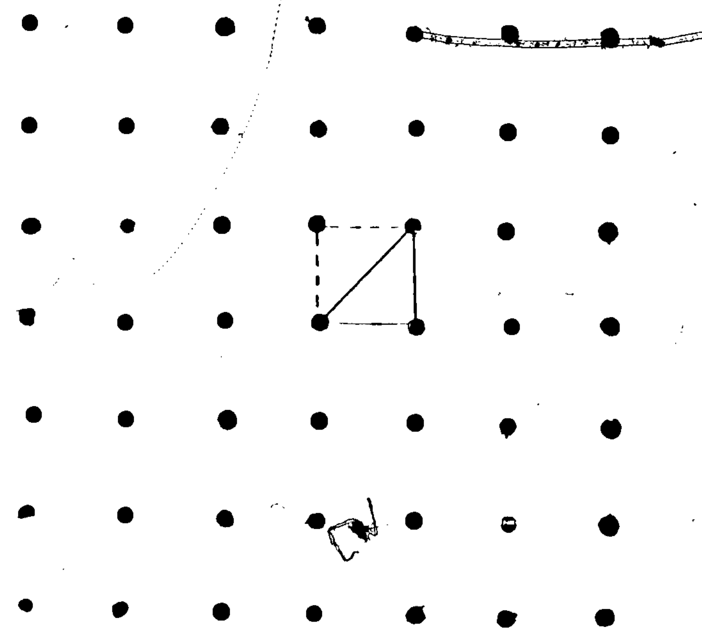
DITTO MASTERI



Now that you can find these areas, can you give the number of square units in the following figure?*

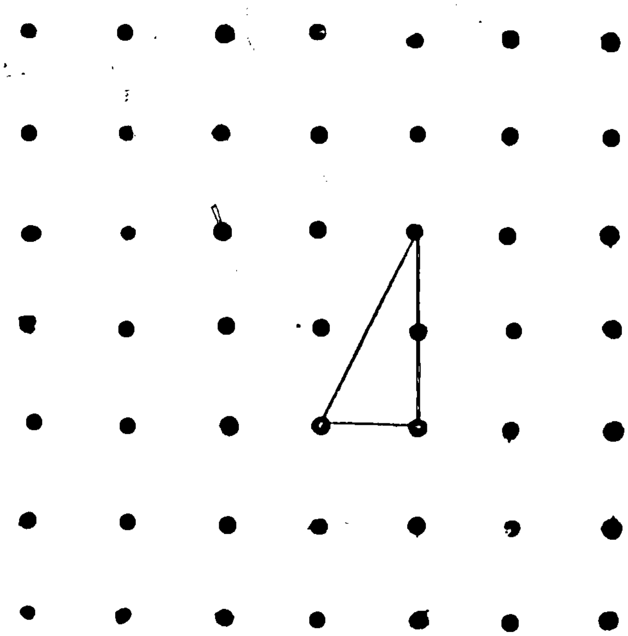
SUGGEST SEVERAL OTHER EXAMPLES FOR THE STUDENTS TO COMPLETE (STAY WITH SQUARES AND RECTANGLES).

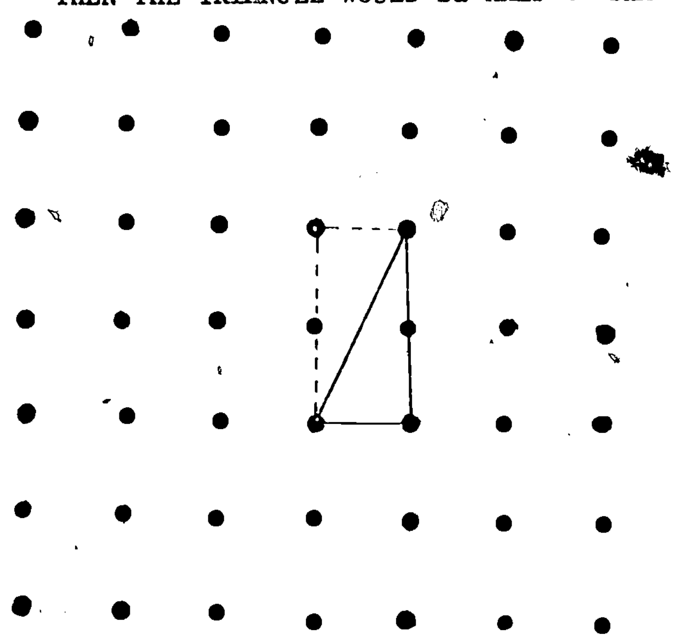




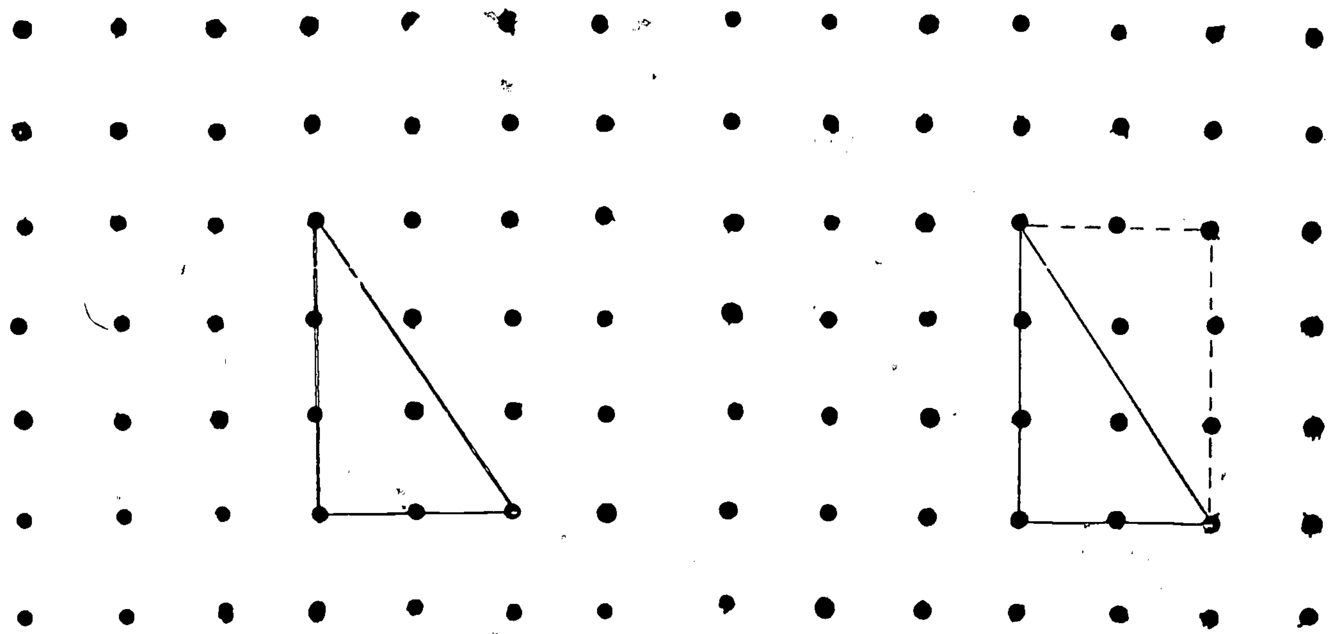
Try to count the area of the following two figures. Once you are through the class should discuss hwo the area can be found.

