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A Math Program for the Third Grade

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by

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Abstract

Title: A Math Program for the Third Grade

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This is a study of a math curriculum designed for a third grade class in a departmentalized setting. The children in the class were below average in math skills for this school and had little or no enjoyment from math. This paper shows the methods used to geve the children a more positive outlook towards math while also building their skills. The paper includes descriptions of games and extensive samples of work sheets used.

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Chapter I

PHILOSOPHY OF THE SCHOOL

(...) Lower School of Grades One through Three reflects the School's premise that highly intelligent children are different. They learn faster, often read earlier, and are able, at a tender age, to probe deep and far in an intellectually rich environment. Engagement in all the major symbolic modes is encouraged; we give particular attention in the first three years to mastery of essential verbal and numerical skills.

At present, we have nine Lower School classrooms, roughly designated into First, Second, and Third Years. Within the "Years" we have established general objectives of verbal and mathematical competence. Beyond that, all is variety. One First Year class has, as its central subject, the concept of change: in self, in nature, in the surrounding city. Another builds enthusiasm for reading, writing, figuring, for drawing and dancing, in a study of mythologies. A Second Year class cultivates and pursues "minibeasts" in terraria, in field trips along the Bronx River, in Cadman Plaza Park, reading all the while about little animals in fact and in fantasy from Roger Tory Peterson to E. E. White. A Third Year reads, writes, measures and computes with a focus on the requirements of human and animal adaptation

among the Netsilik Eskimos, salmon and herring gulls, and the citizens of Athens and Sparta.

The life of the classroom is rich, warm, and thought-provoking. It is enhanced immeasurably by (...)'s practice of having artists teach the arts. Lower School students are taught music by performers at concert level, visual arts by exhibiting painters and sculptors, and enjoy the regular presence of a poet-in-residence. The _copore sano_ is not neglected; every Lower School child has at least three classes a week in Recreational Arts to exercise, learn sportsmanship and how to use the body in a program which emphasizes lifetime sports and personal commitment. These classes can be augmented by the free, after-school program in swimming and gymnastics.

(...) Lower School offering is clear; we care about children, and it is our special mission to care about intellectually gifted children. Our goal is to cherish and to challenge every child as though s/he were our own.

Chapter II

THE CHILDREN

The thirteen children who have been in my math class this year are there because they have some problems working in math. Although they may score high on I.Q. tests, their performance in class and on standardized tests reveal problems. For some children it may be that they still need extensive experience with concrete materials. For other children, the problem stems from their behavior or their emotional development. Four of the children were originally placed in my class because they were new to the school and it was felt that it would be better to move them to a higher level math group if necessary than to start them out in a group that would be too difficult. Shortly after school began, I recommended that two of these children be moved to more advanced groups. The other two children, G. and K., remained with me as their math ability is similar to the rest of the class.

The children are constantly reassessed and are switched from time to time, so that the group in the middle of the year was not the same as the group in the beginning of the year. C., for example, came into the class at the beginning of October. By Christmas, it became obvious that it would be best for J., who was having problems concentrating, to try

another class based mainly on work with concrete objects. M., who seems to work better with pencil and paper, moved into my class from the class J. went into. I. moved in the middle of February into a slightly more advanced class.

The children, almost without exception come from homes where both parents have been to college. Many of the parents have advanced degrees. The parents' occupations include lawyers, college teachers, authors and designers. Except for G., all of the children would probably be classified as upper-middle class. G.'s parents are officers in the Salvation Army and I am not sure where that places him.

Only four of the thirteen children who have been in my class have siblings. Of these four, two are so much younger than their siblings--ten or more years--as to be almost only children. Only I. and K. are close in age to their brother or sister.

TABLE 1: Personal Information

Name	Sex	Birthdate	I.Q.	Siblings	Order in Family
A	M	10/19/70	140	None	Only Child
B	F	1/15/71	143	Two	Youngest
C	M	1/16/71	152	None	Only Child
D	M	4/28/71	138	None	Only Child
E	F	9/14/70	141	None	Only Child
F	F	3/13/70	165++	None	Only Child
G	M	7/23/70	127	None	Only Child
H	F	12/23/69	132	Two	Youngest
I	M	3/27/70	143	One	Oldest
J	M		136	None	Only Child
K	F	4/18/70	131	Two	Middle
L	F	12/27/70	151	None	Only Child
M	F	11/13/70	155	None	Only Child

TABLE 2: Standardized Test results, Grades 1 & 2

Name	Grade 1 Percentile Public/Private	Grade 1 Stanine	Grade 2 Percentile Public/Private	Grade 2 Stanine
A	44/12	5	87/44	7
B	86/42	7	84/40	7
C	60/18	6	97/77	9
D	44/12	5	92/56	8
E	36/5	4	90/51	8
F	92/56	8	84/40	7
G	-	-	-	-
H	90/48	8	71/26	6
I	80/36	7	82/36	7
J	-	-	-	-
K	-	-	-	-
L	53/15	5	58/16	5
M	96/71	9	71/26	6

TABLE 3: Standardized Test Results, Grade 3

	Concepts		Computation		Problem-Solving		Total	
Name	%-ile	Stan.	%-ile	Stan.	%-ile	Stan.	%-ile	Stan.
A	90	8	85	7	99	9	95	8
B	75	6	45	5	60	6	60	6
C	85	7	50	5	70	6	70	6
D	80	7	45	5	60	6	65	6
E	55	5	60	6	30	4	50	5
F	80	7	25	4	55	5	60	6
G	55	5	5	2	55	5	45	5
H	65	6	20	3	35	4	40	5
I	85	7	80	7	85	7	85	7
J	80	7	50	5	99	9	80	7
K	40	4	50	5	45	5	45	5
L	95	8	75	6	85	7	90	7
M	--	-	--	-	--	-	--	-

"A."

A. is a small, thin, white male of 8 years. He is an only child; his father is a lawyer and his mother is a social worker who has chosen not to work. A. is an attractive child with a mischievous smile. His blond hair is cut short and stands up in back in a cowlick. He speaks in a slightly high-pitched voice that can be heard distinctly in all parts of the room. He talks rapidly and frequently turns away before he gets a reply.

He is very volatile and will erupt in anger over the tiniest incident. For example, since the children come for math from other rooms, I keep their math books in my room. A. and a friend keep their math books on a separate shelf. One day, he found a third math book on "his" shelf. He was quite angry; his face was flushed, his eyes were flashing, his mouth was set, tight-lipped, as he came storming over to me. He said in an accusing voice, "Somebody put their book on my shelf!", then he turned, went back to the shelf, picked up the book and was about to throw it on the floor when I stopped him. He looked at me with teary, angry eyes and said, "It's not fair! That's my shelf. Their books don't belong there!" With a sulky look, he put the book on the correct shelf and went back to his seat.

Another time, I reminded him to put away the Unifix cubes he had been using. He said with indignation, "I don't need them any more. I don't have to put them away!" His face turned red and he sat there, staring at me and not making any effort to put the cubes away. When reminded that everyone was expected to put things away, he jumped to his feet and started screaming that I was unfair. He picked some cubes up and threw them into the box with such force that they popped out again. He started kicking the box. At that point a friend came over to help him and with that, he put away the cubes.

His anger never seems to stay with him. After an outburst he resumes whatever activity he was working on with friendliness and good humor.

A. picks up concepts very quickly. In the beginning of the year, I started the children working with four-place numbers. A. was one of the few children who were able to understand the concept of place value. He was able to order the numbers as well as read them. In all of the games I have introduced, A. has consistently been one of the first to understand how to play.

"B."

B. is a thin, blond child of average height. Her face is very thin and is dominated by her large eyes and prominent upper teeth. She is one of the youngest children in the class. Her father is headmaster of a Brooklyn independent school (not the one his daughter attends) and her mother is a student working for her BA. B. has a nineteen year old sister who is away at college and a seventeen year old brother who is in high school.

B. is never still. Even when she is sitting at her desk, her fingers are tapping or pushing a pencil, her feet push against her chair, her desk, her neighbor's chair. Her eyes move in quick glances around the room and her tongue flicks in and out as she watches one or another child. When she wants to share a story with the whole class, her body twists and turns and she stares over the other children's head. She invariably starts her narration with, "We.., you see, uh, 'cuz..." and when she has finished her face lights up in a big smile.

When B. is frustrated by something, she reacts by striking out at another child, by shrieking out some provocative statement or by some physical action such as pushing chairs or desks around. Usually her action is not directed toward the object causing her frustration, so it is not

always easy to know where the problem is.

B wants to know the answers. If she does not understand something she will say, "I don't understand this--what's the answer?" She resists any attempt to help her discover a way of solving the problem herself. However, once she is given the answer, she will work through the problem and will go on to solve similar problems.

B. and A. are close friends who work together quite well most of the time. They complement each other. Each will help the other understand the work if there is any problem. When they disagree about how to do something, they come to a teacher and calmly accept the teacher's advice or ruling.

When I first introduced "Chip-Trading", B. was a little confused, but A., who had played before, helped her until she could play it. She would not accept help from anyone else, nor will she even now.

"G."

G. is a tall, light-haired child with blue eyes and long, thick lashes. His parents are Salvation Army officers and he is their only child. G. speaks in a pleasant voice, but he has some speech problems, as well as some immature speech patterns. He lisps and he does not pronounce the letter "r" correctly. The other children do not tease him about his, but they do try to correct him, especially when he says things like, "I don't have no pencil." He accepts this with good humor.

He was admitted to the school this summer and has no standardized test results on record (other than the New York State PEP test I administered in November). He was originally placed in my math group as a trial; if the pace was wrong for him, he could always be moved, but without knowing his ability, he could not be placed in a faster group. This group turned out to be the correct place for him.

He performs well when not under pressure, but he is anxious and does worse on tests than his class work indicates. For example, he did only two out of three sections on the PEP test. He looked at one section of the test, then folded his arms and said he could not do it, although he had solved problems similar to many in that section before. When we play any oral games, he does not participate. He

never guesses the rule in "What's My Rule" nor does he come up with an answer when I ask the children to do some mental arithmetic such as "add 3 to 4, double it, subtract 4." He was also unfamiliar with Unifix cubes and still cannot use them to combine sets. On the other hand, when I started some games using co-ordinate geometry, he was one of the first to come up with a winning strategy for "Four in a Row Tic-Tac-Toe".

He gets along well with the other children and has successfully adapted himself to their style of play and work. He had previously attended a public school in a small, upstate town and when he first entered this class he was quiet, clinging to the teachers a lot. The class as a whole is very verbal and G. did not take part in class discussions. He also did not play games by the rules although he seemed to know them. For example, when he first played chess with some of the other children, he would sometimes move two pieces or move a piece illegally. When it was pointed out to him, he would argue that it was "OK" because he wanted his piece there. The game would usually end in an argument. He kept playing like that for about a month, until it was hard for him to find a partner. In order finally to get someone to play, he had to promise to play by the rules. He has been playing correctly since then.

"K."

K. is a child of mixed racial background. She has light skin, dark hair and eyes. She is one of the largest as well as one of the oldest children in the class. Her father, who is white, is from England and owns his own business. Her mother, who is Jamaican, has worked as a fashion model, but is not working now as she is expecting her fourth child in the spring. K. has an older half brother of 17 and a younger full brother of 3.

K.'s parents place a great emphasis on appearance. K. usually comes to school in frilly dresses, white tights, and patent leather shoes. K. will at times come in her preferred clothes of blue jeans, polo shirt, and oxfords, but her parents do not approve.

K. is new to the school. Her parents were told by her last school that perhaps she would do better in another school, so they enrolled her here this year.

She does not seem to know how to get along with the other children. She is the victim of their jokes and taunts, but she is not the innocent victim. She provokes them by staring at other children until they complain, by copying from them, or by calling out when she thinks someone is not behaving.

Her number skills are among the best in the class.

When I gave a series of timed quizzes on the addition facts, K. was one of only two children to do them all correctly. However, her grasp of logic and concepts is poor. She needs a great deal of individual attention in order to finish any assignment. It may be that her lack of self-confidence prevents her from looking at a problem and seeing it as something she can do. I once sent home a sheet with the addition facts for the numbers 0-9 to be filled in. It was in a table form and the children had never used this precise form before, although I had given them single rows to finish in the way this table was to be filled in. Every child but K. did it easily. The next day, I showed her the similarity to the other form by covering all but the first row. She did the first row easily, but could not do the second row. She started filling in the same numbers as she had in the first row. She was finally able to fill in some of the rows, but she never indicated that she saw the pattern the numbers were making.

During the part of the period used for games, K rarely plays, even with a teacher. She will take crayons and paper and make pictures of a house with a flower or tree. She sits near the other children and points out mistakes in their play, but will not join in more than that.

Chapter III

THE CURRICULUM

This is my first year teaching full time, my first year teaching third grade, and my first year as a subject teacher. When I was hired, I knew I would be a third grade assistant and that I would be involved in the math program, but until a week before school started in September, I was not sure how I would be involved. Nothing specific had been said. Just before school started, I met with the director of the lower school and she explained the math program for the coming year and my role in it. In addition to my regular classroom teaching, I would be getting a class of 13 children that would be meeting with me 45 minutes a day, 4 days a week. It would be up to me to decide how I would use that time.

