

# Kingston Counts!

A Celebration of Family Math



## Making Math Magic at Home!

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The scenario in the cartoon above is familiar to many: a person in an express checkout line with more than the stated number of items. The humour in the cartoon comes from one of the captions—the totally unexpected “that guy can’t count” comment.

The term ‘literacy’ is widely known and understood. Literate adults have reading and writing skills that enable them to meet the challenges of living and working in society. Literate people can read and understand the instructions on a box of over-the-counter cold medication or a cake mix. They can correctly complete a job or passport application. They can understand and use information from a brochure about *Canada’s Food Guide*. They can locate and use information included in a train schedule or a chart about the developmental milestones for a 2-year old.

What is lesser known is the fact that in Canada, ‘numeracy’ is considered to be part of literacy. For example, literate adults should be able to balance an account, figure out a tip, understand an exchange rate, complete an order form, or determine the amount of interest on a loan from an advertisement.

This translates into understanding how much food to give your dog given the instructions included on the can, when the guidelines look like this:

Weight of dog	Daily Amount
	1 = 700g
5kg - 10kg 	$\frac{3}{4}$ to $1\frac{1}{3}$
10kg - 25kg 	$1\frac{1}{3}$ to $2\frac{1}{2}$

Numeracy also translates into knowing whether or not you should offer to pay for a drink and snack for yourself and two of your friends at a local coffee shop when you know you have just \$10.00 in your wallet; being able to compute a ballpark figure for the sale price of a pair of \$95 shoes that are marked down by 40%; knowing how much money you would save by bringing lunch from home every day for a week instead of buying your lunch; or, deciding whether to buy a 2 lb. bag of limes (approximately 7 limes) for \$4.22 or individual limes priced at 2 for \$1.42 when your recipe calls for 6 limes.

Numeracy is a life skill that incorporates mental computation, estimation, and practical strategies for catching calculator or computer mishaps (such as punching in the wrong number or operation, or pressing the '=' key more than once).

Kingston Counts! is a celebration of numeracy in all its manifestations: geometry, numbers, probability, measurement and algebra.

Our goal is to dispel the myth that math is the "bad guy" by raising awareness of the far reach of math and showcasing its fun and creative side...perspectives that are not emphasized nearly enough.

In the same way that parents, grandparents, older siblings and caregivers read to children from the time they are born to promote the positive development of language and literacy, we hope to share with you some ideas that you can use the same way to promote the development of a healthy attitude towards and knowledge about mathematics and numeracy.

Math may be the "other" literacy but it is vital. Please continue to support math at home by using the resources available on our website at [community.outreach.educ.queensu.ca](http://community.outreach.educ.queensu.ca). We will continue to add materials, so please visit often.

Thank you for attending the first Kingston Counts! event, made possible by a grant from the Imperial Oil Foundation and the Faculty of Education at Queen's University. We look forward to more educational and *mathematical* celebrations like this in the future with your support and interest.

Please let me know how I can help you to help the children who are central to your life learn to love and appreciate mathematics. Everyone can learn math. Everyone can be successful at math. The key is a positive attitude and the willingness to recognize that math is everywhere.

In closing, I would like to thank the incredible team of teacher candidates from the Faculty of Education at Queen's University who made this event possible. Their hard work, dedication, creativity and commitment have been unparalleled. In some 33 years as an educator, I have never been so privileged and honoured to lead a team. I hope that you understand my pride as you use this book at your kitchen-table to continue the magic that they have created.

A handwritten signature in black ink that reads "Lynda Colgan". The signature is written in a cursive, flowing style.

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Kingston compte! En français.	

## Family Math

Many of us are exposed to the world of literacy before we are even born. Mothers often read books to their infants from the time they are in the womb. From there on, it seems that literacy is promoted and given more attention than all other subject matter. So where does math fit in?



Unfortunately, in our society, math does not have a good reputation. It is seen as that dreaded and terrifying subject that is designed only for 'smart' people. If you do not have the coveted 'math gene', you will not succeed in math because it is just too hard. Therefore, math should be avoided whenever possible and when it cannot be avoided, we all just have to struggle our way through it. On top of all this, it is perfectly acceptable to be 'bad' at math because, let's face it, "when are we ever going to use it anyway"? Yes, math has a bad reputation indeed.

The truth of the matter is that math is everywhere! It is all around us and is important for many career choices and for our everyday lives. Math is not as tricky as we have been programmed to believe. The tricky part is trying to forget all of the anxiety and all of those negative attitudes that we may have built up about math over the years. We need to imagine a world where everyone can be successful at math and where math can even be (dare we say) FUN!

This is the goal of Family Math. It is to eliminate all of those negative connotations associated with math that spill over from one generation to the next.

Most parents and guardians want their children to succeed in math, but they do not always know how to help because of their own horrifying math experiences. Moreover, the math that their kids do in school today looks foreign compared to what they learned oh-so-many years ago. So what is Family Math?

Family Math creates opportunities for families to come together and take part in math activities in a safe, relaxed, and fun environment. It is a chance for parents and guardians to become familiar with what their kids are learning in math class so that they may become more comfortable and confident themselves and transfer these feelings over to their children. The activities and games involved in Family Math are meant to be engaging and hands-on. The goal is not necessarily to find one correct answer in a speedy fashion, but rather to foster problem-solving strategies and to see math in a new and exciting way. One important notion to keep in mind is that there is nothing wrong with making mistakes. In fact, this is how we learn best! Family Math encourages math curiosity and exploration without the stress and pressure of performing well. Overall, the goal is to stimulate interest and positive attitudes about math, and to demonstrate how easy it is to work math into everyday conversations. It all begins with the parents and guardians. If these role-models can gain a respect and an appreciation for math, their children are bound to gain these as well, and are sure to succeed in the 'dreaded' world of math!



# Math Everywhere, Everyday!

Using math everyday not only improves math skills, but is also a great way for families to enjoy math together! Here are some ways to implement math into your lives.



## Around the House:

- ❖ Explore opportunities for your child to make connections with mathematics through extra-curricular activities they are involved in such as organized sports, instrumental music lessons, or art classes. Be sure to talk to your child about the math connections in these activities
  - For example: “How many of your team mates were wearing black shoes? White shoes? T-shirts? Long sleeves? What are the ratios and fractions?”; “Let’s count the rhythm in your music from your lesson”; “What shapes did you use in your drawing? Did you use measurement to space out your design?”
- ❖ Have your child use anything with columns and rows, such as muffin tins or egg cartons, to practice addition, subtraction, multiplication and early division concepts.
- ❖ Sort a variety of items at home (e.g., toys, utensils, dishes, socks, mail, shoes, colouring tools, fabric, recyclables). Ask your child to describe the rule that you used to do the sorting. Then ask him or her to try sorting the same items again using a new rule.
- ❖ When cooking and/or baking in the kitchen involve your child by teaching them measurements and letting them add ingredients. (For more ‘Kitchen Math’ see page 6)
- ❖ Work with newspapers (For more ‘Newspaper Math’ see page 14)
- ❖ Do math with calendars (For more ‘Calendar Math’ see page 12)
  - Ask questions about which day it is, what was yesterday, what is tomorrow.
  - You can also talk about what day of the year it is and represent the number with materials like straws. For example: Day 45 would have 4 bundles of 10 and 5 single straws.
  - You can also use money to represent which day it is. For example: Day 45 represents 45 cents. How many ways can you represent 45 cents with coins? (4 dimes and 5 pennies, 9 nickels, 1 quarter and 2 dimes, etc.)





## In the Neighbourhood:

- ❖ While waiting in line to pay for your groceries, ask your child to estimate how much the bill will be. You can also do this by keeping track of the cost of items in the cart/basket as you walk around to estimate the cost. This activity can also be done at the end of a meal at a restaurant. How close are you?
- ❖ Another grocery store activity is weighing produce on the scales. You can also estimate how much you think something weighs, or weigh something and then try to calculate the price of the item
- ❖ Play “I Spy” with your child, looking for and describing shapes in a playground, on a farm, in a town, or in a city.



## On the Road:

- ❖ Make the largest three-digit number possible from the numbers on a licence plate.
- ❖ Ask younger children to name the largest single digit number and the smallest single-digit number on a licence plate and to call out the numbers in order from smallest to largest.
- ❖ Search for numbers that are spelled out (example: two, seven, thirty-one, etc.)
- ❖ For older students you can estimate and calculate how long the trip will take based on speed and distance (example: You are travelling 100 km/hour and have to travel 100 km. You will take 1 hour to arrive).



## Family Math Games:

- ❖ Play games such as monopoly, checkers, chess, connect four, memory games, cards, dominoes.
- ❖ Find computer games that incorporate math (For more see ‘Website to Explore’ page )
- ❖ Play board games, number cube (dice) games, card games, and dominoes. Solve puzzles together. Ask your child to tell you what he or she did to try to win the games or solve the puzzle. Then ask your child to tell you whether he or she would do the same thing next time, giving reasons why or why not.
- ❖ For more games, see ‘Math and Number Games’ on page 42)

# Everyday Math Tools

Just as math can be found everywhere, the tools you use for math are the same. Almost anything sitting around the house can be used for family math activities. Below is a partial list of some common household items you can gather, with some simple suggestions as to how they can be used. For further suggestions on their use, look through the activities included in this package.

## String, thread or paperclips:

These can all be great measurement tools. How many paper clips long is your hand? Chain them together to compare lengths of things. Cut a piece of string that you think is the height of your chair. How close were you?



## Bowls/Glasses/Jugs/Bottles:

Fill a small container such as a glass. How many glasses do you think it will take to fill a larger bowl or jug? How many does it actually take? How close were you?

## Water:

Did you know that making musical water glasses involves math? Take 4 or so glasses. Fill one up to the top and set it aside. Fill another to the top, and then pour half of it into another. Set one of these aside. Take the one that's half full and pour half of that water into the last glass. So now you have 4 glasses of water that are full, half full, a quarter full and one eighth full. What kind of musical note does each glass make? Wet your finger and rub around the rim of the glass or use glass bottles instead and blow across the top of them.

## Modeling clay:

Sculpt various 3-dimensional shapes. Put them together to see what you can create. Will a sphere balance on a cube? What does a sphere on top of an upside down cone look like?



## Thermometer:

Measure the temperature of something (a cup of hot chocolate, a glass of cold water). Measure it again 5 minutes later, 10 minutes later or half an hour later. What changes are there? What do you think the temperature will be at the end of the day?

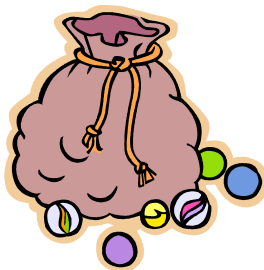
## Dice:

Rolling dice is a great way to study probability. There should be a one in six chance of rolling a 2, but if you roll the dice six times, do you get only one 2? What if you roll twelve times? Do you only get 4 twice? You can also cover up the faces of the dice so they have fractions, coin denominations or other numbers on them for games.



## Beads, buttons or marbles:

Great for many math activities, such as counting, estimation, patterning and sorting. Grab a handful and count how many there are. Try to grab 10. Try to grab 20. How close can you get? Start a pattern and see if your child can finish it? Sort them into different groups using specific criteria. Can the other person guess how you've sorted them (i.e. by colour, by size)? Use beads or buttons to make a necklace or keychain that represents your family, friends or neighbours. Take a poll and assign a colour for each possible answer. String together your beads or buttons to represent the choices people answered.



## Egg cartons:

Label the egg carton with the number 1-12. Place 1 in the egg cup labelled '1', 2 in the cup labelled '2' and so on. How many will you need? Hint: it's more than 50, so make sure you have enough counters!

## Coins:

Flip a coin repeatedly to see if you really get tails half of the time. Estimate the size of different coins by drawing a circle from memory and then testing to see how close you were to the actual size. Try using different coin denominations to make change (trade a dime for two nickels or ten pennies).

## Kitchen Math

Math is everywhere – even in your own kitchen! Math is needed to measure ingredients, to bake food at the right temperature, to time cooking events appropriately, and more!

In Case You Were Wondering...

16 tablespoons = 1 cup  
12 tablespoons =  $\frac{3}{4}$  cup  
10 tablespoons + 2 teaspoons =  $\frac{2}{3}$  cup  
8 tablespoons =  $\frac{1}{2}$  cup  
6 tablespoons =  $\frac{3}{8}$  cup  
5 tablespoons + 1 teaspoon =  $\frac{1}{3}$  cup  
4 tablespoons =  $\frac{1}{4}$  cup  
2 tablespoons =  $\frac{1}{8}$  cup  
2 tablespoons + 2 teaspoons =  $\frac{1}{6}$  cup  
1 tablespoon =  $\frac{1}{16}$  cup  
2 cups = 1 pint  
2 pints = 1 quart  
3 teaspoons = 1 tablespoon  
48 teaspoons = 1 cup

## Cherry $\pi$ Recipe

### *Ingredients*

#### **Pie Crust:**

1 tsp. salt (from a cylinder container)  
3 cups flour  
8 oz. (1/2 lb.) shortening (a rectangular prism package)  
1 egg, beaten (a Cartesian oval)  
1/3 cup cold water  
1 tsp. white vinegar

#### **Filling:**

5 to 6 cups fresh pitted cherries, about 2 1/2 to 3 pounds (spheres)  
1/2 cup water  
1 1/4 cup granulated sugar (in a rectangular prism package)  
4 tablespoons cornstarch

### *Directions*

#### **To make the crust:**

Combine flour and salt in a bowl until well mixed. Using two knives or a pastry blender, cut in shortening until mixture resembles coarse crumbs (some chunks can remain).

Beat egg (Cartesian oval) in a separate small bowl; add water and vinegar and stir until mixed.

Add egg (Cartesian oval) mixture to the flour mixture and stir all together using a large spoon or by hand.

Press mixture into a ball (sphere) and roll it out on a sheet of wax paper until about 1/2-inch thick. Place another sheet of wax paper over the top and roll until 1/8-inch thickness. If dough is too sticky, dust very lightly with flour and refrigerate for 30 minutes.

Carefully remove the top sheet of paper and put the crust onto an ungreased pie pan. Do not stretch the dough; drape it in the pan (circular trapezoid) loosely. Neaten the edges using scissors or a sharp knife.

#### **To make the filling:**

In a saucepan, combine cherries (spheres) with remaining ingredients. Bring to a boil; reduce heat to low and cook, stirring frequently, for about 10 minutes. Cool slightly before putting in the pie.

Bake at 350° for 40 minutes.