* THE AREA IS 1/2 SQUARE UNIT, YOU NEED TO GET THE STUDENTS TO UNDERSTAND THAT SINCE THE WHOLE SQUARE HAS AN AREA OF 1 SQ. UNIT THEN THE TRIANGLE WOULD BE HALF OF THAT





* SHOW THE STUDENTS THAT YOU CAN IMAGINE A RECTANGLE WITH AREA OF 2 SQ. UNITS AND TAKE HALF OF THAT (SEE BELOW)

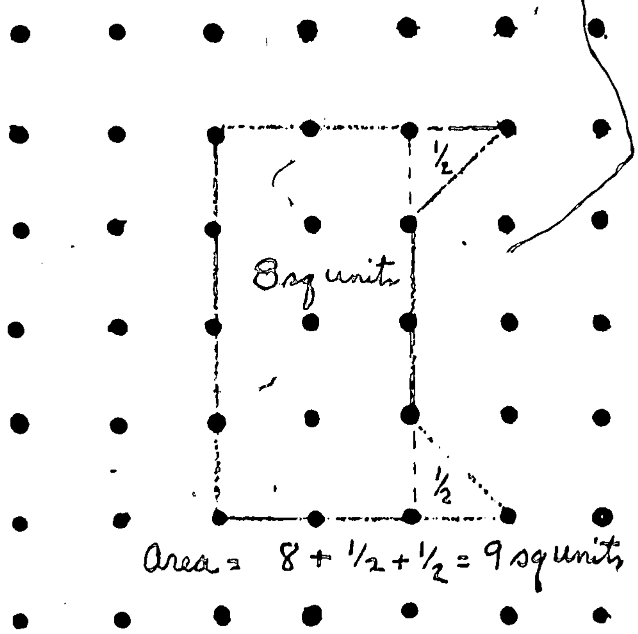


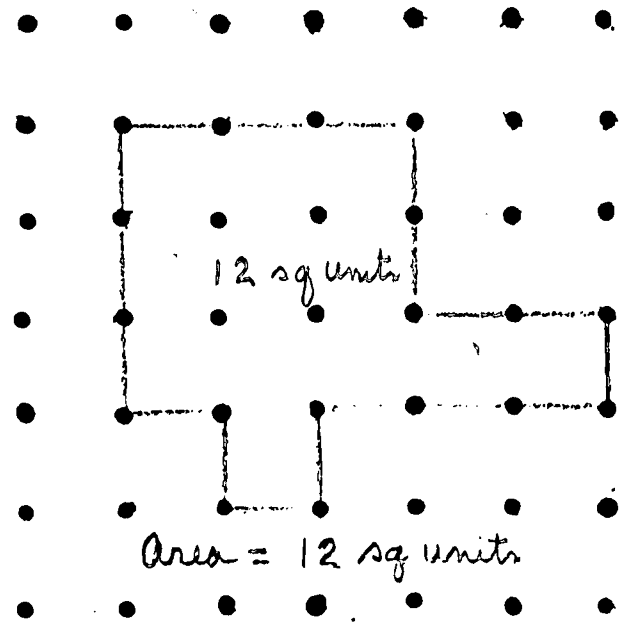
Now find the area of each of the figures in the assignment your teacher has given you.

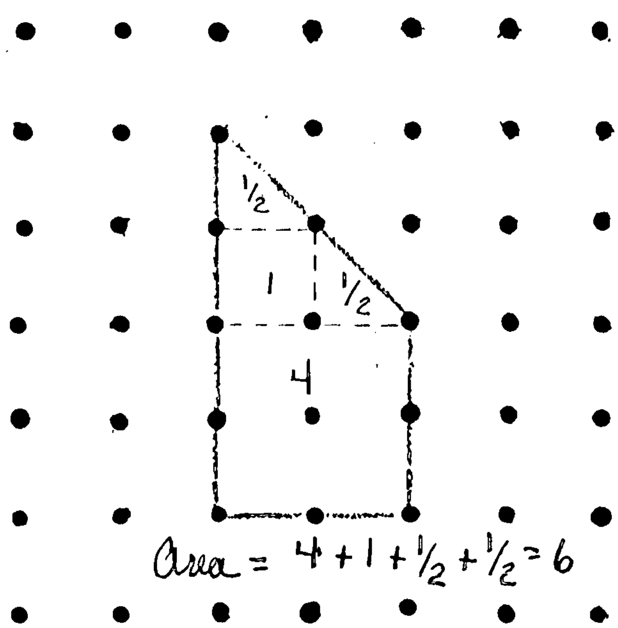
* USE THE RECTANGLE ILLUSTRATED ABOVE AND TAKE HALF OF ITS AREA (3 SQ. UNITS).