This year, the school decided to departmentalize math in the lower school because many children did not function as well as expected in middle school math. There were sixty children enrolled in the third grade at the beginning of the year. They were divided into five groups based on math ability and all would meet with a special math teacher four times a week during a math period. Three of these math teachers were from the middle and high school math department. They would be working with the top three groups. Because it

was felt that the children who were not doing as well in math needed more concrete experiences, the two lowest groups would be working with lower school teachers. I was given the next to the lowest group and the lowest group was given to another third grade teacher. I had to cover the minimum skill requirements set by the math department and I had to teach the children to use a textbook, but I could do so with any method and any program I wanted.

Math was scheduled four times a week, Monday and Friday from 1:10-1:55 and Wednesday and Thursday from 9:35-10:20. Because the class met for only 45 minutes, the most would have to be made of every period. At the same time, these were only seven and eight year old children and they would not always be ready to fit into such a schedule. I have attempted to provide enough different activities to stimulate their interest in math and at the same time, build their skills.

After I learned what I would be doing, I set some goals for the year. My major goal would be to help the children become comfortable with math. I felt two things were important in accomplishing this. One, their skills should be strengthened as much as possible and, two, they should have opportunities to find fun with math they could do.

In order to accomplish what I wanted, I have organized each class session into three periods. The first 15 to 20 minutes I use for whole group activities or games. I then have the children do individual skill work for about 15 minutes and as they finish, they have time for math and skill games alone or in small groups.

After deciding on my goals and my timing, I took a survey of the equipment, games, and supplies available. I found eleven sets of Cuisenaire rods, a huge amount of Unifix cubes, two dozen 12-inch rulers, one 1-meter stick, and a number line for the wall. There was a large supply of the textbook, Elementary School Mathematics[1], including a Teachers' Edition. There was also a good supply of math games such as chess and checkers, Mastermind, Cala, (the African stone game), Spacelines (three-dimensional tic-tac-toe), and a metric measurement game, Centimetre by Centimetre. In addition, there is virtually unlimited access to a duplicating machine, so that I can prepare work sheets as needed.

Each child does skill work from either a work sheet I prepare and put into his/her folder or from an assigned page in the text. The work from the text goes into a soft-back composition book. I had thought at first I would give the children several pages of skill work at a time and let

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[1]Robert E. Eicholz and Phares G. O'Daffer, Elementary School Mathematics (Menlo Park, California, 1971).

them work on the pages as fast as they wanted. However, because of the nature of the children and of the class, this did not work. They were all intimidated by having so much work and most of them demanded directions on every page. Since the class is very homogeneous, this meant they were all doing virtually the same sheets and I was answering the same question twelve times a period. I soon decided to give them no more than two sheets at a time--one to reinforce the skills we were working on and one just for fun.

When it came time to actually set up a program, I decided that since both the text and the math department's skill sheet started with a review of place value, I would start with place value. After assessing their understanding, I would work from there. At first, everything was fine. Each child seemed to understand that 29 was 2 groups of ten and 9 ones. They all knew that 100 came after 99, but they began to flounder when asked how many groups of ten in 329. By the time the book was into thousands and ten thousands, all but two children were lost. The two who could order numbers with five digits could order numbers with seven or more digits. Because of the policy of the school to group the children homogeneously, by the end of the second week I realized these two children belonged in a more advanced class.

The rest of the children were demoralized by this experience with place value. I had assumed from their responses that they understood more than they actually did and that they could make and use generalizations about our number system. I learned that I would have to go slower and give them more experiences. I learned that their verbal abilities were far ahead of their abilities in logic and math. New skills would have to be introduced slowly and step by step.

I thought, for example, that learning to use a textbook was a simple process. Open the book, find the page, find the problem, copy it, then solve it. The children taught me it is not so simple. Just opening the book required that they keep the page number in mind while comparing the number in the book and turning the pages forward or backward. Since some of them did not have a complete understanding of place value, they were not always sure which way to turn. After they found the correct page in the text, they had to open their notebooks to the correct page. Then the layout of the book had to be learned. Each set of problems had a number and each problem had a letter. They had to learn to read the number in the margin and associate it with a letter so that when told to do problems 3A, B, and C, they knew which ones they were. When it came time to copy the problem,

many children could not set them up correctly. They did not know how to line up the numbers one under the other. Since they could not keep the whole problem in their head, they wrote digit by digit and frequently copied the numbers from two different problems.

The problems the class was having with both place value and learning to use the textbook began affecting the mood of the children. Frustration was making them more and more unruly and so I stopped all work with those two subjects. I would cover place value and use of the textbook, but later and it would be done differently.

I planned, instead, a series of work sheets and activities around geometry and we spent a week with that. The unit was essentially from the text, but the children explored on their own without a book. We started with some definitions--point, ray, line, line segment, angle, polygon. We talked about the rigidity of various polygons and most of them knew and could show that the triangle was the most stable shape. We looked at forming triangles from other shapes, which led to a definition of diagonals and to drawing diagonals within given shapes. Many children were confused by the definition of diagonal. They insisted a diagonal is a slanted line from one corner of a rectangle to another corner. I did not insist on the use of the word and

they all were able to find the pattern and relationship between the number of sides of a polygon and the number of diagonals witin that polygon.

By the fourth week, the class was running more smoothly. One more child, C., had joined our class after trying and failing to work in two other classes. All of the children were comfortable with the routine and with me. They were enthusiastic about the week we had spent on geometry and I now decided it was time to start work that would lead to exchanging.

From the beginning of the year, some of the children insisted they knew how to "carry", but their work with place value showed a great deal of confusion. Anytime they had a problem which could be done with carrying, I saw further signs of confusion. Given an equation such as 15+7=n, they would use the number line or their fingers and come up with 22. Put the same numbers vertically, $\begin{array}{r} 15 \\ +7 \end{array}$, and someone was sure to answer 31--they reasoned that 5+7=12, so they "put down the 1 and carried the 2." Once a child came up with 13 as his answer. He added the two digits in 12, giving him 3, then he saw the problem had a 1, so he put that down in front of the 3. Even when they answered 22, none of the children could explain why or how in terms of place value of the numbers.

To help the children get a concrete understanding of place value and practical experience with exchanging, I introduced them to the Chip-trading game. I made them each a board using a 9-inch by 12-inch piece of oak tag and divided it into four sections, each 3 inches by 9 inches. Each section was a different color. For markers, we used Unifix cubes to match the color of the section. Within two sessions each child understood how to play and it is still a favorite.

Their skill work at this time concentrated on the addition facts. Most of the children were relying on the number line or their fingers and I feel that it is important that the addition facts be memorized before more complex manipulations of numbers are started. One tool I used was to give each child a set of flashcards to take home and memorize. We also played Bingo and did problems orally to stimulate interest in memorizing these facts. Finally I gave a series of 90-second timed tests, but throughout these exercises, not too much progress was noted.

When the children were very comfortable with Chip-trading and the exchanging necessary, I gave them Chip-trading Record Sheets and had them mark down what the board looked like before a throw of the dice, what the dice throw was and the way the board looked like after the move was com-

pleted. They were, of course, doing multi-base arithmetic at this point, but I never gave them problems to solve as such. For these children at this time, it would have been too confusing.

Instead, I started giving them base-10 sheets where they would have to exchange ones for tens and eventually tens for hundreds. At this point I was not concerned with adding and subtracting but that they understood that if they had twelve ones they could exchange that for one ten and two ones. In doing this, I referred to the exchange process in Chip-trading and every child did it quite easily and naturally. We gradually started adding numbers together and when there were more than nine ones, the children would exchange with ease. What is more, they could all explain why.

Through the use of Chip-trading, the children learned many basic qualities of our number system. They learned to work from right to left--the opposite of reading skills, but essential to math skills. They learned that "carrying a 1" is really exchanging a lot of ones for one ten. They learned to work in columns and they now have a picture with a concrete basis for what is happening.

Subtraction was a problem with a lot of the children. Most of them started off not really understanding that

10-1=9 is related to 9+1=10 or that knowing 9+1=10 will give them the answer to 10-n=9. They could work quite easily with missing addends such as 9+n=10.

The group resisted strenuously any games where the object was to take away things. I finally gave them two sticks of Unifix cubes--each stick a different color. I had them put the two sticks together and then write an addition equation explaining what they had done. Then they had to separate them by color and write a subtraction equation about that.

Because of my success with Chip-trading for addition, I was determined to use it for subtraction. This was much more difficult for the children. Each child needed considerable experience building up, exchanging for a higher un it and then immediately exchanging back to the lower unit. I showed them how to play Chip-trading by starting with a full board, then taking away the number of unit chips shown by the dice until there were no chips left. There was little enthusiasm for either the Chip-trading or the Unifix cube activities, but the children did them.

When the children had some time to get used to subtraction with Chip-trading, I started giving them work sheets that involved exchanging. Once again, there was a reluctance to have anything to do with subtraction. The

Nuffield series states the "'Subtraction' has too often been a mysterious process, introduced too early and unmeaningfully. Much of the trouble is concerned with premature introduction of the 'minus sign' and loose talk about 'taking away'."[2] I have thought about that statement often while watching my class struggle and hearing from other teachers about their classes' struggles with subtraction. I was sometimes tempted to postpone subtraction and borrowing, but I did not. Since subtraction is a skill they are expected to learn in the third grade and since they will be tested later in the year, it seemed best to continue. After much encouragement and practice, most of the children became reasonably proficient at subtraction. There is still a tendency, though, whenever they have not used subtraction for a while, to subtract without regard to the position of the numbers. Their reasoning seems to be: "If 32+26 is the same thing as 36+22, then 32-26 should be the same thing as 36-22."

Subtraction was hard work for most of the children and so when I started a unit on coordinate geometry, everyone was relieved. This was not work--it was fun! To make sure everyone knew how to find a location using coordinates, I had them decode a secret message by finding the letter

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[2]Geoffrey Matthews and others, Mathematics: The First 3 Years, Nuffield/CEDO Handbook for Teachers (New York, 1970) p. 48.

given by the coordinates. Then they placed letters at the correct location on the grid. I introduced "4 in a Row, Tic-Tac-Toe." Each child had to record the coordinates of his/her move before making it. Before the game the children decide whether to penalize an error in naming the coordinates and what the penalty should be. Usually they decide that the person making the mistake loses that turn, but sometimes they decide to give no penalty at all. Several of the children who had not been quick to catch onto other games responded very enthusiastically to this game. The next step with coordinates will be to plot functions. I will use a game of "What's My Rule?" to come up with a function and a series of number pairs. We will then plot them on a graph. I have not done this yet so I am not sure how far it can be taken.

While still involved with subtraction during part of the period, I started doing some problems with repeated addition, skip counting (counting by 2's, 3's, etc.) and with objects in arrays. Most of the children had some previous experience with multiplication and they had very little trouble with these exercises.

As with addition, once I was sure the children understood the concept of multiplication, I encouraged them to memorize the facts as soon as possible. I made multipli-

cation fact cards for "Go Fish" and "Concentration" games, I gave them each a set of flash cards to take home, we played Bingo using multiplication facts, and I gave them work sheets with story problems and practice exercises.

The children enjoy the many activities involving multiplication. They will not, however, memorize their multiplication facts. At this point it may be enough that they have sufficient means of finding products without pushing for quick recall of the facts. Division, which we are doing concurrently with multiplication, is giving the children no difficulty at all.

I have just reintroduced place value with the most encouraging results. I made a big diagram on the chalkboard that looked like a Chip-trading board with seven areas. I started in the ones column and put a one it it. Then I put a nine in it and asked, "If I add one more, what will happen?" The children responded, "You would get a one and a zero." They said that was a ten. We built the tens and ones up until we got to one hundred and continued onto one thousand. After filling up the thousands, they were not quite sure what number would come next, so I emphasized that first we had ones, then tens, then hundreds, and now we have one thousands. No one saw the pattern yet, so I told them that next was ten thousands. Then I asked them what they thought

would come next. "Hundred thousands?" some guessed hesitantly. When told that was correct, they were quite excited. I told them one million came next and by then most of them saw the pattern and knew that ten millions and hundred millions would be next. They were so excited by this that we kept building numbers until we reached one quintillion (1,000,000,000,000,000,000!) and although they will probably not remember the names for numbers over one billion, they understand the pattern of one, ten, hundred and can build the number given the name of the place. They can now look at most numbers and order them with no trouble. Some of the children can also take a number written out in words and translate it directly into numeral form, but most of them still need to fill in a chart.

