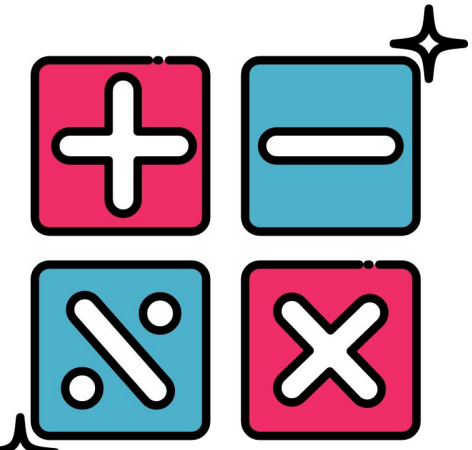
Memory Joggers



Companion Book

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Introduction

Memory Joggers have been a part of my math program since I first found them in 2005. Introducing concepts before the brain is developed enough to understand them can lead children to forming the wrong impression about their math ability. A multi-sensory concrete approach to introducing abstract concepts to visual spacial learners has improved their math confidence. Visual memory, using color, is important for long-term recall, but it wasn't until I found the Memory Joggers that I found the formula that yielded lasting impaction on my students.

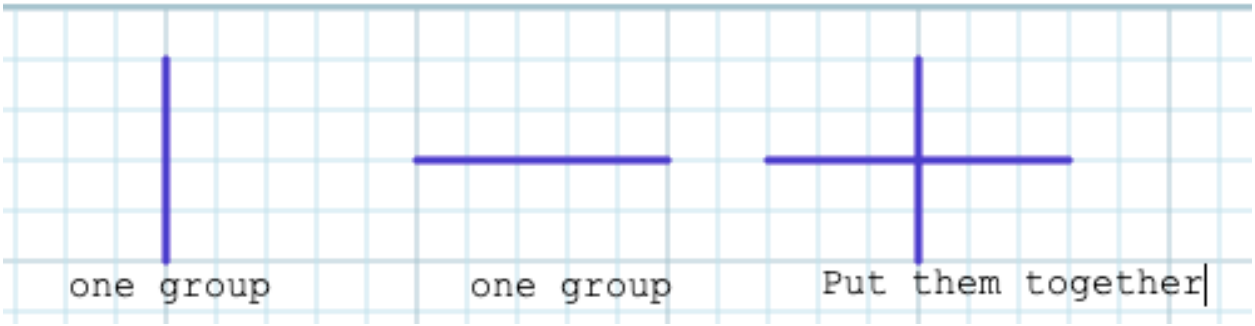
My former students will often comment that they still remember that Nate 8 and Kevin 7 did flippy kicks 56 in the talent show. Facts and data are lost unless they are used, but the memory joggers, along with the other activities the students do before I speak in abstract terms, cements them in a way that memorization and drill does not. Many students form negative self-images surrounding their math ability with "drill and kill," There are companies that are guaranteed business, because they know taking timed tests without a concrete understanding of the concept will create repeat business.

Preparation Prior to Using Cards

Prior to introducing the picture cards created by Dr. Yates, it is crucial to explain exactly what symbols mean. When we talk about addition, subtraction, multiplication, or division, we are speaking about putting groups together or taking them apart. I believe we have made it more difficult by not offering a more concrete explanation of what each symbol represents. We will say + means to add and — means to subtract, but that does not help one understand what the sign actually means.

Children find it interesting to know that mathematicians didn't mean for the symbols to be so confusing. They wanted to use symbols instead of words for simplicity. There is logics to these mysterious symbols.

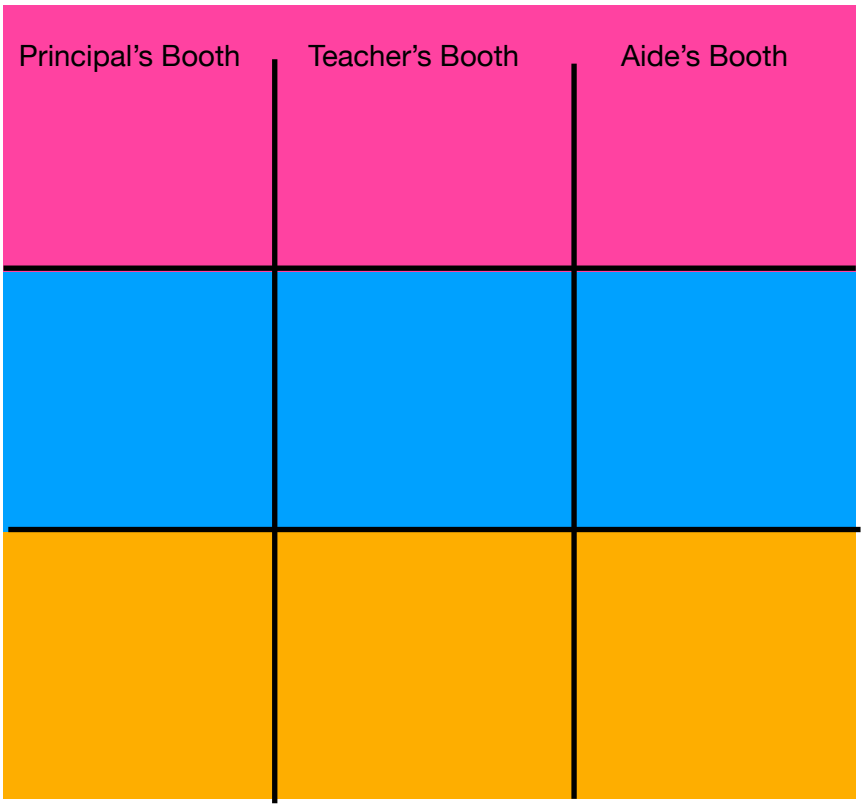
Using a picture of the horizon, they will quickly see the line that separates the sky from the ocean. The horizon and creates what we call a horizontal line. Ask what they notice about the word horizontal. They will see the word horizon in it. To describe vertical, have them look at a place where the walls come together. They form a perfect vertical line. With their arms stretched straight out in front of them, swiping side to side, say "horizontal." Point the hand to the ceiling and the elbow to the flow and with a chopping movement, say, "vertical."