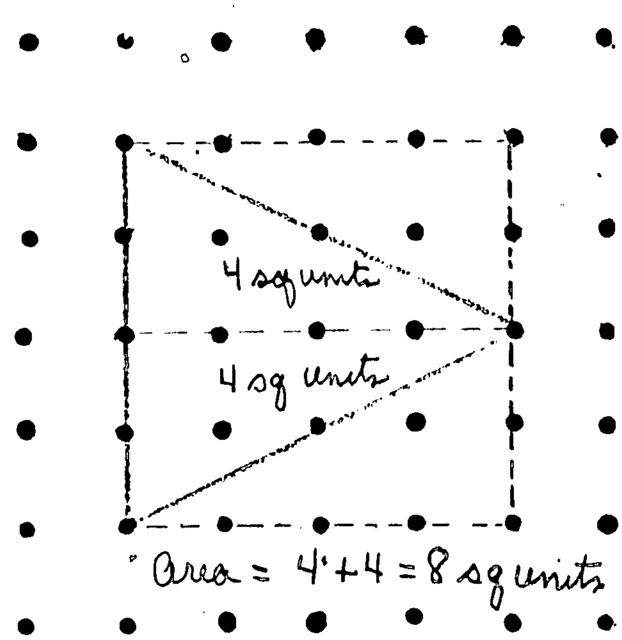
END CLASS HERE

LESSON NUMBER 1 NAME ______________

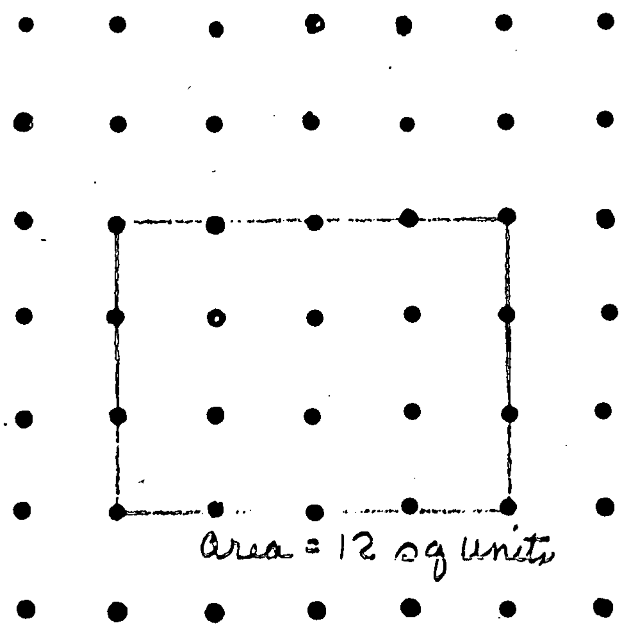


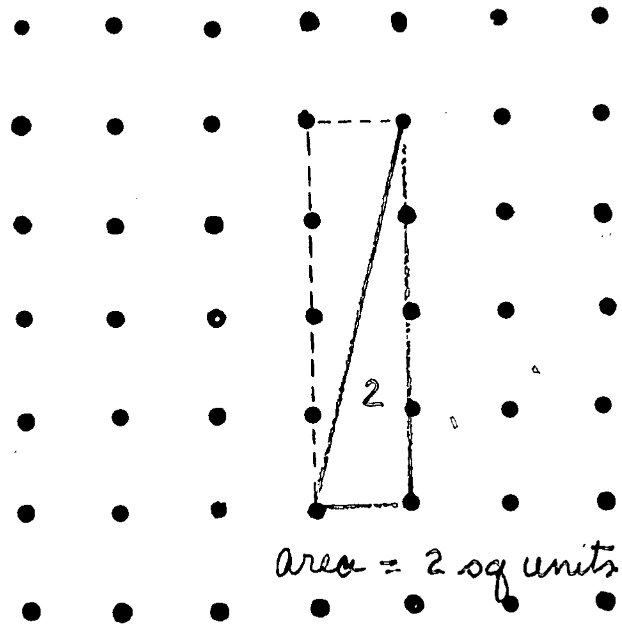


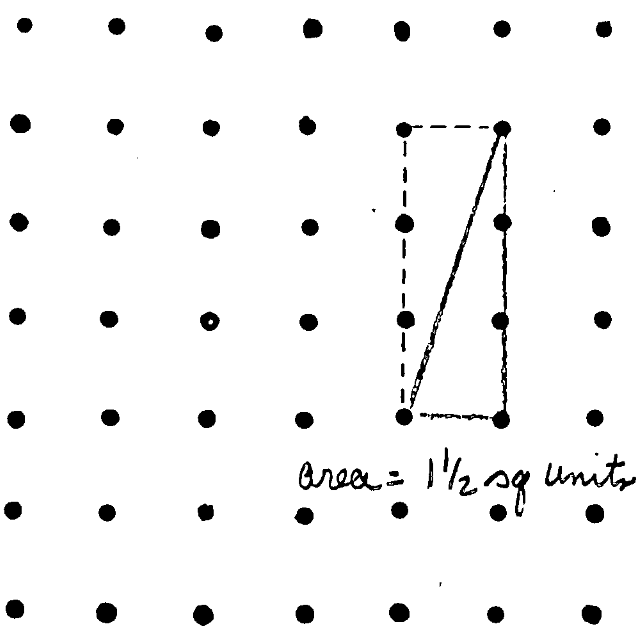


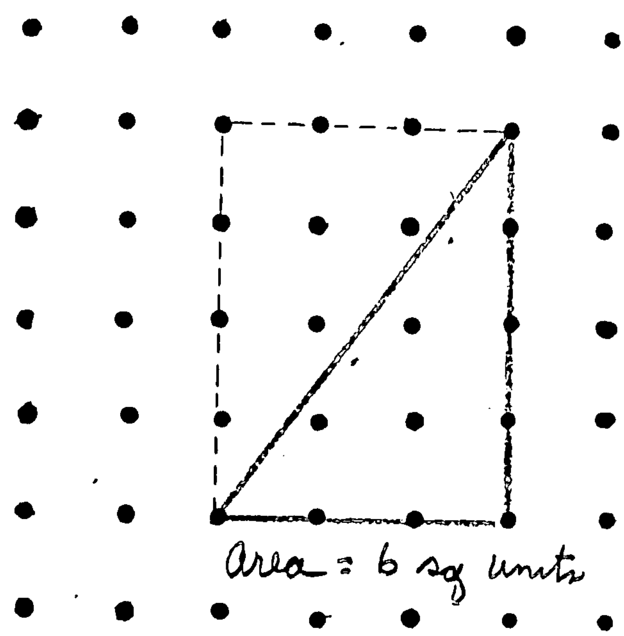


NAME ____________________


area = 12 sq units

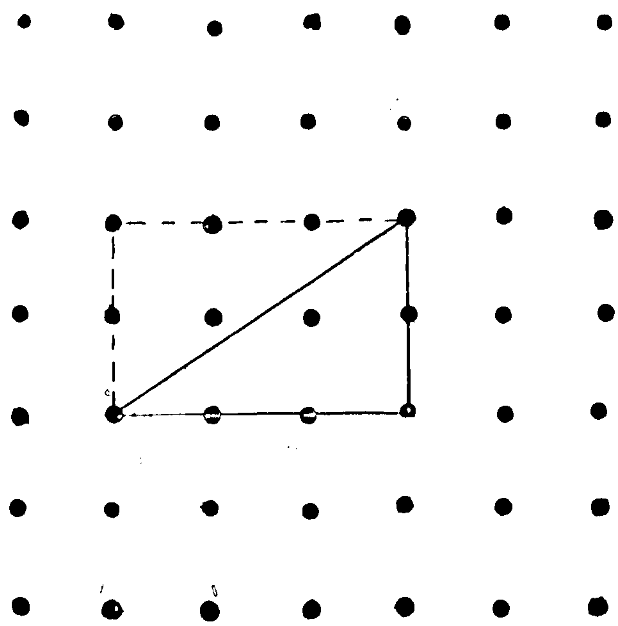

2
area = 2 sq units


area = 1 1/2 sq units


area = 6 sq units

2. AREA (con't)

Now that you have learned a basic way of counting area, lets try something a little bit harder. In the first problems you just had to think of a rectangle or square to get the area, for example:



If we wanted to count the area of the above figure I would do the following:

(a) Draw in or imagine the rectangle as shown by the dotted lines.

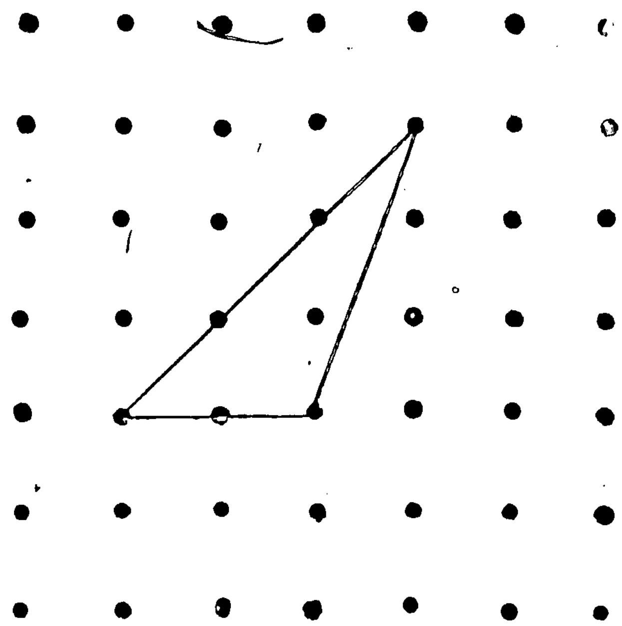
(b) Point the area of the rectangle (6 sq. units).

(c) Since the triangle takes up half of the rectangle it's area is 3 sq. units.

This method can't always be used for example look at the following figure.

* IF YOU HAVEN'T GONE OVER THE HOMWORK, DO SO BEFORE CONTINUING WITH THIS LESSON.

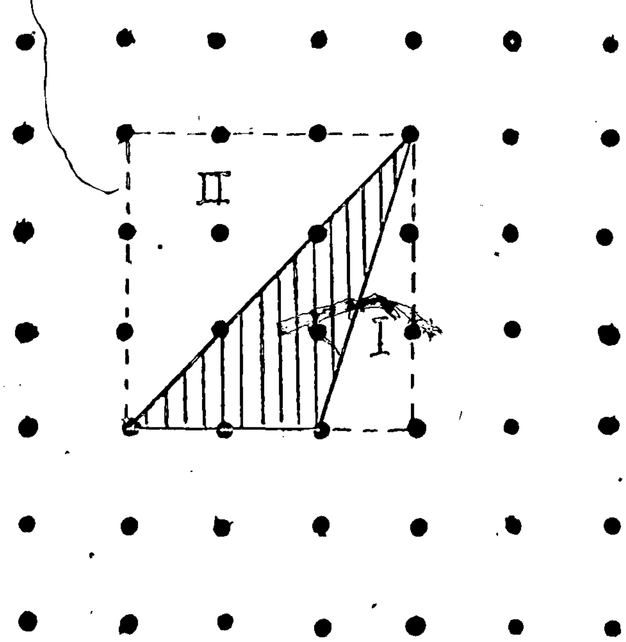
* YOU SHOULD DISCUSS THIS PROBLE MAKING SURE THE STUDENTS UNDERSTAN THE METHOD INVOLVED (NO FORMULAS) USE MORE EXAMPLES IF NECESSARY.



Let's find it's area:

(a) Start again by drawing or imagining a rectangle or square (shown below)

* BEGIN DISCUSSING ADDITIONAL METHOD OF FINDING AREA. THIS IS A METHOD OF SUBTRACTING WHAT WE DON'T NEED.



(b) We want the area of the figure that is shaded. Therefore, we need to find out what part of the square we don't need.

* MAKE CERTAIN THE STUDENTS SEE WHAT PART WE WANT THE AREA FOR.

(c) We don't need part I and part II.

What is the area of Part I______?