LOWER SCHOOL MINIMUM SKILL REQUIREMENTS

MATHEMATICS

First Grade:

Numerals

a. Recognize 0-9
b. Write 0-9
c. Counting and ordering (one more, one less)

Place Value

a. Grouping by tens up to 99
b. Counting and order through 99
c. Inequalities stressing place value

Addition

a. Union of sets
b. Number line
c. Vertical notation
d. Facts--combinations to 18 (no carrying)

Subtraction

a. Sets, subsets
b. Number line
c. Inverse relation to addition
d. Facts--combinations related to sums to 18 (no borrowing)

Number Theory

a. Odds, evens
b. Skip counting 2's, 5's, 10's
c. Fractions--halves, fourths

Extras

Money, measurement, geometry

LOWER SCHOOL MINIMUM SKILL REQUIREMENTS

MATHEMATICS

Second Grade:

Numerals

a. Recognize 0-99
b. Write 0-99
c. Counting and order

Place Value

a. Grouping by tens and hundreds up to 999
b. Counting and order (ten more/less, hundred more/less)
c. Inequalities with the symbols

Addition

a. Union of sets
b. Number line
c. Equations
d. Vertical notation
e. Facts--through 18
f. Two-digit problems with carrying

Subtraction

a. Sets, subsets
b. Number line
c. Inverse relation to addition
d. Facts--combinations through 18
e. Two-digit problems with borrowing

Multiplication

a. Equivalent sets
b. Number line skip counting
c. Repeated addition
d. Products through 9x9
e. Facts through 5's table

LOWER SCHOOL MINIMUM SKILL REQUIREMENTS

MATHEMATICS

Second Grade, continued

Number Theory

a. Odds, evens
b. Skip counting 2's, 3's, 4's, 5's, 10's, 100's
c. Fractions--halves, quarters, thirds, fourths

Extras

Money, linear and liquid measurement, geometry

LOWER SCHOOL MINIMUM SKILL REQUIREMENTS

MATHEMATICS

Third Grade:

Place Value

a. Counting and order up to millions
b. Recognizing and writing up to millions

Addition

a. Union of sets, number line
b. Equations, vertical notation
c. Commutative and associative principles
d. Facts--through 18 and application by place value
e. Carrying

Subtraction

a. Sets, subsets, number line
b. Equations, vertical notation
c. Facts--through related sums to 18
d. Borrowing

Multiplication

a. Sets, number line, repeated addition
b. Commutative and associative principles
c. Properties of 0 and 1
d. Facts--tables through 9x9
e. One-digit times two- or three-digit factors

Division

a. Repeated subtraction
b. Number line
c. Inverse relation to multiplication
d. Facts related to tables through 9x9
e. One-digit divisor problems with remainders

Number Theory

a. Multiples
b. Factors
c. Prime Numbers
d. Fractions--equivalence

LOWER SCHOOL MINIMUM SKILL REQUIREMENTS

MATHEMATICS

Third Grade, continued

Extras

Measurement, geometry and coordinate geometry, areas, volumes

Chapter IV

SUMMARY AND CONCLUSION

This year has been one of learning for me. At the beginning of the year, I set myself a major goal--to help the children become more comfortable with math. My assumption was that as they became more comfortable with math, as their skills improved and as they saw the fun possible with math, they would become easier to work with. I had thought that their problems with math were causing the emotional problems. For most of the children, this was not true and so, although their math has improved, their behavior has not.

The children seem to enjoy math more than in the beginning of the year. Their confidence in themselves has gone up. E., for example, used to start every class by saying, "I can't do it," or, "I don't understand." She has not said those phrases in months and, in fact, is eager to show that she understands. Many parents report that their children for the first time make up math problems to do at home and say it is fun to do so.

They are not as quick with their computations as other children in this school, but they are all able to solve problems accurately. I have recently started making up books of their complicated number stories, which require

many calculations per story, and these stories are very popular with most of the children, both in and out of my math class.

The assumption that I had that improving their attitudes and skills would lead to improvement in their behavior has been only partially borne out. A. does not lose his temper as much, but he still loses it. K. is still teased. Unifix cubes can still be dangerous weapons. G. has to sit by himself or he will accuse people of copying from him which inevitably leads to a fight, but he is beginning to take part in group activities. The children who for the most part are difficult in math are difficult to work with in their home classes and I have come to see their problems as being other than math problems.

The rest of the year will be a continuation of what we have been doing so far. When their multiplication skills are stronger, we will start multiplying bigger numbers. We will be finding areas of rectangles by using graph paper and self-adhesive squares. We will probably estimate the area of irregular shapes using graph paper. We will do some work with fractions and continue work with coordinate geometry.

Our school has recently purchased a mini-computer and we will be doing some work with it--mainly using programs others have written at this point. The goal is to let the

children become familiar with computers and to enjoy them rather than be intimidated by them.

If I had to start the year over, the biggest change I would make would be to start with something less abstract than place value, perhaps some geometry. The routines I have set up and the materials I use seem to be working and the goals I have set seem to be realistic.

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"CHIP-TRADING"

Each player needs a board, one die, and chips to match the colors of the spaces on the board. I made the playing boards from pieces of 9-inch by 12-inch oaktag which I divided into four areas, each 9 inches by 3 inches. At the top of each space, I used magic markers to color a spot. Every board should have the colors in the same sequence, but the sequence itself is no important. From left to right, I used green, red, blue, yellow, making yellow the initial color.

A trading number must be decided on before starting the game and the smaller the number, the faster the game. At first we used three, but the children felt the game was too fast so they chose larger numbers. Numbers larger than seven make the game too slow when using one die.

To play, one player throws the die and places that number of chips on his initial color. If the number of chips equals or exceeds the trading number, chips equal in number to the trading number are exchanged for one of the next color. For example, if the trading number is three and if after throwing the die, there are four yellow chips, three yellow chips must be exchanged for one blue chip. The board then has one blue chip and one yellow chip. The die throw always determines the number of chips to be placed in

the rightmost space. As soon as the chips in that space exceed the trading number, they are exchanged. When the number of chips in that next space exceed the trading number, they are exchanged for one chip in the next space in the same manner.

The first person to get a chip in the leftmost space can be the winner or the loser, a determination that must be made before the game starts.

"CONCENTRATION"

This is a card game for two or more players. A deck of cards is made as in "Go Fish". The cards are placed one at a time face down on the table with no overlapping. The game is easier if the cards are placed in rows, but they do not have to be.

Each player in turn must turn up any two cards, one at a time, leaving them in their original position on the table. If they are a pair, the player takes them and turns over two more cards. If they are not a pair, they are turned back, in their original position, and the player on the left goes next. The person with the most set of cards wins.

"FOUR IN A ROW, TIC-TAC-TOE"

This is a two player or two team game played with pencil and paper or on the chalkboard. A 5x5 grid is drawn with the axes marked at the intersection of the lines. The lower left corner is 0. Thus the corners of the grid are (0,0), (0,4), (4,4), and (4,0). One team marks its points with an "X", the other, with "O". The object is to mark four points in a row, horizontally, vertically, or diagonally. The team whose turn it is decides on a location for its mark, gives the coordinates of that location, then marks it. If the address is illegal, e.g., it is outside the grid or the point is already marked, the team loses its turn. If the player gives the coordinates for a point that is legal, that point is marked, even if that is not the point that the team had in mind, e.g., the player called (1,4) but meant (4,1). The team to get four points in a row wins.

"GO FISH"

This is a card game for three or more players. Use oaktag cut into rectangular pieces to make a deck of 52 cards. You will need 13 sets of 4 cards each. I find that cards 2 inches by 3 inches to be convenient. Each set has one card with one number and three cards with a problem whose answer is that number. For example, if the cards are to strenghthen multiplication facts, one set might have "8" as the one number and "4x2", "2x4", and "8x1" on the other three cards.

The dealer deals six cards, one at a time, to each player. The remaining cards are placed in the center, face down. Each player tries to collect sets of 4 that match. Each player in turn calls another player by name and asks for cards of a specific number. For example, one might say, "John, give me all your 8's." The asker must have at least one card of this number in his hand. If the person asked has any cards of that number, he must give them up. The asker's turn continues as long as he succeeds in getting cards. If the person asked has none of the named cards, he/she says, "Go fish!" The asker then takes the top card from the pile in the middle and the player on the left goes next. Whenever a player gets a set of four cards, he/she shows them, then places them on the table in

front of him/herself. The one who gets the most sets wins.

When the card from the "Go fish" pile is one that the player had asked for, that can be considered a match and that player continues in his/her turn. This is an optional rule that should be agreed upon before playing.

"WHAT'S MY RULE?"

This is an oral game played with a group to find a particular function. The function can be arithmetic, but does not need to be. One person thinks of a rule (function) such as, "All people wearing corduroy go in set A, all people not wearing corduroy go in set B," or "Choose a number, add 5 to it." The person with the rule applies the rule to one or two cases, without revealing the rule. If a member of the group thinks he/she knows the rule, the leader gives him/her a chance to apply it. The leader then tells the person if the rule had been applied correctly without revealing the rule. No one is to actually name the rule until each person has had a chance to apply it or until no one else wants to try to apply it.

This game has no winner in it.

1. Jim had 21 apples.
He gave 3 to Sandy, and then
Jim bought 6 more apples.
How many apples did he have left? _____

-M

2. Bill had 27 match box cars.
He lost 5.
His father gave him 3 new cars.
He found 8 in the dogdish.
How many match box cars did he have all together? _____

-D

3. Kathleen had 12 cats.
Daisy took 5.
How many cats did she have left? _____

-H

4. Barbie had 20 pennies.
Her father gave her 30 pennies.
Her sister took 10¢.
Her brother gave her 80¢.
Her other sister took 30¢.
How much does Barbie have now? _____

-k

5. Bobbie had 21 foot balls.

3 of them popped.
15 more he gave away.
He bought 5.
How many did he have left? _____

- I

6. There were 100 cars.
24 drove away.
How many were there? _____

- c

7. Jim had 17 books.
His friend asked for 10.
The dog ate 2 of them.
How many did Jim have left? ______

—L

8. John had 12 apples.
3 apples were rotten and his mother told him to get rid of them.
She gave him 6 more.
He gave 2 apples to each of his 4 brothers.
How many apples did he have left? ______

— G

9. Sam had 20 cars.
He gave a friend 10 cars and another friend, 6 cars.
How many cars does he have? ______

— A

Answers:

2. 33, 3. 7, 4. 40¢, 5. 8, 6. 76, 7. 5, 8. 7, 9. 4

Name _____ Date _____

Complicated Number Stories - part 2.

1. Joyce had 8 plants. Each plant had 3 flowers. She gave 12 flowers to her mother, 3 flowers to George and 1 flower to Sue. How many flowers did she keep? _____

2. Willy had 6 cars. He gave half of them to Pete. He received 5 cars for his birthday, then had to buy 2 new tires for every car he had left. How many tires did he have to buy? _____

Write your own complicated number story. Put the answer on the back.

There were 100 cars.
20 drove away.
6 were sold.
8 drove away.
12 came back.
[illegible] broke down.
[illegible] were left? _____

—C

2. John had 8 oranges
He gave 2 oranges to Mary,
½ an orange to Sue, and he gave
1 more orange to Mike.
How many oranges did he keep? _____

—E

3. Sue had 21 horse books.
She gave 7 to Molly,
4 to Bill and then she received
12 more horse books.
How many horse books did Sue have left? _____

-M

4. Linda had 90 dolls.
Pia took half of the dolls.
For Linda's birthday, she got 20 dolls, but
10 of them broke and
she lost 5.
If Linda had to get 2 dresses for
each doll, how many dresses would she
have to get? _____

-L

5. Tom had 7 valentines that came in the mail.
Then Bill gave Tom 2 Valentines.
Then Tom bought 12 valentines and
gave 7 away.
How many valentines did Tom have left? _____

- B

4. [illegible] had 132 cars.
[illegible] were stolen.
[illegible] came back.
[illegible] broke down.
[illegible] ran out of gas.
How many still ran? _____

- D

[illegible] back.
[illegible] gave her 23 more.
[illegible] took 17.
Lucy bought 18 more.
Ethel took 9.
Fred took 4.
Ricky gave 7 back.
Fred gave 9 back.
How many does Lucy have? _____

-K

8. Jon had 8 apples.
He gave 5 apples away.
His mom gave him 10 more apples.
How many does he have now? _____

-G

Chris had 22 balls.
He gave Molly 12 and
she gave him 5.
He gave Tom 12 and
his mommy gave him 23 and
he gave his sister 3 and
his Dad gave him 3.
How many did he have? _____

F

Sarah had 7 balls.
She gave Sam 6.
Sarah bought 6 more.
Sarah gave Sam all of them.
How many did Sarah have and
how many did Sam have? _____

