Learn Math...

without knowing it!

Make mathematics a fun, everyday part of your classroom!

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Introduction:

Let me share a story with you and then we'll conduct a quick math experiment.

I was working with a young girl over the summer. Her name was Ava and we were doing a range of art experiences. I got talking to her and she told me with some embarrassment that she was repeating 2nd grade in the fall. I asked her if she liked school and she said she did, but she hated math and reading. It broke my heart when she told me that her mother said that it was okay that she wasn't good in math because she was pretty. When I asked her why she didn't like math, she told me that it was because she couldn't do it. We then got into a bit of a tug of war with me saying, yes, you can do math and her responding, no I can't. Back and forth we went until I offered to prove she could do math.

I asked her how high she could count. Remember...Ava is an 8 year old. She said that she could count up to 10. I asked her to count and she made two mistakes. I think she was a bit nervous, so that might have caused her to choke a little while counting.

I then said to Ava that I could show her a trick so that she could count up to 100. Did she want to see it? Of course she said yes. I showed her the trick and literally three minutes later, she was able to compute numbers up to 1000. Another little girl was listening to our conversation. Her name was Mical and she was just 5 years old and getting ready to enter grade one. I asked Mical how high she could count and she told me she could count to 100. After I showed Ava my "trick", Mical was able to compute numbers up to 10,000. As soon as she had done it, Ava also gave it a try. She struggled a bit, but she was able to get the right numbers up to 10,000. In about 20 minutes Ava went from struggling to count to 10 to counting up to 10,000.

Ava and Mical demonstrate two very important points. First, I think we set benchmarks for younger children too often with Mathematics. We expect children to be able to count to 10 or 100 and if they can't do it (or aren't ready to do it), then they have failed. It's my experience that children who have failed at something tend not to want to try it again. The flip side is that children who are able to meet our benchmarks fairly effortlessly are somewhat limited by these benchmarks. Once they have counted to 10 or 100 they stop. We want to create activities and projects where children can grasp the fundamentals and exceed the benchmarks in a fun, positive environment.

Number Experiment

Get a group of colleagues together and try this experiment: Everybody stand up. Give your colleagues a number between 1-10 and ask them to represent the number using their fingers. Start by making two fists and putting them on top of your head so your palm rests on the top and back of your head. Make sure your hands are facing forward. Call out a number. Ask your colleagues to raise their fingers to represent the number.

Students can get the correct answer by using different methods

Here's an example: Call out the number 1. You could represent the number by raising your right or left index finger or maybe a thumb. It doesn't matter how you represent the number.

Let's start with the number **one**. Now, let's try the number **ten**. Now, let's try the number **four**. We're going to do one more. Now let's do the number **six**. Take a look around. How did your colleagues represent the number six? Some people did it with five fingers on one hand and the index finger or thumb on the other hand. Other people created the number with three fingers up on both hands. A few did 4 fingers on one hand and two on the other. It doesn't matter. All of you got the right answer, but you didn't all do it the same way. That's one of the beauties and one of the challenges of mathematics for young children. We have been taught that there is always a right answer. Too often we try to impose this block head version of math on our students. *There is only one way to do math*. The reality is that there is more than one way to solve problems. It's beautiful because it allows children to be creative, but it's problematic because it means math is not cut and dry.

My goal is to give you some ideas to encourage children to develop math concepts without really being aware that they are learning mathematics. Instead of having an assessment at the end of the process, I encourage you to assess your students' skills throughout the process. You will immediately know when you need to focus on particular concepts. The reality with math for young children is that it's usually more about building vocabulary than understanding difficult concepts. They already know more than they think they know! It's equally true that they already know more than *we* think they do.

The Importance of Early Numeracy

Early numeracy is often described as learning how to count; distinguishing between unequal quantities; and performing basic operations like adding and subtracting. What we don't often appreciate is the depth of knowledge or experience a child has before entering preschool. In a study done by the University of Waterloo, children as young as 3 months old can understand the difference in quantities. In other words, they can distinguish between "more than" and "less than." This study came out about 15 years ago and I was working with an institution that wanted to take the research and use it to educate babies. At that time, I could believed that it was possible for young children to appreciate basic math, but I questioned whether it was important for them to do so. Just because a baby can learn to count, did it follow that we should teach them to count? I don't have an answer to that, but I can tell you it is important for them to be aware of and interpret their environment. A lot of their environment can be thought of in terms of math.

Ask children to talk about their process in generating answers—you might be surprised

I bet even very young children will intuitively understand that some of the above pumpkin pie slices are bigger and some are smaller. Which one do you think they will want to eat and why? I've been surprised by some of the answers. One child picked the smallest piece and when I asked why, she told me that she didn't like pumpkin pie! That was interesting because I was looking for a math answer and was expecting her to pick the largest piece. Instead she gave me a "taste" answer which ended up being a math answer—it was just approaching the answer from a different perspective. It's important to ask "why" questions to give children a chance to interpret their environment.

Once we fully appreciate that children have at least a basic understanding of quantity, just like they have an understanding of color, shape and patterns, we need to help reinforce these understandings and give children opportunities to learn more. My goal is to create an environment where children learn math without really thinking about it as math. Instead I want them to have fun and through this fun, come out with basic math skills.

In addition to building towers and forts, use R60550 Newspaper Builders to make complex shapes.

My Basic Math Teaching Philosophy

There are three things that I think are important for promoting numeracy in young children. The first is to give them opportunities to explore math without worksheets or boring activities. The second is to give children time to explore numeracy at their own speed. The third is to continually assess what they know and demonstrate to them how much they know. This is the most satisfying part. Basically this approach is similar to Montessori or Discovery Math. I think it's very effective for younger children, but it does require some extra work. Let me develop these points a little more thoughtfully and offer some ideas for reducing the amount of extra work they involve.

Find out more about Lisa Murphy at ooeygooey.com

A few years ago I heard Lisa Murphy, the Ooey Gooey lady, give a talk to a huge auditorium filled with teachers. Lisa is dynamic and thoughtful. One teacher asked her how she deals with “bad” children. Lisa responded by saying something that has stuck with me ever since: Don't control the child; control the environment! I think that makes a lot of sense.

The environment within a preschool classroom has a huge impact on the way children behave and the things they learn. As a quick example, take a look at the new classrooms in my home town. We're converting the bright, primary color scheme with lots and lots of wall decorations to something much more calming and understated.

Here is an example of an older type of classroom: You can see that a lot of work has gone into decorating the walls. It's wonderful, but personally, I think it's more of a theatrical set than a classroom. It's been my experience that when you put a child in a theatrical environment, you shouldn't be surprised when they start to act up! In this classroom, it's hard to focus on the individual elements because so much is competing for attention. I also find the lighting harsh.

Here is a contemporary classroom design:

There is still a lot going on, but there are less distractions. For instance, the wall colors are muted, there are minimal wall decorations and there is a flow to the activity centres. For a classroom that has a focus on technology, I like the painted ceilings and the indirect lighting—there is less glare on the screens and smart boards.

Scavenger Hunt

Just like we can manage our classroom environments to guide students, we can actively add math elements to the play centres to increase numeracy and number sense. Let's dive into some ideas.

Let's start with basic counting. Too often counting is taught by rote memory work. Not only is this method boring, but it is also ineffective for most children. The few children who can learn through memorization usually know how to count. Instead, let's start by assessing what kids already know.