Part II______?

(d) What is the area of the square______?

(e) Thus, the area of the shaded figure is the area of the sq.-the area of Part I and II.

(f) What is the area of the shaded figure?

_______*

Now try to find the area of the four practice problems given to you by your teacher. The class should discuss the solutions after each one.

3. Summary (Area)

For this lesson you will be placed in groups of three or four students. This is done so you will have an opportunity to talk about problems you are not able to work. However, you should work as many as you can by yourself. The following assignment will give you a chance to use both methods to find area on a geoboard. Also, there will be some vocabulary you may not know. If this should happen, discuss the words among yourselves. If none of you know what the word means then ask your teacher.

* PART I HAS AN AREA OF 1 1/2 SQ.

* PART II HAS AN AREA OF 4 1/2 SQ. (WE CAN USE OUR FIRST METHOD OF COUNTING AREA)

* SQUARE HAS AREA OF 9 SQ. UNITS.

AREA OF SQ - AREA OF PART I & II

* 9 - 1 1/2 + 4 1/2

= 9 - 6 = 3 SQ. UNITS.

* 3 SQ. UNITS.

AFTER DISCUSSING THE PROBLEMS GIVE THE STUDENTS THE FOUR PRACTICE PROBLEMS. HAVE THEM WORK ONE AT A TIME, DISCUSS AFTER EACH PROBLEM. USE THE OVERHEAD - GEOBOARD TO ILLUSTRATE HOW TO WORK THE PROBLEMS. IF MORE EXAMPLES ARE NEEDED USE THE "OVERHEAD."

HAND OUT ASSIGNMENT NUMBER 2.

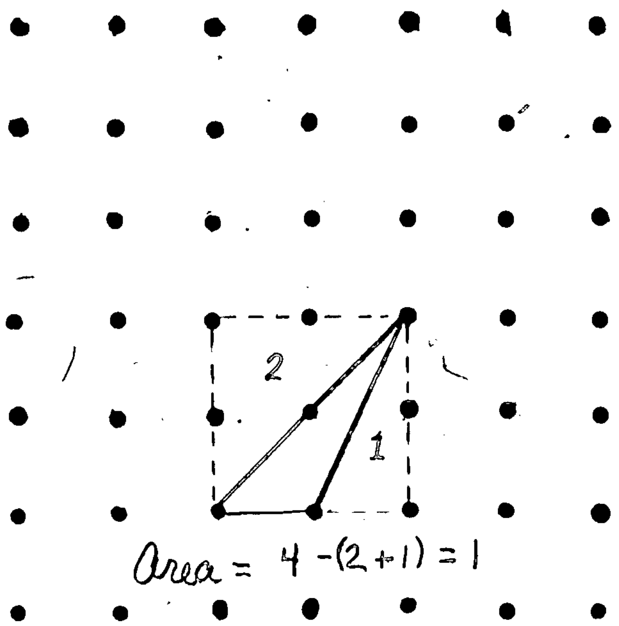
END CLASS HERE.

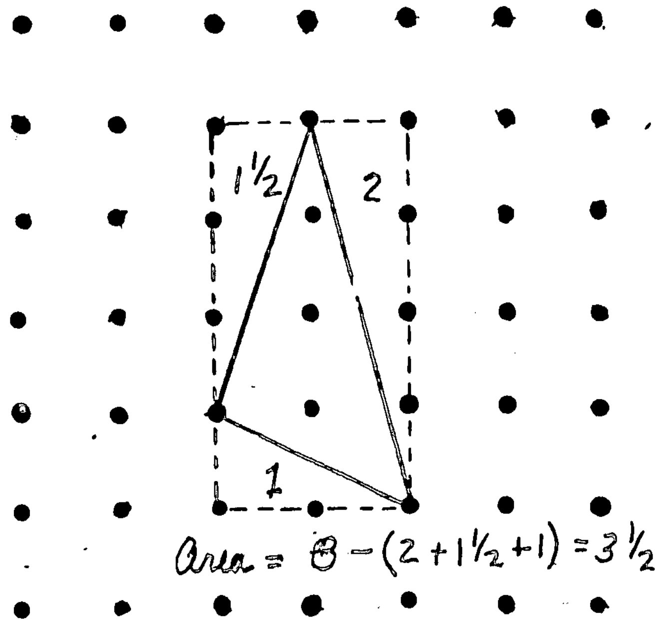
HAND OUT LESSON NUMBER 3. THIS LESSON IS MEANT TO BE A MEANS OF CHECKING TO SEE IF THE STUDENTS CAN FIND AREA OF DIFFERENT FIGURES AND TO ESTABLISH SOME VOCABULARY. LOOK OVER THE ASSIGNMENT AND BE PREPARED TO DISCUSS WORDS THE STUDENTS MAY HAVE TROUBLE WITH.

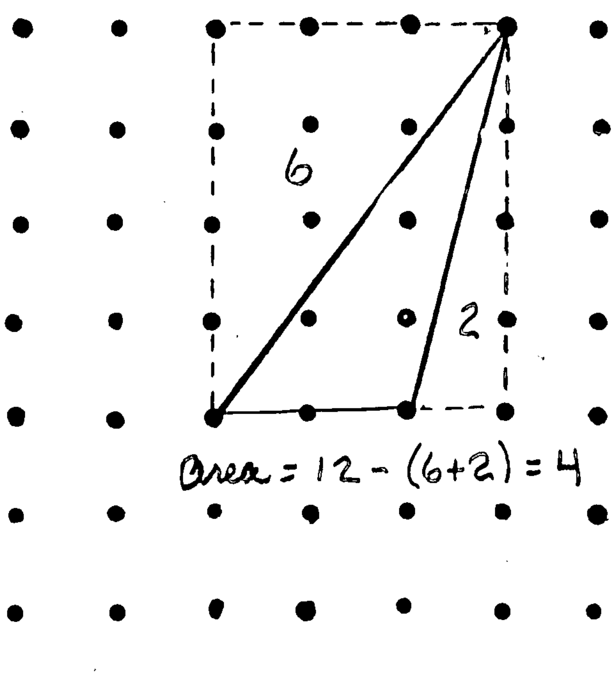
AFTER THE STUDENTS HAVE COMPLETED THE LESSON, CHECK IT IN CLASS AND DISCUSS ALL PROBLEMS THAT GAVE ANY DIFFICULTY.

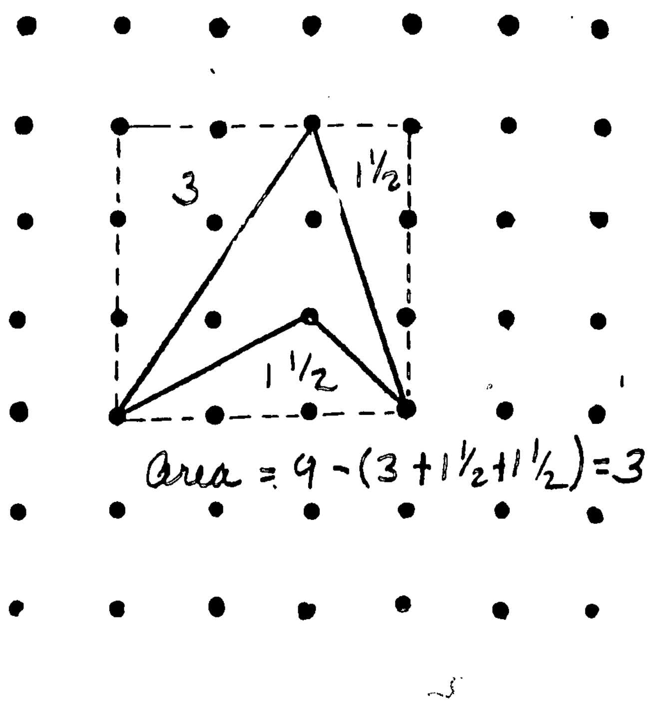
END CLASS HERE.