A

PLACE VALUE

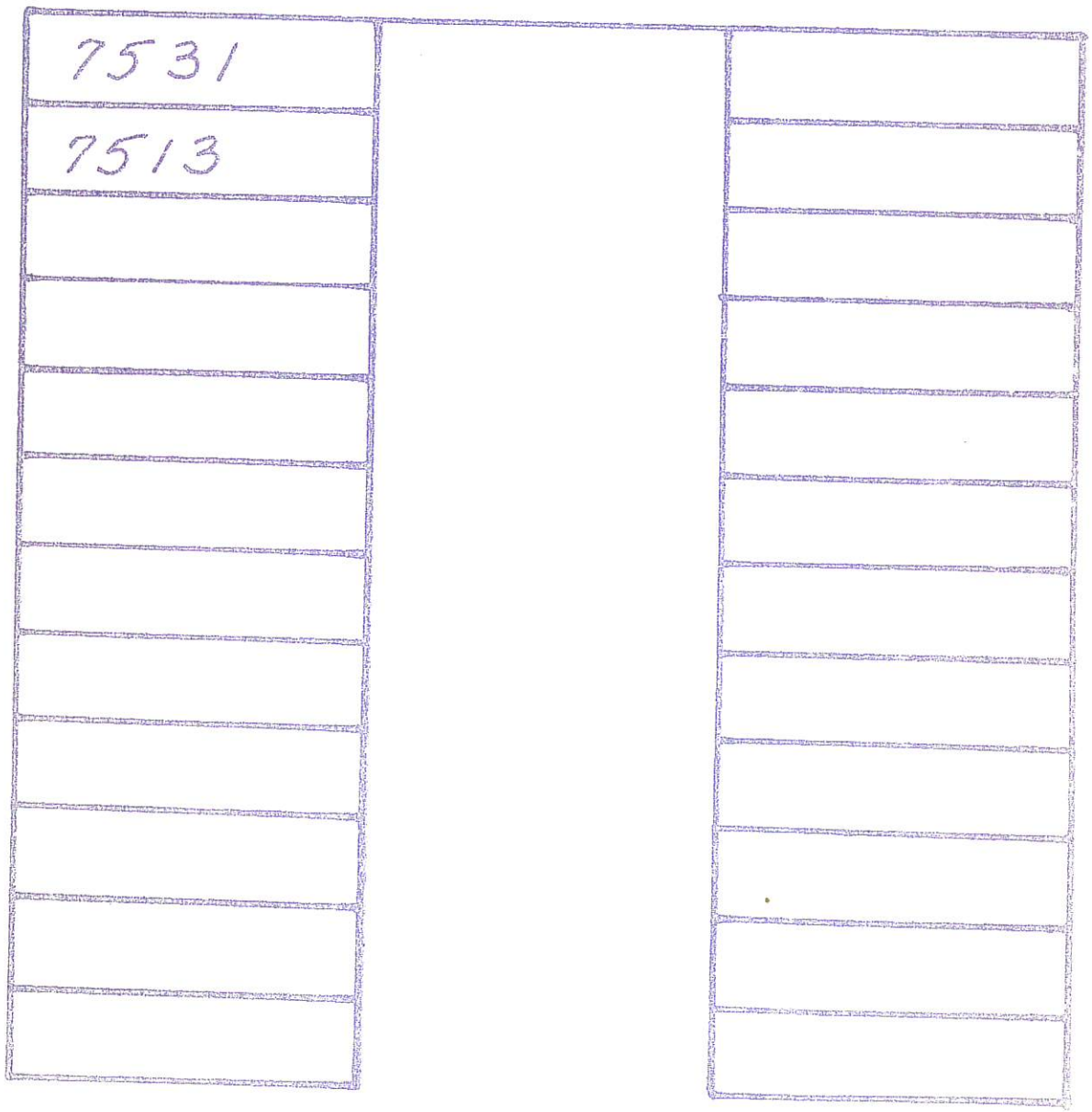
List all the numbers possible using these four different digits: 1, 3, 5, and 7.

Example: The largest would be 7531. The smallest would be 1357.

1, 3, 5, 7

7531

7513



Variation: Repeat using two, three, or five different digits.

PLACE VALUE

	Hundreds		Tens		Units
197 =		+		+	
203 =		+		+	
187 =		+		+	
543 =		+		+	
678 =		+		+	
923 =		+		+	
250 =		+		+	
891 =		+		+	
783 =		+		+	
697 =		+		+	
974 =		+		+	
300 =		+		+	
999 =		+		+	

Name _____ Date _____

The inequality mark < means "less than"
The inequality mark > means "greater than"
Put the correct mark in each box.

6 ☐ 2

3 ☐ 7

72 ☐ 92

72 ☐ 71

65 ☐ 55

34 ☐ 64

837 ☐ 537

462 ☐ 762

684 ☐ 654

237 ☐ 239

Name _____ Date _____

Give the number:

7 hundreds 3 tens 5 ones _____

3 hundreds 9 tens 1 one _____

5 hundreds 2 ones _____

1 hundreds 4 tens 8 ones _____

8 hundreds 7 tens _____

Circle the numbers that have 7 in the hundreds place:

743 674 700 71 507 767

Circle the numbers that have 5 in the ones place:

354 15 585 65 507 105

Circle the numbers that have 0 in tens place:

610 500 905 50 507 303

Take out your 0-99 Number Grid to answer the following: The numbers going across show counting by ones / tens (Circle correct one)

The numbers going down show counting by ones / tens

What number is 10 greater than 2? _____

Name _____ Date _____

Check Yourself

Give the number

a. 5 tens 6 ones _____ b. 4 tens 1 ones _____

c. 4 hundreds 6 tens 3 ones _____

d. 6 hundreds 8 tens _____

Circle the numbers that have

e. 8 in the tens place.

98 83 84 68 88

f. 3 in the hundreds place.

319 432 356 223 303

Give the number

g. 80 + 2 _____ h. 900 + 50 + 3 _____

Give the numbers in order. Begin with the least.

i. 705, 708, 707, 709, 706

_____

j. 239, 229, 269, 249, 259

_____

k. 568, 268, 468, 668, 368, 768

_____

Name _____ Date _____

Look at the number on the left.
Place each numeral in its place-value column.

	Hundreds	Tens	Ones
26			
569			
40			
308			
4			

Name _____ Date _____

1. For each pair, circle the larger number:

3764; 4764 3894; 3943 67,289; 67,290

2. Write the numerals for these numbers:

four-hundred and twenty-nine _____

eight thousand four hundred twenty-nine _____

six hundred and one _____

3. Measure the left side of this page _____

4. Write 2 addition and 2 subtraction equations for 13. Use the same numbers for all four equations.

_____ _____

_____ _____

5. Solve the equations

$348 = 300 + 40 + \square$ $5423 = 5000 + 400 + 20 + \square$

$586 = 500 + \square + 6$ $295 = \square + 90 + 5$

6. $6 + 7 = \square$ $8 + 4 = \square$ $9 + 3 = \square$

$7 + 6 = \square$ $4 + 8 = \square$ $3 + 9 = \square$

7. $(4 + 3) + 6 = \square$ $(7 + 3) + 6 = \square$

$4 + (3 + 6) = \square$ $7 + (3 + 6) = \square$

$(5 + 2) + 4 = \square$ $(8 + 4) + 3 = \square$

$5 + (2 + 4) = \square$ $8 + (4 + 3) = \square$

Name _____ Date _____

1. Put these numbers in order smallest first, largest last.

4,861
1,846
6,841
1,864

_____ (smalles
_____
_____
_____

2. Put these numbers in order smallest first, largest last.

1,972
14,192
192
1,792

_____ (smalle
_____
_____
_____

3. Put these numbers in order smallest first, largest last.

7,351
7,531
7,513
7,135

_____ (Smalle
_____
_____
_____

Name _____ Date _____

Find the sums.

+	3	1	4	7	9	2	5	8	6
4	7			11					

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

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

Name _____ Date _____

Find the sums.

+	4	7	6	1	8	3	5	2	9
6									

+	9	2	5	3	8	1	6	7	4
5									

+	9	5	8	6	4	7	1	3	2
7									

Name _____ Date _____

Find the sums.

+	2	9	5	1	8	3	7	4	6
8									

+	6	4	7	3	8	1	5	9	2
9									

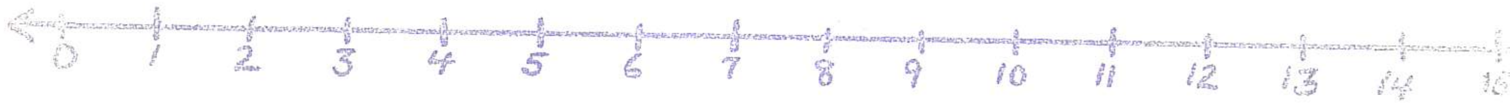
7	5	3	9	4	5	
+4	+6	+8	+8	+6	+3	+2

Name _____ Date _____

Addition Facts 0-9

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

Name ____________________ Date ________



Use arrows to show 6+8 on the number line.

Finish these equations.

$4 + 11 = \square$	$8 + 3 = \square$
$5 + 10 = \square$	$7 + \square = 12$
Match these! $13 - 4 = \square$	$6 - 1 = \square$
$6 + 4 = \square$	$3 + 12 = \square$
$4 + 8 = \square$	$11 + 2 = \square$
Match these $6 - 6 = \square$	$9 - \square = 4$

Did you find 4 subtraction problems? ☺

Name _____ Date _____

Find the sums. Add the numbers in parentheses first, to help you find the sum more easily.

ex. $(7 + 3) + 5 = \square$ (10)

1. $(8+2)+7=\square$ 2. $(4+6)+3=\square$ 3. $8+(7+3)=\square$

4. $(5+5)+9=\square$ 5. $1+(8+2)=\square$ 6. $(2+8)+(4+6)=\square$

Find the sum. Look for tens.

7. $7+3+2=\square$ 8. $7+8+2=\square$ 9. $1+6+9=\square$

Name _____ Date _____

Rename these numbers.

tens	ones
5	16

_____

tens	ones
6	10

_____

tens	ones
8	11

_____

ten	ones
4	14

_____

tens	ones
3	12

_____

tens	ones
5	18

_____

tens	ones
8	12

_____

tens	ones
4	13

_____

tens	Ones
7	11

_____

tens	ones
5	14

_____

tens	ones
2	17

_____

tens	ones
3	16

_____

tens	ones
1	10

_____

tens	ones
6	15

_____

tens	ones
2	11

_____

Complete.

7 tens 16 ones = 8 tens ____ ones

2 tens 14 ones = ____ tens 4 ones

8 tens 10 ones = 9 tens ____ ones

1 tens 12 ones = ____ tens 2 ones

4 tens 15 ones = 5 tens ____ ones

5 tens 11 ones = ____ tens 1 one

3 tens 17 ones = 4 tens ____ one

6 tens 13 ones = ____ tens 3 ones

7 tens 10 ones = ____ tens 0 ones

8 tens 14 ones = 9 tens ____ one

Name ..... Date .....

Rename.

H	T	O
8	16	8

H	T	O
6	6	13

H	T	O
5	18	1

H	T	O
8	16	18

H	T	O
6	11	3

H	T	O
7	2	17

H	T	O
3	17	11

H	T	O
6	4	10

Find the sums.

T	O
4	6
+ 3	7

T	O
2	3
+ 2	7

T	O
4	9
+ 1	6

T	O
7	5
+ 5	8

H	T	O
3	6	8
+ 2	1	7

H	T	O
2	5	14
2	1	9

H	T	O
3	6	8
6	2	7

H	T	O
3	6	8
1	7	1

13
19

139
242

861
39

407
421

Name: _____ Date: _____

Find the sums (+). Rename if necessary.

$$\begin{array}{r} 36 \\ +43 \\ \hline \end{array} \qquad \begin{array}{r} 36 \\ +44 \\ \hline \end{array} \qquad \begin{array}{r} 136 \\ +44 \\ \hline \end{array} \qquad \begin{array}{r} 136 \\ +144 \\ \hline \end{array}$$

$$\begin{array}{r} 295 \\ +295 \\ \hline \end{array} \qquad \begin{array}{r} 634 \\ +117 \\ \hline \end{array} \qquad \begin{array}{r} 123 \\ +456 \\ \hline \end{array} \qquad \begin{array}{r} 111 \\ +99 \\ \hline \end{array}$$

Riddle:

I am an even number between 10 and 20.
I am greater than 14.
I am not $1+3+5+7$.
Who am I?

Name _____ Date _____

Pirate Pete followed this treasure map. How many steps did he walk from point A to the treasure at X?

Pirate Pete found five treasures.
Find the total number of pieces in each treasure.

	1st	2nd	3rd	4th	5th
Pieces of gold	59	360	248	53	294
Pieces of silver	22	112	61	17	347
total					

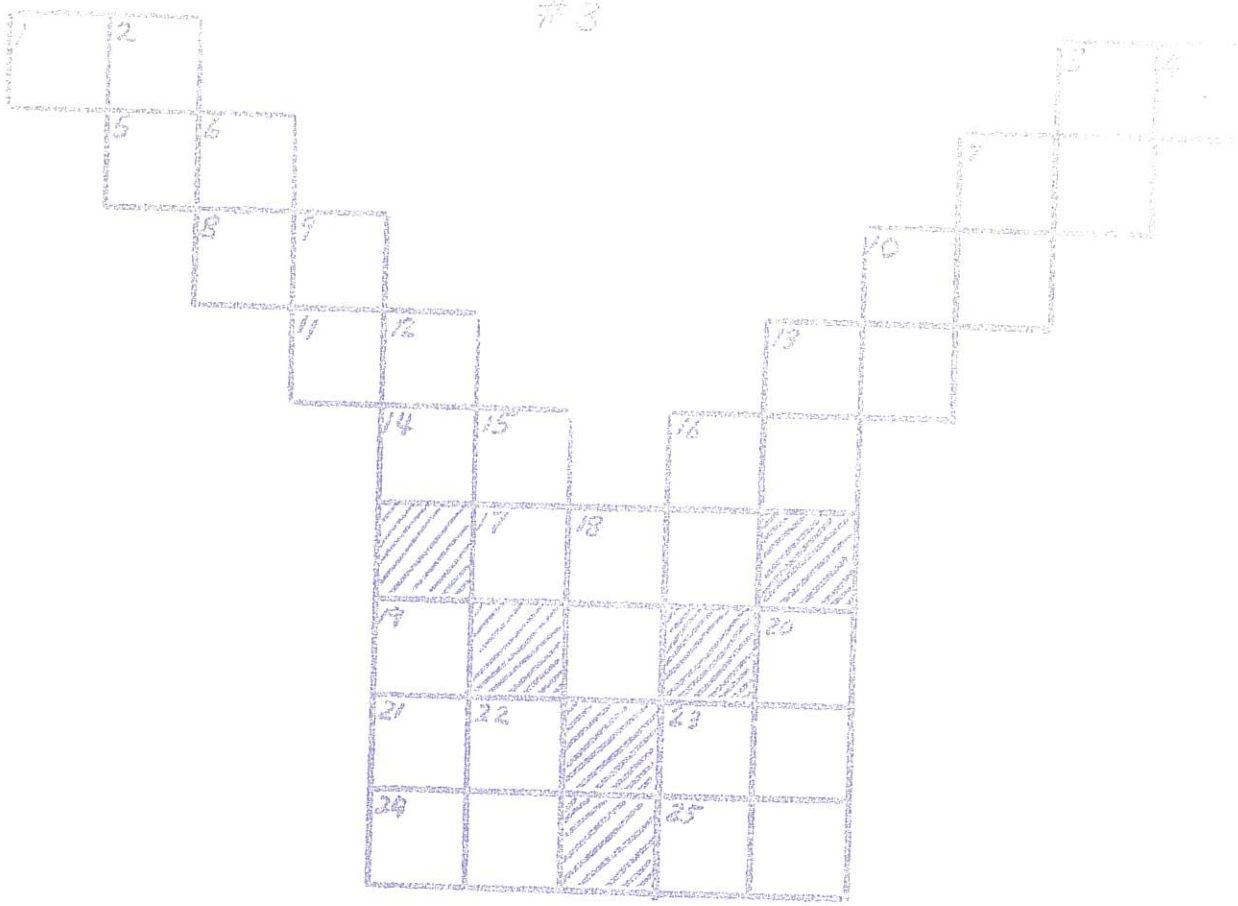
Name _____ Date _____

1. George is 3 years older than Alice. Together their ages add up to 11. How old is George? _____ How old is Alice? _____ (Hint: If Alice is 1 how old is George? (4) Do their ages add up to 11? (No) How about if Alice is 2? 3? 4? 5?)