## Play Dough Recipe

*Why spend money on play dough  
when you can make your own?!*

### *Ingredients*

- 2 cups of flour
- 1 cup of water
- 1 cup of salt
- 1 tbsp of cooking oil

### *Instructions*

- In a medium-sized bowl (or 1/2 a sphere), mix together the flour, salt, and water.
- Add in the cooking oil to keep the mixture from hardening.
- Knead the play dough until you have your desired texture.
- Store in an airtight container (perhaps a cylinder?) or plastic bag.

### Just a Few Math Activities That Can Be Done With Play Dough

- \* When making the play dough, children can learn all about the importance of measurement, the proper terminology for 3-dimensional figures, and the ratio of flour to water.
- \* Children can make models of 2-D and 3-D shapes and then use them to count the faces, edges, and vertices.
- \* Play dough can be used to form numbers and addition or subtraction problems. This is a great hands-on way to learn how to write addition and subtraction facts from left to right.

## Shortbread Cookies

This recipe uses a specific ratio of ingredients so that you can adjust the amount or weight of food being cooked without changing the texture or the taste. You can make as many or as little cookies as you wish as long as you always use the proportion 3:2:1!

### *Ingredients*

mixing bowl	wooden board
3 measures of flour	cookie cutter
2 measures of margarine or butter	knife
1 measure of sugar	nonstick baking sheet

### *Directions*

1. In a bowl, mix all the ingredients. Use a knife to cut the butter, then knead with your fingers until the flour and sugar are blended into the butter and the mixture is sticky.
2. Spread some flour on a hard work surface and then lay the mixture out on top of it. This will prevent it from sticking. Flatten the mixture to about  $\frac{1}{2}$  inch (1cm) thick. Use the cutter to make cookies, and lay them on the baking sheet. Make sure their edges do not touch.
3. Bake the cookies at 250°F/120°C for about 20 minutes or until light brown. Use an oven mitt to take the baking sheet out of the oven, and place it on a wooden board so that the tray does not burn the work surface.

*Now you have your delicious shortbread cookies and practiced some math skills in the process of making them!*

**Just So You Know...**

$$F=9/5C + 32$$

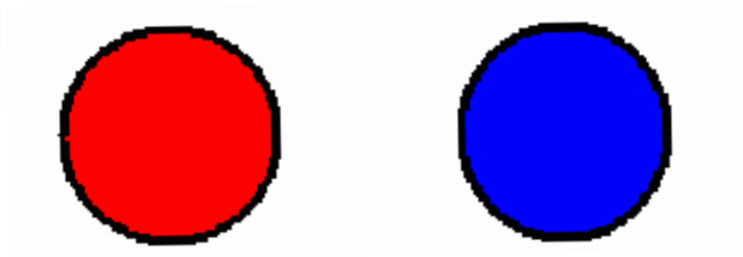
**gives the conversion of Celsius to Fahrenheit**

## Paper Plate Math!

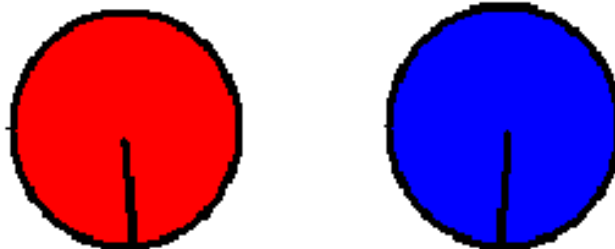
With two paper plates you can cut them to show a clock, fractions or pie chart.

How to make math plates:

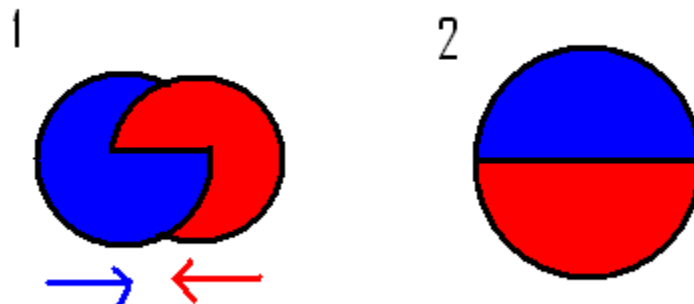
- 1) Take two different coloured paper plates or two white plates and colour them each a different colour.



- 2) Make a straight cut from the edge of each plate, at any spot, to the middle of the plate.

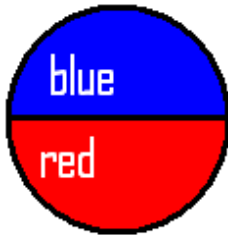


- 3) Slide the plates together where the slit is on each plate to make one plate (half will be one colour, and half will be the other colour).

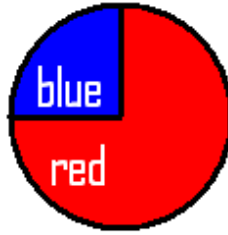


- 4) Now that you have made your fraction plates, you can move the plates around to show different amounts.

For example:

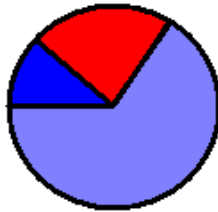


Red =  $\frac{1}{2}$   
Blue =  $\frac{1}{2}$



Blue =  $\frac{1}{4}$   
Red =  $\frac{3}{4}$

- 5) You can add more plates as well. Pick another colour and add it in by putting two plates with slits on top of each other (match up where the slits are). Next, slide the third plate into the others just like you did with the first two.

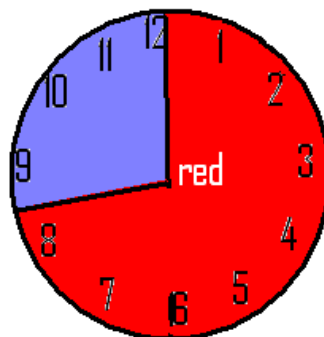
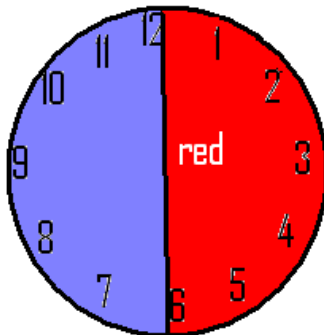


### Paper Plate Clocks

To make paper plate clocks you can use a black marker to write the numbers 1 to 12 around the plates. Move the plates around to show different times.

For example:

If this first clock was marked by red I would say it 6:00. If I looked at the second clock and again used red to tell time I would say it is 8:30.







# Calendar Math



Calendars are a great math tool that most people have in their homes. They're also a relatively easy resource to find as companies often give them away as promotions. Here are some activities you can do with your calendars at home!

## Calendar Cut Up

Select any month, and cut up the page with each day being a different square. Place all of your pieces face down (so that you can't see the numbers).

Flip up a couple at a time and try some of these computations (do as much as you can without a calculator, and use one when you need it or to check your answers):

- Flip up 3 numbers. Multiply them together.
- Flip up 5 numbers. Find their mean (add them all together and divide by 5).
- Flip up 4 numbers. Add them together.
- Flip up 3 numbers. Multiply the two largest and subtract the smallest.
- Flip up 3 numbers. Arrange them to make the smallest number possible.
- Flip up 2 numbers. Arrange them to make the largest number possible.
- Flip up 6 numbers. Make two numbers. Subtract the smaller from the larger.
- Flip up 5 numbers. Find the median.
- Try coming up with your own computations!

## Make a Calendar

This is good to do at the start of the month.

Make a simple table with 6 rows and 7 columns. Label the first row with the days of the week. Print it out.

With your child ask, "What is today's date?" Together, try to determine what will be the best place to put the date (is it the first week of the month? The second?)

Together fill in all the dates of the month, and put up the calendar somewhere where everyone can see it and add to it.



## Fill It In!

Once you have a calendar (made, found or bought), it is a great idea to fill it in with your child.

Here are some things you can do when filling it in:

- Write down special events and holidays. Instead of just saying what day they fall on, give clues such as, "It's on the last Saturday of the month" or "The birthday party is 6 days after the 21<sup>st</sup>."
- Draw a little symbol to represent the weather each day. What does each symbol represent? Look at patterns over the month.
- Keep track of weekly events, lessons and meetings. Estimate how many meetings there would be in a year, if you did them every week for 8 months. How many weeks do you think you miss because of holidays and other commitments?



## Calendar Magic

You can also use calendars to do magic that will astound your friends and family!

Try this trick out:

- Pick a block of 9 days, in a 3x3 square.
- Circle a number in one of the rows. Cross out the other numbers in the same row and column.
- Circle another that hasn't already been crossed out. Again, cross out any remaining numbers in that row or column.
- Circle the last remaining number.
- Can you tell anything special about the three circled numbers? Find their average.
- Give your friends these instructions and have them tell you the sum of their numbers. You should be able to find the center number without looking!

# Newspaper Math



The newspaper can be used for many different math activities. If you don't get a daily or weekly newspaper delivered to your house, you can look for free community papers available at grocery stores, movie theatres, coffee shops or other local places. You could also look for fliers from stores or magazines that aren't being used anymore.

Here are some ideas for activities. You can change and adapt them in any way, depending on what kind of resource you're working with:

- Read the job postings. Look for one that lists a salary. Try to calculate the hourly, daily, weekly, monthly and annual wages.
- In the classified ads, look for apartments or houses for rent. What would the monthly or annual rent be? Compare different places to determine which would be the best bargain and give your reasoning.
- Examine fliers to see what kind of sales they have. How much money would you save? What percentage of the price is that? What would that be as a fraction? As a decimal?
- Select a particular article with many different numbers. Classify them as fractions, decimals, ratios, currency, times, temperatures, percentages, whole numbers, odd, even, etc.
- Examine the weather page. What will be the weekly average temperature in your area? What about another part of Ontario or Canada? Make a line graph to represent the different temperatures for the week. Continue it throughout the month. Compare it to another month later in the year.
- Look at the obituaries and try to determine a person's age by date of birth and date of death alone.
- Compare the number of articles to ads in a particular section. Does this depend on which section it's in?
- Find the number of pages in the first section of the paper. Which section has the most pages? Which has the least? Is this the same every day?
- Try to find different shapes in the paper. Where can you normally find shapes (ads, classifieds, articles, pictures)? What shape used most often?



- Look at the sports scores from the previous day. What was the highest score? How many points were scored overall for a particular sport? Look at the standings for a sport. Which team is in first place? Which is in second? How many points do they need to catch up?

- Find an ad that has a long-term payment plan option. How much would you pay upfront? How much would it work out to if you took a number of weeks or months to pay it off?
- Find a text box and measure the length and height. What is the area of the box (length x height)?
- Try to find the newspaper's fee for ads or classified notices. Design your own ad. How much would it cost to put it in the paper? Calculate the area of all the ads on a page. How much money did they make selling that ad space?
- Compose a list of a few characters from the comic strips. Survey friends to see which ones are favourites. Graph your results.
- "E" is the most commonly used letter in the English alphabet. Select an article and see how many sentences you can find that don't use this letter. What percentage of the article is that?
- Look at the birth announcements. Count the number of boys and the number of girls born that week. Make a bar graph to compare the numbers.



### Newspaper Scavenger Hunt

A good way to incorporate both math and language in everyday life is to do a scavenger hunt using the daily or weekly newspaper, fliers or magazines.

It's as simple as looking through your newspaper, finding any or some of the following items and marking them down or cutting them out.

Things to find:

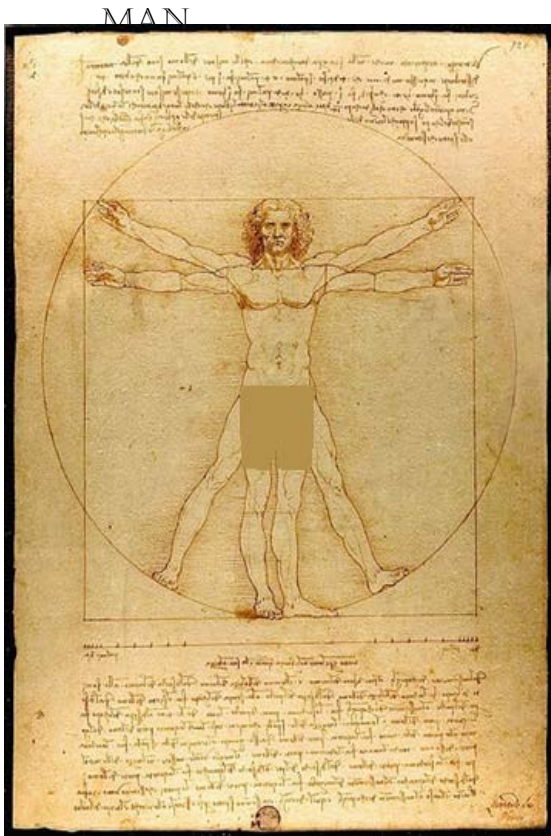
- A price
- An address
- A date
- The date the paper was published
- A time
- A number that gives size
- A phone number
- A distance
- A temperature
- A score in a game
- An odd number
- A number great than 235
- A number in the thousands
- A decimal
- An e-mail address
- A square/rectangle
- A pattern (using numbers, letters, shapes or colours)
- An average



## Body Math

People come in all different shapes and sizes, but did you know that your body is made from parts that are all proportional to each other in the most fascinating ways? Don't believe us? Just take a look...

### DAVINCI'S VITRUVIAN



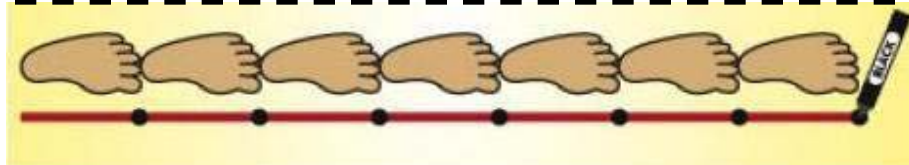
- a palm is the width of four fingers
- a foot is the width of four palms (i.e., 12 inches)
- a man's average height is four cubits (i.e., 24 palms)
- the length of a person's outstretched arms (arm span) is equal to her height
- the distance from the hairline to the bottom of the chin is one-tenth of a person's height
- the distance from the top of the head to the bottom of the chin is one-eighth of a person's height
- the distance from the bottom of the neck to the hairline is one-sixth of a person's height
- the maximum width of the shoulders is a quarter of a person's height
- the distance from the middle of the chest to the top of the head is a quarter of a person's height
- the distance from the elbow to the tip of the hand is a quarter of a person's height
- the distance from the elbow to the armpit is one-eighth of a person's height
- the length of the hand is one-tenth of a person's height
- the distance from the bottom of the chin to the nose is one-third of the length of the head
- the distance from the hairline to the eyebrows is one-third of the length of the face
- the length of the ear is one-third of the length of the face
- the length of a person's foot is one-seventh of his height

### 7 Feet Tall

*According to da Vinci's Vitruvian Man, everyone is 7 feet tall ... 7 of our own feet that is!*

### Try It!

*Placing one foot directly in front of the other, count out 7 steps, marking your start and finish with two pieces of masking tape. Lay down on tape marks to compare your height. Are you 7 feet tall?*



### How Square Are You?

According to da Vinci's Vitruvian Man, people are perfect squares, meaning that the length of their arms spread out from side-to-side is equal to the height of their bodies. However this is certainly not true of everyone. For example, basketball players tend to have longer arm spans, making it easy for them to shoot and dunk. So what other body shapes exist out there?