PRACTICE SET 1 NAME ______________

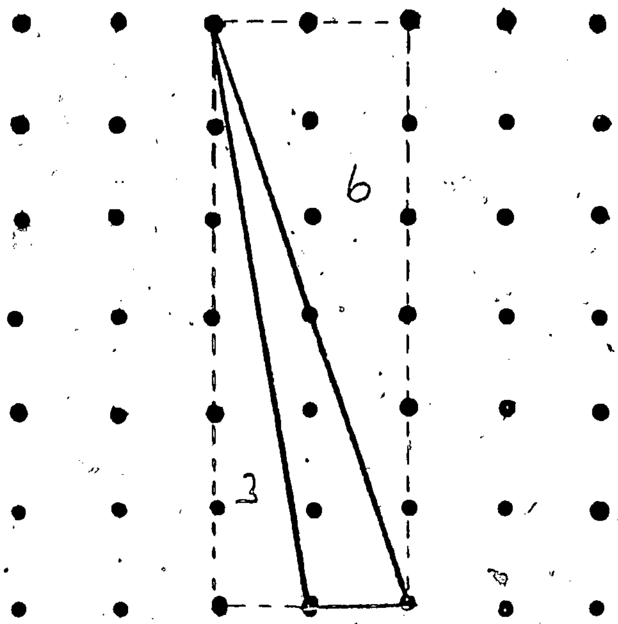




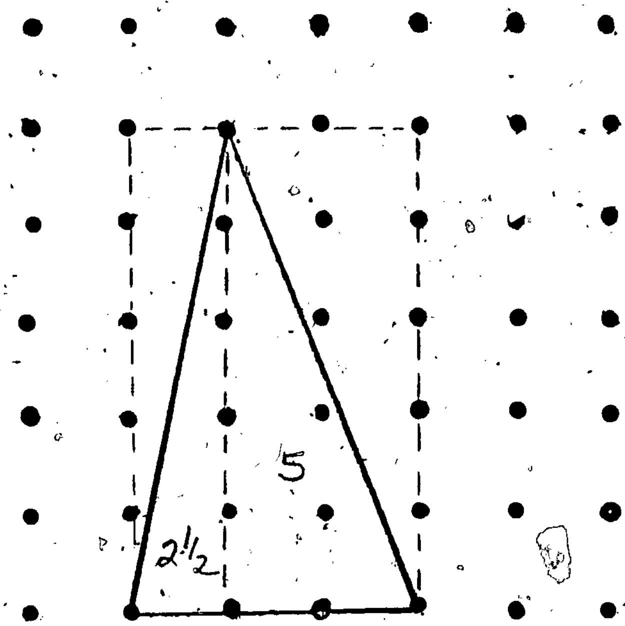




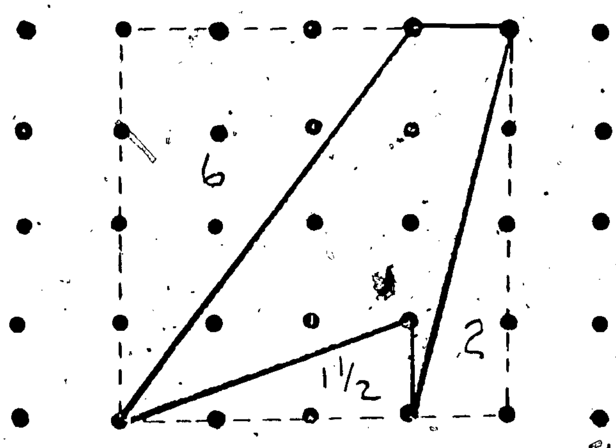
LESSON NUMBER 2 NAME ____________



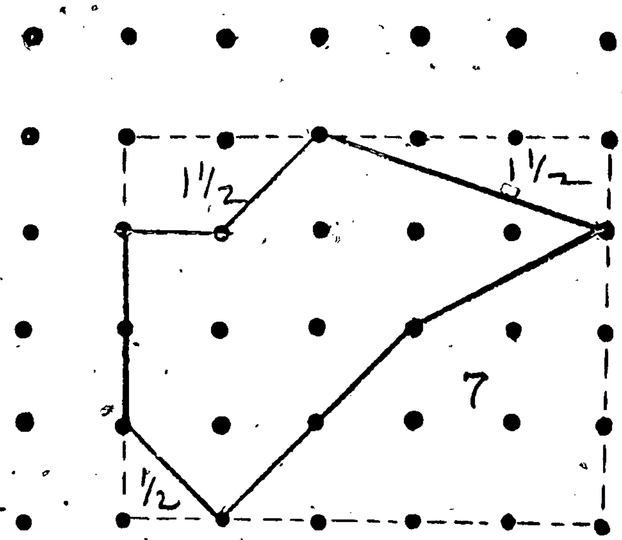
Area $= 12 - (6+3) = 3$



Area $= 5 + 2\frac{1}{2} = 7\frac{1}{2}$

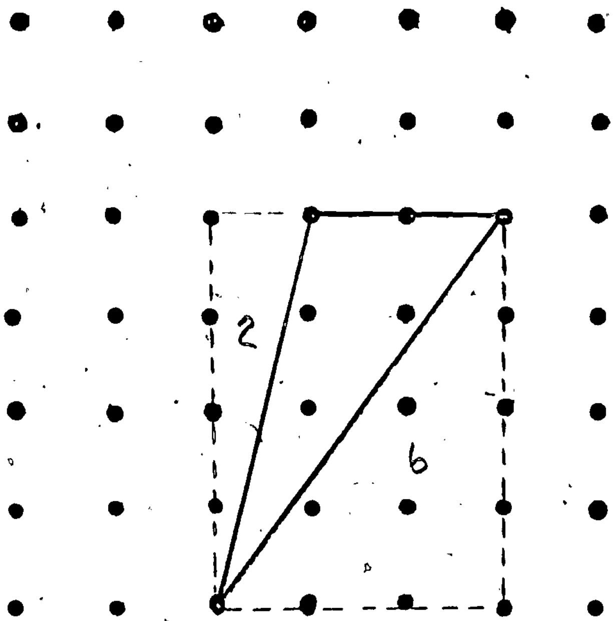


Area $= 16 - (6 + 2 + 1\frac{1}{2}) = 6\frac{1}{2}$

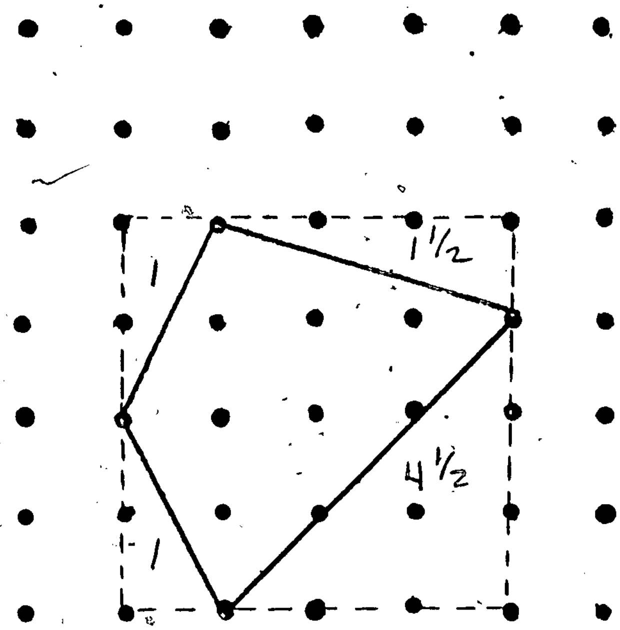


Area $= 20 - (7 + 1\frac{1}{2} + 1\frac{1}{2} + \frac{1}{2}) = 9\frac{1}{2}$

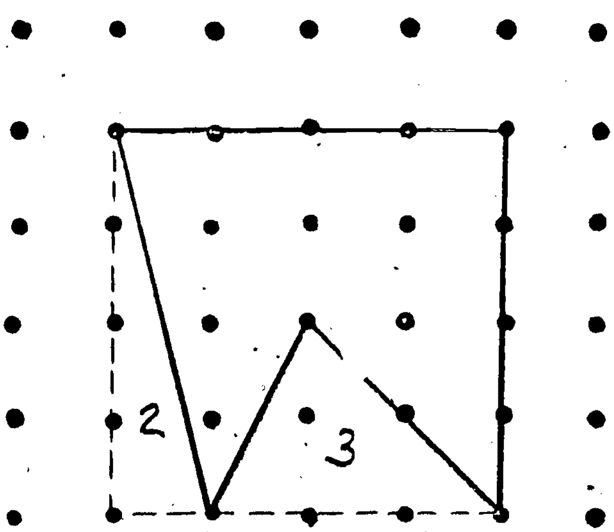