2. Maria had a stamp collection with 37 stamps. For her birthday, Maria got 11 more stamps. How many stamps did she have then? ☐

3. Morton's mother cooked 92 pancakes for breakfast. Morton's father ate 31 of them. Mortons mother ate 1. Morton ate the rest. How many did he eat? ☐

CROSS-NUMBER PUZZLE #3



ACROSS

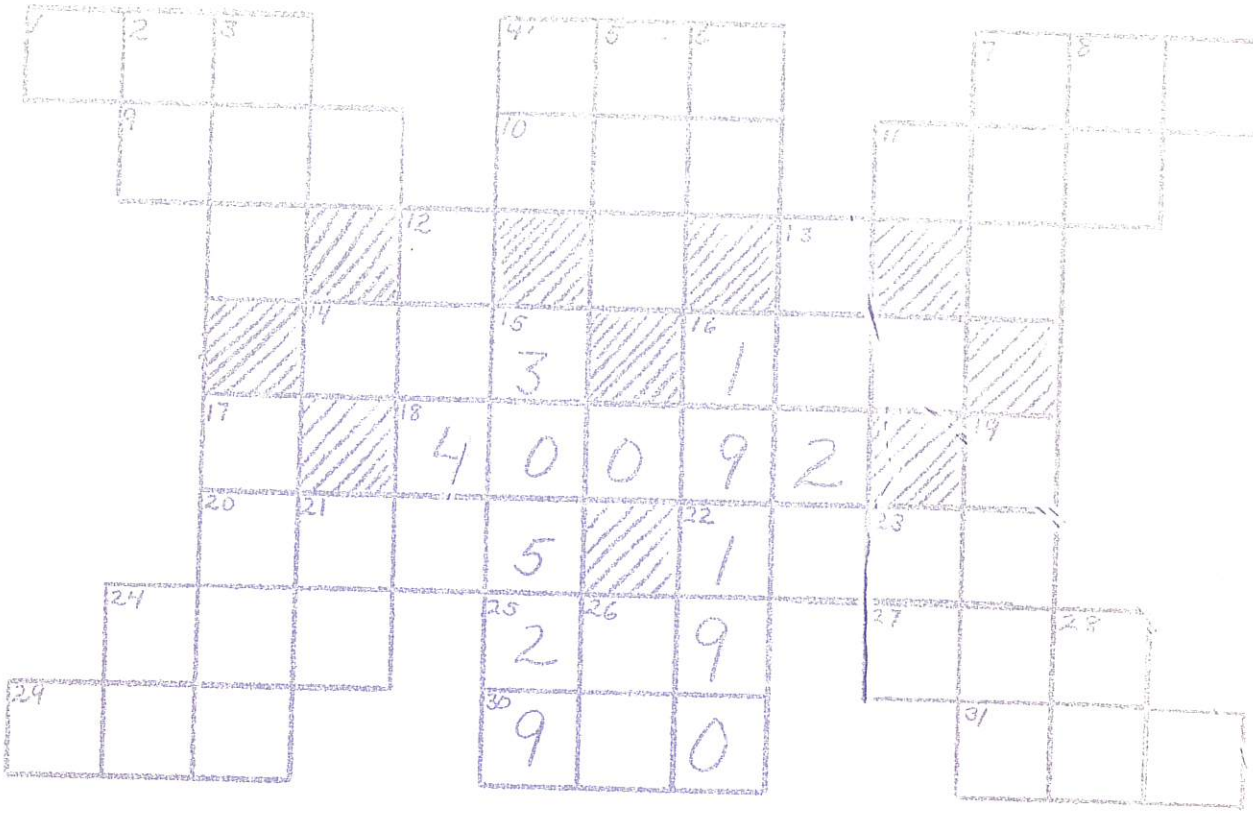
1. 3+7
3. 4+13
5. □-7=5
7. 9+9+9
8. 42+6
10. 12+8+5
11. 16+5
13. 16+13
14. 10+30+3
16. 24+6+2
17. 100+60+3
21. [illegible] 6+5
23. 13+6
24. 15+11

DOWN

2. 50+1
3. 13+4
6. 12+12
7. 12+13
9. 40+40+2
10. 20+9
12. 6+8
13. 10+12
15. 21+10
16. 22+11
18. 30+35
19. 100+12
20. 100+90+2
22. 10+6

Name

Cross-Number Puzzle



Across

1. 246 + 132

4. 56 + 72

7. 65 + 74

8. 413 + 72

10. 413 + 22

11. 65 + 161

14. 17 + 116

16. 70 + 37

20. 1216 + 79

22. 1000 + 155

24. 329 + 158

25. 158 + 101

27. 962 + 30

29. 810 + 151

30. 414 + 486

31. 391 + 323

Down

2. 22 + 52

3. 843 + 45

4. 6 + 8

5. 141 + 95

6. 35 + 50

7. 84 + 37

8. 19 + 17

12. 1720 + 629

13. 1191 + 82

17. 2068 + 1103

19. 1234 + 3363

21. 12 + 15

23. 44 + 15

24. 38 + 8

26. 25 + 25

28. 9 + 12

Name _____ Date _____

Solve each subtraction problem. Then make an addition equation for each problem.

Example $15 - \boxed{9} = 6$. Then $6 + 9 = 15$

or $15 - 9 = \boxed{6}$ Then $6 + 9 = 15$

	Addition
$12 - 7 = \square$	$7 + 5 = 12$
$8 - 2 = \square$	
$17 - 7 = \square$	
$10 - \square = 6$	
$12 - \square = 7$	

Name _____ Date _____

Write down 5 addition equations for 10.
For each addition equation, write 1 of its subtraction equations.

Ex. 9+1=10 10-1=9

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____
5. _____ _____

Name _____ Date _____

1. Solve the equations.

$7+6 = 10+\square$ $\quad 8+5 = 10+\square$ $\quad 8+7 = 10+\square$

$9+3 = 10+\square$ $\quad 7+7 = 10+\square$ $\quad 9+5 = 10+\square$

2. Since $8+9=17$, we know that $17-9=\square$

Since $29+46=75$, we know that $75-46=\square$

Since $13+24=37$, we know that $37-24=\square$

* Watch to see if you add or subtract.

3.

16 − 7	8 + 7	13 − 6	12 − 8	7 + 9	6 + 8
35 − 11	23 + 66	44 − 13	89 − 37	26 + 42	76 − 35
85 + 29	123 − 64	48 + 75	97 − 69	84 + 66	147 − 75

4. < means "less than" > means "greater than" Put the correct sign between each pair of numbers.

$42 \square 47$ $\quad 36 \square 306$ $\quad 117 \square 171$

$6+2 \square 8+10$ $\quad 9+3 \square 10+3$ $\quad 2\times3 \square 2+3$

Name _____ Date _____

Do your work here.

1. Laura had 29 cents.
She spent 1 dime and 5 cents.
How much does she have left.

2. Tim had 92 cents.
He spent 11 cents.
How much does he have left.

3. Joan had 5 dimes and 3 pennies.
She spent 21¢.
How much does she have left?

4. Marc had 1 dime and 9 pennies.
He spent 2 pennies.
How much does he have left?

Name _____ Date _____

1. Sally is the same age as Dan. Together their ages add up to 16. How old is Sally? ☐ How old is Dan? ☐

2. Josh had 15¢. He spent 5¢ for a pencil and 3¢ for an eraser. How much did Josh spend altogether? ☐. How much money does he have left? ☐

3. Mandy had 10 balloons. She wanted to tie a string to each balloon. She had 7 strings. Did she have enough strings? ☐ How many more strings does she need? ☐

Name _____ Date Nov. 3

Rename to show more ones.

Tens	Ones
9	2

Tens	Ones
8	4

Tens	Ones
7	8

Tens	Ones
3	5

Tens	Ones
6	2

Tens	Ones
4	0

Tens	Ones
2	1

Tens	Ones
9	7

Tens	Ones
8	3

Tens	Ones
8	8

Tens	Ones
6	0

Tens	Ones
5	8

Complete.

4 tens 2 ones = ____ tens 12 ones

9 tens 3 ones = 8 tens ____ ones

7 tens = 6 tens ____ ones

2 tens 5 ones = ____ ten 15 ones

6 tens 1 one = ____ tens 11 ones

2 tens 7 ones = ____ ten 17 one

1 ten 4 ones = ____ tens 14 on

8 tens 1 ones = 7 tens ____ one

5 tens 1 one = 4 tens ____ on

4 tens = 3 tens ____ ones

Name _____ Date _____

Subtract. Rename to show more ones if necessary.

T	O
7	6
− 5	8

T	O
8	4
− 1	8

T	O
9	1
− 3	7

T	O
7	9
− 2	1

T	O
4	6
− 2	3

T	O
8	7
− 1	5

T	O
8	8
− 5	4

T	O
6	7
−	3

T	O
9	4
− 8	6

T	O
6	2
− 2	5

9	4
− 6	5

9	6
− 8	1

4	7
−	9

9	1
− 6	5

2	6
−	5

93	68	72	81	64
− 47	− 29	− 35	− 66	− 39

The camp cook had 35 boxes of oatmeal. He cooked 18 boxes. How many were left?

Name _____ Date _____

Find a pattern. Make the next two in each row.

1.  _____ _____

2. S ∽ SS _____ _____

3. \ X ✕ _____ _____

4.  _____ _____

 . Continue these number patterns.

5. 2, 4, 6, ___, ___, ___

6. 3, 7, 11, 15, ___, ___, ___

7. 20, 18, 16, ___, ___, ___

8. 1, 4, 7, 10, ___, ___, ___

Please do 3 things with the following problems:

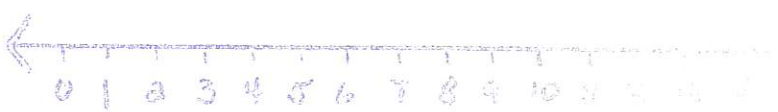
1. Show the problem on the number line.
2. Write the answer to the addition problem.
3. Write a multiplication equation about the same steps.

A. $3+3+3=\square$

B. $5+5=\square$

C. $6+6=\square$

D. $2+2+2+2+2+2=\square$



Name _____ Date _____

In the multiplication equation $4 \times 7 = 28$, the number 28 is called the product of 4 and 7.

The numbers 4 and 7 are called factors of 28.

1. Answer these questions.

A. In $3 \times 5 = 15$, the number 15 is the product of what numbers? _____

B. In $4 \times 3 = 12$, what is the number 12 called? _____

C. In $3 \times 5 = 15$, the numbers 3 and 5 are factors of what number? _____

D. In $4 \times 3 = 12$, what are the numbers 4 and 3 called?

_____

2. Write a multiplication equation for each exercise. Write an "f" over each factor and a "p" over each product as in the example: $\overset{f}{3} \times \overset{f}{2} = \overset{p}{6}$

A. $4 + 4 + 4 + 4 + 4 = 20$

_____

B. 

_____

Name _____ Date _____

1. Find the missing numbers. Use the sets of dots to help you.

5 twos → 3 twos and ☐ twos. ⁘

6 fours → ☐ fours and 3 fours ⁘

6 fours → 4 fours and ☐ fours ⁘

8 fives → ☐ fives and 3 fives ⁘

2. Solve the equations.

Since $(2 \times 3) + (4 \times 3) = 18$ then $6 \times 3 =$ ☐

Since $(2 \times 4) + (3 \times 4) = 20$ then $5 \times 4 =$ ☐

Since $(3 \times 7) + (5 \times 7) = 56$ then $8 \times 7 =$ ☐

3. Find the products. Make dot sets to help you.

Since $4 \times 4 = 16$, $5 \times 4 =$ ☐

Since $3 \times 5 = 15$, $4 \times 5 =$ ☐

Since $2 \times 7 = 14$, $3 \times 7 =$ ☐

Since $5 \times 8 = 40$, $6 \times 8 =$ ☐

Name _____ Date _____

Use this page to help you fill in some of the multiplication facts sheet.