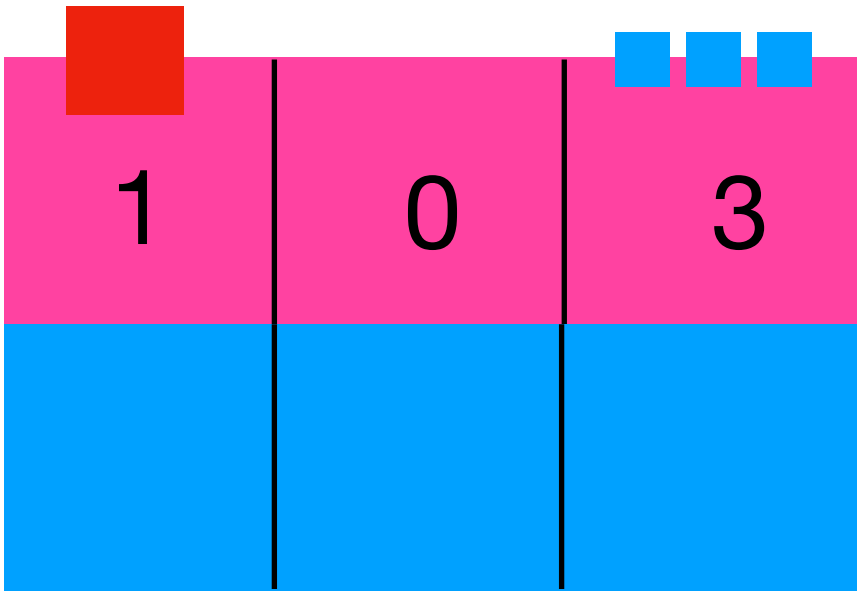


To introduce addition, I draw a vertical line as in the figure be above. I refer to the vertical line of the addition sign as **one group** and the horizontal line as **another group**. Using two rulers I offer a visual representations. I tell them the vertical line

tells me I have one group. The horizontal line tells me I have another group. Then I lay one on top of the other as shown in the picture and ask them what I just did. They can see I put them together. They form a cross when we put them together. So I read this sign as “put groups together.” Now they are ready to apply a math term to this process. “In math terms, when we put groups together we call it addition.”

Introducing the concept of regrouping is best with an activity first that relates to something they have done in the past. Many children have been to fairs where there are dunk booths that they have to pay to play. In my game, “Sink the Teacher,” the students pretend we are having a carnival with three dunk booths. The first is for aides. The second is for teachers, and the third is for the principal. For a chance to sink the teacher, they have sink the aide first. Before they can sink the principal, they have to sink the teacher. The game board looks like the one pictured below. They can be made by gluing large construction paper together.

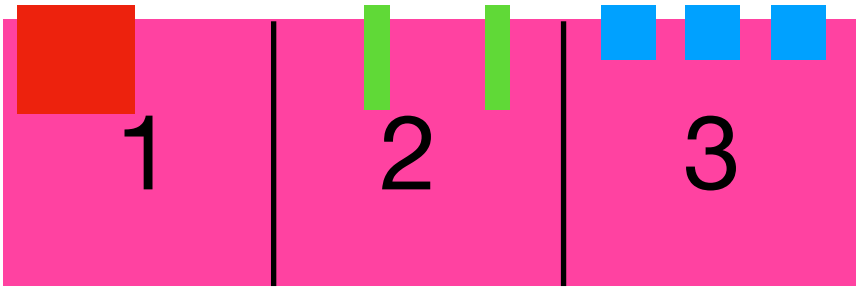




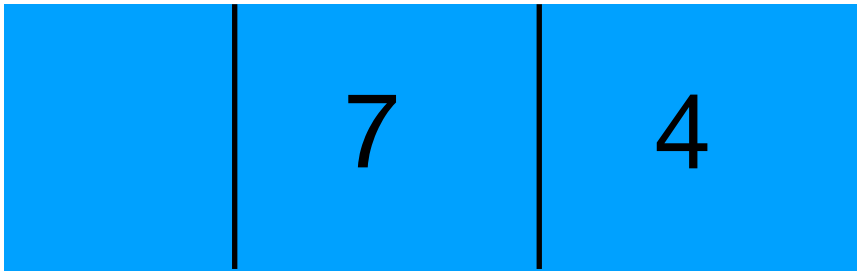
The pink section represents currency the student has to play with. The blue section represents what it costs to play in each booth. The yellow section represents what is left over after playing in each booth. When we begin the game, if the students are successful in sinking the aide and then the teacher, they don't have to pay to sink the principal. Another section can be added to the board when we want to teach the concept of subtracting and regrouping into the 1,000's.

Supplies Needed: A playing board pictured above.
Unit Cubes representing ones, tens, hundreds
One die numbered 0,1,2,3,4,5
One die numbered 4,5,6,7,8,9

Steps:
A player rolls the 0-5 die. This number indicates how many cubes they have to play. The student records it in the first pink box and places the unit cubes above that represent that number. Players will take turns rolling this die two more times and fill in the next two boxes with the results of the roll. Then they will place the unit cubes that represent the number above the box. An example is shown on the next page.

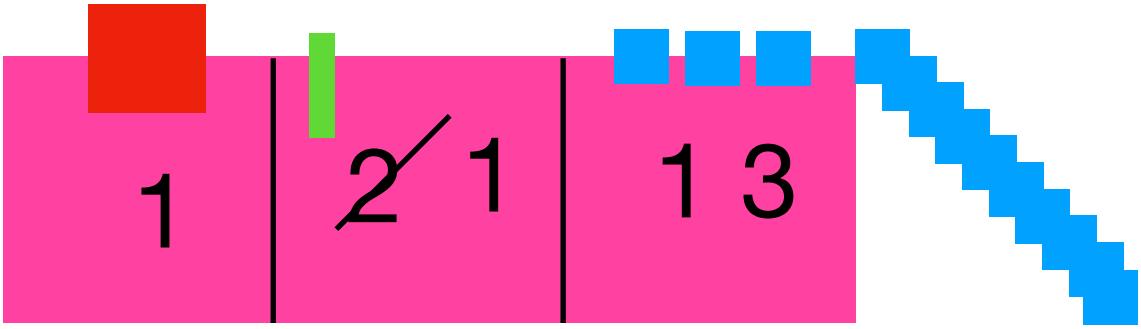


Step 2: Roll the die numbered, 4,5,6,7,8,9 twi times and record the number that represents what the player needs to pay to play at each booth.