NAME ____________________



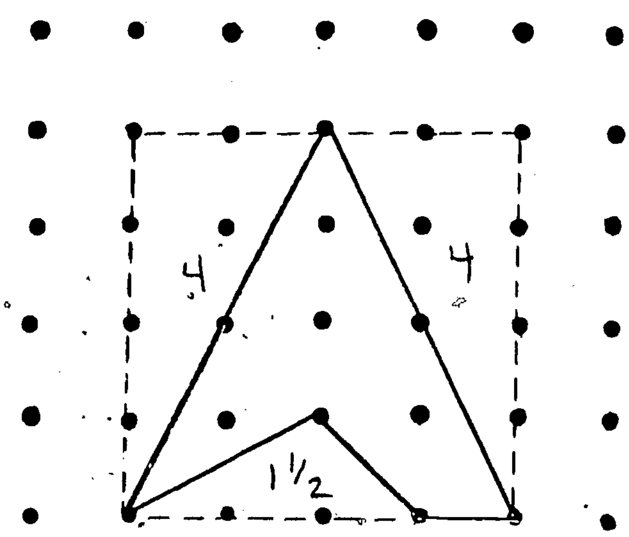
Area = $12 - (6 + 2) = 4$



Area = $16 - (4\frac{1}{2} + 1 + 1 + 1\frac{1}{2}) = 8$



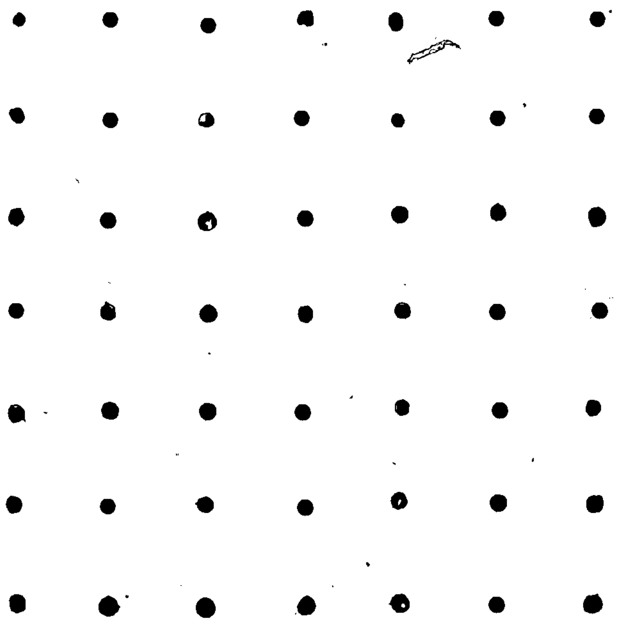
Area = $16 - (3 + 2) = 11$



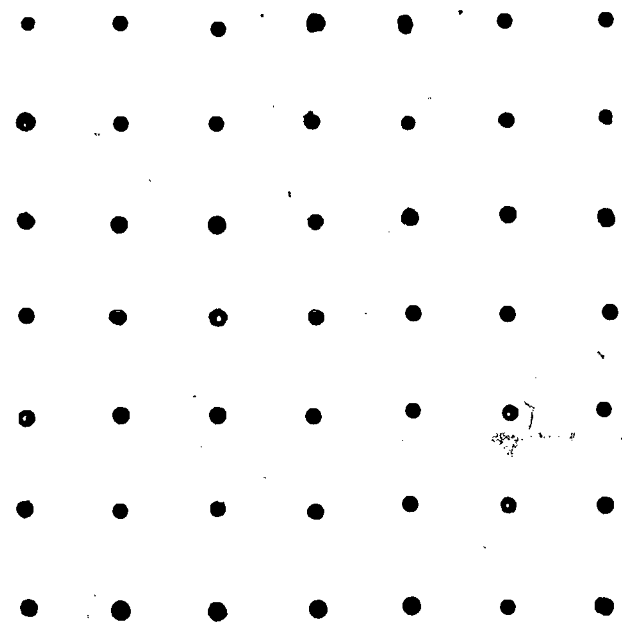
Area = $16 - (4 + 4 + 1\frac{1}{2}) = 6\frac{1}{2}$

LESSON NUMBER 3 NAME________________

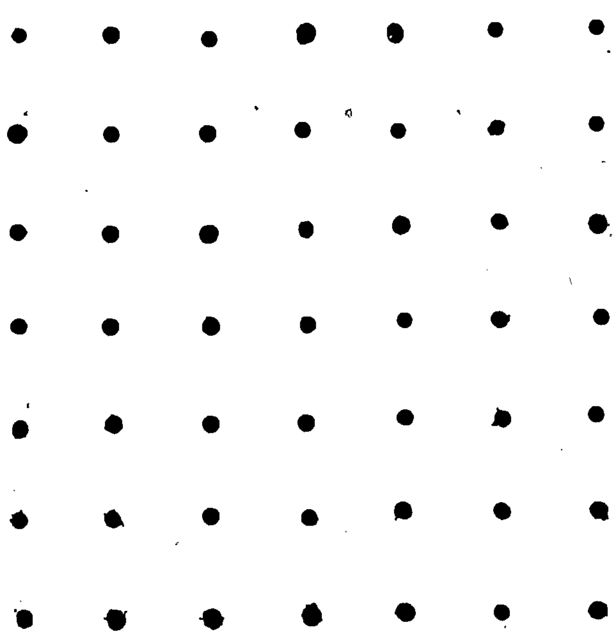
1. Construct a square having an area of four square units.



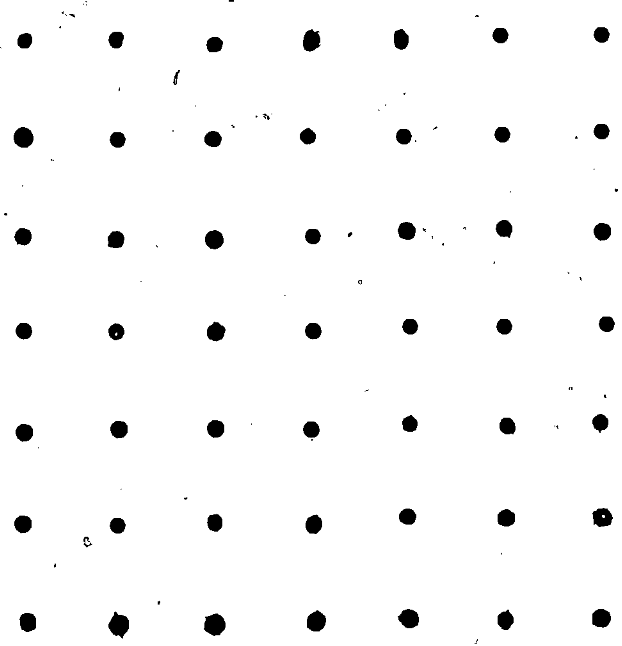
2. Construct a rectangle having an area of 8 square units.