Start with a treasure hunt! For each of your students you will need ten objects. So, if you have 15 students, you'll need 150 objects. Likewise, you will need ten bowls or small pails to put your objects in. Here's a tip: I start out the year with a math treasure hunt and I use our R2185 Math Beads to fill up bowls. There are 264 beads in a package, and in addition to the numbers from 0-9, we include mathematical signs. That will come in handy later. Alternatively, you can use buttons or buy plastic gold coins on-line or in party stores. If you do this, use a permanent marker, like a Sharpie, to draw numbers on each coin.

Start by sorting the beads into number groups. Feel free to assign a student or two to sort the beads. Next, fill 10 bowls with the same number bead. Place these around the room. Here's another tip: I've done this in the classroom and in the school yard. At the beginning of the school year, I think it is a lot more effective to do it in the classroom. Not only will it give you a chance to get to know your students and observe them closely, but it is quicker to set up. This activity is designed to be a hands-on assessment tool, so we want it to be quick and manageable so that you can make observations.

There are two ways to start this activity. The first way is my favourite. Draw a map with all of the stations on it. Draw in little footsteps between each centre and number each step on your map. It's wonderful to see some of the kids count the number of steps they need to take to go from one station to the next. With this method, you'll know right away who can count and who needs to start at a more basic level. For interest's sake, you can draw some of the footprints between stations backwards and ask the kids to walk backwards from one specific station to the next. Likewise, you can draw the footprints side by side rather than heel to toe. Don't be afraid to mix it up a bit.

Make simple scavenger hunt maps! Use Roylco`s R15406 Rolly Scrolly Paper

The other way to indicate the space between the stations is to tape footprints on the ground. I use a child's pair of flip flops or running shoes to make a giant rubber stamp. I press the sole of the shoe into paint and then onto paper. This works fine, however, for an even better effect, you can use our R54480 Paint Pad and Tray. Cover the pad with a light coat of paint. Press the shoe over the paint and lift off. Take a sheet of paper and lay it over the wet paint. Pat gently and then lift off. You can make up to three prints this way. Once dry, cut out the prints and tape them to the floor. These prints are a great tool, so laminate them and reuse them over and over!

Once the children have gone through all of the stations and collected their beads. Ask them to arrange the beads on a table, desk or floor. Once they have arranged them, take a look at how they've done it. Have they done it numerically or by color? Let them come up with their own arrangement. Note: You can start at 0 and proceed through 9 or you can start at 1 and go to 9 or add two beads to the last bucket to create 1-0.

After the kids have organized their numbers, you may find that they can all count to 10. Some children might need a little help.

When they can all put their numbers in order, string them on a piece of yarn and make a number necklace or string the numbers on a pipe cleaner and make a bracelet. Sit back and watch them sequence the numbers on their own. They may want to search through all of the numbers to get all of the same colors, or they may want to have a color pattern: red, yellow, blue, red, yellow, blue, etc. Patterns are great because you can ask questions like what numbers are red? How many yellow beads do we have? What color is the next number?

There are all kinds of variations you can do with the treasure hunt idea. Instead of numbers, you can use shapes. Instead of a map, you can write simple directions. Instead of working with the whole class, you can break into smaller groups and create different challenge levels. A treasure hunt is an engaging way to introduce things to students. The students will work together so everyone will finish. If you have an especially boisterous class, take them outside and conduct your treasure hunt.

My favourite scavenger hunt is to use our R59421 Color Vision Perception Kit. We've created a color vision test based on shapes rather than numbers for pre-literate children. You can use the shapes and the name of the shapes in your hunt. Show the students the card and then ask them to search for the shape in the classroom and check it off on a worksheet. That way, they learn their shapes and the names of the shapes even if they can't read. It works very well and is very engaging—especially outside over a larger area.

A1 ☐	☐ Circle	A9 ☐	☐ Triangle
A2 ☐	☐ Oval	A10 ☐	☐ Arrow
A3 ☐	☐ Leaf	A11 ☐	☐ Diamond
A4 ☐	☐ Tear Drop	A12 ☐	☐ Happy Face
A5 ☐	☐ Pentagon	A13 ☐	☐ Check Mark
A6 ☐	☐ Moon	A14 ☐	☐ Heart
A7 ☐	☐ Star	A15 ☐	☐ "X"
A8 ☐	☐ Apple	A16 ☐	☐ Square

Artematics

When I'm in a classroom, I usually focus on art activities. As I go around a classroom, I constantly ask students to count what they are working on. I may ask a child how many crayons he has on his desk or how many different colors a girl has used in her painting. I'm lucky enough to have been born color blind so I can ask children to point to the colors in a drawing or painting and count them out to me. We can explore colors and counting at the same time. The kids feel like they are helping me while I am getting them to count. It's fun and engaging. Of course, one in every seventeen children is also color blind. Together we explore strategies to cope.

One of my favourite strategies for coping with color blindness is to paint by number. For color blind and normally sighted children I do the same activity. I give them one of our R75401 Big! Huge! Fingerpaint Paper Kids and let them draw on some details, like shirts, pants, eyes, jewellery, etc. Then we number jars of paint. Let's say red is #1, blue is #2, yellow is #3, etc. The children can label each detail with a number or I can do it for them by asking, what color hair do you want? Red? What number is red? This goes on as long as we need until the children are comfortable with how the colors and numbers are paired. They then paint in the details with the appropriate colors. I'm not sure this is the most creative approach to art, but I have to admit that it can produce some very good results while enforcing the relationship between numbers and what they represent.

It's important to remember that numbers in themselves are a completely abstract concept. It's only when they relate to something else that they have meaning.

Art to 100

You remember Ava, the little girl who couldn't count to 10. Well here she is again, just a few days later working on an art project where the goal is to count to 100!

The project is simple and straight forward. We have finger paint paper cut into a giant "100". We wanted to give kids a unique opportunity to paint the 100, but we didn't want to use finger paint—we wanted it a little more special.

We filled up balloons with sand, water, beans, etc., but we finally settled on just plain air. You would think that this would make the project more delicate because the balloons, covered in wet paint, could burst. In fact, it had the opposite effect. When we used sand or beans, kids were a lot tougher on them and they would often break. The result was a completely destroyed work of art. However, when the kids were using just plain air-blown balloons, we explained that they were delicate and could break. We found that the students responded by taking more care and respecting the materials. Not only did this make clean up easier, but it produced a better result and it was easier to count to 100.

The idea is simple. Kids press the balloons into bowls of paint and then dab them on sheets of our R75423 100 Days of School Fingerpaint Paper. We did a couple of things to help the kids who struggled to count to 100 in their head. First, we split the kids up into several sessions. Luckily, the first session was made up of kids who could easily count to 100. They "proved" to the other kids that it could be done. Once the others saw the effect, they knew they could do it too, and wanted to try.

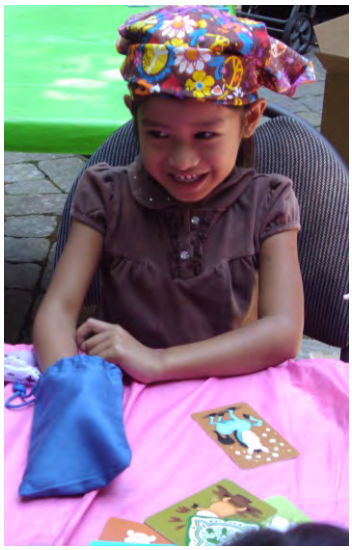
Second, we talked to each child before undertaking this project and asked questions like, "Can you count to 100?" If not, we talked about breaking the big number into smaller numbers. For instance Ava needed to work on basic counting, so we devised a plan just for her. She would dab paint on the paper 10 times

and then make a separate tick mark on the bottom of the paper. She did this ten times and ended up with 100 in total (10 piles of 10). It was wonderful to see her gain confidence in her counting. After she finished she asked to do it again because she wanted to count 4 times up to 25. I loved that she understood the concept of multiples. Likewise, I loved the fact that she wanted to challenge herself. As soon as she was done her second piece, she wanted to do it again as 1 group of 100. I was concerned about the time this was going to take, but, by the third time, she was a pro. It was wonderful to see how quickly she made progress in her counting.