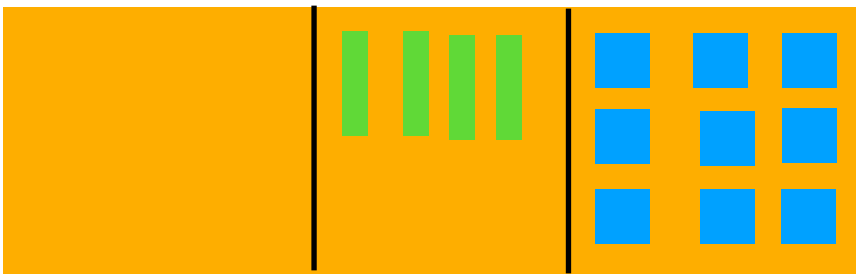


Each student gets a chance to sink all three and records what is left over. When every child has had a chance to play, the winner is the one with the least value left over. One player becomes a banker who will trade tens rods (longs) for units if needed. A hundred (flats) is traded for ten longs.

The play goes as follows:
Students say, “I have three units and I need 4, do I have enough? If the answer is yes, then they hand the banker the amount they need. But if the answer is no, they have to trade a long for ten units. The banker will not trade them until they cross out the number to indicate they traded it.



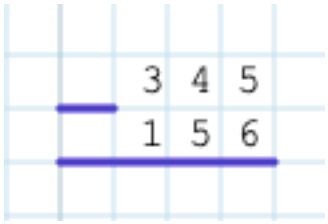
Once the trade is made, the student will say, “I have thirteen, I need 4, do I have enough. The answer is yes, and they pay the banker the 4 units. The remaining units are placed in the yellow section. They move to the next column and repeat the pattern, “I have on long (ten’s rod), I need 7. Do I have enough? The answer is no, so the student needs to trade a flat (hundreds) for ten longs. The same pattern is followed with remaining logs placed in the yellow section. Since there is not fee for the Principal, what ever is left in the flats, is also placed in the yellow section. The player determines if they have enough to play again. If they do, they play. In this case, the doesn’t have



enough to sink all three, so this becomes the player's score for this round.

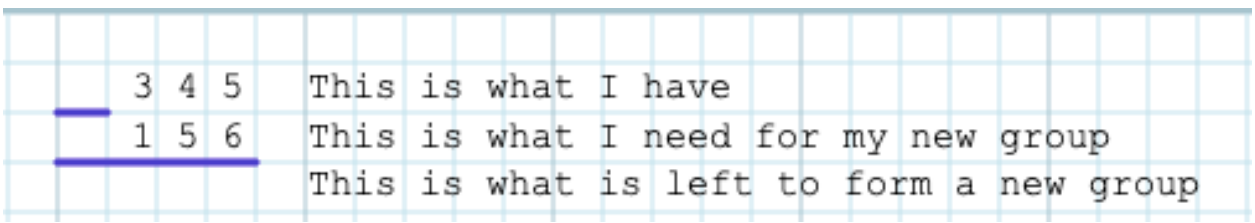
The players switch roles. The banker is always checking to make sure the trade is acceptable, that the player is subtracting the right number of units, and that the player is crossing out the number when a trade is made. The player is encouraged to make sure the banker has traded the correct amount.

Once students are done playing the game several times, they get accustomed to saying, "I have this. I need that. Do I have enough?" Now they are ready to apply this to the abstract form of subtraction.



The — sign indicates they will be making a new group. They will say, "I have a group of 345 and I am going to make two new groups with it. The first group will take 156 pieces and the second group will be what is left over after making the group of 156.

Working in pairs, the student who was the banker before, will check that the player indicates trades and subtracts the from the section that was traded. The player proceeds by saying aloud, "I have 5. I need 6. Do I have enough? No. "This indicates a need to make a trade. Then say, "I have 15. I need 6. Do I have enough? Yes." Then they subtraction and record the number of

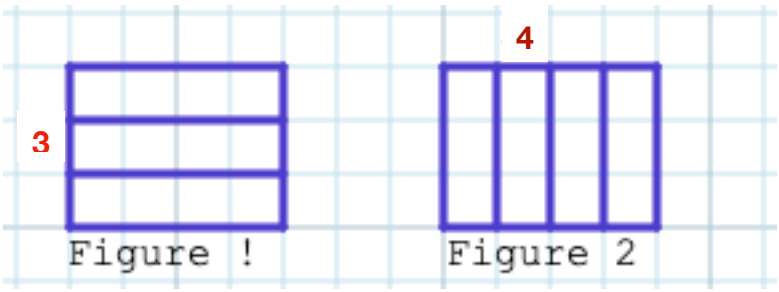


units that will be remaining as in the games. The pattern continues until a check is made by adding the two new groups together to see if they are the same as the original group.

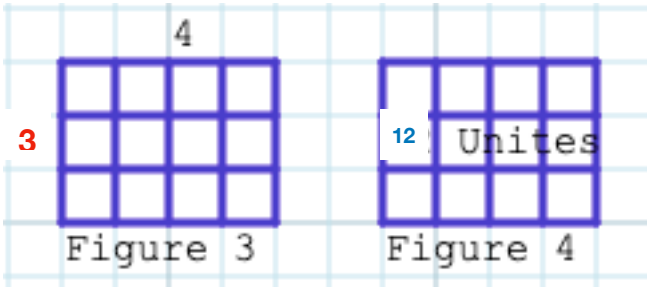
Step 4
Explaining the Multiplication Sign

We can identify the "X By" sign as the multiplication sign X. In an equation it means "put together." The X looks like a rolling addition sign, because multiplication is like repeated addition. The division sign is read "put into What is most important and unlike addition and subtraction, multiplication and division is only used with **equal groups.** In the beginning, I never use the words multiply or divide. I simply refer to them is X=Groups of and ÷ as "Put into equal groups."

Using graph paper is the easiest way to show what multiplication and division look like.



In figure 1, the 3 on the left side indicates the number of rows represents the number of groups. In figure 2, the top number indicated by a 4 is the number of columns that represents how many in each group.

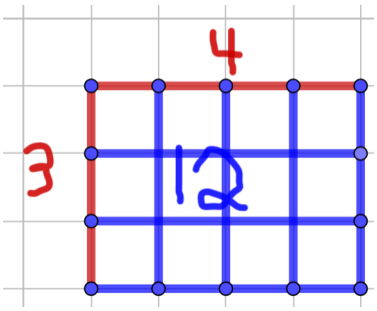


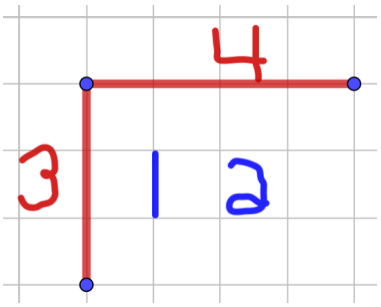
Showing the rows and columns together helps build understanding that they form units inside the shape that they

will later connect to learning area.