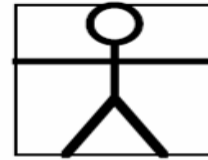
#### Try It!

Lying down, have a partner cut a piece of string to your height and then measure it against your arm span. Which is longer?

If your arm span is longer than your height, you are a  
**SHORT RECTANGLE**

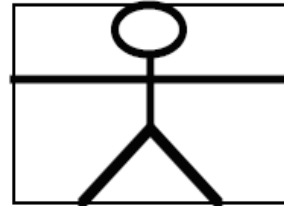
If your height is longer than your arm span, you are a  
**TALL RECTANGLE**

If your height and arm span are about the same, you are a  
**SQUARE**



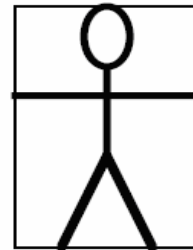
**Square**

height = arm span



**Far-Reaching Rectangle**

height < arm span



**Tall Rectangle**

height > arm span

### How Many Times Around?

Circumference of the neck = twice the circumference of the wrist  
Circumference of the wrist = twice the circumference of the thumb  
Circumference of the head = three times the circumference of the wrist  
Circumference of the waist = twice the circumference of the neck

#### Try It!

Cut a piece of string to the length that wraps exactly around your waist.

Cut the string in half and measure it around your neck – does it fit?

Cut the string in half and measure it around your wrist – does it fit?

How many times does this piece of string go around your head?

Cut the string in half once more and measure it around your thumb – does it fit?

# Measurement Puzzles

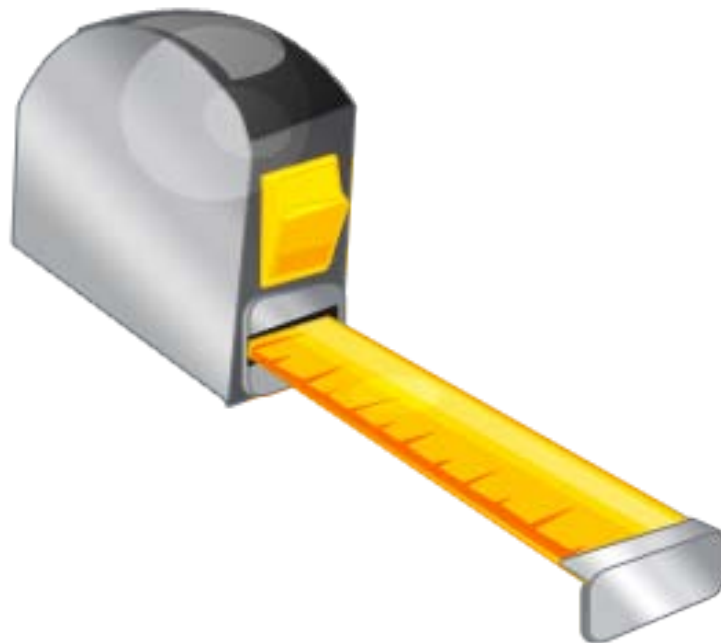
Instructions:

For each of the following puzzles, your team will need to work together to find the answers.

There are various strategies you can use to find these answers so we encourage the trial and error method.

As a team, you will need to decide on the best solution for the problem and be able to explain why.

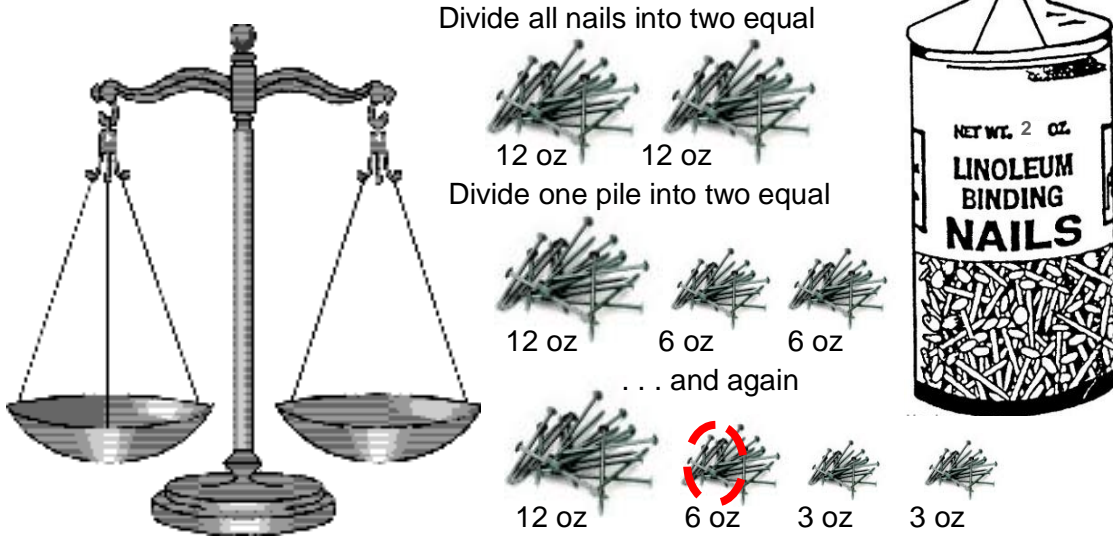
You can find measurement wherever you look, as in the following examples. Everyday tasks can involve any measures, such as weight and amount.





# Activity 1: Measurement at the Hardware Store

A large container is known to hold 24 oz of nails.  
 We have a balance, but no weights.  
 Measure out 9 oz of nails for a customer.



Divide all nails into two equal

12 oz      12 oz

Divide one pile into two equal

12 oz      6 oz      6 oz

... and again

12 oz      6 oz      3 oz      3 oz

# Activity 2: Dividing the Crafts Equally

A bag contains beads or buttons. You have a balance, but no weights.  
 How would you give several kids an equal share of the craft? It's okay to have leftovers, as long as each kid gets the same amount



- 4 kids: \_\_\_\_\_
- 5 kids: \_\_\_\_\_
- 8 kids: \_\_\_\_\_
- 15 kids: \_\_\_\_\_



## Activity 3: Find the Lighter Counterfeit Coin

We have 3 coins. Two are good coins; one is a counterfeit coin that weighs less. Identify the counterfeit with one weighing on a balance.



Compare coins 1 & 2.  
If they weigh the same, coin 3 is counterfeit;  
otherwise the lighter of the two is counterfeit.

We have 9 coins; eight good coins and a counterfeit coin that weighs less.  
Identify the counterfeit with 2 weighings.



## Activity 4: Heavier Counterfeit Coin

We have 3 coins. Two are good coins; one is a counterfeit coin that weighs more. Identify the counterfeit with one weighing on a balance.



We have 9 coins; eight good coins and a counterfeit coin that weighs more.  
Identify the counterfeit with 2 weighings.



*Challenge:* Find one heavier counterfeit coin among 27 with 3 weighings on a balance.



## Activity 5: Measurement with a Scale



You have 5 packages of candy bars and a scale. Each candy bar is supposed to weigh 200 grams. One of the packages, however, contains candy bars that weigh 150 grams. Can you find the package with lighter candy bars using the scale only once?

*Extra challenge:* You only know that one package contains lighter candy bars but you don't know the weight of regular or lighter bars. How many times do you need to use the scale to find out the two weights and the package with lighter bars?



## Activity 6: Measurement with Scales

We have 100 oranges in a heavy cardboard box. How can you find the weight of the oranges (without the box) using a bathroom scale?

Bathroom scales are usually not accurate for small weights (say, less than 30 lbs) or very large weights (say, more than 200 lbs). How would you weigh a baby who is about 20-25 lbs using a bathroom scale?

How would you weigh the 100 oranges accurately using the bathroom scale if you estimate the oranges to weigh 20-30 lbs and the cardboard box 3-5 lbs?

Can you accurately weigh a person who is about 250-300 lbs using two bathroom scales?





## Calculator Magic

Calculators are an important tool for children to be comfortable with, use, and understand. They allow kids to explore numbers and ideas, to discover patterns in numbers and to develop problem solving strategies. Calculators allow for information to be gathered quickly so that children can spend more time exploring the numbers.

Here are a variety of tricks you can try with a calculator. Once you've mastered them, try them out with a friend or family member, to astound them with your magic prowess!

---

Select any number from 1 through 100.

Write the name of the number. This is your first number.

How many letters are in its name? The amount of letters is your second number.

Next count how many letters there are in the second number. This is your third number.

Continue to count the amount of letters in each number you obtain until you find a number which repeats itself.

What number is it?

---

Enter the numbers 12345679 in your calculator. You may have noticed that the number 8 is not included.

Multiply the number by 3.

Multiply your answer by any digit from 1 through 9.

Lastly, multiply your result by 3.

What is your surprising answer?

---

Select a 3-digit number.

Make this number into a 6-digit number by repeating the 3 digits.

Divide the number by 13. What is your answer?

Divide your answer by 11. What is your answer now?

Divide your new answer by 7. What is the final result?

If your answer does not surprise you, you may want to try again!

---

Start with any number.

If the number you started with is even, divide it in half. If it's odd, multiply it by 3 and add 1.

Apply the steps above to your answer (if it's even – divide; if it's odd – multiply and add).

Do it over and over again.

Do you see a pattern? You should!

---

This game requires dice as well as a calculator.

Roll 3 dice (or pick three secret numbers from 1-6).

Select one of the three numbers. Multiply it by 2. Add 5. Multiply this by 5.

Choose one of the two remaining dice/numbers. Add it to the step above. Multiply by 10.

Add the remaining dice/number.

What does the calculator say? What's special about it?



# Calculator Riddles

Did you know that your calculator is a remarkable little machine that can not only calculate problems more accurately than most humans, but it can TALK!

It's time to properly introduce yourself to your calculator. By carefully pressing the following buttons, it will tell you its name. Press  $353 \times 9 \times 100 + 18 =$ . Just turn your calculator upside down, and it will tell you.

Use the following alphabet to help you find the answers when you flip your calculator after the = sign.

## THE CALCULATOR ALPHABET:

Upside-down numbers:	0	1	2	3	4	5	6	7	8	9
Letters:	O	I	Z	E	h	S	g	L	B	G

## TRY SOME RIDDLES:

1. What is the only thing that gets larger the more you take away?

$$25,000 - 68 - 952 - 8956 - 11,320 =$$

2. Which has fewer legs, a goose or no goose?

$$25.009 \div .001 + 10,000 =$$

3. Picture the Canadian coins: a nickel, a penny, and a dime. OK? Ellie's parents have 3 children. One is Nick and another is Penny. Who is the third?

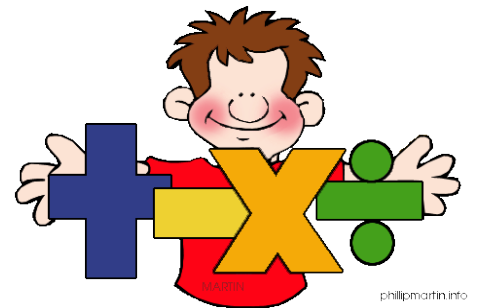
$$.05 \div .01 \div .10 \times 3 \times 211 + 123 =$$

4. How many legs does a barbershop quartet have?

$$2 \times 2 \times 2 \times 10 \times 70 + 338 - 0.09 =$$

5. A pet store owner has 17 eels. All but 9 were sold. How many eels does the owner have left?

$$337.8 \times 17 - 9 =$$



6. Who weighs more, Lee the 5-foot (152 cm) butcher or Bob the 7-foot (213 cm) wrestler?  
 $5 \times 7 \times 10 - 13 =$
7. A doctor gave you three pills and said to take one every half hour: How long will the pills last?  
 $3 \times .5 + 2.6 =$
8. Which would you rather have, an old one-hundred-dollar bill or a brand-new one?  
 $100 \times 77 + 118.001 - 100 =$
9. Bob and Bill took a dividing test in school. Bob wore glasses and Bill did not. Who got a higher score on the test?  
 $10 \times 10 \times 10 - 200 + 8 =$
10. How many seconds are in a year?  
 $31,557,600 \div 1,000,000 - 26.3476 =$
11. A barrel of water weighed 100 kilograms, but after somebody put something in it, it weighed only 25 kilograms. What was put in the barrel?  
 $500 \times 100 + 4000 - 300 + 4 =$
12. Bill subtracted numbers for 20 minutes, Bess multiplied them, and Leslie added them. Who was more exhausted when they finished?  
 $9 + 57 + 868 + 7920 + 93,208 + 215,475 =$
- Who went into debt when they were finished?  
 $17,865 - 9438 - 607 - 95 - 7 =$
- Who got the most work done in 20 minutes?  
 $0.3 \times 2 \times 2.6 \times 20 \times 7.1 \times 25 =$
13. What is the largest number that will fit in your calculator's display?  
 $99,999,999 \div 9 - 11,058,162 + 656,060 =$



14. Bob says that only one month has 28 days. His boss says that there are more. Who is right?

$$28 \times 29 \times 30 + 31 - 18,882.486 =$$

15. What did seven do that made all the other numbers afraid of it?

$$7 \times .07 \div .7 \times 7 + 1.9 =$$

16. What number never tells the truth when it is resting?

$$223,314 \div 7 \div 2 \div 3 =$$

17. How much dirt is in a hole that is 5-feet deep, 2-feet wide, and 3-feet long?

$$5 \times 2 \times 3 - 30 =$$

18. Take two eggs from three eggs and what do you have?

$$9992 \times .2 \times 3 - 2 =$$

19. What part of a lame dog reminds you of what happens when you start adding 37 and 26?

$$224 \times 25 - 25.486 + 37 + 26 =$$



# Caesar's Box Cipher

Julius Caesar (100 BC – 44 BC), Emperor of Rome, had many different ways of sending coded messages to his commanding officers during battle. One of his most famous ciphers is called Caesar's Box Cipher. Caesar would send a group of letters that appeared to be non-sense. The amount of letters in the code added up to a number that could be square rooted. For example the number 25 can be square rooted to the whole number 5. The commanding officers would then create a square entering the letters so that the amount of columns and rows were the same. They would then input the letters starting left to right in the first row, then the second row and so on. Once all the letters were in the box, they would read up

Here is an example of a message: WAUL HNSB AUUO TNAX. It has 16 letters, which makes the box to be 4 X 4 letters. Here is how it is input into a box:

W	A	U	L
H	N	S	B
A	U	U	O
T	N	A	X

Reading from top to bottom starting at the left hand corner, the message is "WHAT AN UNUSUAL BOX"

Can you decipher the following? (Use the graph paper provided)

MCEI AAMC TNAA HBGL  
AETGNF TILTMRET SEHAGRI ATAKEET LHTEDNU IICAICD TNALFE  
WTTFDN IGREBT TEYWEL HOAOPE OMLUOS UEILIS

Can you make your own?