1. The product of any number and 0 is ☐.
   Use this rule and fill in the 0 row and 0 column.

2. The product of any number and 1 is _____
   Use this rule to fill in the 1 row and 1 column.

3. Solve the equations. Then use the results to fill in the 2 row and 2 column.

   Since $2+2=4$ we know $2\times2=$ ☐
   Since $3+3=6$ we know $2\times3=$ ☐
   Since $4+4=$ ☐ we know $2\times4=$ ☐
   Since $5+5=$ ☐ we know $2\times5=$ ☐
   Since $6+6=$ ☐ we know $2\times6=$ ☐
   Since $7+7=$ ☐ we know $2\times7=$ ☐
   Since $8+8=$ ☐ we know $2\times8=$ ☐
   Since $9+9=$ ☐ we know $2\times9=$ ☐

Name _____ Date _____

Use this page to help you fill in more of the multiplication fact sheet.

1. Solve the equations. Then use the results to help you fill in the 3 row and 3 column.

$3 \times 3 \rightarrow (2 \times 3) + 3 = \square$

$3 \times 4 \rightarrow (2 \times 4) + 4 = \square$

$3 \times 5 \rightarrow (2 \times 5) + 5 = \square$

$3 \times 6 \rightarrow (2 \times 6) + 6 = \square$

$3 \times 7 \rightarrow (2 \times 7) + 7 = \square$

$3 \times 8 \rightarrow (2 \times 8) + 8 = \square$

$3 \times 9 \rightarrow (2 \times 9) + 9 = \square$

2. If you need to, use the multiplication fact sheet to help you solve these equations.

$6 \times 1 = \square$ $4 \times 3 = \square$ $3 \times 8 = \square$ $0 \times 5 = \square$

$\frac{7}{\times 1}$ $\frac{0}{\times 6}$ $\frac{5}{\times 2}$ $\frac{3}{\times 6}$ $\frac{3}{\times 6}$ $\frac{2}{\times 7}$ $\frac{9}{\times 3}$

Name _____ Date _____

Find the products.

I.

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

II. Count by 7's.

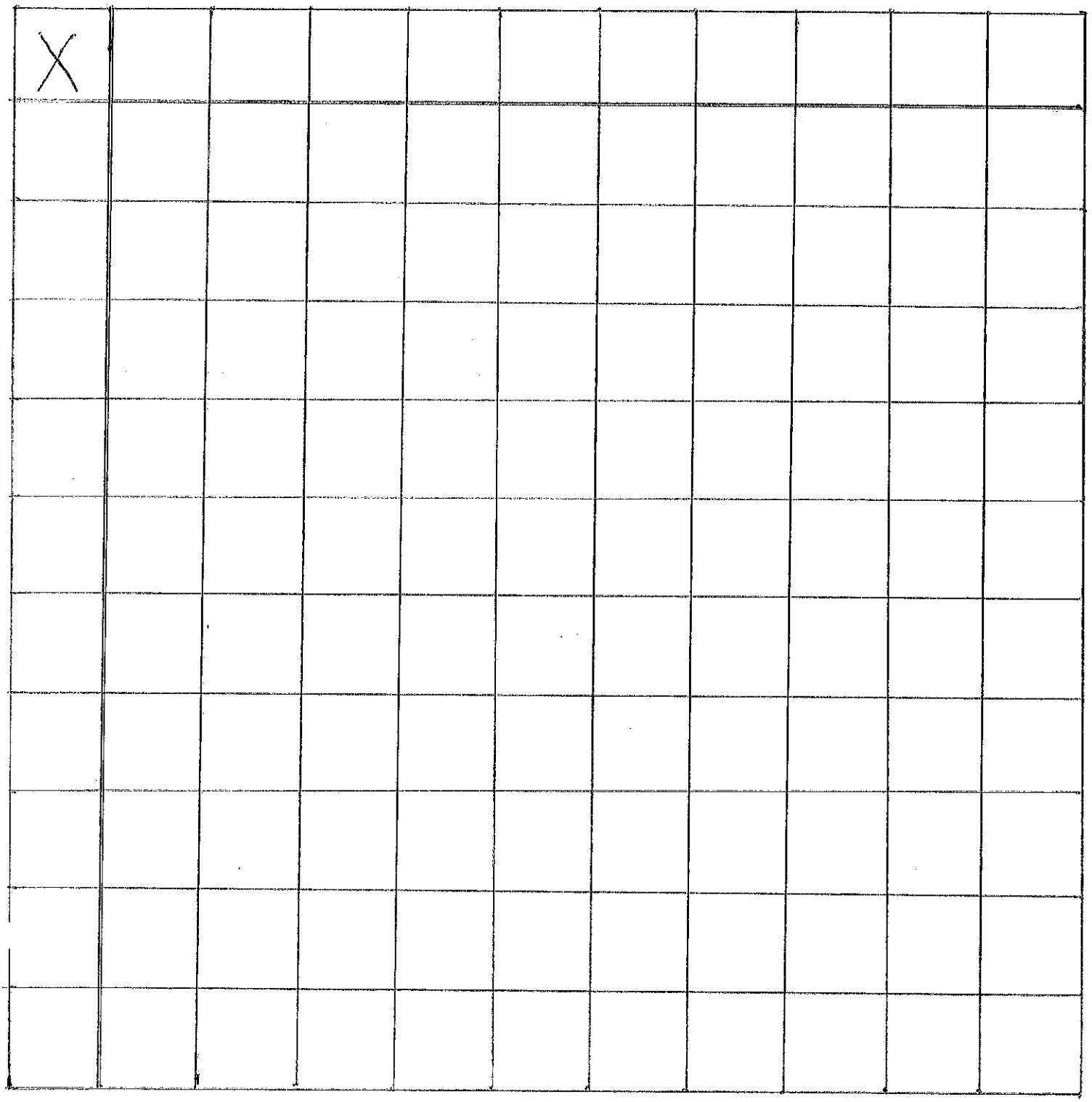
0, 7, ___, ___, ___, 35, ___, ___, ___, ___, 70.

III. Think Time.

Dave is three times as old as Sue.
In 3 years, he will be twice as old as Sue.
How old are Dave and Sue now?

Name _____

Multiplication - Facts



Name _____ Date _____

Here is a code.

A	E	H	I	K	M	O	R	S	T	W	Y
12	13	14	15	16	17	18	19	20	21	22	23

Solve the following equations, then decode the message according to the code above.

1. $10+10+2 =$ 22
2. $3 \times 4 =$ ☐
3. $4 \times 5 =$ ☐
4. $3 \times 7 =$ ☐
5. $7+7 =$ ☐
6. $5 \times 3 =$ ☐
7. $(3 \times 5)+5 =$ ☐
8. $2 \times 7 =$ ☐
9. $6 \times 3 =$ ☐
10. $9+8 =$ ☐
11. $6+7 =$ ☐
12. $11+11 =$ ☐
13. $(2 \times 6)+6 =$ ☐
14. $21-2 =$ ☐
15. $4 \times 4 =$ ☐
16. $7 \times 3 =$ ☐
17. $9 \times 2 =$ ☐
18. $6+6+6 =$ ☐
19. $4+4+5 =$ ☐
20. $(2 \times 4)+4 =$ ☐
21. $5+5+5+5 =$ ☐
22. $(7 \times 3)+2 =$ ☐
23. $5 \times 5 =$ ☐

Message.

Exercise	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Answer	22													
Letter	W													

	15	16	17	18	19	20	21	22	23

Name _____ Date Jan 25 1979

Answer each problem. Write a multiplication equation about it.

ex. 2 basketball teams. 5 players on each team.
How many players? 10 2 x 5 = 10

1. 2 basketball teams. 4 cheerleaders for each team.
How many cheerleaders? _____ _____

2. 1 baseball team. 3 outs in each inning. They play 9 innings.
How many outs? _____ _____

3. In baseball, 3 strikes - you're out. 8 people struck out.
How many strikes? _____ _____

4. Baseball game has gone 4 innings. 0 runs scored each inning. How many runs? _____ _____

Don't forget to study your multiplication flash cards! ☺

Name _____ Date _____

1. Write a division equation for each exercise.

a. 

b. 

c. $\begin{array}{r} 16 \\ -\,4 \\ \hline 12 \end{array}$ $\begin{array}{r} 12 \\ -\,4 \\ \hline 8 \end{array}$ $\begin{array}{r} 8 \\ -\,4 \\ \hline 4 \end{array}$ $\begin{array}{r} 4 \\ -\,4 \\ \hline 0 \end{array}$

d. $\begin{array}{r} 28 \\ -\,7 \\ \hline 21 \end{array}$ $\begin{array}{r} 21 \\ -\,7 \\ \hline 14 \end{array}$ $\begin{array}{r} 14 \\ -\,7 \\ \hline 7 \end{array}$ $\begin{array}{r} 7 \\ -\,7 \\ \hline 0 \end{array}$

2. Solve these equations.

e. $\square \times 6 = 12$ then $12 \div 6 = \square$

f. $\square \times 5 = 20$ then $20 \div 5 = \square$

3. Find these quotients.

g. $8\overline{)16}$ h. $3\overline{)21}$ i. $6\overline{)18}$

Name _____ Date _____

Use division to solve these problems. Write the equation you need.

1. There are 12 books scattered on the floor. How many stacks of 4 books each can be made?

_____

2. If 15 cookies are divided evenly among 3 children, how many cookies does each child get?

_____

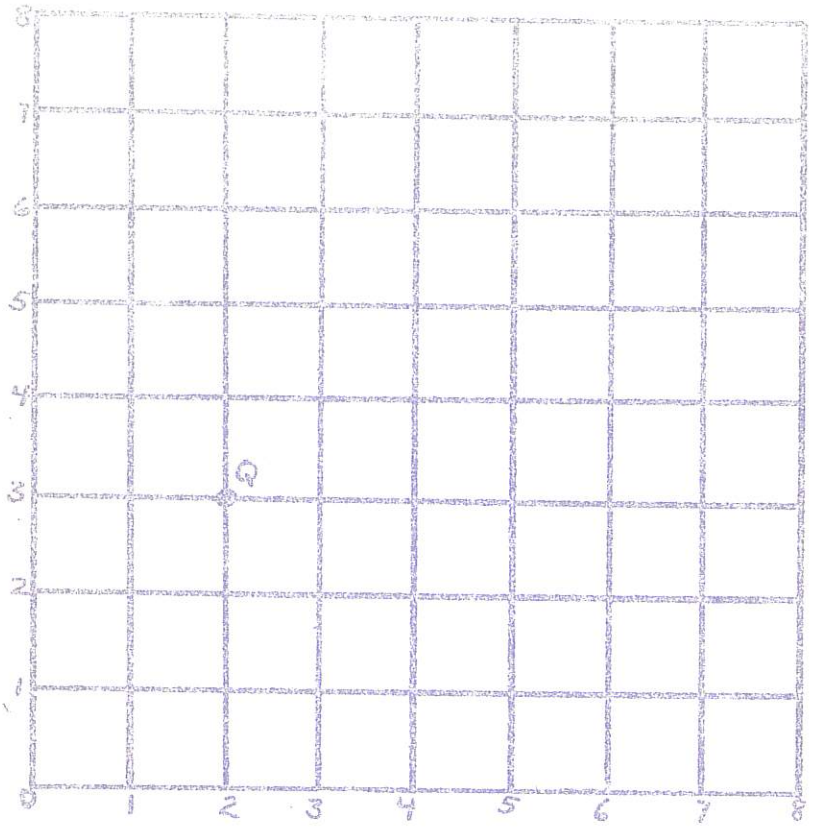
3. There are 24 flowers to be put into 6 vases. If each vase gets the same number of flowers, how many are in each vase?

_____

4. If 14 pencils are divided equally among 7 children, how many pencils does each child get?

_____

Name _____ Date _____



Mark each point on the grid with a point and a letter. The first one is done for you.