Directing students where to place each number in an equation builds concrete understanding that benefits them later on when dealing with word problems. When writing number multiplication number sentences, they begin with the rows and then the columns.

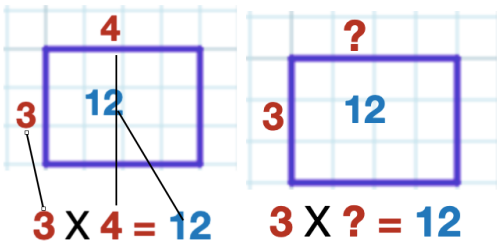
The representation is written as they verbalize, “3 ‘groups of 4’ is 12 items. **3**X**4**=**12**. I don’t share the official words or the names of the parts of parts of each type of operation until they are comfortable with doing the problems first. This keeps the process in the right brain. The minute we label too many things with difficult names, we create unnecessary anxiety. You will also note red is used to indicate factors, divisors, and quotient, while the blue is used to indicate the products and dividends.



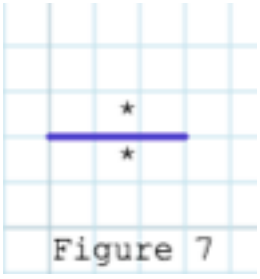


To demonstrate the meaning of the division sign, I show them this figure. They know the 3 represents the number of rows and the 4 represents the number of columns, and they create 12 squares inside. Then I remove the lines as shown above and what is left is the division sign. This makes division so simple. They read this problem, “I have 12, I need to put them in 3

groups or in groups of three. Do I have enough?" I still use this verbiage when subtracting and dividing, which keeps me from making costly mistakes. Balancing a checkbook is a good reason to slow down when subtracting.



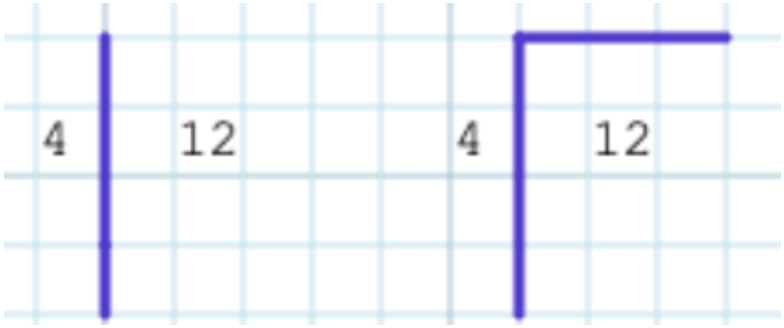
This demonstrates how the division problem can be written as a multiplication problem. Many students find it easier to find the missing factor this way.



The other symbol for division shown can easily be remembered because of how it is written. When asked to tell what attributes they notice, they will describe it as a line between two dots. If they try to label it a division sign, I ask them to focus on what it looks like is happening.

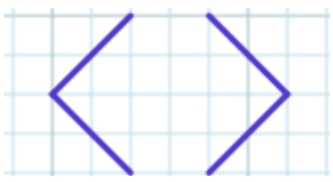
Guide them to seeing how two things have been divided into equal groups. One is above the line and the other is below. Have the read as put __ into ___ equal groups.
12÷**3** is asking us to take 12 items and put them in 3 equal groups.

Many people show this to be read as twelve things put into groups of three, but that is not what placement of this division sign is asking. It's asking us to create three groups and find out how many are in each group.



The equation **12**÷4 should be read **12** items put into **4** groups of **3** or three in each group. They can find the answer using graph paper, by first drawing the vertical line for rows using 4 boxes. Next they label them with the numbers they know. Then they count by 4's until they get to 12, as they draw the horizontal line. Now they know the missing number. Make sure they count the squares inside to be sure they add up to 12.

It may not to seem to matter which number goes on the top or side, but as I shared earlier, it does matter in construction. A 3X4 window and a 4X3 window open differently. It is more concrete and discards confusion about where numbers go in a problem. Just as in subtraction, when we get accustomed to saying the top number followed by "what I have" and the bottom number followed by "What I need to make a new group," children make fewer errors when translating a word problem to an equation. When we get to more elaborate division problems, it be very clear that this process makes the problems easier to understand.



Another set of symbols used in math are the greater than and less than symbols shown at the left. I ask the children to forget the crocodile story for a while, because many

children still make mistakes using it. Instead, I recommend looking at the attributes of one symbols to see what they notice. They will describe angels and that the sides meet or that the lines are diagonal. Direct them to notice the difference between one side and the other. Some will say, “One side is closed and the other is open.” Direct them to notice the space between the lines and that as the lines get closer together on one the closed side and the space gets smaller. On the open side the space between the lines gets bigger and bigger. It becomes logical that the bigger numbers will be on the side with the bigger space and the smaller number will be on the side that is closed.

 This line represents a fraction. They quickly discover that this sign means put in equal groups.

The numbers below the line indicates how many we need to make a group. The number above the line tells us how many we actually have.

$$\frac{3}{4}$$

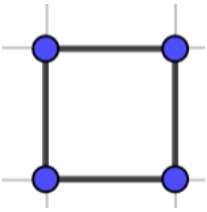
This fraction should be read, “I have three, I need four to make a group. Do I have enough?” If no, then there is not a complete group.

$$\frac{8}{4}$$

If the answer is yes, as in the example above, by drawing 8 items and circle four to make a group. They will quickly see they have two full groups.

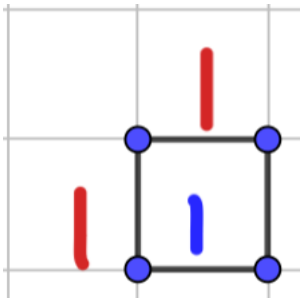
Connecting this image with the division sign will demonstrate how division and fractions are the same. Introduction to Multiplication:

Step 1:



Showing the students what one square inch looks like makes sense to children.

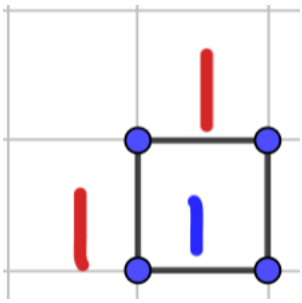
Draw a shape on the board of a square that is one inch on all sides. Students discuss what they see. They identify it as a square and describe the characteristics of a square. All sides of square are the same length.