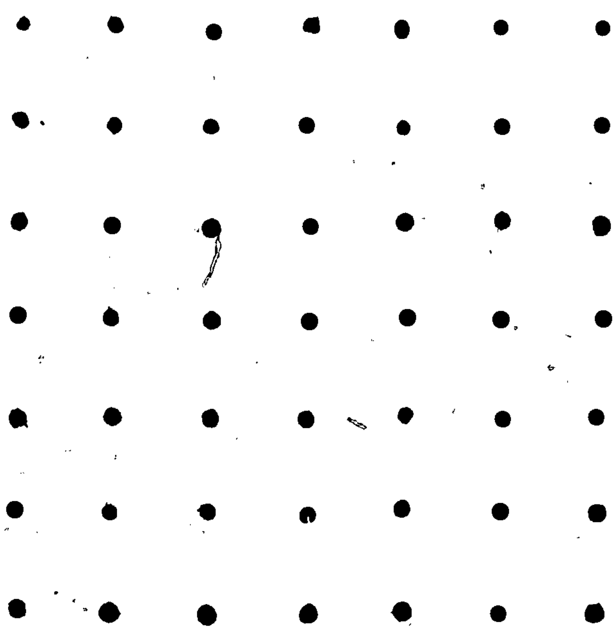
3. Construct a triangle having an area of 6 square units.



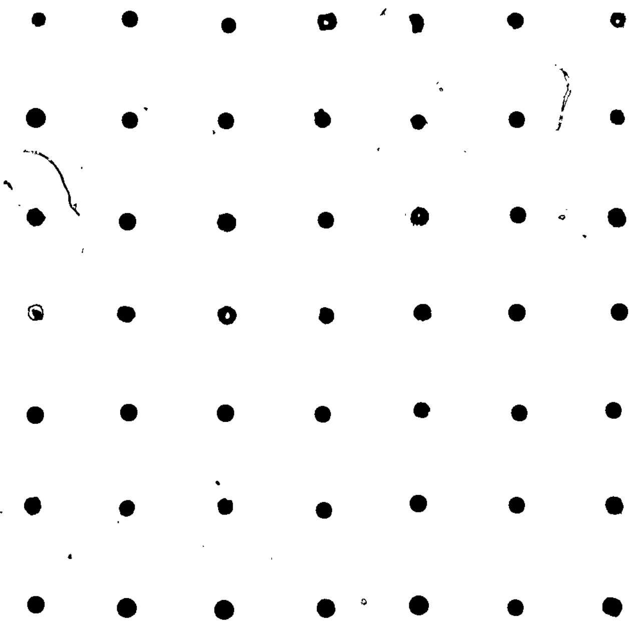
4. Construct a triangle having an area of 5 square units.



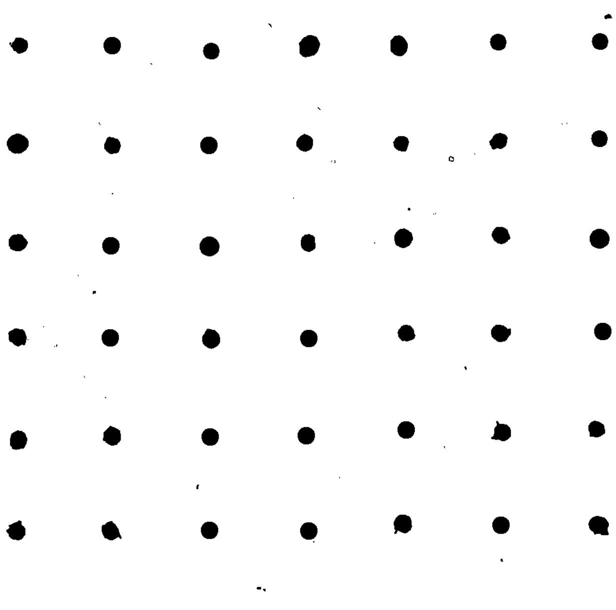
5. Construct a parallelogram having a area of 8 square units.



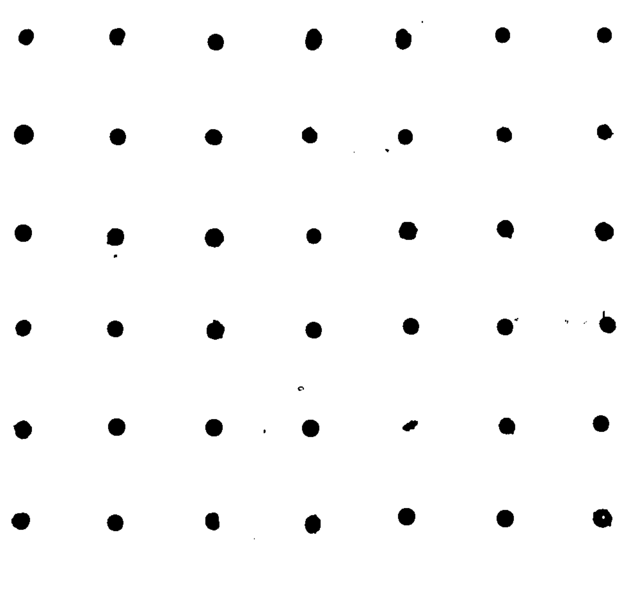
6. Construct a square having an area of 16 square units.



7. Construct a trapezoid having an area of 6 square units.



8. Construct a Triangle having an area of 4 1/2 square units.



4. Area (Formulas)

In this lesson we are trying to develop an easier way to find the area of finding the area of a rectangle.

You are to complete the following problems and then discuss them in class.

You have been given 3 woeksheets to do your assignment, be sure to use these for the problem.

Step 1: Use the following table to record your answers.

GIVE EVERY STUDENT 3 COPIES OF WORKSHEET 1. (YOU WILL HAVE TO MAKE A DITTO MASTER TO PRODUCE THESE.)

* GIVE AN EXAMPLE OF HOW TO COMPLETE THE FOLLOWING TABLE.

Figure	length	width	area in square units
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Step 2: Using the worksheets construct 9 different rectangles. Find the area by counting, record the length, width and area on the table.

Step 3: Can you see any relationship between the length width and area?

THE STUDENT MAY ALREADY HAVE AN IDEA ABOUT THIS FORMULA, HOWEVER THE PROCESS IS IMPORTANT.

* IT MAY BE NECESSARY TO HAVE A CLASS DISCUSSION ARRIVE AT AN ANSWER.

AFTER COMPLETING THIS ASSIGNMENT IT IS RECOMMENDED THAT YOU MAKE UP AN ASSIGNMENT THAT WOULD REQUIRE THE USE OF THE PARTICULARS AREA FORMULA.

5. Area of square (Formula)

This will be an in class discussion

END CLASS HERE

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* THIS PARTICULAR DEVELOPMENT SHOULD BE RELATIVELY EASY. USE THE STRATEGY DISCRIBED IN LESSON 4.

FOLLOW - UP THE LESSON WITH AN ASSIGNMENT USING PROBLEMS REQUIRING THE USE OF AREA FORMULAS FOR BOTH RECTANGLES AND SQUARES.

END CLASS HERE.

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6. Area of a triangle (Formula)

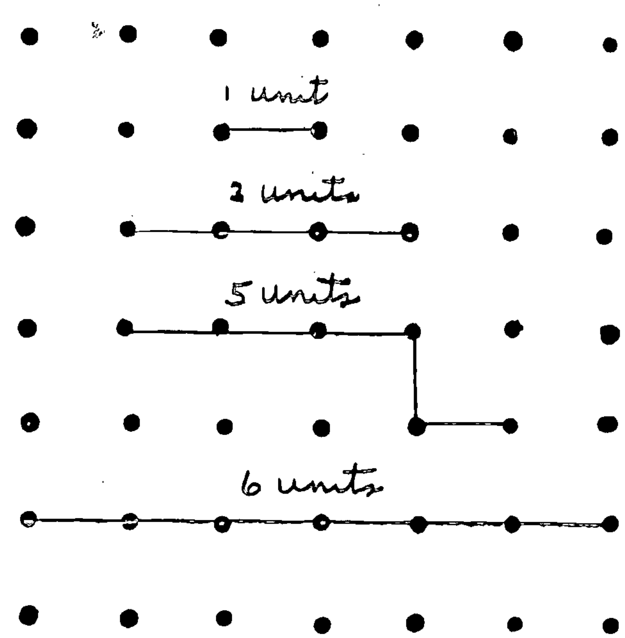
In class discussion

* USE A DEVELOPMENT SIMILAR TO THAT USED IN LESSONS 4 & 5.