Third, I always want to show children techniques that will help them succeed with art projects. I feel this is important because everyone can make beautiful things even if they are not proficient at drawing or painting or are like me, color blind. To this end, I love the effect of the balloons. Not only does it make great, "wrinkled" circles of paint, it also feels good and even sounds good while you're doing it. It's a wonderful paint technique for you to use. You can buy latex free balloons. Alternatively, double or triple wrap ½ lb (225 g) of dry beans.

The fourth and final element is about paint color. Because I am always looking for opportunities to add math or counting into our everyday conversations, I asked the kids how many paint colors they wanted to use on their 100 banner. I'm still waiting for the day when a child answers that he or she wants to use 100 different colors! I know it's coming, but it hasn't happened yet. Normally they stick to between 1 and 7 colors. They almost always pick an odd number. After they have decided on a number of paint colors, I squirt all of the colors into the same bowl. Our R5519 Classroom Bowls work perfectly. When the kids press their balloon into the bowl, they get an interesting pattern. They can dip their balloon into the wet paint once and use it at least 5 times. I encourage kids to count by 5's by dipping the balloon in the paint and then pressing 5 times. They love this process.

Math through Touch



Let's start by getting kids to use their fingers to feel the differences between objects. You can make your own “feelie” kits with assorted buttons and a photocopier, but to make things even easier, we've developed a game called R76350 Touch and Match Animal Cards. We start with our R2040 Animal Face Buttons. We printed these on cards and children reach into a bag and feel for the animal face printed on the card. To make it easier, put only three or four different buttons into a bag and give it to the children. When they get good at it, put more buttons into the bag. I integrate counting into this by asking the kids to select 3 or 5 cards and continue asking them throughout the process, How many buttons do you have now? This is clearly a process of adding one each time. At the end, we can talk about the total number of animal face buttons they have. I can then add a few more to a third pile or take a few away and we can continue talking about the total amount. Some children may need to recount their pile of buttons after each addition or subtraction, but that's okay. Eventually they will get the point.

To make things more interesting for the kids, there are three challenge levels of cards.

Once the students can differentiate easily with their fingers, you can try an amazing experience with them. Our R59630 Sensory Tray works perfectly for this activity, but you can also use a large opaque bowl or water tray. Start by filling the bowl with Styrofoam packing peanuts. I work with a company called PlayMais. They make a kind of self adhesive packing peanut in rich, beautiful colors. These work very well. Next, throw in a small number of objects that you want the children to find and count. If you are using our Sensory Tray, you can turn it on. It vibrates making the peanuts jump and dance and shift the objects around on the bottom of the tray. It's really fun. As the kids pull out the pieces, they can count them. Alternatively, you can add number beads or our R2143 Really Big Buttons to the Sensory Table and ask the children to pull them out in order from 0-9. Just photocopy the beads or the buttons onto paper and cut out the images to make “cards.”

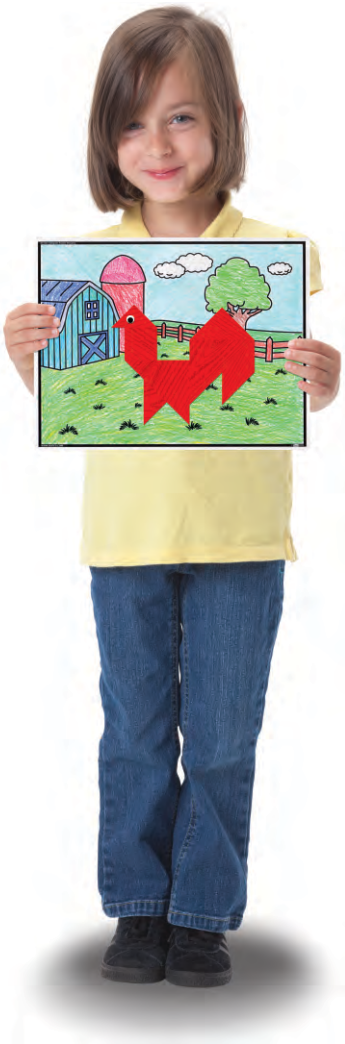
Art/Math Explorations

My biggest area of interest is art. I think you can teach almost any subject area to young children through art and literature. I wanted to start with the very basics, so we decided to make paper chains. My original goal was to ask each child to make their own paper chain and then ask them to count the number of links they used. Once I saw what they had done, it became much more than that. I have to admit that the kids were really not very engaged in the process. I waited a few weeks and then tried again, but this time I set an objective: Who can make the longest paper chain? It was fascinating to watch the process. Some children made really long links by cutting their paper lengthwise into strips. Others wanted to make as many links as possible so they cut out their sheet in half and then cut the strips out of the half sheets. The finished results were very interesting. Once they were complete, we laid them out side by side and described the chains. Which was the shortest, which was the longest, which had the most links and which had the fewest links? We tried to form conclusions but our observations weren't uniform. It was a fascinating process. At the end, I was happy to see that they started pulling out tape measures to measure each chain. One child wrote down the lengths and then compared the numbers. It was great to see how comfortable they were with the concepts of length, number and measurements.