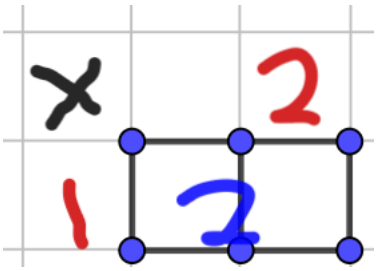
The red notations represent the length of sides. The blue represents the space inside.

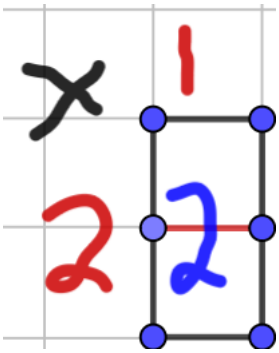
Next Step:
Graphing Numbers

The following activity helps students understand what numbers mean. Using unit cubes, we take one cube and see how many even rows and columns they can create with the cubes. They draw the ways on graph paper. One cube can only be drawn one way.



With two cubes the children discover their are only two ways to show two cubes. We place an X in the upper left hand column to represent the word "**by.**"





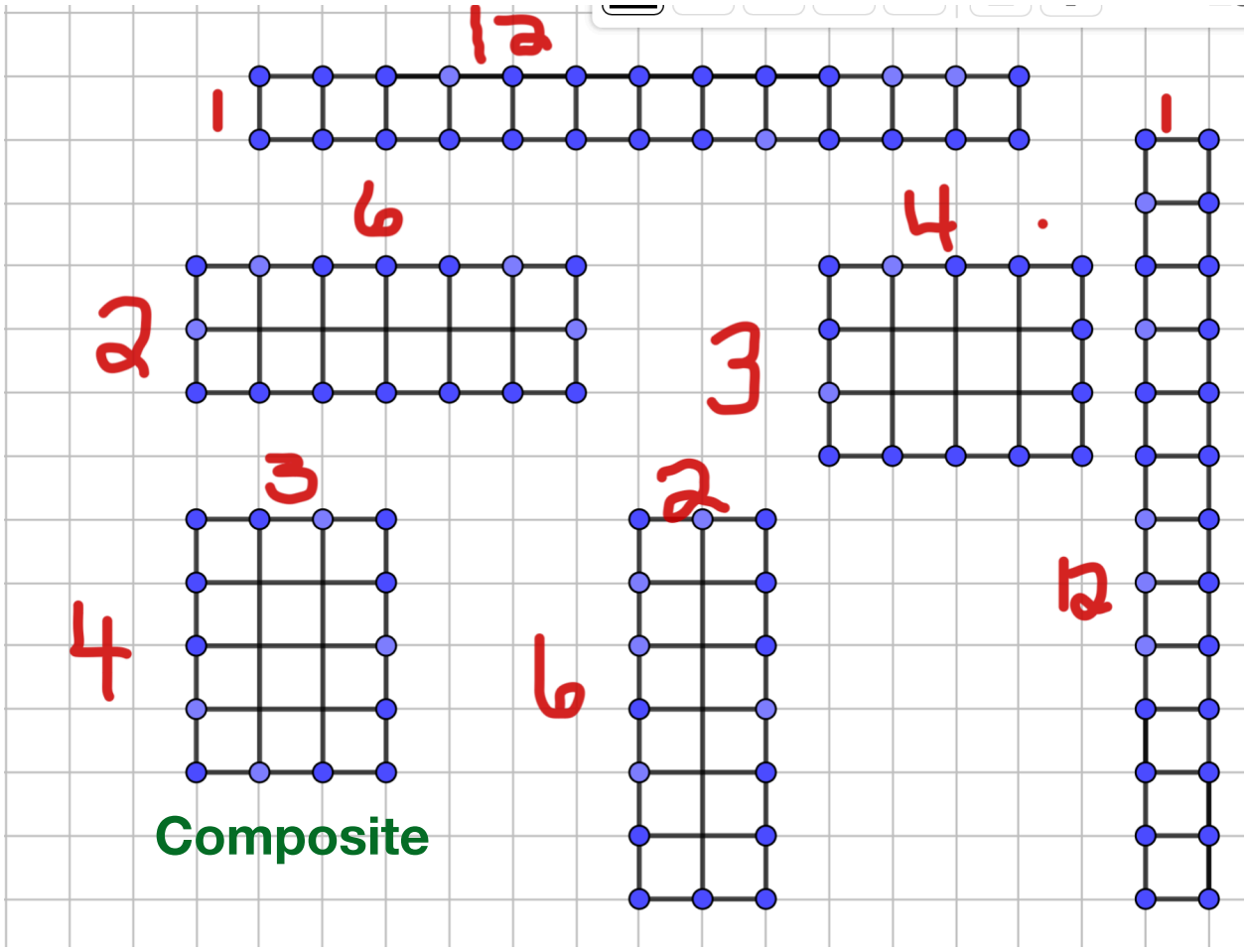
These figures are read, "one by two" and "two by one." Point out the way it is read is important with the left side the first number read. If I order a window for a space that is a 2' X 1", and they send me a window that opens like a 1' X 2'

window. it won't work, because the cut in the wall is going a different direction. So, the order in illustrating an equation is very important.

The children continue increasing their cubes by one and drawing all the ways that each new number can be organized in equal rows and columns. They will discover that larger numbers have multiple ways of organizing the cubes in equal rows and columns. As they begin to see patterns, they will notice some form the shape of a square. They will often see that some numbers can only be done in two ways and others can be done in multiple ways. They usually see that every number can be done a 1by the number and the number by 1. Once they make these observations, they are ready to label the numbers. If the number can only be one in two ways, they label that number as **prime.** If a number forms the shape of a square it is labeled **square** in **blue.** If the number can be drawn in three or more ways, they label it in **green** as a **composite number.** When they are introduced to the properties of multiplication, the identity property will make total sense to them after doing this activity.

During the process, stop periodically to have the describe what patterns they are seeing. Some of the observations the children have made in the past are: Every number can be done in one column and one row. All even numbers can be done in two rows or columns. Most will believe that odd numbers can only be done in one row and one column, until they get the number nine. They may not try three rows unless it is suggested that they try all rows possible.