7. Perimeter

The perimeter of a figure in units of length. A unit of length on the geoboard or dot-paper is the distance between any two "vertical" or "horizontal" nails. Examples of such lengths are given in the following figure

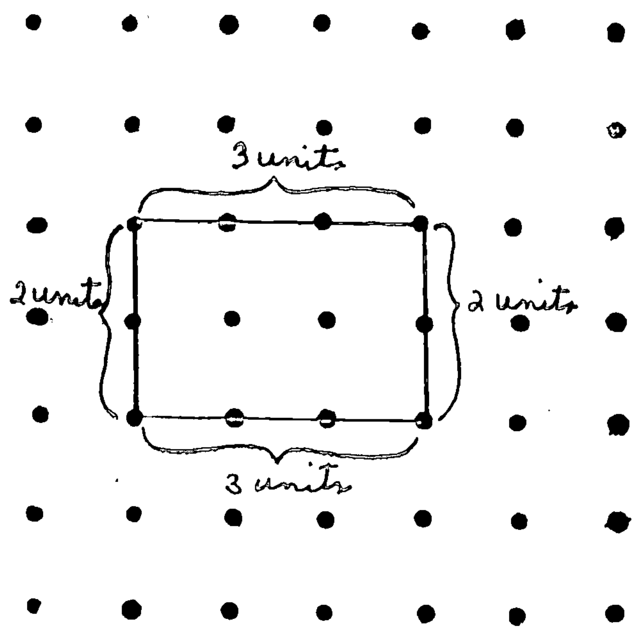
AT THIS POINT YOU MAY NEED TO DEFINE THE TERMS VERTICAL AND HORIZONTAL.



* MORE EXAMPLES MAY BE GIVEN, USING THE OVERHEAD GEOBOARD.

To find the perimeter of a figure is found by counting the number of units of length around a figure.

For example the perimeter of the following figure is 10 units long.



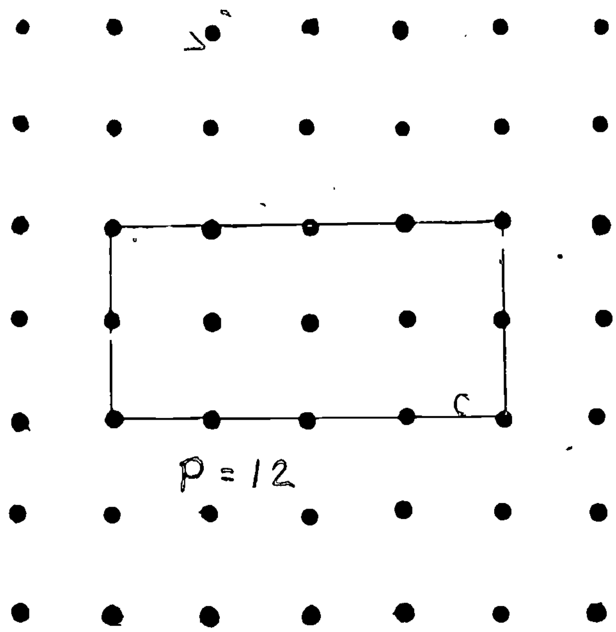
* GIVE THE STUDENTS SEVERAL OTHER EXAMPLES OF SQUARES AND RECTANGLES AND THEIR PERIMETERS.

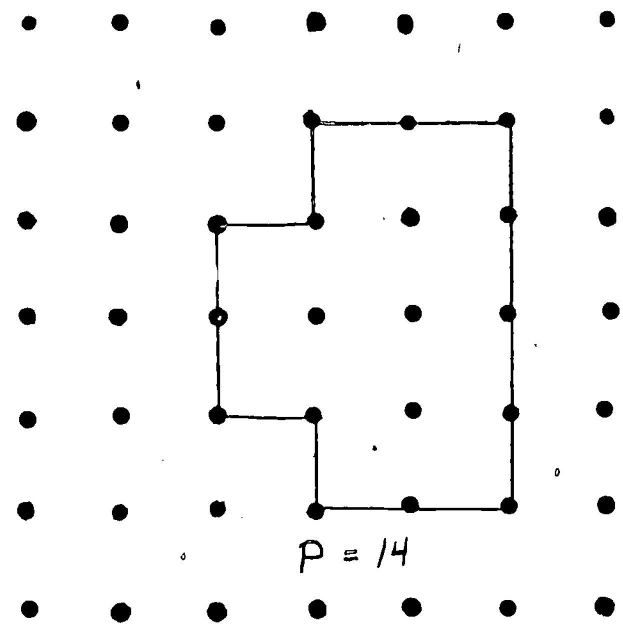
AFTER AMPLE DISCUSSION HAVE THE STUDENTS WORK LESSON NUMBER 4 ON THE FOLLOWING PAGES. LEAVE TIME TO DISCUSS THE PROBLEM IN CLASS.

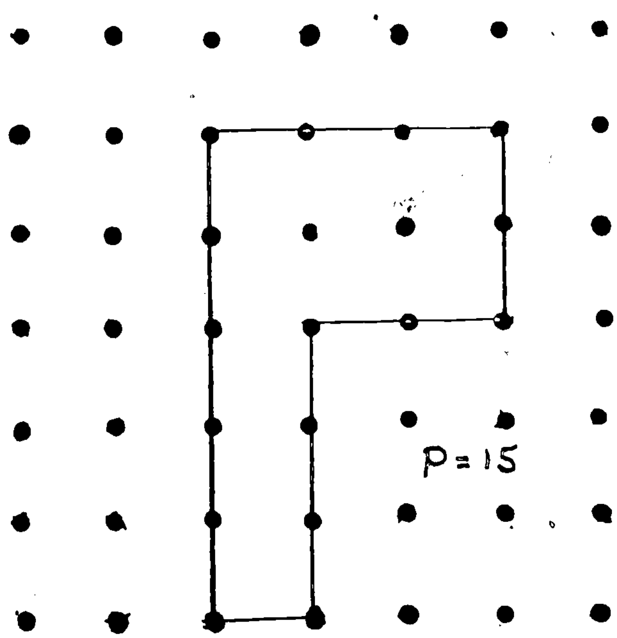
END CLASS HERE

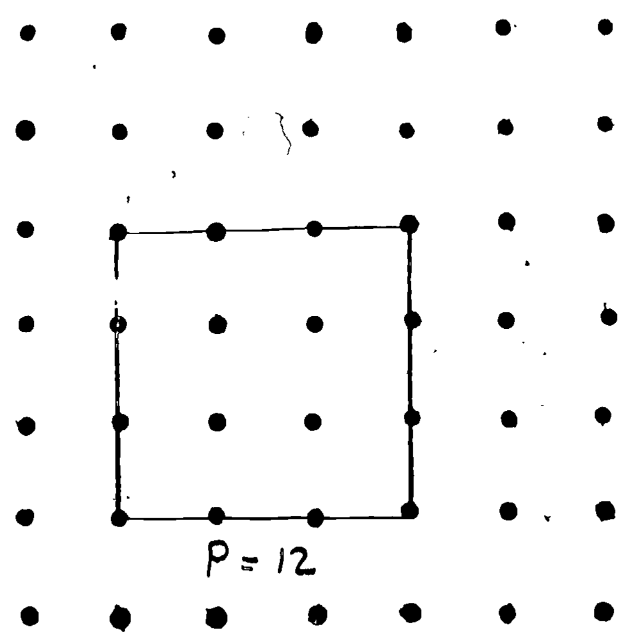
THE NEXT LESSON SHOULD BE A FOLLOW-UP ON PERIMETER. YOU SHOULD DEVELOP A LESSON THAT WILL USE THE PERIMETER OF OTHER FIGURES, SUCH AS, TRIANGLE, PETAGONS, ETC. THIS CAN NOT BE DONE ON THE GEOBOARD BECAUSE THE LENGTH WILL NOT ALL BE RATIONAL.

LESSON NUMBER 4 NAME ______________









LESSON 4 CON'T NAME ______________