Mosaics

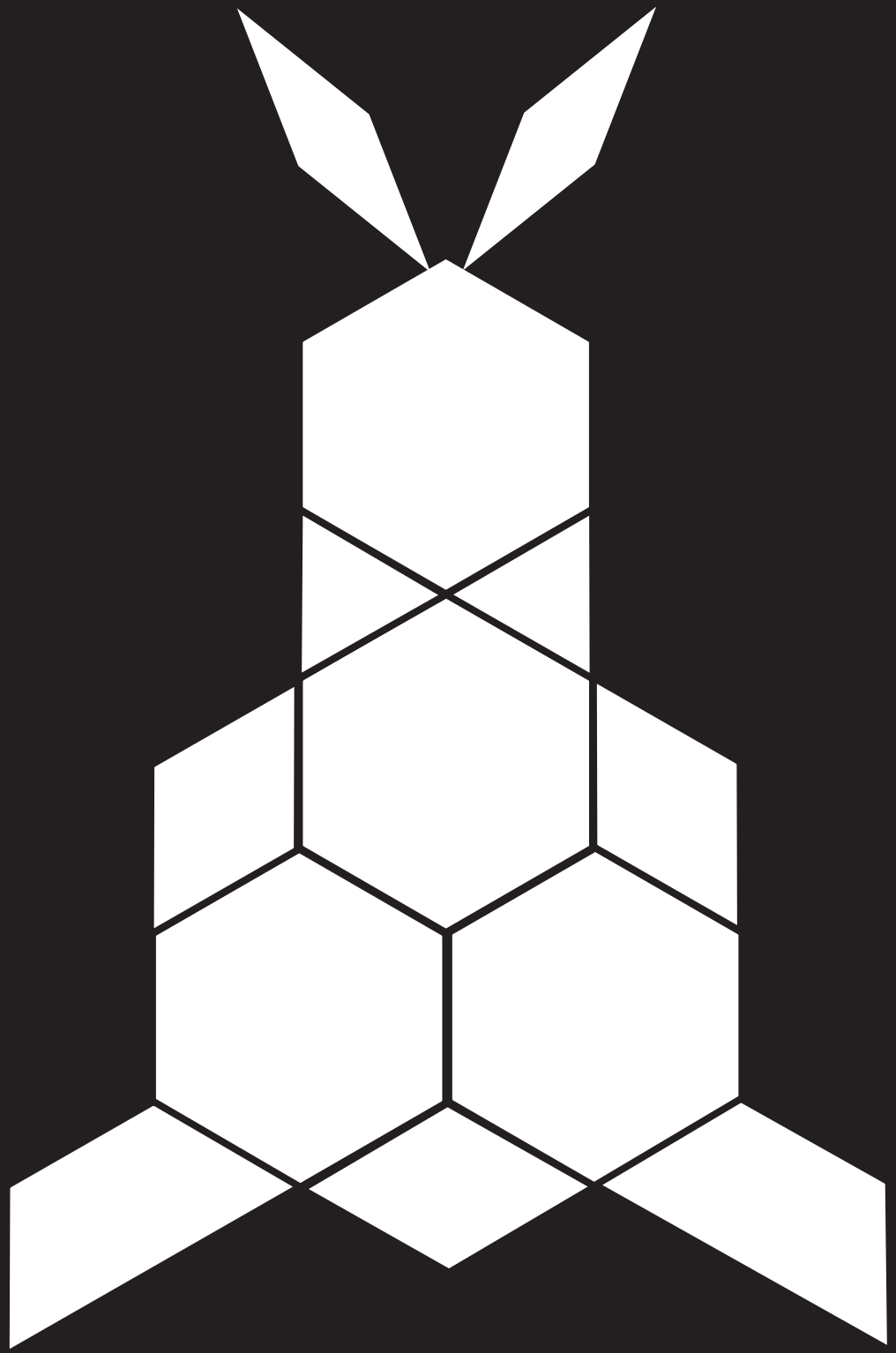
Mosaics are a great way to introduce patterning into your math curriculum. You can simply put out a package of mosaics, some glue and tag board, and let children discover patterning on their own. To help initiate the process, you can set out some line drawings or our R15671 Mosaic Fish Plaques. This approach gives students more direction and lets them develop mosaic techniques before starting the more challenging "process" based art projects.

We make a range of card stock mosaics in different color combinations and sizes. Our top seller is our R15630 Double Color Mosaics Squares. You get 10,000 in a pack and it includes 16 different colors. Each mosaic is roughly 1 cm square. Use the mosaics to create patterns and then use the finished art for greeting cards, bookmarks, pencil holders, etc.



We have two special "math" related mosaics that I love. Mosaics are great because they are inexpensive and colorful. Our R15663 Tangram Puzzle Mosaics are perfect for solving animal puzzles. Each pack contains 700 pieces or 100 complete puzzles. We have on-line resources containing a range of puzzles kids can solve. You can print them off and children can fill them in. I love these because they not only help children develop logical thinking processes by solving puzzles, but the end results are really fun and interesting.

The final product is our 15664 Tessellations Mosaics. These are based on Pattern Block shapes. I love Pattern Blocks. You can make absolutely beautiful designs, however, it can take a while to put together all of the blocks. I like the tessellations mosaics because children can make their designs and then keep the artwork.



Make Your Own Games

Check out more math inspired ideas at:
BuggyAndBuddy.com

Another way to assess counting ability is by playing a fishing game. You can purchase one of these or make your own. Start by finding a lightweight magnet. You don't need anything too strong. Tie one end of a string onto the magnet and the other onto a wooden stick or dowel. Next make your fish. An easy way to make fish is with Roylco's R15312 Sealife Print Papers. Cut out fish shapes, draw in numbers, laminate to make them waterproof and cut out. Tape a paperclip on each fish. Put the fish into a large bowl of water or our R59630 Sensory Tray. Let the children fish, but ask them to start with #1 and progress to #10. If you are using our Sensory Tray, you can switch it to vibrating mode and the fish will seem to "swim" around the water making it more fun and challenging for the kids.

There are a lot of things you can do along the same vein as the fish pond game. Once you start looking for ways to incorporate basic math into your curriculum, you will get many interesting and engaging ideas. That being said, I have two more ideas before moving onto written numeracy activities.

Activity Games

I want to give you two quick ways to make math fun and real for children. Both involve math-related skills.

The first activity game is called Straw Rockets. I simply bought two packs of straws where one was slightly smaller than the other and would fit inside.

The students started by comparing the two different straws. I used math language to have them compare the straws by asking which straw is longer? Which has the smaller diameter? I then direct them to take the straw with the smaller diameter and use a piece of tape to pinch the top closed.

To make our rocket launcher, I direct the students to insert the smaller straw into the bigger straw. It won't fit all the way through because the taped end will stick out. Next, take a big breath of air and blow into the bottom of the rocket to launch it as far as possible. Tip: Do this activity outside where you have more room and less things to damage. These rockets can go a long way at a good speed!

Finally, measure the results. Use a child-friendly tape measure or tape several fabric or IKEA tape measures together to make one long, safe tape measure. Children can record the lengths their rockets flew!

Another math activity is building on a vibrating table. Our R59630 Sensory Tray works great for this activity, but you can make a vibrating table out of a cardboard box and compact back massager. Just tape the massager onto the inside of the box and cover with a plastic tray like our R7512 Fingerpaint "No Mess" Tray. Give the students lightweight building blocks like our R60450 Skyscraper Building Cards.

There are two ways to proceed. If you want to introduce the concept of time, you can ask the children to speed build while you time them with a stop watch. Alternatively, you can ask them to progressively build higher and higher by counting the cards before they start and adding more after each round. Combine both ways to make a spectacular math activity.

Light Table Magic

I use Light Tables in the classroom extensively to teach all subject areas. I find that a small light table is perfect. It does three things:

1. It helps focus students' attention on a relatively small space. I find this lets children block out the distractions around them and really concentrate on what they are doing. As an example, if you have a student who is a reluctant builder, put the blocks on a light table and stand back. There is something really special about the light table that grabs children and holds them until their project is done.

2. The light table helps build children's confidence. I have found time and time again that a child will try something new when it's put on a light table. In the past I have experienced children struggling with a basic idea or concept. I work hard to turn abstract concepts like the alphabet and numbers into concrete activities. I then put these activities onto the light table and watch them focus on the objects with laser-like concentration. Without all of the classroom noise distracting the child, we get a chance to see what he or she can really do.

3. There are many other benefits, but the last one I want to talk about is how careful children are with materials placed on the light table. They respect the materials more and they work harder to take care of them. It's remarkable.

I developed my own light table last year. It's the perfect size for early childhood classrooms because it's easy to move and store when not in use. It is very strong and bright. It comes with a remote control so you can manage it from a distance and it has a long battery life which means you can move it around your classroom without tripping over cables.

One of my favourite math activities for the Light Cube is counting straws. Start with a row of cups. You can use a dry erase marker to label the cups with different numbers. Set out a pile of straws and ask children to place straws in the cup to correspond to the number on the cups. It's very basic, but the Light Cube transforms this basic activity into something wonderful.