The following is what the number 12 will look like:

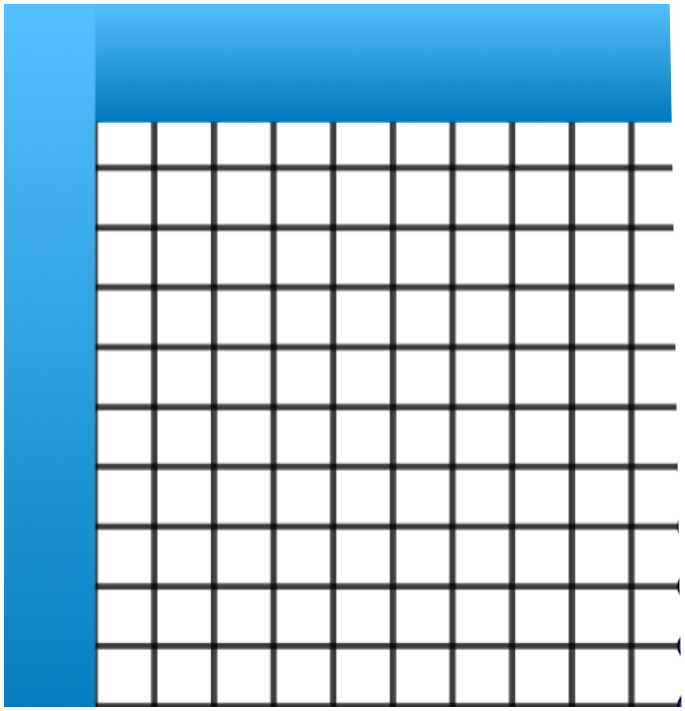


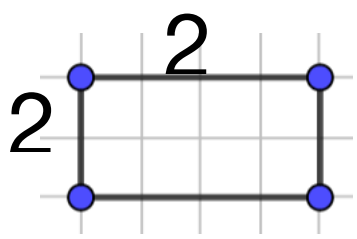
They continue drawing pictures of the even rows and columns until they have recorded numbers up to 48, or further.

Step 3:
Understanding the Multiplication/Division Chart

When they can identify shapes is a 3X3 or a 3X5, etc. they are ready to construct a class multiplication table, which will lead to a better understanding of its meaning.

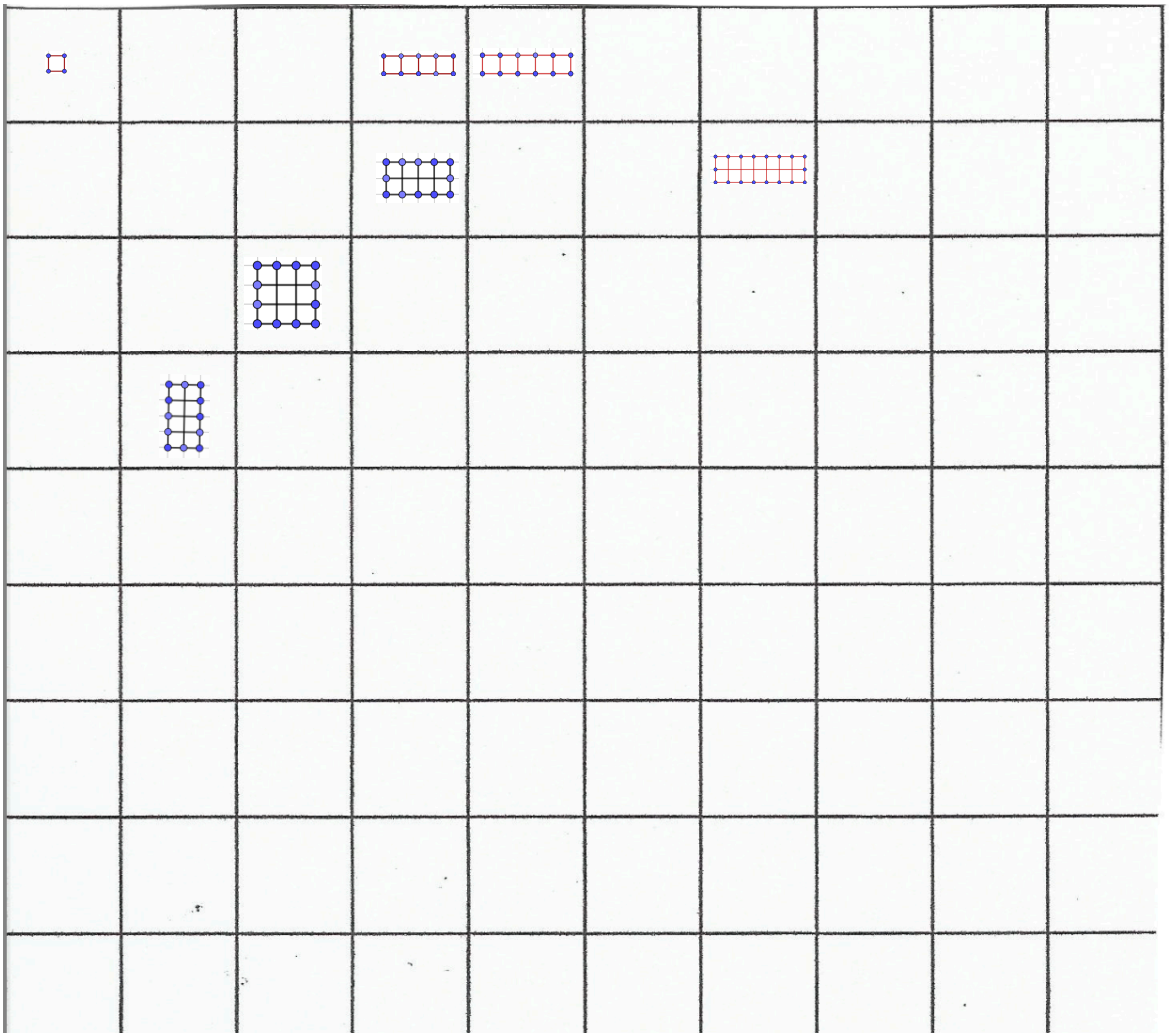
Materials needed: A large 11X11 chart with each square measuring 6'X6'. Cover the Left column and the first row of squares.