Instructions

- 1) Create message that is 9, 16 or 25 letters long
- 2) Create a box and place letters starting at the top right to the bottom right. Continue from top to bottom until all the letters are placed
- 3) Write your coded message starting with the top left to top right, and then continue on the next row from left to right
- 4) Give your message to a friend or family member. Can they find out what it is?

# Book of Magic Tricks

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## 1) Binary System Cards

- This is a magic trick based on the addition of different integers. To complete this trick, ask a friend to pick a number between one and thirty-one. Once they choose it, go through the different cards, asking them whether their number appears in each one. If your friend answers yes to a card, add the first number that appears. For example, your friend chooses the number 25. It appears in Card A, D, and E. The first numbers of those boxes are 1, 8 and 16. Add these numbers together to figure out which number you have: 25.

A				B				C				D				E			
1	3	5	7	2	3	6	7	4	5	6	7	8	9	10	11	16	17	18	19
9	11	13	15	10	11	14	15	12	13	14	15	12	13	14	15	20	21	22	23
17	19	21	23	18	19	22	23	20	21	22	23	24	25	26	27	24	25	26	27
25	27	29	31	26	27	30	31	28	29	30	31	28	29	30	31	28	29	30	31

## 2) The Four Kingdoms

- The King is having a party. This card trick seems magical, but it's not. To perform, separate all of the Aces, Kings, Queens and Jacks from a deck of cards. The rest of the cards will not be used. Begin the trick by telling this story of the greatest and most powerful wizard.

Once upon a time there were four kingdoms. In each kingdom there was a beautiful castle. (Put down the four Aces, face-up, in a row, next to each other.)

In each castle lived a wise and just King. (Put down the four Kings: the King of spades on the Ace of spades, each of the other Kings on the Ace of the same suit.)

Each King was married to an equally wise and just Queen. (Put down the four Queens, the Queen of spades on the King of spades, etc.)

One year to each family was born a healthy, happy child, and all seemed right with the world. (Put down the four Jacks, the Jack of spades on the Queen of spades, etc.)

And the greatest and most powerful wizard saw just how good things were and said, "Great! Now I can take that vacation to Disney World and visit the Florida Keys to soak



up some sun." And so he began to pack. (While you are saying this, pick up the four piles and place them one on top of the other.)

In the mean time the evil wizard, Morganus, was conjuring up an evil spell to be cast on the four kingdoms. Once the good wizard left, Morganus didn't waste any time. He chanted, "Mouse tails, bat's eyes, blood from a rat. Mix it together in a great big vat." (While saying this, deal the cards into four face-down piles, one card for each word.)

His spell took hold of the four kingdoms and, leaving no stone unturned, he cast them to the four winds. (While saying this, arrange the four piles in a diamond shape.)

The results were devastating. The children became lost in the forests, the Kings and Queens wandered aimlessly in the desert, and the castles were empty. (While saying this turn over the four piles to show the piles of all Aces, Kings, Queens, and Jacks.)

But soon the greatest, most powerful and most rested wizard returned, and he saw what Morganus had done. "This just cannot go on!" he said. And he cast his spell. It worked a magic much more powerful - it gathered in the Kings and Queens, children, and castles from the four corners of the earth. (While saying this, pick up the four piles and lay them on top of each other.) And he said, "Morganus is in trouble if ever he's sighted. But these families four will soon be united." (While saying this, deal the cards into four face-down piles, placing one card for each word.)

And the wizard proclaimed that all was right in the kingdoms. (While saying, turn over the four piles to reveal the four united families.)

### 3) Calculator Card Trick:

- You need a calculator to complete this card trick.

Take out a three of any suit and lay the card face down (make it look like you are choosing a card at random).

Turn to your friend and ask them to pick any card besides a face-card (jack, queen, king)

Ask them to place their card to their left of the three that you have already placed down

Remembering their number, have them take their calculator and double that number. For example if they had a card that was a four, they would double it to make 8. Have them take their answer and add 2. In our example, the number would now be ten. Have them multiple that number by 5. Our example would be 50. Next have them take 7 from that number.

They are left with a number that ends in three. Our example would be 43. No matter which card they choose the final answer will always end in three.

#### 4) I Know Your Birthday Calculator Tricks

Enter the year they were born, without letting you see it. For example: 1987. Multiply that year by 2.  $1987 \times 2 = 3974$ . Add the number of months in a year:  $3974 + 12 = 3986$ . Multiply that total by 50:  $3986 \times 50 = 199\,300$ . Add their age to that result:  $199\,300 + 23 = 199\,323$ . Add the number of days in a year:  $199\,323 + 365 = 199\,688$ . Finally, ask them to hand you the calculator with the final total showing. Just subtract 965, and the year the person was born and their age will magically appear!  $199\,688 - 965 = 198\,723$ .  $1987 = \text{year born} = 23 = \text{age}$

#### 5) I know how old my teacher is Calculator Trick

- This trick works only if the person you are playing the trick on is at least ten years old or older.
  - a. **Step 1:** Ask your teacher (or another older person) to punch his or her age in the calculator without you looking.
  - b. **Step 2:** Ask him or her to:
    1. Think of a favourite number from 1 – 9.
    2. Subtract that number from the number showing in the display.
    3. Multiply by 9.
    4. Add his or her age to the product.
  - c. **Step 3:** Take the calculator. Look at the three-digit number on the display. Add the number made by the first two digits to the last digit. That's how old your friend is

Example: Let's say your teacher is 33 years old. Let's say her/his favourite number is 7. Subtract  $33 - 7 = 26$ . Multiply  $26 \times 9 = 234$ . Now add  $234 + 33 = 267$ . Finally, add  $26 + 7 = 33$  --- your teacher's age!

#### 6) Base Ten Card Trick

- For this card trick you need a full deck of cards. Have your volunteer choose two cards from the deck. They get to keep them in their hands. Start putting down about 8 cards in a row. You're covering up sums that add to ten. So for example if the volunteer puts down a 4 and 6 you cover these with another two cards. For face cards (Jack, Queen and King) you wait until there are one of each to cover them; you cover a Jack a Queen and a King at the same time. Once all your cards are placed, take your piles and make ten from that. If, for example, an 8 is left then one of your friends has a two. If a King and a Jack is left your friend has a Queen. If on the off chance no cards are left over, you know that the sum of the numbers they are holding is ten and you can adjust your trick.

# Magic Hat Mixtures

## You will need:

- Beads (or any other item you can use as a counter) of various colours.
- A “magic hat” or bowl or place to put the beads.

## Getting Ready:

- Each of the “magic hats” is a number problem.
- Each has two kinds of beads; Work together to find a solution for each mixture.



## Why:

- It is important to lay the foundation for algebra at a young age. It’s just getting some ideas about algebra and numbers.

## Make your Mixtures:

1. Work together to make up a magic hat mixture.
2. Arrange the beads as you tell the story.
3. If you come across a tough mixture, set it to the side and work your way up to that level with easier mixtures.

## Magic Hat Mixture Examples: (Each box represents an INDEPENDENT mixture)

There are 3 blue beads in my magic hat. (Place 3 blue beads in your “hat” or bowl)  
There is 1 red bead for each blue bead. (Place a red bead next to each blue bead)  
How many beads are there? (You count them aloud with your child)

Every time I put a red bead in the pot, (place one red bead “in the hat”)  
2 Black beads have to be added. (Have your child add 2 beads each time.)  
I have 4 red beads in total.  
How many black beads are there?

**Magic Hat Mixtures (some may have more than one solution):**

This Magic Hat has 10 lite-bright pieces.  
4 of the lite-bright pieces are green, the rest is a mixture.  
How many are purple?

This Magic Hat has 8 “bunches of grapes”.  
Half of the bunches are pink.  
How many are not pink?

This Magic Hat has 8 coloured macaroni noodles.  
Half of the noodles are blue.  
How many are green?

This Magic Hat has 5 white pompoms.  
There are 2 more red pompoms than white pompoms.  
How many red pompoms are there?

This Magic Hat has 6 black buttons in all.  
There are 3 more white buttons than black buttons.  
How many of each kind?

This Magic Hat has 5 wood beads.  
There is 1 less brown bead than beige beads.  
How many brown beads are there?

There are 5 orange snowflake beads.  
There are 2 less pink snowflake beads than orange beads.  
How many pink snowflake beads are there in total?

This Magic Hat has 2 brown wood beads.  
Each brown wood bead has 2 beige wood beads next to it.  
How many beige wood beads are there?

This Magic Hat has 5 puffs in all.  
There is 1 more red puff than pink puff.  
How many of each kind are there?

This Magic Hat has 6 rings in all.  
There are half as many yellow rings as clear rings.  
Describe this magic hat mixture.

This magic hat has 4 green hangers.  
There are an equal number of pink and yellow hangers.  
How many hangers are there?

This Magic Hat has an equal number of large and small washers.  
There are fewer than twelve washers all together.  
How many of each kind of washers could there be?

This Magic Hat has 4 red buttons.  
The number of blue buttons is double the number of red buttons.  
How many buttons are in the magic hat?

This magic hat has the same even number of each kind of button.  
There are between 5 and 10 buttons in the magic hat.  
How many of each button could there be?

This Magic Hat has 4 star beads in all.  
There are three times as many purple beads as red beads.  
How many of each colour?

This magic hat has 9 bread clips in all.  
There are twice as many white bread clips as green bread clips.  
There are an uneven number of green bread clips.  
Describe the magic hat mixture.

# The Magic Box

The Magic Box is a fun and magical way to learn the answers to those math questions you have. The Magic Box will help you and your friends practice your math skills.

## Materials:

- a box (i.e. a 2L milk carton)
- 3" by 9" piece of cardstock
- masking tape
- an exacto knife
- tape

## Procedure:

- Cut two rectangular openings on one side (face) of the box (near the top and the bottom).
- Take your piece of cardstock and push it into the top opening and pull the edge through the bottom opening.
- Tape the top of the cardstock to the edge of the top opening.
- Once the card stock is curved correctly, tuck the excess cardstock flush to the inside of the carton.
- Tape the bottom of the cardstock to the inside.

Now, you can decorate the face as you wish. Use construction paper, cardstock, markers, yarn, anything you would like!

## Magic Box Cards

## Materials:

- 64 cardstock cards (2 ½" by 2 ½")
- permanent marker

## Procedure:

- Create a set of math questions on one side of the cards and the answers on the other side.
- One card at a time, place your question face up into the carton to ensure the answer appears face up in the second opening.

# Napier's Bones

## Magical World of Multiplication

### History

These multiplication aids are at least 400 years old. A Scottish mathematician by the name of John Napier invented the original multiplying "bones." He also invented the decimal point. 'Napier's Bones' is also thought to be one of the first examples of a calculator. In the 1600s, the bones would be carved from wood, ivory, real bones and horn. They would be carried by magical multiplying magicians in leather or wooden boxes.

### How to Make

To make a set of 'Napier's Bones', begin with strips of paper, each marked out with nine boxes which have been divided by a diagonal running from bottom left to top right. In each strip we write one of the multiplication tables of the digits 0, 1, 2, to 9. A complete set of strips is shown below.

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

**How to Make**

To multiply one number by another you need to align the digits as they are positioned in the given number against the row of multiples as shown. You look for a number that you are multiplying your large number by and read the results from right to left by adding the digits in each square diagonally in the appropriate row.

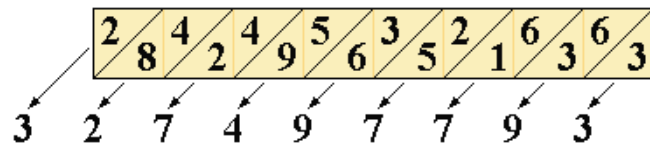
For example: to multiply 62 by 7, you need first to position your bones to get the index bone followed by rods beginning with 6 and 2 in order.

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

You look at the row of numbers to the right of the “7” on the index card and read the results from *right to left* by adding the digits in each diamond in the appropriate row. This means that the final answer is 4 hundreds (2+1) tens and 4 ones: 434. Napier’s magic multiplying bones work because they turn multiplication into addition.

To multiply 7 X 46,785,399 simply line up multiplying bones like this and add. The product is 327,497,793.

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





# Multiplication Fun

Having difficulties with multiplication? Want to learn new ways to multiply quickly? Here are some fun and interesting ways to try to work out those multiplication problems.



## **Two Times Tables:** Double Your Pleasure

When multiplying a number by two, you're simply doubling that number. Any number multiplied by two is the same as that number **ADDED TO** itself. Here's an example:  $2 \times 5$  is the same as  $5 + 5$ , which equals 10.

## **Four Times Tables:** Double, Double Trouble

When you multiply four with anything, you can use the doubling-up trick (that's the one you used for the two times table) twice. Here's an example:  $4 \times 7$  is the same as  $7 + 7 = 14$  and then  $14 + 14 = 28$ . Therefore  $4 \times 7$  equals 28. Here's another double, double example:  $4 \times 10$  is the same as  $10 + 10 = 20$ , so then  $20 + 20 = 40$ . So the answer is  $4 \times 10 = 40$ .