To make things a bit more challenging, start with opaque objects like plastic buttons or small pebbles. Write a number upside down on a see-through plastic cup. Ask the children to arrange the buttons or pebbles under the cups to correspond to the numbers on the cups. It's more challenging and fun than you might think!

Sorting is a natural activity on the Light Cube. We make R2183 Fancy Stringing Rings. They come in a wide range of shapes and colors. Set out some transparent cups and ask the students to sort the rings into the cups. Let them choose their own system of sorting. Most children will start to sort by color. Once they are familiar with the product and the process, encourage them to get more complicated by sorting by shape instead of color or by sorting by both shape *and* color. It adds a brand new element to a traditional math activity. Once children are familiar with the process, expand on it by adding different transparent objects.

You can find all kinds of resources of the light table once you start looking for them. I found these numbers in a Nasco catalogue. They are filled with a colored liquid so they are fun to squish. For younger children, encourage them to arrange the numbers in correct sequence.

After children know their numbers ask them to relate objects to each number. For instance, use out R20208 See-Through Big Buttons with the Light Cube. Set out a number and a bowl of buttons. Ask a child to arrange the corresponding number of buttons beside the squishy number. You can continue to work up to higher and higher numbers.

Once they are comfortable with the basic numbers, call out bigger numbers and ask students to arrange the squishy numbers in the same sequence. For instance, if you call out 147, the children will select the 1 and put it on the left side of the Cube's top edge. They will follow 1 with 4 and finish off with 7.

Finally, don't forget to trace! Tracing is a great way to develop fine motor skills. It's easier and more fun to trace on a light table because you can see the image under the paper. Once you have a set of large numbers, cut them out and relate them back to other objects. Tip: We make a great set of number stencils which are perfect for tracing and cutting out numbers, R58621 Big Number Stencils. Arrange buttons on top of the cut out numbers.

Full Body Math

If your students aren't ready for work sheets, go back to more active math exercises. One of my favourite full body math activities is to get children to wear a number. I use our R49620 Dry Erase Classroom Tunics. They come in packs of 20 so I write out as many numbers as we have children. Once they are wearing their numbered tunics, I ask the kids to sort themselves into the proper order. Sometimes I'll start at a higher number like 10. In no time at all they have figured out how to count into the teens. After that, I start at 100. It's a wonderful moment when they realize that they can count to 100. When the kids are familiar with counting, I then get them to do equations. I draw in a plus sign and an equal sign on two of the tunics. I physically arrange them into an equation without an answer. I ask the rest of the class to work out the correct answer. The child who gets it, then stands up after the equal sign while wearing one of the vests and I write on their answer. They really like it when they feel me writing on the tummies through the tunic!

The next step is to explore subtraction while I still have the kids standing at the front of the room. I ask the answer child to move to the far left. I then rotate the tunic so that the sign on the back of the tunic faces forward. (you can write on both the front and back of the tunics). I then position one of the other children beside the minus sign and ask the rest of the children for the answer. Of course the correct answer is standing right there! It's the last child from the first equation! I do this because I want the kids to see how addition and subtraction are related. In other words, if Child A is #2 and Child B is #5; the answer child is #7. Then if we shuffle them up and switch the addition sign to subtraction, we start with the #7 child and subtract child A or B from him to get the answer. It works out very nicely. By the end of a session, which is usually about 20 minutes long, everyone gets basic addition and subtraction. I make sure to ask them to tell their parents about their great math skills!

Funsheets not Worksheets

That brings me to working with numbers. I had a realization a number of years ago while working with one little boy and his older brother. I was working on a number project with the older boy when his brother asked if he could participate. I had written down a number of equations and then wanted to solve them using our fingers and writing down the answer. I gave both boys a different equation. The older one worked it out and wrote down the number. The younger one worked it out and told me the answer. I absentmindedly told him to write down the number and he did. I'll admit it wasn't a perfect number 4, but it wasn't bad. We continued this way for about 15 minutes. After that time I thought it was time to move onto something else. As we were walking to the next centre, the little boy told me that was the first time he had written numbers. That was enlightening to me. At the end of the day, I asked his mother if he could print the letters of the alphabet or his numbers and she told me that she didn't think so. It was one of those moments when I realized that kids know a lot more than we think they know. I sometimes impose limitations on them that aren't true. When it comes to math, over and over again, when I ask a child to do something he or she has never done before, it surprises us both when they do it. The knowledge is in there, we just need to give it a way out!

Dry Erase Math

I want to go back to dry erase materials for a moment because I find that children love them. One of my all time favourite items is our R5905 Hands Up Answer Boards. Hand out a board to each child. They are double sided so children can use either the blue side or the red side. Start with your fingers and ask the kids to write down the number of fingers you are holding up. You will be able to instantly look around the room and see who understand numbers and can write them down and who needs extra help. You can continue using the boards to introduce equations. Hold two fingers up in one hand and four fingers up in the other. Ask students to write down the total number of fingers you are holding up. Continue using different finger configurations to test the kids. At some point, hold up three fingers on each hand. The answer will be the same, 6. At a different point, hold up all five fingers from one hand and one finger from the other. Again, the answer will be 6. You don't have to point out that the same answer can be derived from different numbers, but it is an important concept to start introducing to your students.

The last dry erase item I want to discuss is our R49625 Count to 100 Dry Erase Boards. I love these boards. I could honestly write an entire resource book on a 100 grid dry erase board, but I'm focus on some of my favourite activities.

Our R49625 Count to 100 Dry Erase Boards are a great resource for a multitude of mathematical concepts that you can use to teach your students! Each board is coated with a high quality dry-erase gloss that can be used with any whiteboard marker or dry-erase crayon. On one side we have a single large grid. This grid has 100 squares printed on it and is great for teaching children about their basic numbers from 1-100. In addition, the edges of each square are 1” so it makes a great tool for measuring simple items in the classroom. If we turn over to the other side of the dry erase board, here we can see that there are 4 smaller printed grids. These grids each have 100 squares, but they are significantly smaller. Each of the squares measures 1 cm across. You can measure items in both imperial and metric by using both sides of the board!

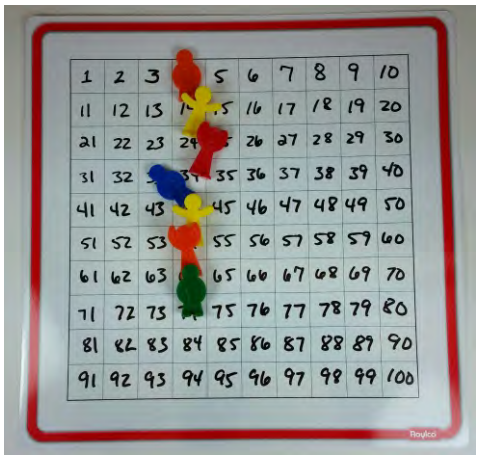
I'd like to discuss a few things that we can do on the dry erase boards.

Bright Buttons: The first activity uses our R2131 Bright Buttons. Use Bright Buttons to create a simple pattern. Start with a straightforward A/B pattern. This means we choose two things that some of the buttons have in common (such as color) and place them in consecutive order. For instance, I might choose to pattern two colors such as green and pink. Find all the buttons in your pack that are green and pink.

Now place the buttons on the board. Start at the top lefthand corner and place the first colored button—I'll say "green"—onto the first square. Beside it, on the next square, place a pink button. On the third square, place another green button. And so on! Keep going until you have run out of buttons.