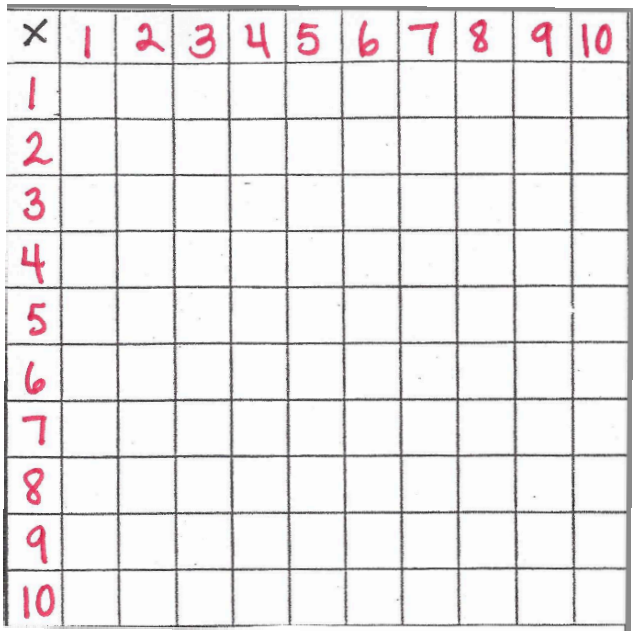




Cut pieces from graph paper as follows: 1x1, 1x2, 1x3, 1x4, 1x5, 1x6, 1x7, 1x8, 1x9, 1x10, 2x1, 2x2, 2x3, 2x4, 2x5, 2x6, 2x7, 2x8, 2x9, 2x10, 3x3, 3x4, 3x5, 3x6, 3x7, 3x8, 3x9, 3x10, 4x4, 4x2, 4x3, 4x4, 4x5, 4x6, 4x7, 4x8, 4x9, 4x10, 5x5, 5x6, 5x7, 5x8, 5x9, 5x10, 6x6, 6x7, 6x8, 6x9, 6x10, 7x7, 7x8, 7x9, 7x10, 8x8, 8x9, 8x10, 9x9, 9x10, 10x10.

Let the children pick the pieces out of a bag and write what it would be labeled. Place some glue pieces in the chart before they begin adding theirs. Mine are the red ones on the chart. After all pieces are labeled, the students begin to glue them to the chart.





×	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

As they glue their pieces on the chart, they will begin to the see patterns. When asked what we could do with the chart to make it easier to know where the pieces should be glued, they suggest numbering the sides.

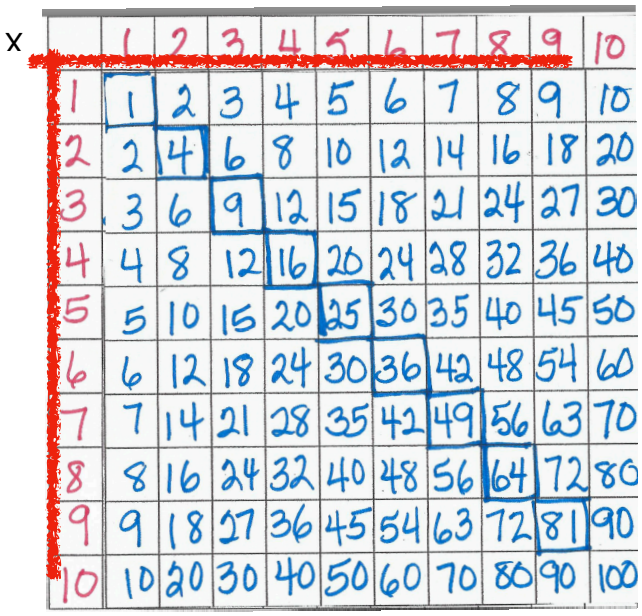
The first thing the students ask for are numbers down the side and across the top. I do them in red so the numbers are distinctly different and write the numbers as shown in this image. They realized it made it easier to find where their pieces would go.

	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

To fill in the rest of the squares as indicated, the class repeats, “A 1 by 1 shapes forms one square. A 1 by 2 shape forms 2 squares.” Continue with the first row and discuss patterns they see. They will identify

that any number multiplied by one is going to be that number. Since we have spoken about square numbers, point out that a 1 by 1, a 2 by 2, 3 by 3, and 4 by 4 all form square shapes, so we outline all square numbers in blue. The numbers that indicate the number of squared formed are notated in blue. Using red for the outside number and blue for those that indicate number of squares formed will aid is helpful when transitioning to doing equations.

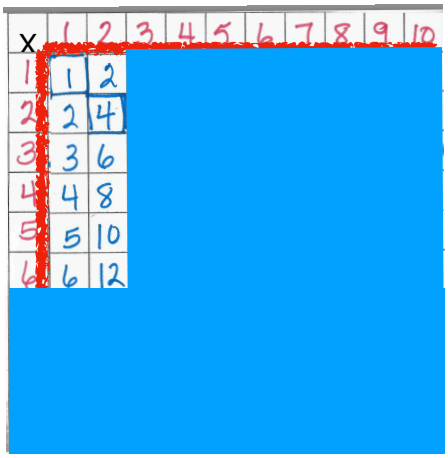
Once each row is completed, ask the children for patterns they are noticing. Then practicing reading the pattern for multiples of two, three, four, etc aloud. Creating movements that go with the patterns of clapping, stepping, or snapping will help with retention.



After the chart is completed, we examine it by adding the red lines as shown in this illustration. Introduce the red lines and show them how they look like a division sign. Introduce the red numbers as factors that are used to determine the product of the numbers. One of my students saw the relationship and came up with this saying to help them remember which numbers were products and which were factors,"We put the numbers together in the factory and we produce a shape."

It's a good time to identify the correct mathematical term the answers in each row and column. In row 1 the multiples of one are 1,2,3,4,5,6,7,8,9,10. In row 2, the multiples are 2, 4, 6, 8, and 10.

In a division problem, the blue numbers are what we have and the red numbers are how many we need in each group or how many groups we can make.



Using construction paper, demonstrated how you find the answer to 12 divided by six to solve the equation. First find row 6 and put construction paper to cover the bottom remaining rows. Find 12 in that row and cover the remaining columns in the chart. The red 2 at the top is the solution to the equation.

Step 5
Procedures for Using Memory Joggers

The following process for introducing multiplication has been 47 years in development. Believe me, I have tried hundreds of ways to teach this concept and I am giving you the shortcut. Each step is deliberate and brings about quicker results and fact fluency.

This process requires that children know how to access past experiences using mental imagery. If your children haven't tried to form mental images, they will need to experiment doing so before starting this program.

Ask them, "How many of you can form mental images?" Most don't realize they can, so have them close their eyes and see themselves in bed this morning. "Can you see your bed? I can see myself riding a bike when I was 11. Can you see yourself at the beach?" Since our brain stores memory in images, they will easily discover they can retrieve any memory with images. This is a very valuable memory skill and will serve them well on tests. When I was in college and was tested on the works in an anthology that was a 1000 rice pages long, I couldn't answer the question on the test with the exact answer, but I could see it on page 329. I gave the answer of page 329 and got credit for it.

Day 1: Memory Jogger

I begin by using the first 1X's memory jogger. It displays all the numbers and the characters they will be called in the story. At the time, I introduce the X as meaning "groups of." I don't want to introduce Zero or two's until they have a firm foundation in the process I use.