## **Five Times Tables:** It's Why You Have Fingers

To quickly multiply by 5, divide the number in two and then multiply it by 10. Often this can be done quickly in your head. For example let's take  $5 \times 8$ . First  $8 \div 2 = 4$ , then multiply this by 10 ( $4 \times 10 = 40$ ). Your answer will then be  $5 \times 8 = 40$ .



## **Nine Times Tables:** One Seriously Handy Tip

Here is a fun way to remember your nine times tables. For this method you are going to need both your hands. Place your hands in front of you. Your fingers represent the numbers one to ten (one is either your left thumb or pinky finger; ten is your right thumb or pinky finger).

Now let's try. Take the question is  $9 \times 4$ . Count to the fourth finger from left to right (you should end on your left index finger or ring finger, depending if your palms are up or down) and curl that finger under. Now count the fingers before your curled finger to show the first digit (You should have 3). Now count the finger to the right of the curled finger to give you the second digit. So the answer is 36. Let's try  $9 \times 8$ . Put down the 8th finger so that you have seven fingers up before the finger you curled under and two fingers afterward. Your finger should give you the digits 7 and 2. So the answer is 72.



### Ten Times Tables: Just Add Zero and Stir

If you want to multiply something by 10, just **add a zero** on the end. Here are two examples:  $10 \times 8 = 80$  and  $10 \times 100 = 1,000$ . Try it with any number - from one to a billion.

### Eleven Times Tables: Seeing Double

Here's another one interesting one. Any number - **up to nine** - multiplied by 11 is itself written out twice.

Confused? Check it out:  $9 \times 11 = 99$ ,  $4 \times 11 = 44$ ,  $3 \times 11 = 33$  and so on.

Now to multiply any **two digit** number by 11 follow these rules. For this example we will use  $11 \times 54$ .

Separate the two digits (5\_\_4). Notice the hole between them!

Add the 5 and the 4 together ( $5+4=9$ )

Put the resulting 9 in the hole of the 5 and 4 to make the answer 594. That's it!  $11 \times 54=594$

The only tricky thing to remember is that if the result of the addition is **greater than 9**, you only put the "ones" digit in the hole and carry the "tens" digit from the addition. For example:  $11 \times 57 \dots$   
 $5\_7 \dots 5+7=12 \dots$  put the 2 in the hole and add the 1 from the 12 to the 5 in to get 6 for a result of 627  $\dots 11 \times 57 = 627$ .





## Finger Multiplication



Hold your hands up in front of you, palms facing upwards (so you can see them).

Number your finger as follows:

Your thumbs are each a "6",

Your pointer fingers are each a "7"

Middle fingers are each an "8"

Ring fingers are each a "9"

Pinky fingers are each a "10"

Place your hands in front of you, palms upwards and fingers pointing towards each other. Let's try multiplying  $7 \times 8$ .

Touch your pointer finger of your left hand (7) to the middle finger of your right hand (8). Now count the two fingers that are **touching** plus the fingers above on each hand. When counting the two touching fingers and the ones above you should have five "upper" fingers. That is how many "**tens**" the answer will have.

On the bottom of your hands, below the touching fingers, you should have 3 fingers on the left and 2 on the right. You will then multiply these fingers to get your "**ones**" which is  $2 \times 3$  answering 6.

Therefore, the answer to  $7 \times 8$  is 56 (Since we found 5 in the "tens" and 6 in the "ones").

Let's try another question. To multiply  $7 \times 7$ , touch your number 7 fingers together and you get: 4 above and  $3 \times 3$  under – thus your answer is 49

# The Soroban Abacus & Chisenbop

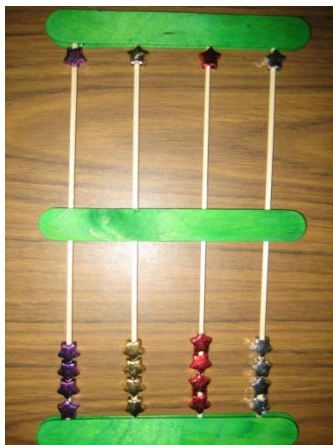
The Soroban (from the Japanese for “abacus”) is an ancient mathematical tool used for calculations. The abacus is one of the world’s first calculating tools and its earliest forms date back close to 2500 years ago. Original types of abacus were made of stone and covered with dust and a stylus was used for marking numbers. This model later evolved into a slate with stones used as counters to mark numbers. Finally, it evolved into a framed device with beads sliding across bamboo rods.

The beads on the abacus slide up and down on rods which are divided horizontally (across) by a beam. In general, a single row of beads above the beam are worth **5** and are called “Heaven Beads.” The beads below the beam are called “Earth Beads” and are worth **1**. Beads have value when they are pushed towards the middle beam and they lose value when they are moved away from the beam.

On your Soroban, there are 4 rods, representing the following place values (From left to right):

<b>Rod 4</b>	<b>Rod 3</b>	<b>Rod 2</b>	<b>Rod 1</b>
Thousands (1000s)	Hundreds (100s)	Tens (10s)	Ones (1s)

In the first example, the Soroban has a value of zero (0) because no beads have moved towards the centre beam. In the second example, the Soroban is showing a value of **18** because 3 Earth Beads and 1 Heaven Bead in the ones column are pushed towards the centre beam. There is also 1 Earth Bead in the tens column pushed towards the centre beam (1 ten + 8 ones = 18). In the third example, the Soroban is showing a value of **172** because 2 Earth Beads in the ones column are pushed towards the centre beam. In the tens column, there are 2 Earth Beads and 1 Heaven Bead pushed towards the centre beam. Finally, there is also 1 Earth Bead in the hundreds column pushed towards the beam (1 hundred + 7 tens + 2 ones = 172).



**Example 1**



**Example 2**



**Example 3**

## Adding and Subtracting with your Soroban

Adding on your Soroban is easy! Let's try adding  $30 + 16$  (equalling 46). To add 16, we need to add 1

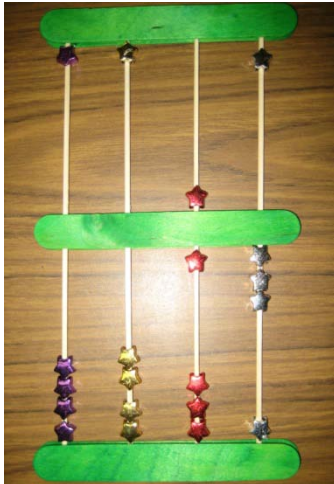


tenth and 6 ones, so let's first raise an Earth Bead in the tens column to make 40. Because we need 6 ones, we first take a 5 from the Heaven Beads and move it towards the centre beam. We also need to add one Earth Bead from the ones column, so move it towards the centre beam and voila! You have now learned how to add on your Soroban!

A total of 30 on the Soroban

## Subtracting with your Soroban

Subtracting is also quite simple because it's just the opposite of adding on your Soroban. Let's try  $63 - 25$

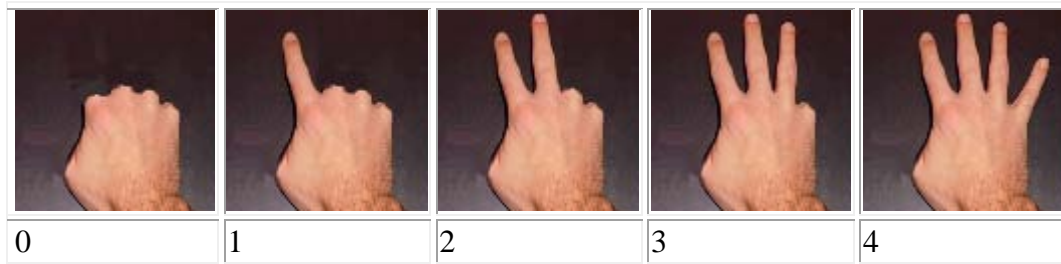


(equalling 38). We can easily find the answer to this problem by estimating. Since 25 is close to 30, we can calculate  $63 - 30$  on our Soroban by regrouping. First reset the Heaven Bead in the tens column, leaving only 3 beads in the ones column on your Soroban.

A total of 63 on the Soroban

# Chisenbop

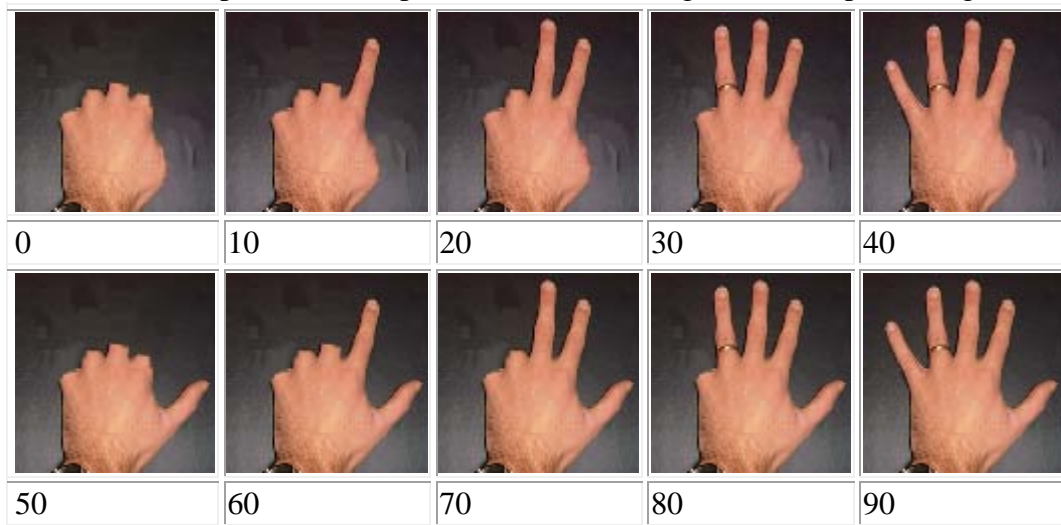
Chisenbop is a method of doing basic mathematics using your fingers. It was created in Korea and works very similar to counting on a Soroban. The key to understanding Chisenbop is learning the counting technique. The right hand stands for the values zero through nine. Each digit counts as one, and the thumb counts as five. Here's an illustration:



The right hand represents multiples of one, with the thumb representing 5.



The left hand represents multiples of ten, with the right thumb representing 50.



Photographs courtesy of: Andy Harris Indiana / Purdue University  
<http://www.cs.iupui.edu/~aharris/chis/chis.html>



# Math and Number Games

Many games involve math and problem solving. Many others can be adapted to include math concepts.

Here are some math games and classic games with a math twist:

## Tic-Tac-Toe Variations:

### 1) Free Tic-Tac-Toe

Players take turns placing either an X or an O in a square. The objective of this game is to try and create three Xs or Os in a row. The twist of this version is that a player can either decide to put an X or an O. For example, player one may choose to put an X in a box, Player two can also put an X in the box.

### 2) Number Tic-Tac-Toe

Instead of using X's and O's, use the numbers 1-9. Numbers cannot be repeated. The objective is to have row, column or diagonal line that adds to 15.

### 3) Multiple X Tic-Tac-Toe

In this version both players mark the grid with X's. On their turn, each player may place as many X's as they want, as long as they are all placed in the same row or column. The object is to be the person who places the last X.

### 4) Multi-player Tic-Tac-Toe

You can play this version with more than two people. Make a larger tic-tac-toe board (maybe 10x10). Each player should choose their own symbol, letter or number. Your goal is to get 4 in a row instead of 3 in a row.

## Cut and Check

Fold a piece of paper in half, and then in half again.

Cut out a small shape on the fold- discard the cut-out. Before unfolding it, try to draw what the paper will look without the cut-out when it's unfolded.

Then unfold it and compare. How close were you?

Try again, can you decide what you would like the paper to look like beforehand and then cut it so it does?



## Draw That Shape!

Think of common items that you and your child use every day or could easily recognize. In particular, items that have a distinct shape. Items such as coins, markers, a \$5 bill, a playing card or a knife would be perfect.

Now, without looking at the object, try drawing the shape of the object (i.e. a circle the size of a penny).

Measure it against the real object. How close were you? Try it again after some time has passed. Are you any closer?

## **New Year's Eve**

The purpose of this game is to be the first one to say "December 31<sup>st</sup>".

Rules of the game:

- 1) The starting date is January 1<sup>st</sup>.
- 2) Take turns with a partner saying dates.
- 3) Each turn, you can only change the month or the day, not both.
- 4) Whatever date you say must be later in the year than the date said before it.

For example:

Player A: January 12

Player B: May 12

Player A: May 16

Player B: October 16

Player A: November 16

Player B: December 16

Player A: December 31!



Having a strategy may help you win this game.





# Fraction Surprise!

Divide the following words to produce new words and solve the puzzle! Pay attention to *how* to divide the words (first, last, second, etc.). The first clue is done for you. When you are finished, put the words together to make a phrase!

1. The first half of foam + the last quarter of pour. F O + R = FOR
2. The last third of fat + the first 2/5 of heavy. \_\_\_\_\_
3. The last half of go + the last 1/2 of done. \_\_\_\_\_
4. The first 1/5 of water + the first 1/4 of head the first 1/5 of olive. \_\_\_\_\_
5. The first 3/4 of fine + the last 3/4 of dish + the last 1/3 of fishes \_\_\_\_\_
6. The last 1/6 of fright + the first 3/7 of history. \_\_\_\_\_
7. The first 2/5 of yours + the first 1/10 of understood. \_\_\_\_\_
8. The first 1/5 of Waits + the last 3/4 of pill. \_\_\_\_\_
9. The first 2/4 of hand + the last 2/5 of valve. \_\_\_\_\_
10. The first 1/3 of get + the second fourth of Jody + the last 2/4 of hood.

\_\_\_\_\_

11. The first 2/4 of lump + the last 2/5 of black. \_\_\_\_\_
12. The last 3/5 of stall. \_\_\_\_\_
13. The second eighth of adorable + the last half of sway. \_\_\_\_\_

Answer:

\_\_\_\_\_

Magic Puzzle: Can you find the word?

1. The first half of make. \_\_\_\_\_
2. The last  $\frac{1}{6}$  of rabbit. \_\_\_\_\_
3. The first  $\frac{2}{7}$  of hexagon. \_\_\_\_\_
4. The first  $\frac{3}{8}$  of magazine. \_\_\_\_\_
5. The last  $\frac{1}{2}$  of epic. \_\_\_\_\_

Put all the letters together: \_\_\_\_\_

# NIM Games

NIM is a game that originated in China many years ago.

It is a simple game designed for two people. The basic idea is to start with a pile of counters (such as beads, bingo chips, toothpicks, etc.). Each player takes turns removing 1 or 2 items each round until none are left. The person who removes the last 1 or 2 counters is the winner. You are not allowed to skip a turn!