I like to use the patterns in other, non-math related activities. Use the buttons to create your own pattern. Once you've got an interesting pattern, string them on a pipe cleaner to make a bracelet. Alternatively ask students to create a pattern-letter. Try out the letter T.

Topplers: Our next activity uses our R75304 Super Topplers. These guys are cute and lots of fun to play with. Children can arrange them one in front of the other to make a domino run. To incorporate our Count to 100 Dry Erase Boards, start by numbering all of the squares from 1-100 using a dry-erase marker. Start at the top lefthand corner at the first square and write the numbers in sequence all the way to the bottom of the grid.



Once you have numbered all of the squares you can return to our activity! I am going to give you a sequence of numbers and I want you to place one of your Topplers on each of the numbers. To make things easier, let's turn all our Topplers to face forward. We will only do about 7 numbers this time.

The first sequence of numbers is… 74… 14… 34… 54… 24… 44… 64

Notice how there are no gaps between each of the Topplers? This is how you know that you have made an effective domino line. Now, I want you to tip the first one over to hit the one behind it.

Here is a more complicated sequence of numbers: …. 77… 44… 34… 25… 68… 58… 27… 26… 48… 38. I can repeat the numbers if needed. Place the Topplers on each of the numbered squares in the sequence above. Some of the Topplers need to be angled in different ways to make the dominoes fall down sequentially. You may need to repeat the process several times until you get the right placement for each of the Topplers. However, this is a great opporunity to talk about angles with your students.

Sequencing Skills with Dry Erase Markers: Let's try another exercise simply using our dry erase markers. Make sure your board is fully numbered from 1-100. Now I want you to find the number 3 and shade it in completely. Count 3 numbers to the right of number 3. You should land on 6. Shade that number in. move three more spaces until you land on the number 9. Shade it in. Keep going until you have filled in every number in the sequence of counting by 3s.

Take a look at your work and notice the pattern that you've made on the board. You can make skip-counting on the board more complex by adding more space between the numbers and count by 6s or 7s. This is a great way to encourage pattern recognition and get your students to understand the basis for how multiples work.

I want to point out that I've made a mistake on this slide. Can you see where the mistake is? Yes, I missed filling in #87.

When working with patterns like this, you should have two goals. First, you want students to count without hesitation. Straight forward exercises should present little challenge. When you get to some of the more complex patterns, they will need to work a little more carefully.

Second, they should be able to predict the pattern without counting! By this I mean that after a while, students should recognize that the pattern is both numerical and graphic. This is an important way to view numbers. They represent more than just numbers; they predict patterns or, as in the case with my mistake, you can see mistakes.

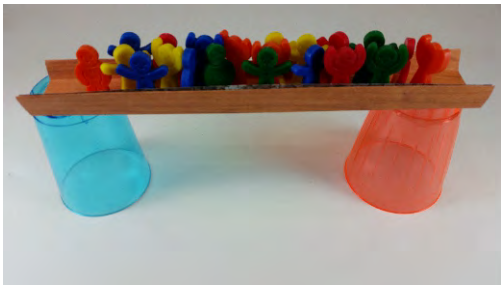
Further develop patterning. Let's turn our attention to the opposite side of the Hundreds Board. The opposite side has the 4 smaller grids. You can use these 4 grids for making bar and line graphs or making illustrations using small mosaic squares, like our R15630 Double Color Mosaic Squares. Here's a quick tip on how to make a smiley face on your grid. Note down the following numbers and fill in the squares with mosaics or with a dry erase marker to make your design.

4 5 6 7 13 18 22 29 31 34 37 40 41 50 51 53 58 60 61 64 65 66 67 70 72 79 83 88 94 95 96 97.

It's a great way to reinforce number comprehension and encourage your students to finish the puzzle.

Engineering in Preschool

Integrate engineering into preschool math activities! I got this idea from a calculus professor. He does a unit with college students on paper bridges. He has formula for determining the strength of folded paper bridges. Students fold up bridges and pile pennies on top. The formula is used to predict when a bridge will collapse under the weight. I told him I was inspired to create an activity for young children using the same method. He was fascinated. Could pre-schoolers learn calculus? The answer is, Yes! Not only can little kids instantly grasp the concept, they can adapt their bridges to make some pretty spectacular, stable and strong structures. Here's how it works:



Start with a sheet of paper. I like using our Craft Paper because it's always exactly the same thickness, so there won't be any surprises from one year to the next when your repeating the activity with a new group of kids. I like our new R15294 Terrific Tree Craft Paper. The paper is printed on both sides: one side features wood bark; the other side features the grain of the same tree. It's beautiful. I think making bridges out of the this paper is fun and makes sense.

Fold the sheet to make a U channel by folding up both long sides. Set the bridge on two cups. Use our R75304 Super Topplers to fill up the bridge. Count them as you add them to the bridge. Tip: Write numbers on the back of Super Topplers with dry erase marker.

Students will learn that they can build stronger bridges by double folding the paper. It won't bend as easily, but it has less surface area for the Topplers. They soon learn that the large area of a weak bridge can accommodate almost as many Topplers as the smaller surface area of a strong bridge. It's a great learning moment!

Use the same technique with your water table! Instead of building bridges, children can make tin foil boats. Cut several sheets from a roll of tin foil so they are exactly the same size. Show kids different pictures of boats. Resist the urge to form a boat out of the tin foil yourself. If you make one, all of the children will copy the design. Let them experiment with their own shapes by showing them pictures to get inspired.

Encourage the students to add Topplers to their boats and then set them adrift in a water table. I love our new R59630 Sensory Tray because you can fill it with water and ask the kids to add their boat. Then you can turn on the vibrating mechanism and watch the water become turbulent. It's really fun.

Building Math Skills

I want to return to building activities and suggest how to use building to encourage basic counting and develop math skills.

Start by gathering different types of blocks. I like to form groups of 2-4 students when I'm working with young children. I generally have 15-20 students and one to three helpers. After splitting the students up into smaller groups I set up 3-5 different block stations. I like to mix up the types of blocks I use and the surfaces I use them on. Try building directly on the floor; on a light table, like our R59601 Educational Light Cube; and on a desk or table. I think each surface gives the blocks a different context and these contexts make it more interesting.

Here is an example. I started with our Straws and Connectors. They are ideal for group projects. We'll talk about them more later, but from a versatile and economical point of view, they are hard to beat. I made jelly blocks out of gelatin powder mixed with less water than what the package calls for. If you want to make blocks that will last a long time, here is a recipe:

Mix 12 packets of Knox gelatine with 3 cups warm water, 1 cup of glycerine and 2 cups of 70% alcohol. Mix thoroughly and pour into a baking dish or some kind of mold. I used a fancy cupcake mold. Let set and pop out. If you're using a baking dish, pop out the gelatin sheet, flip it over and let it sit for an hour or so to allow the bottom of the sheet to dry out. Carefully cut the gelatine into squares or rectangles with a sharp knife.

I love using light tables in the classroom. I developed our Light Cube to be bright, fun, safe and reliable. You can use it for a lot of classroom activities, but building is my favourite. Even reluctant builders will build on a Light Cube because it is a magical experience. I've known out-of-their-minds hyper kids settle down and carefully build on the Light Cube. I knew one boy who loved to build and then destroy the towers he built. He would recreate basically the same tower on the Light Cube but refused to knock it down—it was just too special. My favourite things to use on a Light Cube are clear color blocks like our R60310 Crystal Color Stacking Blocks. They are specially designed to stack in interesting and intuitive ways while being strong enough to withstand falls and collapses. They even sound nice when they fall to the floor!