"We will be learning some stories in the next month. Each day I will tell you a new story, show you a picture about the story. Your job is to focus on the story and picture so you can retell it later on. Using the card that represents numbers one through nine, explain that each number in each story will always be read the same way. For example, 3 will always be a tree. 4 will always be a door. 6 will be sticks and 7 will be Kevin. 8 will be Nate the snowman, and 9 is Nina the porcupine."

Introducing the First Story

"Today we will meet two trees in the forest. As I tell you the story, I would like you to concentrate on the picture. Concentrate on it throughout the entire story so you can memorize it.

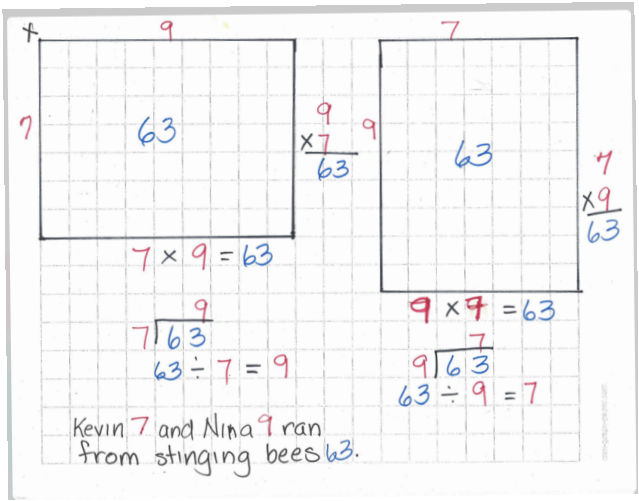
After the back of the card is read and the children respond appropriately, they snap an imaginary picture of the card. They then close their eyes, process the film, and see the picture in their mind's eye. They are asked to recall what they see with their eyes closed. This can be done with partner share. With eyes closed they share what they see and their partner adds what might be missing. Then they are given a chance to look at the

card again to see if they missed anything. Since our brains store information in the form of pictures, this picture can be pulled up anytime they need the fact family.

A second read is done with their eyes closed. This helps them solidify their image memory.

Once they have a clear visual image of the card, they will create a simple sentence to remind them of the story. In her book, Dr. Yates recommends having them write the story again. I have found that doing so for homework, and retelling the story to someone else is another way of making a lasting impression.

On plain paper they will redraw the picture using red an blue felt pens only.
They then they will graph the equation as indicated by the illustration below.



Using the information about rows and columns, they will draw the graphing representation of the story. Instead of a red 63, they will use blue, which represents products. They write the correct equation below each of their graphs. The first number in an

equation is the red number at left and the second number is the red number at the top and the blue number is the number indicating the squares inside written in blue. After creating the graph below, they record a sentence summarizing the story.

Each picture and graph set is put into a binder for them to review each night. They will add to it until they have completed the last story about Nina and Lina Nine.

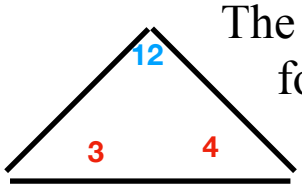
Transitioning to equation practice with fact tests can begin after all the the three's stories are completed. The students need to be taught to read their equation 3 x 4 as tree three and four door. This will speed up the access of the picture with the 12 elves in it.

It is also a good time to alternate with a division test practice. They can read 12 ÷ 3 as twelve elves in tree three. It's read twelve elves and tree three, what's the missing story word? Doors 4. Later they will read a division problem like they read a subtraction problem. "I have 63. I need 7 in a group. How many groups can I make. When learning to master the facts, it's best to use words until recall is automatic.

Stress Blocks Recall

If students have had lots of practice retrieving mental images, recall of facts comes quickly. If they haven't, they may get frustrated. Frustration can result in triggering the stress response. If they understand how the stress response works and what they can do to stop it in its tracks, they will gain confidence and improve performance. Learning to retrieve the blocked memory is important for future success.

This is a perfect opportunity to sneak in a little neuroscience information. Sharing the following with students not only fascinates them, it also helps them understand why they might forget something they knew really well the day before. When we tense our bodies, as in the case of forgetting something we think we should know, the stress creates an automatic response designed to protect us from harm. The blood in our bodies is directed to our feet for a quick get-away. The brain wants to find the information, but can't as long the blood is drained from the part of the brain that works to help us remember. So, all we have to do to help our recall is take some deep breaths, tell ourselves we know the answer, and skip the problem, tell ourselves we will come back to it, move on, or think of something like riding a bike. Before they know it, the picture will pop into their heads like a lightbulb turning on. Point out that the dendrites that are formed by reviewing the cards nightly before bed, will allow the brain to find the image quicker each time. During sleep the brain decides if something is important to remember.



The last step is to create a triangle math flashcard for all three favs families, as seen illustrated here. The factors are in red and the product is blue.

Practice is best done just before bed. The brain stores facts and vocabulary words best when reviewed just before. This method helps the brain recognize that this information is really important and makes sure it doesn't get pruned during the night's brain cleaning. In the movie *Inside Out,* there is a janitor that cleans out dead memories while the girl sleeps. Our brain does the same thing. If we do not give facts, birthdays, phone numbers, or any other data focused and deliberate attention, while forming mental pictures, the brain will discard the information while we sleep.

Introducing the abstract can be done once students demonstrate competence in remembering the stories sentences. We want them naturally to think tree three when they see a three and Nate 8 when they see an eight. This is not drill and kill. Taking timed tests is an opportunity to practice retrieval of the pictures faster each time. I do not recommend traditional drill at all. It may work in the long run, but will destroy the visual learner who works mostly in the right brain.

Practice continues until the students recall is accurate. They work through practice of the 0,1,2,3's and take mixed practice worksheets. Then they work through the fours, then fives, and

sixes and then do mixed practice of 1-6's.7-9th facts are practiced and then students take mixed fact practice using the words of the story to complete the worksheets.

This process has proven successful for over 30 years.

I have received many testimonials from former students in their 20's and 20's who still use the stories in their everyday life. David Grant, a students I had over 20 years ago, came to me when he finished he first year of college to share, "Ms. O. I thought you would get a kick out what happened to me this year in my freshman math class. We had to take a timed test and I finished before everyone else. We don't spend much time practicing multiplication after elementary school. They all wanted to know how I could finish the test so fast. I told them, 'If I told you, you wouldn't believe me."

He still had the images deeply ingrained in his memory just after on year of the practice found in this book when he was eight and nine.