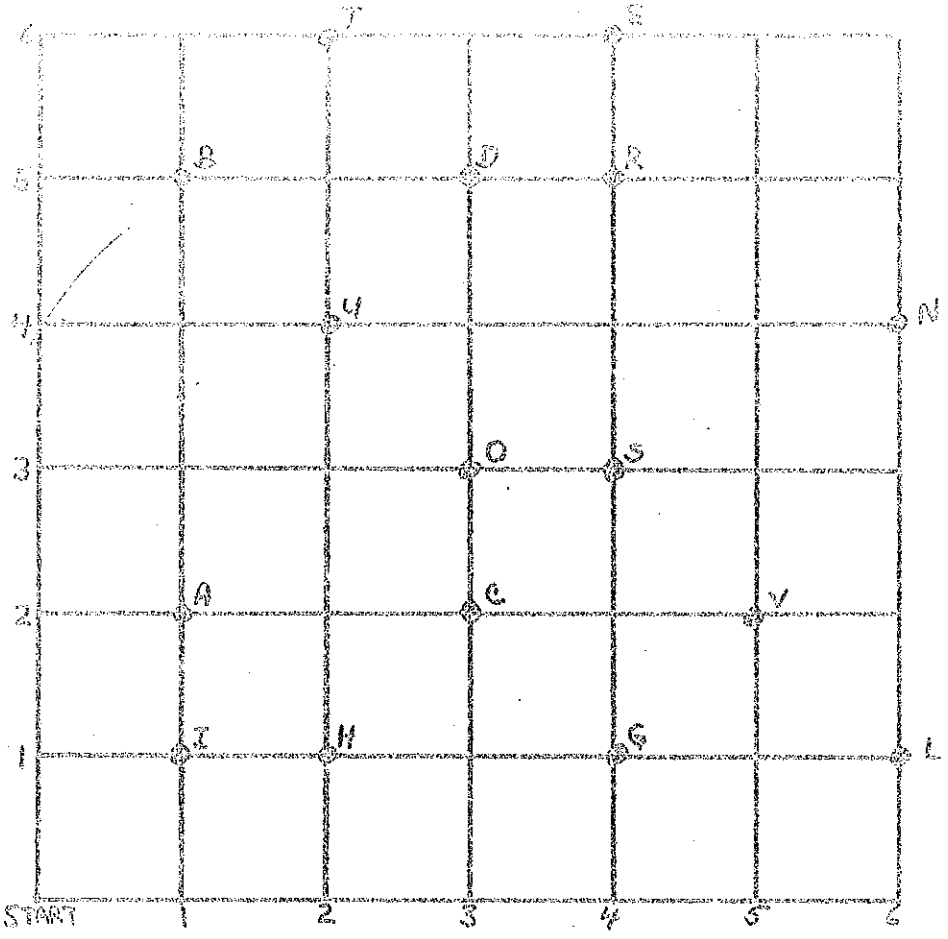
Q (2,3) R (6,4) S (4,7)

T (3,1) U (7,6) V (5,5)

W (4,1) X (3,6) Y (1,4)

Z (5,3)

Name _____ Date _____



To find the message, write the letter for each number pa

(2,6) (2,1) (4,6) (4,1)(3,3) (6,1) (3,5)

_____ _____

(1,1) (4,3) (1,5) (2,4) (4,5) (1,1) (4,6) (3,5) (1,1)(6,4)

_____ _____ _____

(2,6)(2,1) (4,6) (3,2)(1,2) (5,2) (4,6).

_____ _____

Name_____ Date_____

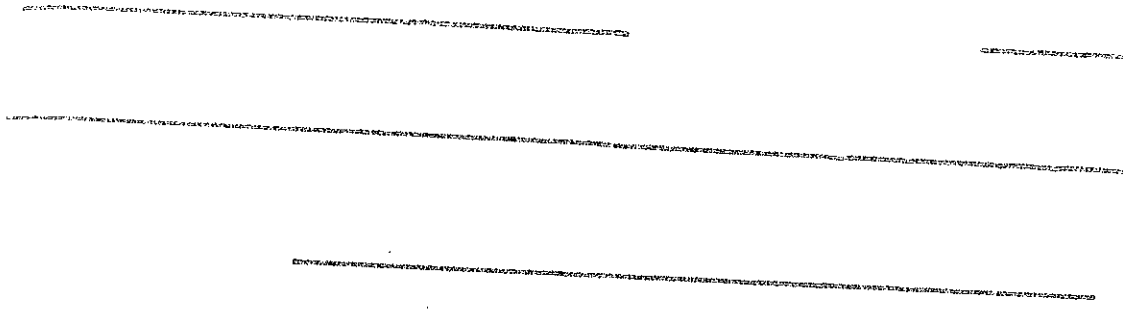
1. Draw a 4-sided polygon (quadrilateral) Use your ruler. Draw all the diagonals. How many diagonals are there?_____. How many diagonals are there from each vertex?_____

2. Draw a 5-sided polygon (pentagon) Use your ruler. Choose one vertex. How many diagonals can you draw from it?_____ Can you draw the same number of diagonals from any vertex?_____

3. Before you try it on your paper guess how many diagonals you can draw from one vertex of a 6-sided polygon (hexagon)._____ Now draw this on your paper and see how well you guessed.

Name _____ Date _____

1. Measure each line segment to the nearest inch. Write your measurement on the line.



2. Use a ruler to draw segments of these lengths. Label each segment.

a. 2 in., b. 6 in., c. 1 in., d. 8 in., e. 4 in.

Name _____ Date _____

Measure each line segment to the nearest centimeter.

1. Write the length on the line segment.

a. _____ b. _____

c. _____

d. _____

2. Use a ruler to draw segments with these lengths. Label each segment.

a. 4 centimeters (4 cms.) b. 8 cms. c. 14 cms.

d. 20 cms.

3. Without using a ruler, draw segments that you think have these lengths.

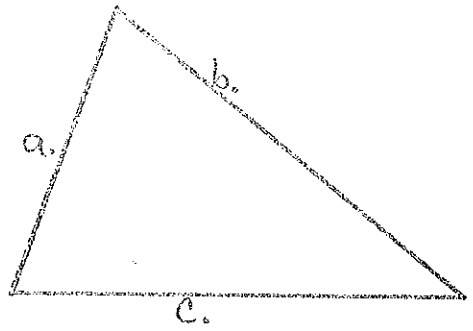
a. 3 cms.

b. 10 cms.

c. 15 cms.

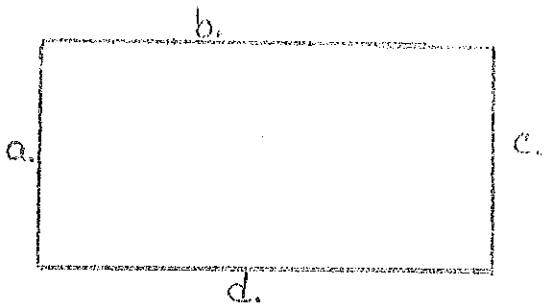
Check by measuring.

1. Use a centimeter ruler. Measure each figure to the nearest centimeter.



a. _____ b. _____

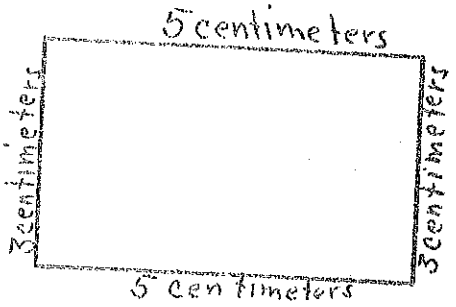
c. _____



a. _____ b. _____

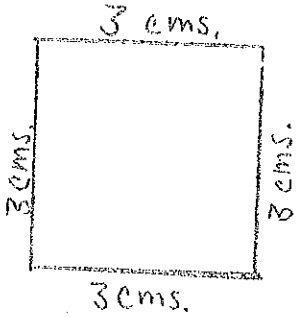
c. _____ d. _____

2. The distance around a figure is called its perimeter.

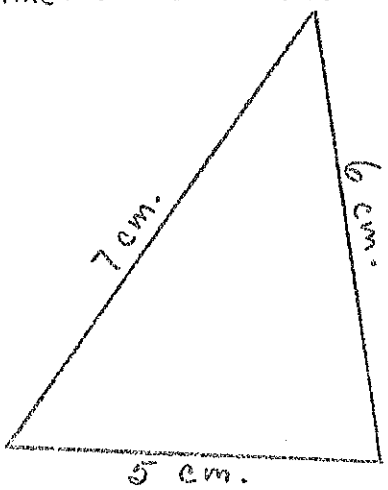


You can add to find the perimeter. In the rectangle the perimeter is $5 + 3 + 5 + 3 =$ ☐ centimeters.

3. Find the perimeter of these figures.

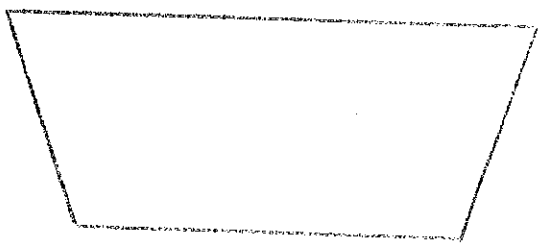


_____



_____

4. Measure each side to the nearest centimeter. Find the perimeter.



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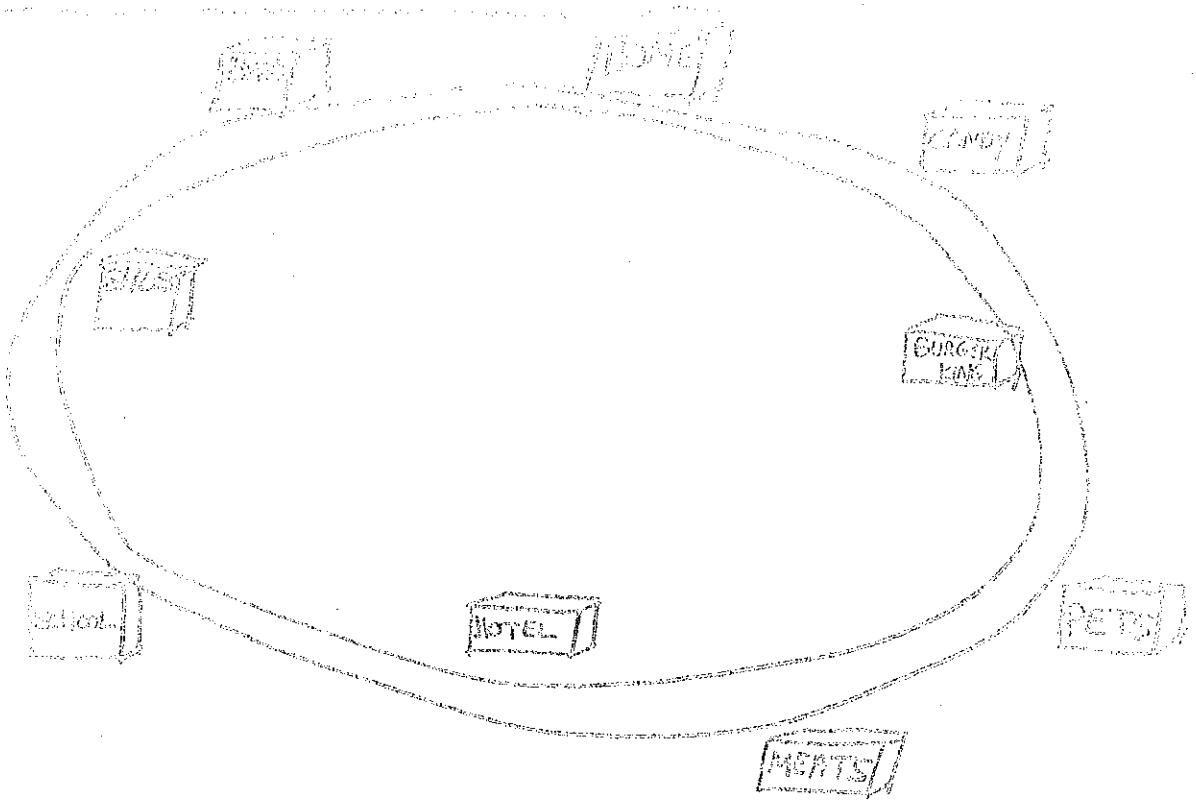


When the mail carrier makes his stops, HOME is the first stop. The candy store is the ninth stop. Tell which is

third (3rd) _____

seventh (7th) _____

second (2nd) _____

fifth (5th) _____

fourth (4th) _____

sixth (6th) _____

eighth (8th) _____

Name _____ Date _____

1. What is the name of the biggest bird in the world?

Use these clues to help you.

The seventh letter is H.

The third letter is T.

The first letter is O.

The fourth letter is R.

The fifth letter is I

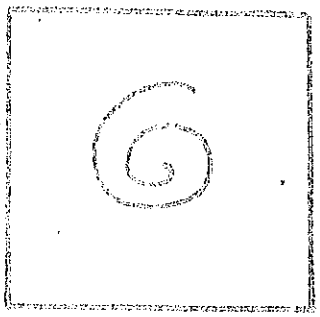
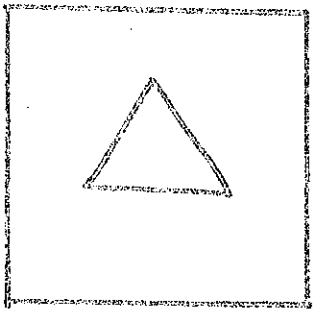
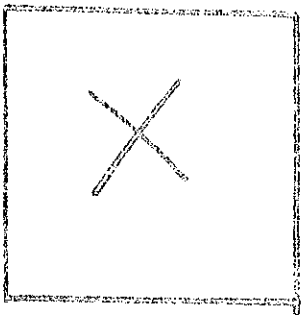
The second letter is S.

The sixth letter is C.

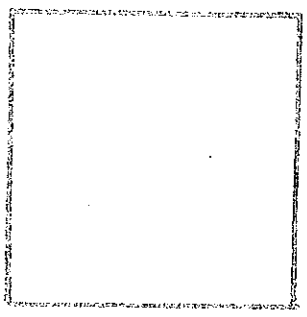
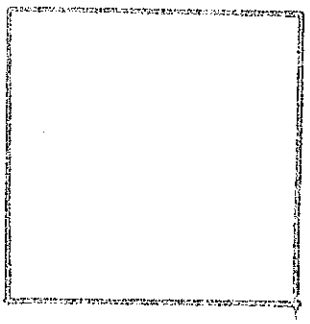
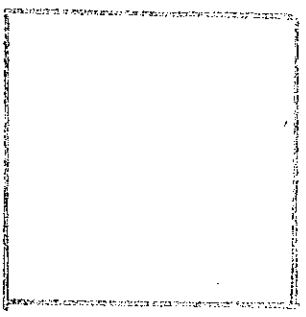
---

2. Tom is 4 years older than his sister.
He is 6 years older than his brother.
The sum of their ages is 26.
How old is each child?