Another block that works well is our R60450 Skyscraper Building Cards. These are inexpensive and very easy to use while being extremely versatile. There are two different types of cards—one is folded in the middle and provides support as children build upwards. The other is a flat, rectangular panel which can be layered between each story. Children can build their towers very high, very quickly. Again, I love the sound they make when they fall over. It's lovely to hear!

The final block I want to talk about isn't a block at all—it's our R60160 Constructa Clips. These come in different configurations with rubber teeth to that hold the card shapes in place. The clips come in angles of 60, 90 120 and 180 degrees. We sell these in a bulk pack or you can buy them as a kit with pieces to make animals or abstract sculptures. I suggest buying the bulk pack and cutting out your own shapes.

I start out by splitting up the classroom and sending one group to each of the different areas. I encourage them to play with the blocks and create whatever they want. After 20 or 30 minutes, I rotate them to the next area. This time, however, I give them an objective. How tall can you build? How strong can you build? How fast can you build? Each of these objectives can be quantified.

Let's take, How Tall Can You Build? We can use a yard or meter stick to measure how tall the structure is. Alternatively, we can count up the number of stories. For this objective, I always ask the kids to add one more story even after they think they are done. Sometimes the structure knocks over at that point, but that's okay, because we have already measured it once.

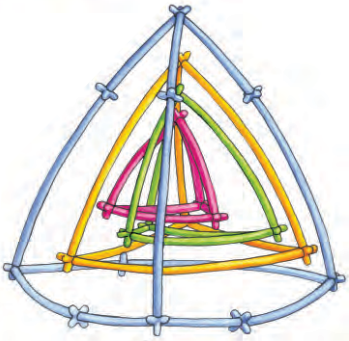
Depending on how much time we have, I ask the students to count up how many blocks they used. I love when they do this, because they often use different ways of counting their blocks. Some children can simple count numerically while others break the total into more manageable groups. It's a great way to see mathematical understanding. One little girl made a pile of blocks and counted them up. She then did something even more remarkable. She created a second pile and added and took away blocks until it was even with the first pile. When I asked how many she used, she told me she had two piles of 25 blocks. By matching up their heights, she was able to gather another pile of 25 blocks without counting them. I asked her how many blocks she had in the second pile and of course she was right when she said, 25. In this example, the child is making an informed estimation, demonstrating advanced counting, determining size and focusing on a task—all while having fun. I had never seen her count to 25 before, so I thought she had already made a big achievement.

Blocks are a wonderful mathematical tool. The trick is to give kids a task that incorporates math principles. You don't have to do this all the time—sometimes it's just fun to build and smash a tower, but if you do this, have a plan to evaluate how well they do.

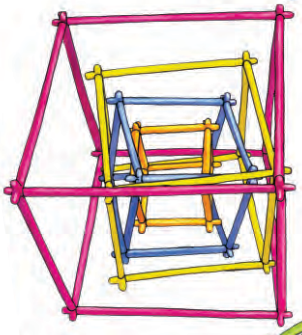
Building & Measuring

I love to use building to teach math. Likewise, I love to measure things using tape measures or other units of length. We can combine these two techniques in one wonderful activity. Our R6090 Straws and Connectors is a great tool for building, but you can easily use it for math in a number of different ways.

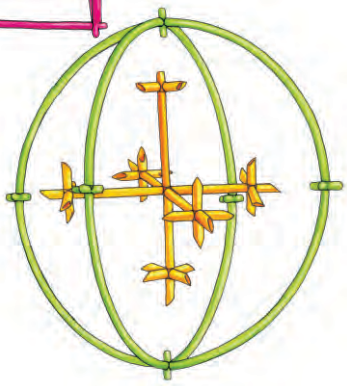
Start by giving students a handful of Straws and Connectors. Encourage them to work in a group and build whatever they like. Once they have been introduced to the product, you can start to use it in a more directed way.



Show students pictures of different shapes and ask them to create the shapes with the straws. Once they discover the basic technique for making cubes, triangles and circles they can use these techniques for making larger and smaller versions of the same shape.



Motivate students to make towers and buildings. Because the straws are all a standard length, measuring the finished structures is easy. You can count the number of straws or stories and then multiply by 8 to get the number of inches (each straw is 8" long) or by 20 to get the number of centimetres. Alternatively, you can just count the number of straws and use the length of the straw as your unit of measure.



Once you've started using straws as a unit of measure, you can do one of my favourite things. Compare the lengths of different animals that you can't fit into your classroom. I've made a chart of water mammals. I started with a beaver and progressed up to a Blue Whale. I've given you the length in both imperial and metric measurements. I've also converted this in the number of straws. For instance, an average full grown beaver is 12" (28 cm) long. This is the equivalent of 1½ straws. Take a straw and cut it in half. Add a connector and then add a second straw to make 12". Now you have a measurement of the length of a beaver. Repeat this with a sea otter, seal, dolphin, narwhal, killer whale, humpback and blue whale. One package gives you more than enough straws to represent all of the different lengths at the same time. It's fascinating to compare the different sizes and brings home the message that whales are huge! You can do this with smaller animals, but I like going outside and doing it with big animals like whales and dinosaurs!

Beaver: 12" (28 cm) long = 1½ straws

Narwhal: 180" (4.6 m) long = 22½ straws

Sea Otter: 51" (130 cm) long = 6½ straws

Killer Whale: 276" (7 m) long = 35½ straws

Seal: 72" (183 cm) long = 9 straws

Humpback Whale: 550" (14 m) long = 69 straws

Common Dolphin: 96" (2.5 m) long = 12 straws

Blue Whale: 950" (24 m) long = 119 straws

Beaver: 12" (28 cm) long = 1½ straws

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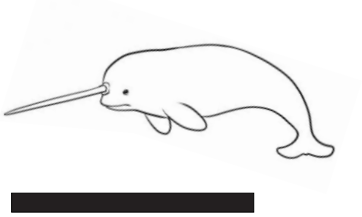
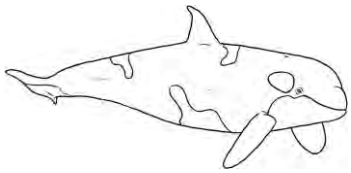
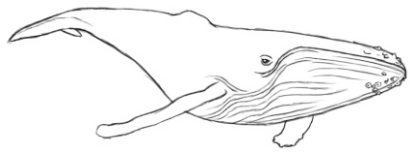


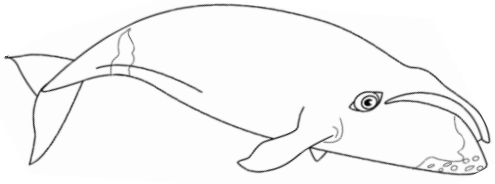
Narwhal: 180" (4.6 m) long = 22½ straws



Killer Whale: 276" (7 m) long = 35½ straws



Humpback Whale: 550" (14 m) long = 69 straws



Blue Whale: 950" (24 m) long = 119 straws

Cooperative Projects

There is a lot to be said for children working cooperatively on projects. I like the idea that higher performing children can help those who are struggling. Sometimes seeing a peer work on something is a far greater incentive for reluctant children than anything a teacher can say or do.

Years ago I developed a math building block for older students. It was intended to help older children work on large scale Platonic solids. These are three-dimensional shapes made up of all one length of sides arranged at different angles. I think the resulting shapes are beautiful, but they don't generally engage students. Often times these interesting shapes look boring, but we can bring them to life by making giant models.