You can try it out now! Just gather 20 items. Play it a couple of times and see if you notice a pattern. At what point can you predict who the winner will be?

Now you can change the game. Try it with a different starting number (i.e. 21, 15 or 30). Try removing 1, 2, 3 or 4 at a turn. Try playing it with a different number of players. Work in the opposite direction by adding to your pile. Change the rules so that the person who can avoid taking the last counter wins. What new strategies developed?

By now you should be a NIM expert! So now you can try some more variations. The game “Hot Air Balloon Ride” on page 48 is a take on NIM.

Here are some other variations:

## Target

5	5	5	5	5
4	4	4	4	4
3	3	3	3	3
2	2	2	2	2
1	1	1	1	1

Choose a number between 25 and 55.

Take turns placing a marker on top of the numbers on the board.

Each time add the number to the running total. Each square can be used only once.

Try to be the player to reach the target number exactly.



## Calculator Variations

These NIM variations use some higher numbers, so you may want to play them by entering your numbers into a calculator instead.

### 101 Calculations

Start by entering 101 on the calculator. Players take turns subtracting a number. You may take away any number from 1 to 9 inclusive. The player who ends on 0 wins.

### Hundreds

Start with the display on 0. Players take turns adding numbers, from 1 to 9 inclusive. Make it total 100 and you win!

### 21<sup>st</sup> Century

Start at 2001 on the calculator. Players take turns subtracting a number from 1 to 99 inclusive. The person to reach 0 is the winner!

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## Two-Dimensional NIM


Players take turns putting counters on the board.

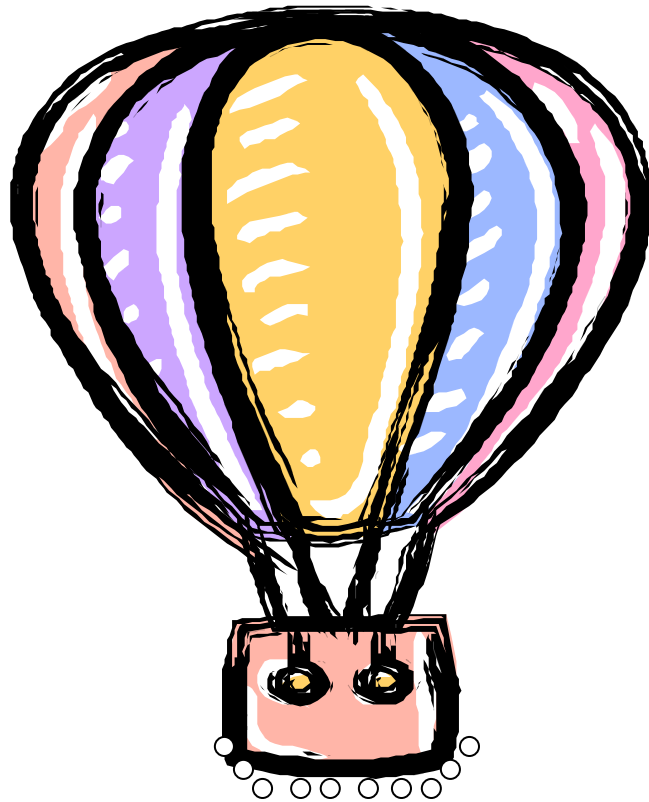
After the first one is placed, any others must connect fully on one side. In other words, all counters must be placed beside, above or below another counter.

Players place 1 or 2 at a time.

The player to cover the last square (or two) is the winner.

## Hot Air Balloon Ride

**Materials:**  
10 toothpicks (or more)

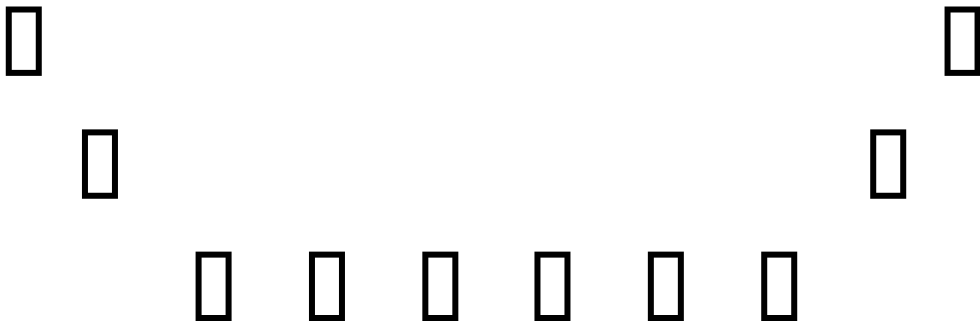


**Hot Air Balloon Ride**  
*2 Player Game*

**Object of Game:** In this variation of the Chinese game of NIM, ten ropes hold a hot air balloon to the ground. Each player may cut either one (1) or two (2) ropes. The person to cut the last rope wins a free ride on the balloon!

**Just a Few Things:**

- \*Use 10 toothpicks (ropes) to attach the balloon to their pegs.
- \*Take turns picking up 1 or 2 toothpicks at a time (cutting the rope)
- \*The person who picks up the last 1 or 2 toothpicks wins the game.
- \*You may NOT skip a turn.



Once you have played a few times, you may notice some strategies that arise to ensure a way that you can win every time. You may want to start the game with just a few toothpicks, adding more each time you play. This could help you figure out some strategies for winning.

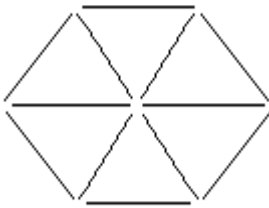
*This game helps to build number sense and numeration skills in addition to problem solving. It also offers good subtraction practice.*

## Toothpick Math



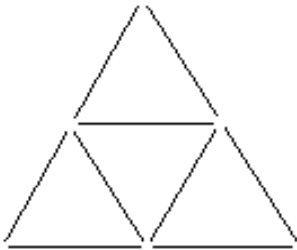
**Construct this figure using 17 toothpicks**

1. a) Remove 5 toothpicks to leave only 3 squares behind
- b) Remove 6 toothpicks to leave only 2 squares behind



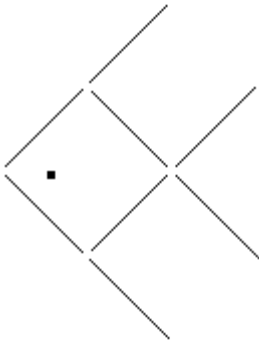
**Construct this figure using 12 toothpicks**

2. a) Remove 4 toothpicks to leave only 3 triangles behind
- b) Move 4 toothpicks to form only 3 triangles



**Construct this figure using 9 toothpicks**

3. a) Remove 2 toothpicks to leave only 3 triangles behind
- b) Remove 3 toothpicks to leave only 1 triangle behind
- c) Remove 6 toothpicks to leave only 1 triangle behind
- d) Remove 4 toothpicks to leave only 2 triangles behind
- e) Remove 2 toothpicks to leave only 2 triangles behind



**Construct this fish using 8 toothpicks and 1 button**

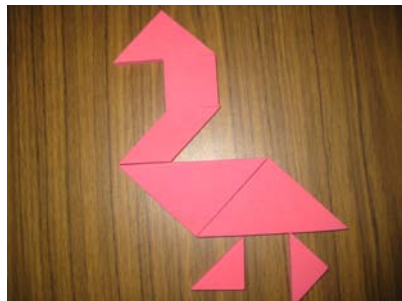
4. Move 3 toothpicks and the button to make the fish appear to be swimming in the opposite direction

# A Brief History of Tangrams

Legend holds that thousands of years ago, a sage in the ancient orient was asked to transport a pane of glass. The pane was to be used in the royal palace as the first glass window for the king and queen. In those days, panes of glass were a prized commodity, especially one as perfectly made as this one for it was perfectly square. So, as you can imagine, the transporting of the glass was an awesome responsibility. To protect the glass, the sage first wrapped it with the finest silk in the land to protect it from being scratched. He then wrapped the package with leather that was strong to protect the glass yet soft enough as to not break the glass. Finally, the sage wrapped the entire package in a thick layer of canvas. This, he thought, would protect the pane of glass from all danger.

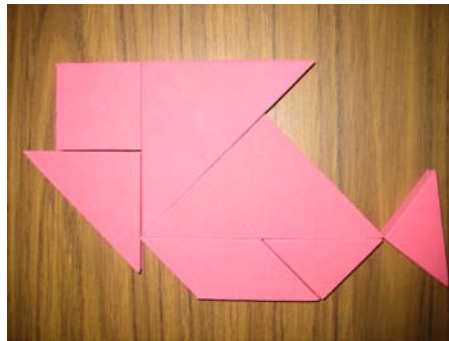


After days of travel, the sage came to the hardest part of his journey, a rocky mountain. He ascended the mount, carefully selecting each step so as not to accidentally trip and possibly break the glass. When at the top, after successfully evading many potential pitfalls, he could see his destination in the valley below-- the royal palace. He realized his journey was nearly over. Unfortunately, while peering off into the distance, he didn't see the tiniest of pebbles, no bigger than his little toe, on the ground before him. Before he knew it, he was tumbling down the hill along with the glass! When he eventually got himself under control, he immediately opened the package containing the glass. First he unwrapped the canvas, then the leather, and finally the silk. To his amazement, the pane had not



shattered into a million pieces. Instead, it had broken into seven pieces. There was one square, one parallelogram and five triangles.

The sage tried to fit the pieces back together in the shape of the original square. At first he made a rectangle. Next he came up with a parallelogram. Finally, after many attempts, he was able to fit the pieces into a square. He realized the infinite amount of combinations and interesting shapes that could be made by arranging the pieces. With this revelation, the sage wrapped the pieces back up as in the original package and continued his trek. Upon arriving at the royal palace, the sage presented the package to the king, but not as a simple pane of glass. Instead, the sage proceeded to tell of the story of his trek using the pieces of broken glass to illustrate his adventures. The king was amazed at the shapes, and he and the people of his kingdom quickly embraced them. And so the art of Tangrams was born!



As interesting as this story may be, it is unfortunately total fiction. The actual origin of Tangrams is unknown. However, it is known that Tangrams were popular in China near the start of the nineteenth century. This was followed by a craze in America, Europe, and Asia where it was one of the most popular games of the nineteenth century.

The earliest recorded reference to Tangrams was in 1813 in a Chinese book. The book was most likely written during the reign of Emperor Chia Ching (1796-1820) when Tangrams was at its height of popularity in China.

Instructions:

Use your cut outs of four triangles, one parallelogram and one square to create many possible animals/shapes/designs.





# GO SUM!

**Materials:** 1 deck of cards with Jacks, Queens, and Kings removed.

**Players:** 1 to 4

**Setup:** The cards are shuffled and both players receive 5 cards each (note: if playing with 4 players, each player gets 4 cards. If playing with 3 players, each person still receives 5 cards). The remaining cards are placed face down in the centre of the table. The top card is turned over and that number becomes the “magic” number for that round.

**Playing the Game:** Players look for two cards that add up to the magic number, or two numbers that can be subtracted to give a difference of the magic number. For example, if the magic number were **5**, then players could add cards **3 and 2** or subtract cards **9 and 4**. *If a player holds the magic number in their hand in the form of a single card, they may play it.*

When beginning the game, each player draws a card and the one with the highest number goes first. The first player attempts to make a sum or difference of the magic number. **If he or she can arrive at the magic pair**, the cards are placed as a pair on the table and the player picks up two new cards from the pile of remaining cards. Play then advances to the next player. **If he or she cannot arrive at the magic pair**, they can “GO SUM” by asking another player for a specific card. For example, if player 1 has a **4** in their hand, they can ask player 2 for an Ace (1) to try to arrive at the magic number. If player 2 has the card, they must give it to player 1 and take another card from the remaining pile. If player 2 does not have the card, they tell player 1 to “GO SUM” where player 1 takes a card from the remaining pile and discards one card from their hand. **If player 1 picks up a card that helps them arrive at the magic number, they must wait until their next turn to play the pair.**

Play continues until all the cards from the centre deck have been played. All players attempt to make the magic number with their remaining cards, and then count how many pairs they have. The winning player is the one with the most pairs.

## Variations

1. Players can use more than 2 cards to make the magic number. For example, if the magic number were **7**, a player could use **4, 4, and 1** ( $4 + 4 - 1 = 7$ ).
2. Use face cards (Jack = 11, Queen = 12, King = 13) to make the game more challenging for advanced players.

# Sphere

<b>S</b>	<b>P</b>	<b>H</b>	<b>E</b>	<b>R</b>	<b>E</b>

## Requirements

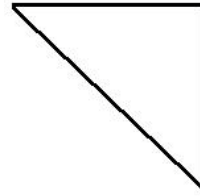
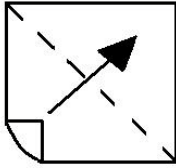
- Pens
- Sphere Grid (above)
- Die

## Instructions

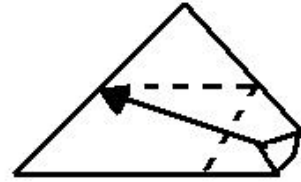
The object of this game is to accumulate the most points. There are six rounds: "S,P,H,E,R,E". At the beginning of the round all players are standing. The die are rolled and the sum of both is calculated. The sum is then written into the grid under the S column. Players then have the choice to either sit down, which ends their turn, or continue playing. The players who continue playing have the chance to score more points. If a 1 is rolled; they lose all their points from that round. Those people who are sitting when a 1 is rolled do not lose their points. The round is over if all players are sitting or a 1 is rolled. If, during the game, two 1s are rolled, players standing up lose all the points from the entire game. After the final round, the points accrued from all 6 rounds are calculated and the player with the most points is declared the winner.

## Popcorn Cups

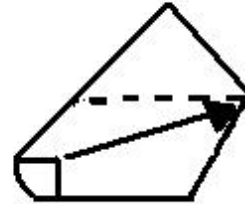
Step 1: Fold your piece of paper from one corner in half to form a large triangle



Step 2: With the two points at the bottom, fold one of the corners across in a straight line to touch the other side



Step 3: Repeat Step 2 by folding the other corner across to meet the other side. Keep the line straight with the other.