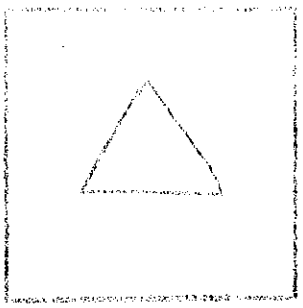
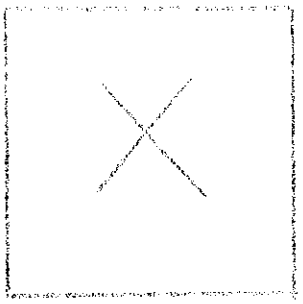
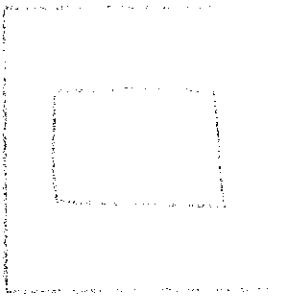
Name _____

Can you arrange these designs so that the △ is the farthest left and so that ⓖ is not by the △?

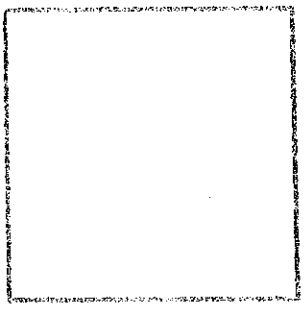
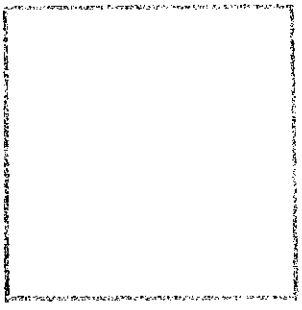
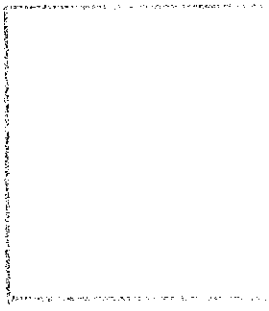




Name _____ Date _____

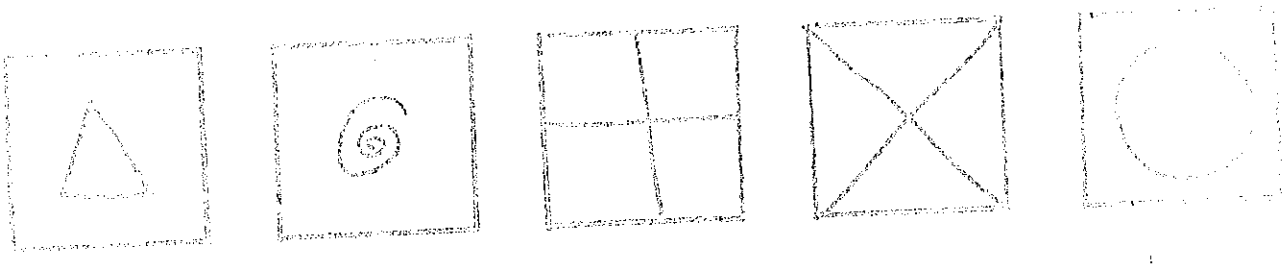





Arrange the designs so the following are true:

1. The  is not next to the  .
2. The  is farthest to the right.
3. The  is to the left of the  .

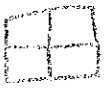
Name _____ Date _____



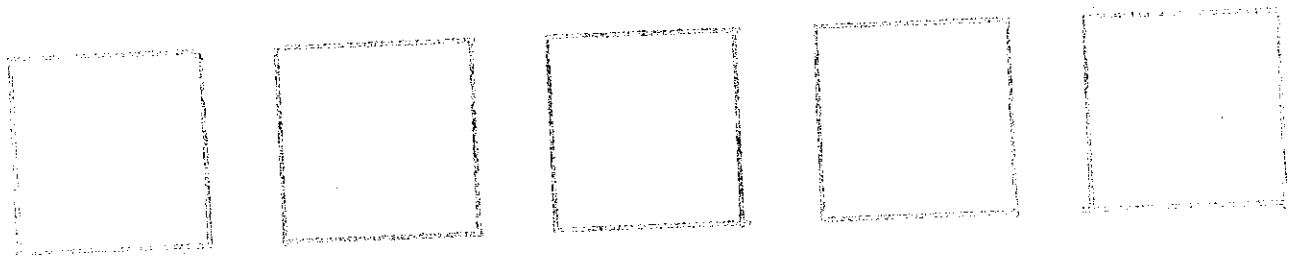
These figures were arranged in a special way.

 was just right of  .

 touched only  .

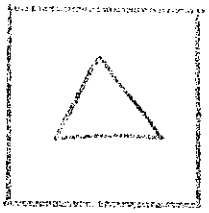
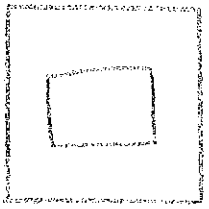
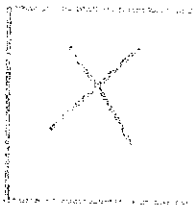
 touched only  .

When you figure out the arrangement draw it in the squares below.



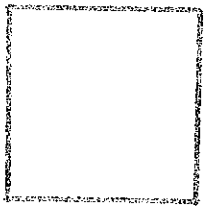
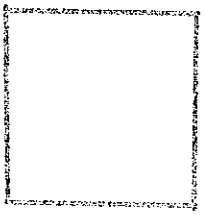
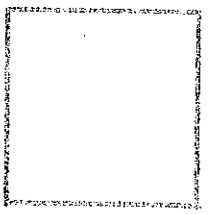
Name _____ Date _____



Place these figures in the boxes below so tha
the following are all true:

1.  does not touch  .
2.  touches only  .
3.  is on the far right.


How To Torture Your Friends

1. While standing on a hard wooden floor, how could you drop an egg three feet without breaking the shell? Nothing must be used to cushion the fall.

2. A little Eskimo and a big Eskimo are walking in the snow. The little Eskimo is the big Eskimo's son. The big Eskimo is not the little Eskimo's father. Who is the big Eskimo?

3. How can you throw a ball with all your might, and make it stop and come straight back to you, without hitting a wall, or any other obstruction, and without having anything attached to it?

4. There are ten red socks and ten green socks in a drawer. If you reach into the drawer in the dark, what is the smallest number of socks you must take out before you are sure of having a pair that match?

5. On February 28 you go to sleep at seven o"clock at night, having set your alarm clock to waken you at eight the next morning. If you sleep soundly all the time, how many hours' sleep will you get?

6. If sneakers are used in tennis, cleats in football, and spikes in running, in what sport are the shoes made entirely of metal?

7. Which is correct: 8 and 8 are 15, or 8 and 8 is 15?

8. Mr. and Mrs. Smith had seven daughters, and each daughter had one brother. How many people were in the Smith Family?

9. A man was blindfolded, and then someone hung up his hat. Revolver in hand, the man walked 100 paces, turned around and shot a bullet through his hat. How was that possible?

10. You are the pilot of an airplane that flies from New York to Chicago - a distance of 1000 miles. The plane goes 200 miles an hour and makes one stop for thirty minutes. What is the pilot's name?

11. A set of ten books is arranged in order along a shelf. Each of the books has 100 pages, making 1000 pages altogether. A worm, starting on page 1 of the first book, eats his way through to page 100 of the last book. How many pages has he eaten?

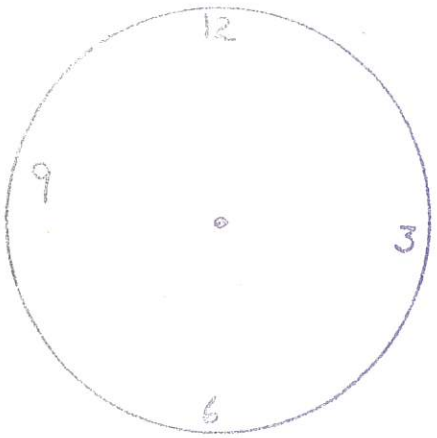
12. What is the smallest number of ducks that could swim in this formation: two ducks in front of a duck, two ducks behind a duck, and a duck between two ducks?

13. We all know there are twelve one cent stamps in a dozen, but how many two-cent stamps are there in a dozen

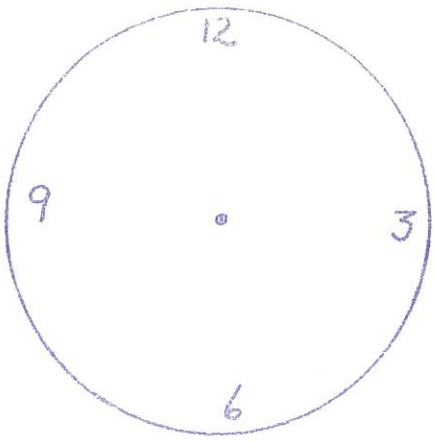
14. How can you put your left hand completely in your right-hand trouser pocket and your right hand completely in your left-hand trouser pocket, both at the same time? Of course, you must be wearing your trousers, or slacks.

Name _____

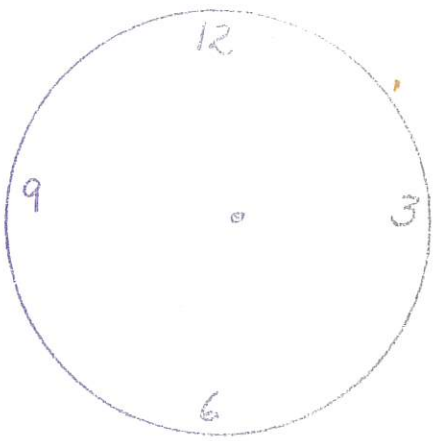
1.



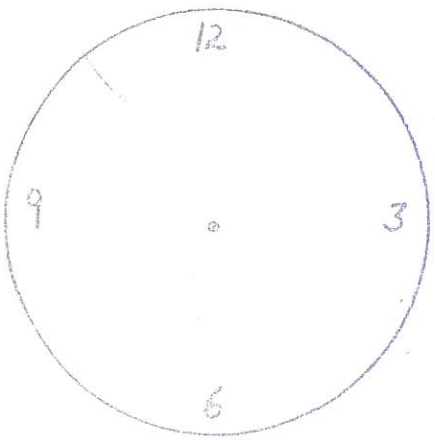
2.



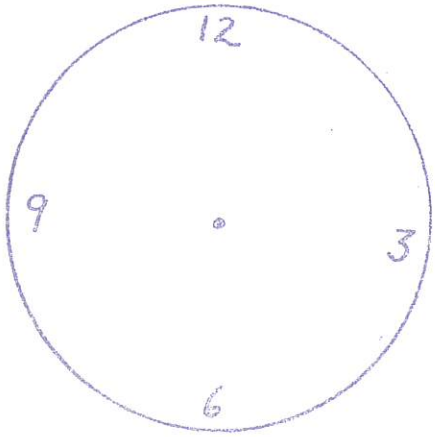
3.



4.



5.



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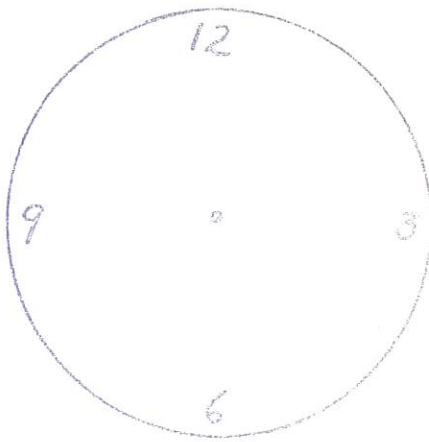

a. Fill in the missing numbers on each clock.

b. Make the third clock say 4 o'clock.

c. Make the first clock say 10 minutes before 1.

d. Make the second clock say 5:45

e. Make the fourth clock say nine-thirty.

f. Make the sixth clock say half past 3.

g. Make the fifth clock say 10:00

Name _____ Date _____

Number Maze #1

31	25	24	22	21	8	9	11	10
30	24	23	21	7	20	10	12	13
26	29	24	6	19	23	9	13	16
28	25	5		20	22	8	14	15
26	27	4		21	7	15	17	23
31	27	3	16	6	3	4	16	22
30	28	15	2	2	5	5	6	21
29	15	14	2	1	4	7	8	20
16	30	3	13	2	3	8	9	19
17	31	4	12	11	9	11	10	18
18	32	14	5	12	10	12	17	12
19	13	33	6	13	14	13	16	26
20	12	7	34	16	15	14	15	17
11	21	8	9	35	16	17	16	18
10	9	11	10	End	20	18	19	19

Try to get from 1 in the middle to 35 and "End". Start in the box in the middle where number 1 is. Move one box up or down or right or left or through a corner to a box with the number 2. Continue in this way, moving one box at a time, to 3, 4, 5 and so on, until you reach 35 and "End."

1. There are 2 cups in 1 pint.
There are 2 pints in 1 quart so
there are ☐ cups in 1 quart.
There are 4 quarts in 1 gallon so
there are ☐ cups in 1 gallon.

2. There are 8 tablespoons in one stick of butter.
There are 2 sticks of butter in 1 cup so
there are ☐ tablespoons in 1 cup.
There are 2 cups of butter in 1 pound so
there are ☐ tablespoons in 1 pound.

Chip Trading Record