I developed our R60550 Newspaper Builders to help make Platonic solids on a gigantic scale. We start with regular newspaper that we roll around small tubes taped to each end. These tubes then fit around flexible connectors so you can get different angles by using one standard connector.

While I didn't specifically develop Newspaper Builders for younger children, they work very well. You will need to make up the newspaper rods yourself, but it isn't difficult. Once built, it's great to work with one or two adult helpers to build a giant structure that all of the children can fit inside.

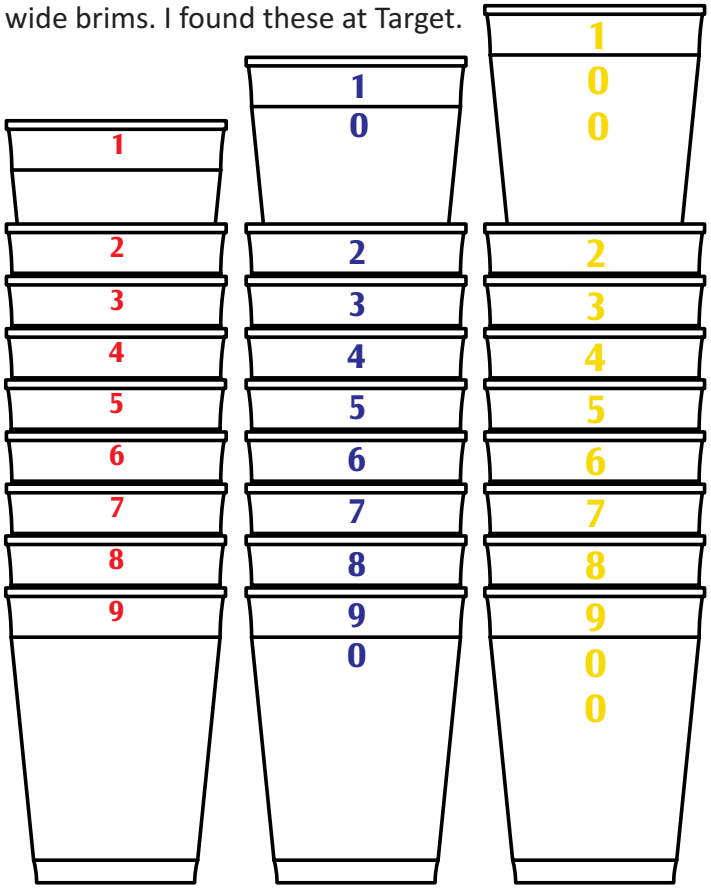
As you're building remember to use mathematical language. When assembled into a 3D shape, each rod is technically called an *edge*. The point where two or more rods join together is called a *vertex*. Encourage children to work together to build a pyramid. Once built, everyone can sit or stand inside. Relate the experience back to math. As children enter the pyramid, ask them to call out a sequential number. As they leave, they can call out a declining sequential number.

Step back and admire your structure. How many sides does it have? Use a measuring tape to determine how long the base is. Are all four sides the same? Talk about the individual shapes within the pyramid. For instance, the bottom is a square while each of the sides are triangles. You can even explore how many triangles were used to make one side of the pyramid. Can you guess how many triangles are in each side? The correct, but not obvious answer is, 13.

Count to 10,000

To finish off, I want to bring this discussion right back to the beginning and reveal my little secret for counting to 10,000. Remember, both Ava and Mical mastered this trick in about 20 minutes. This is something you can make in about 15 minutes for about $8.00.

Start by collecting up some Styrofoam cups with wide brims. I found these at Target.



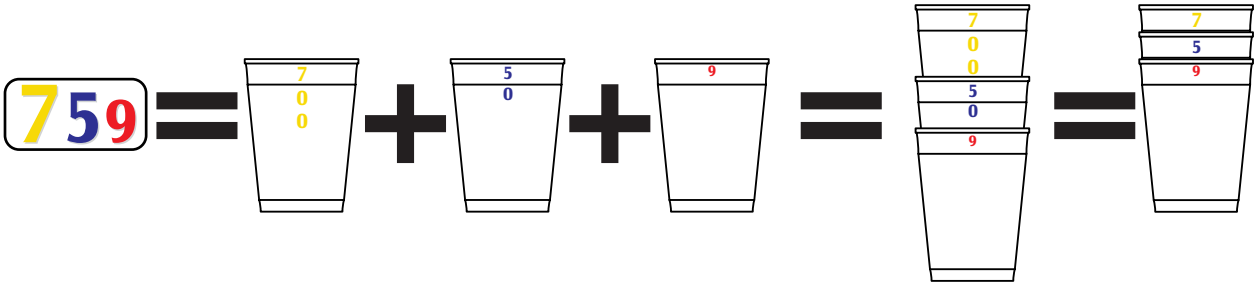
On the brim, write out the numbers 1-9. On a second pile of cups, write out the numbers: 10, 20, 30, 40, 50, 60, 70, 80, 90.

On a third set write out: 100, 200, 300, 400, 500, 600, 700, 800, 900. You can keep adding number sequences as high as you want to go. Note: To make this a little easier for children I use a different color of marker ink for each number sequence. Additionally, I write out the smallest value sequence with the smallest physical number. Each greater sequence I increase the size of my numbers.

When I introduce the cups to students, together we count from 1-9 but we don't stack them. I then show them the number cup for 10 and then continue counting by adding a single digit cup to the 10 cup to create 11, 12, 13, etc.

I like to print up some number cards to go with these. Because I'm color blind I tend to write everything out in black, but you could use matching colors to give students more cues.

To count higher numbers, start with the largest number, for instance, 700. Slide the next highest number cup onto the first cup. Let's say I'm making 759. I would slide the 50 cup onto the 700 cup. End off with the lowest number. Note: You don't need a 0 cup But it may make it easier to demonstrate the concept to younger children.



Once children get a handle on this method of configuring numbers, there is no limit to the possibilities.

Conclusion:

I've talked about three things:

1. We don't need to set out rigid benchmarks for young children. We need to give them opportunities to explore math and to assess the knowledge they have gained.

2. We want to encourage number sense and math development in a fun way that avoids rote memory work and boring worksheets. Making it fun and engaging will help ensure that every student is successful in at least a few of the activities we set out for them.

3. Children know more than we think they do. In fact, they know more than they think they do! We need to explore ways to express this knowledge so they develop an awareness of math as it relates to their day to day experiences.

Have fun teaching math. It is very rewarding because it is so clear when your students grasp a concept. Once they have learned the fundamentals, they will never "unlearn" them. You are preparing your students to LOVE math and numbers. This love of math will guarantee their academic success in the future.

It all starts with you.

Appendix

Product Hightlights:

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Page 6	R54480	Paint Pad and Tray
Page 6	R15406	Rolly Scrolly Paper (photograph)
Page 7	R59421	Color Vision Perception Kit
Page 8	R59421	Color Vision Perception Kit (photograph)
Page 9	R75401	Big! Huge! Fingerpaint Paper Kids
Page 10	R75423	100 Days of School Paper
Page 11	R5519	Classroom Bowls
Page 12	R76350	Touch and Match Animal Cards
Page 12	R2040	Animal Face Buttons™
Page 12, 19, 20, 30	R59630	Sensory Tray
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Page 31	R59601	Educational Light Cube
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Page 33	R6090	Straws & Connectors™