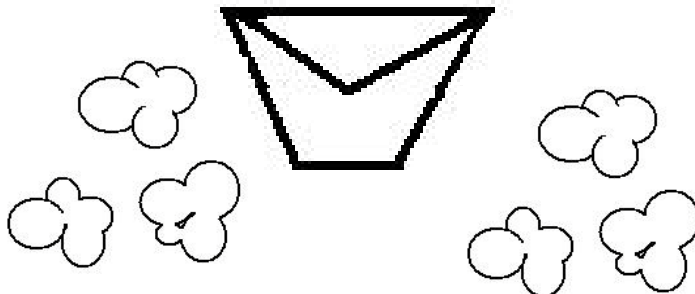


Step 4: Pull the top point of the folded paper down to the line of the paper folded in Step 2 and 3.



Step 5: Repeat Step 4 on the other side. You should have this shape.

Step 6: Open the center to reveal your cup.



# Cootie Catcher

You can make a Cootie Catcher and to share with your friends and family. Cootie Catchers are fun for telling fortunes. Pick a theme for your Cootie Catcher or just have your friends ask it a question and see what answer will be revealed.

## What you need:

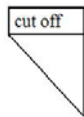
- ✓ Scissors
- ✓ Rectangular sheet of plain paper
- ✓ Pen or Markers

## What you do:

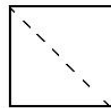
Follow these step by step instructions to create your very own Cootie Catcher.



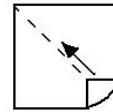
**Step 1:**  
Fold the bottom of the paper to the far side of the page to make a triangle.



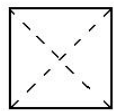
**Step 2:**  
Using scissors cut off the flap at the top



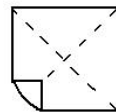
**Step 3:**  
Open your paper to reveal a square



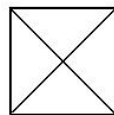
**Step 4:**  
Fold the paper to re-make a triangle, but in the opposite direction



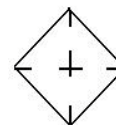
**Step 5:**  
Open your paper two reveal two diagonal lines making an 'X' and center point on the paper



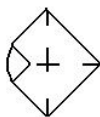
**Step 6:**  
Fold each of the 4 corners of the paper to meet the center of the 'X'



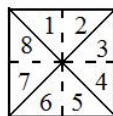
**Step 7:**  
When all corners have been folded, the Cootie Catcher should look like this



**Step 8:**  
Turn the paper over so that the folded sides are facing down



**Step 9:**  
Fold all the corners to the center of the 'X.'



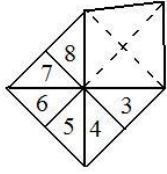
**Step 10:**  
Once you have folded in all corners, write the numbers 1 - 8 on each of the triangles like above.



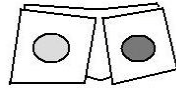
**Step 11:**  
Hold the paper in front of you as shown and fold it up into a square.



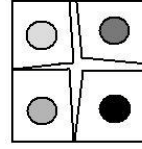
**Step 12:**  
Now unfold and fold the square in half horizontally. This helps crease the sides

**Step 13:**

Open each of the numbered flaps and write something on each triangle. You can write jokes, riddles, or whatever you wish.

**Step 14:**

Flip the Cootie Catcher over and write the names of colours, animals, people or places on the flaps

**Step 15:**

Flip the Cootie Catcher over so that the numbers are face up. Fold the square in half (as shown) and slip your thumbs and pointer finger under the four flaps.

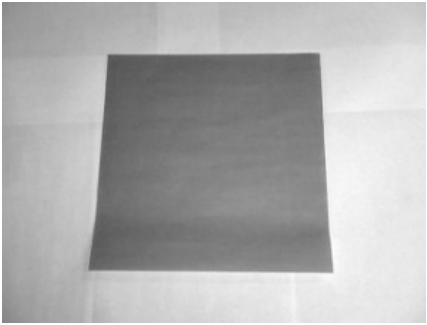
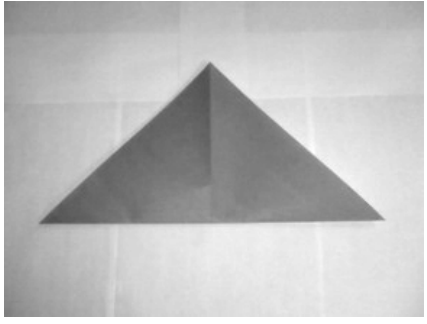

How to play:

- Find a friend and ask them to pick a colour, animal, person or place that you have written on one of the outer flaps.
- Move the flaps in and out and side to side to spell out the word they have chosen.
- Open the Cootie Catcher to reveal the numbers and ask them to pick one. Count out the number they have chosen by moving the flaps in and out and side to side. Ask them to pick another number and count it out in the same manner.
- This time ask them to pick a third number and reveal the answer you have written on the inside flap.

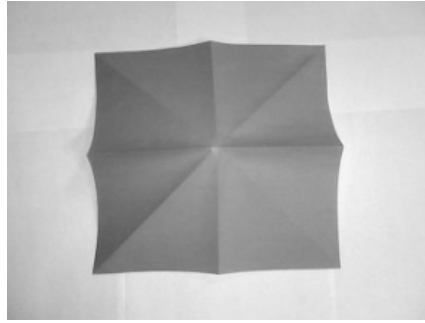
# ORIGAMI - Puffer Fish

Origami is a form of Japanese art. The word origami comes from “Oru” which means “to fold” and “Kami” which means “paper”. That is exactly what we are going to do! Taking a normal piece of square paper we can transform it into beautiful objects such as animals, flowers, holders, etc. It will bring a smile to your face each time you complete an origami!

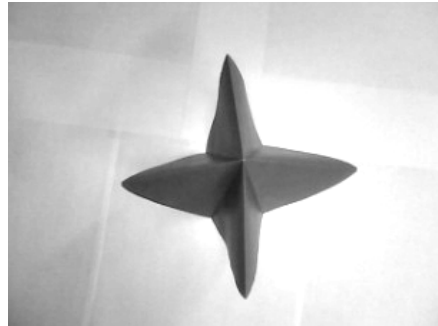
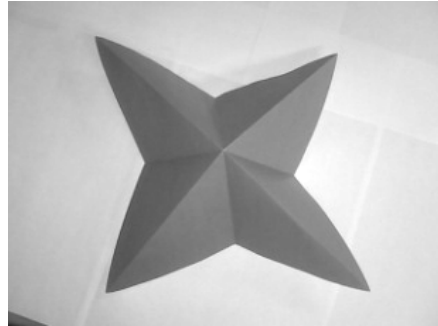
## STEP – BY – STEP: Puffer Fish

<p>1. Start with a square piece of paper.</p>	
<p>2. Complete a triangle/ diagonal fold (tip to tip of corners) – Open and repeat this to alternate corners.</p>	
<p>3. Open and complete hamburger fold (with the colour side in) – Open and repeat this to opposite direction as well.</p>	

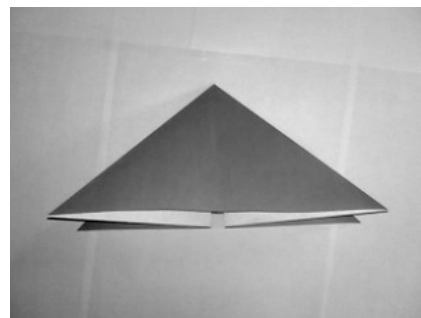
4. When you unfold you should have two diagonal, one vertical and one horizontal fold as seen in the picture on the right.



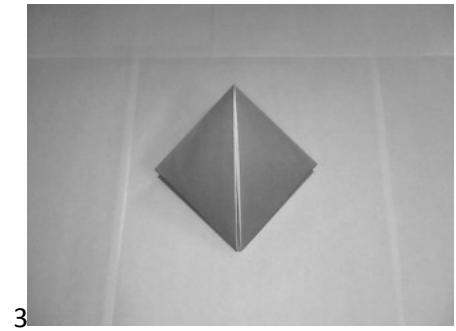
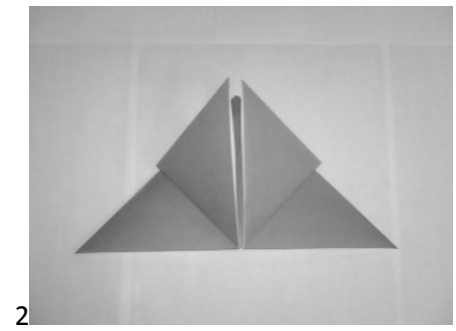
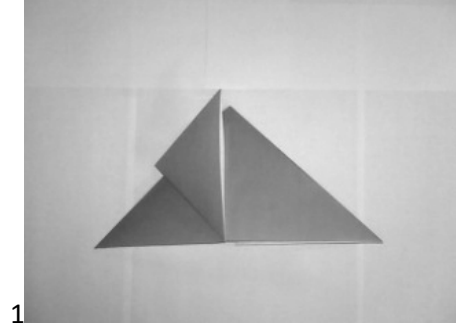
5. Start to collapse the folded piece of paper.



6. You will end up with a triangle.

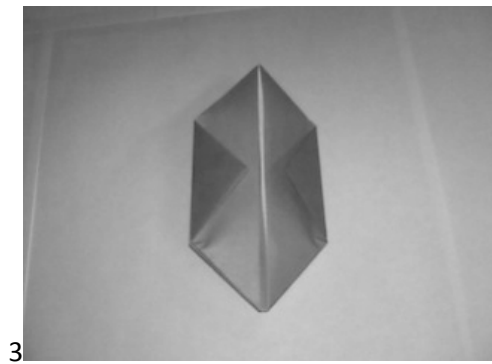
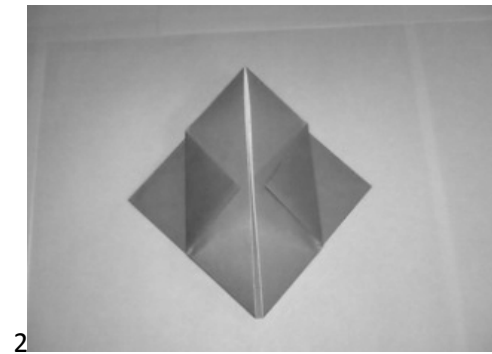
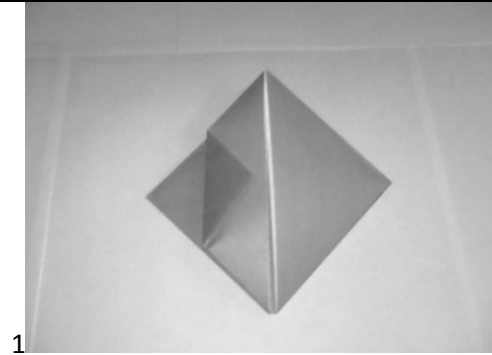


7. Now fold the corners up to top of the triangle as illustrated in the following pictures. Flip and repeat on the other side.

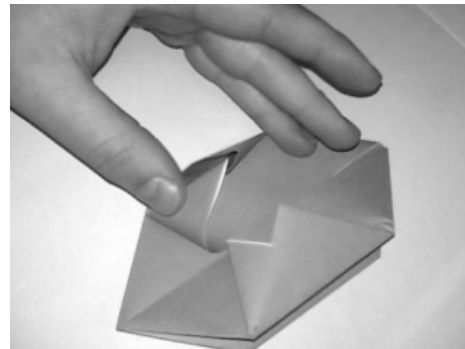




8. Now fold the four horizontal corners inwards to meet at the centre. Flip and repeat on the other side.

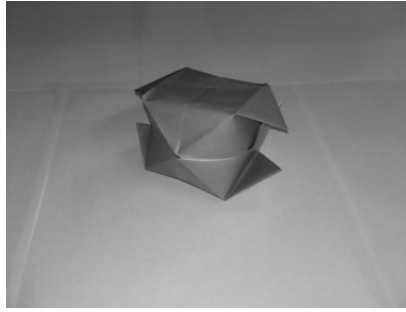


EXTENSION for those who finish quickly:  
- Tuck the bottom flaps into the pockets found where the horizontal corners were folded inwards.

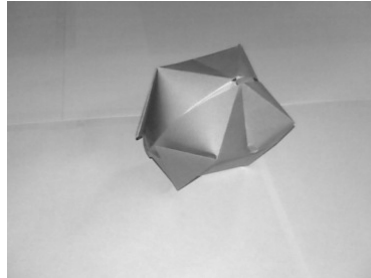


9. Find the hole at the top of the object and blow into it and let it PUFF OUT!

PUFFER FISH:



PUFFERFISH WITH EXTENSION:

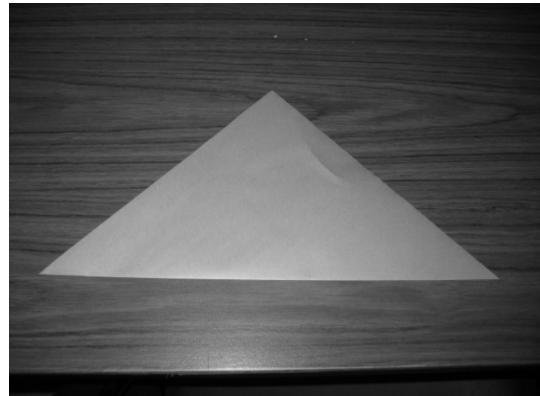


# Crane Instructions

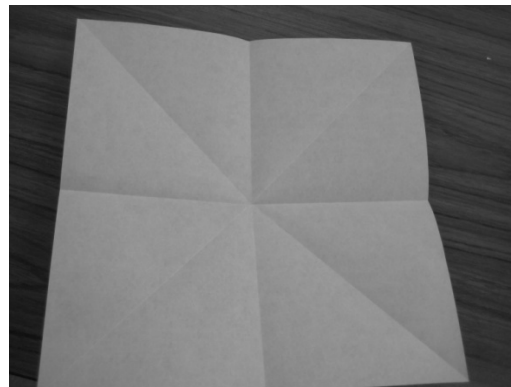
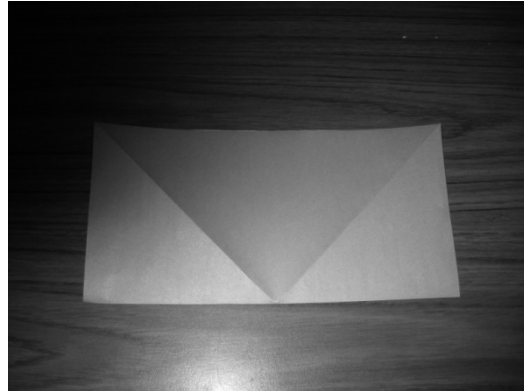
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Material: Origami Paper (or easily folded paper cut into a perfect square).

1. It is easier to make origami when you pre-fold your paper. First fold the paper along the diagonal. Make sure to align your points. Open your sheet of paper up and repeat along the other diagonal. Then open again.

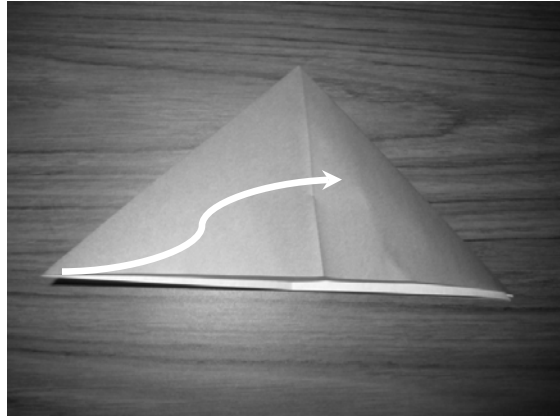


2. Fold the paper in half creating a rectangle (hamburger fold). Again make sure the points line up, repeat in other direction. If you open your paper you should have 2 diagonal and 1 vertical and 1 horizontal

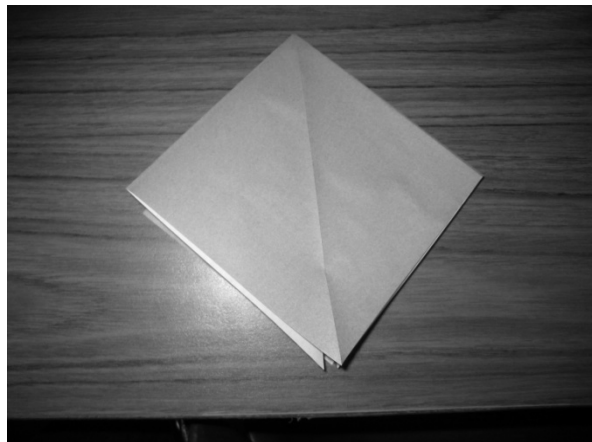
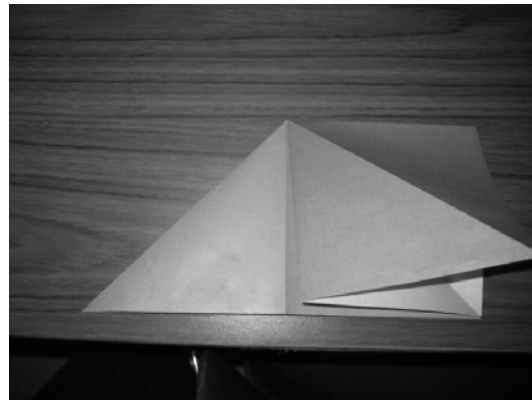


## Crane Instructions

3. Now that the pre-folds are complete, fold the paper along one of the diagonals. Take the two congruent angles and fold into a smaller triangle. You should have two triangles joined along one fold line

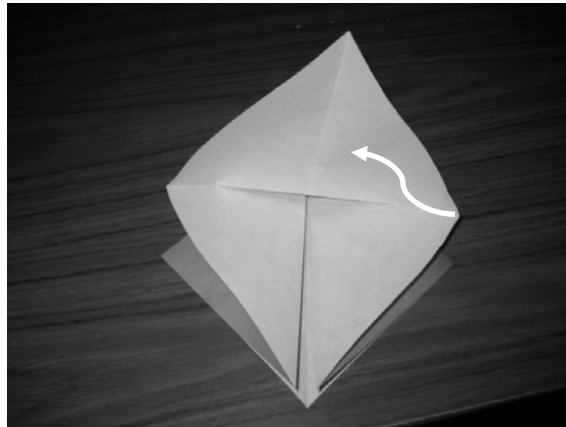
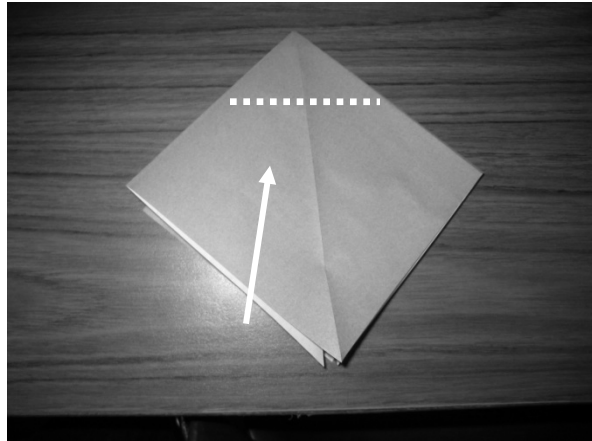


4. Take one of triangles and make a box by lifting the open flap and moving it across the triangle to the other side (see picture). Repeat on second triangle. (the centre fold of the triangle should move so that it is parallel with the base of the triangle). Repeat on the flip side. You should now have two folded squares.



# Crane Instructions

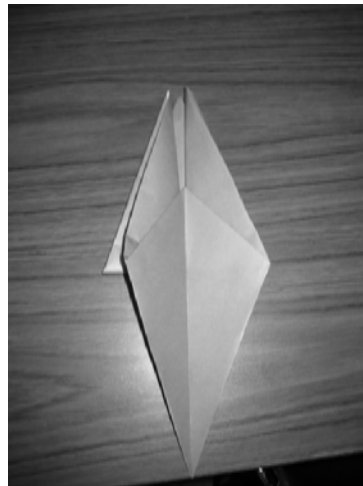
5. Open one of the squares up into a diamond shape. Fold 4 cm from the top. Fold the outsides to the insides. Fold it back down. The shape that you have now should resemble a kite. Do the exact same with the other side.



continued...

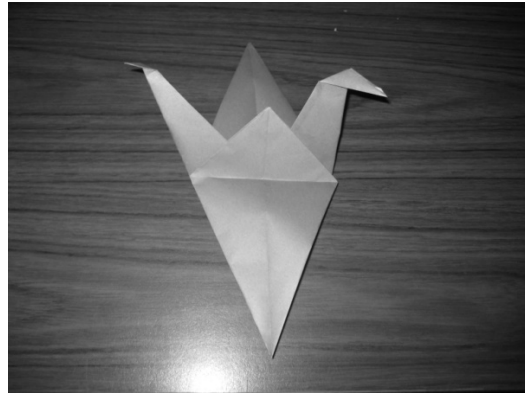
# Crane Instructions

6. Next fold all four sides up. The two triangles that are not folded are now your wings. The two folded triangles are the head and tail of your crane. Fold a small triangle to designate the tail, and a bigger one to designate the head.



# Crane Instructions



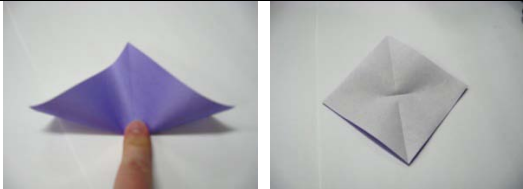
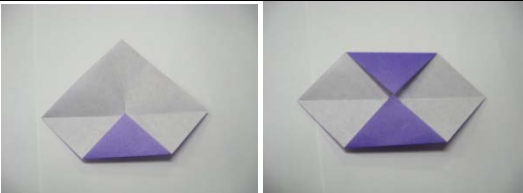
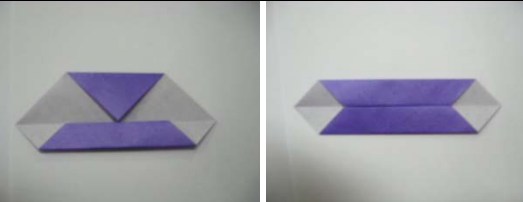
Voilà, the end product is a crane.



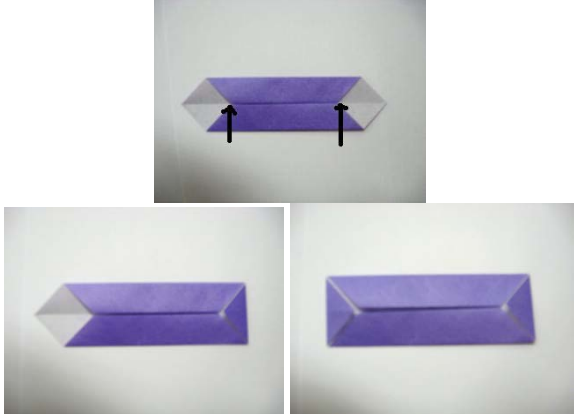
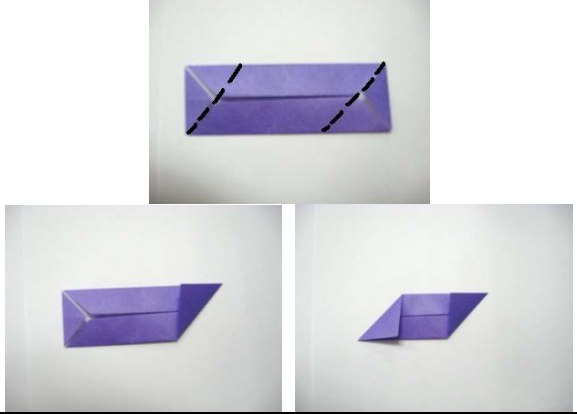
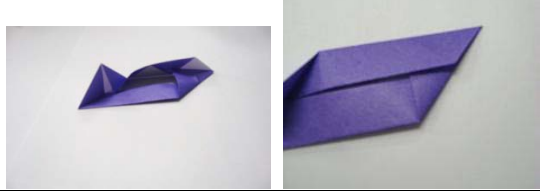



# Origami - Sonobe Cube


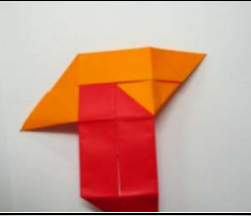
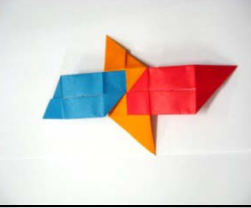
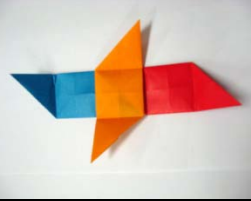
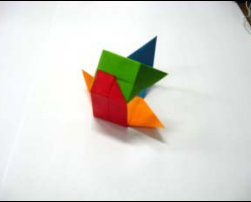
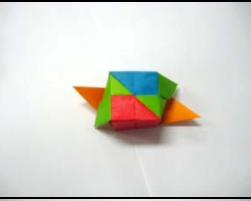

Origami is a form of Japanese art. The word origami comes from “Oru” which means “to fold” and “Kami” which means “paper”. That is exactly what we are going to do! Taking a normal piece of square paper we can transform it into beautiful objects such as animals, flowers, holders, etc. It will bring a smile to your face each time you complete an origami!


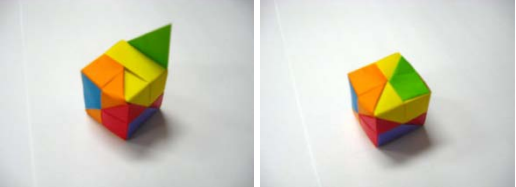
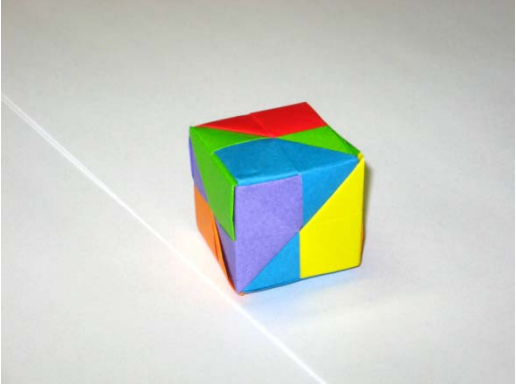
## STEP – BY - STEP: Sonobe Cube

Start with a SQUARE piece of paper. With the colour side down.		
Fold on the HORIZONTAL diagonal. Crease well and unfold.		
Now fold along the VERTICAL diagonal line. Crease the centre and unfold.		
Now fold the top and bottom tips and meet the crease in the centre.		
Now fold the top and bottom sides and meet at the crease in the centre.		



<p>Now fold right and left tips to meet at the arrows on the diagram.</p>	
<p>Now fold the both sides along the dotted-lines on the diagram.</p>	
<p>Now you will fit the 2 flaps you just folded into the "pockets". Start with the RIGHT side. Bring the right flap over and open the paper slightly then slide the paper into the pocket.</p>	
<p>Now repeat the previous step for the LEFT side.</p>	
<p>Flip paper over.</p>	
<p>Now fold the flaps in at the dash-line shown on the diagram.</p>	

<p>OK, so that was 1 modular unit. There are 6 sides to a cube, so complete 5 more of these modular units.</p>	
<p>To assemble the cube, Take the orange modular unit and insert the tip of the red unit into the pockets.</p>	
<p>Then insert the blue tip to the orange unit pocket from the other side.</p>	
<p>Next flip the paper over.</p>	
<p>Now adding the fourth modular unit. Bring up the tips of the red and blue units and insert them into the green modular unit pockets.</p>	
<p>Now you have 2 sides (top and bottom) completed. You will need to complete the remaining 4 sides (2 open and 2 closed but not complete) using the 2 modular units you have left.</p>	
<p>Now, use the remaining purple unit and place it on the one side, notice that the tips of the purple unit will need to be tucked in on each side.</p>	

<p>Bring the side tips in and tuck into the pockets on the purple unit.</p>	
<p>Last one! On the last open side, take the last yellow unit unattached and place it on the cube, tucking in the tips to the side pockets. Tuck the remaining side tips into the pockets of this last unit.</p>	
<p><b>NOW YOU HAVE A SONOBE CUBE!</b></p>	

# Anamorphic Art

The idea of anamorphic drawings is to create an image on a curved grid. By doing this, the image appears distorted and it is difficult to tell what the image is. The only way to see the image clearly is to use a cylindrical mirror. Some could say that it is magic!

Anamorphic drawings wrap science, math and art into a fun and exciting project for children. With only a few supplies and a little imagination, images can be “magically” brought to life.

## **What you need**

- ✓ Mylar sheet with reflective coating – 15cm x 15cm
- ✓ Tube, plastic bottle or other cylinder about 4cm in diameter
- ✓ Tape
- ✓ Copies of a blank square grid, a blank curved grid and a grid pattern with a simple pattern

## **First Steps**

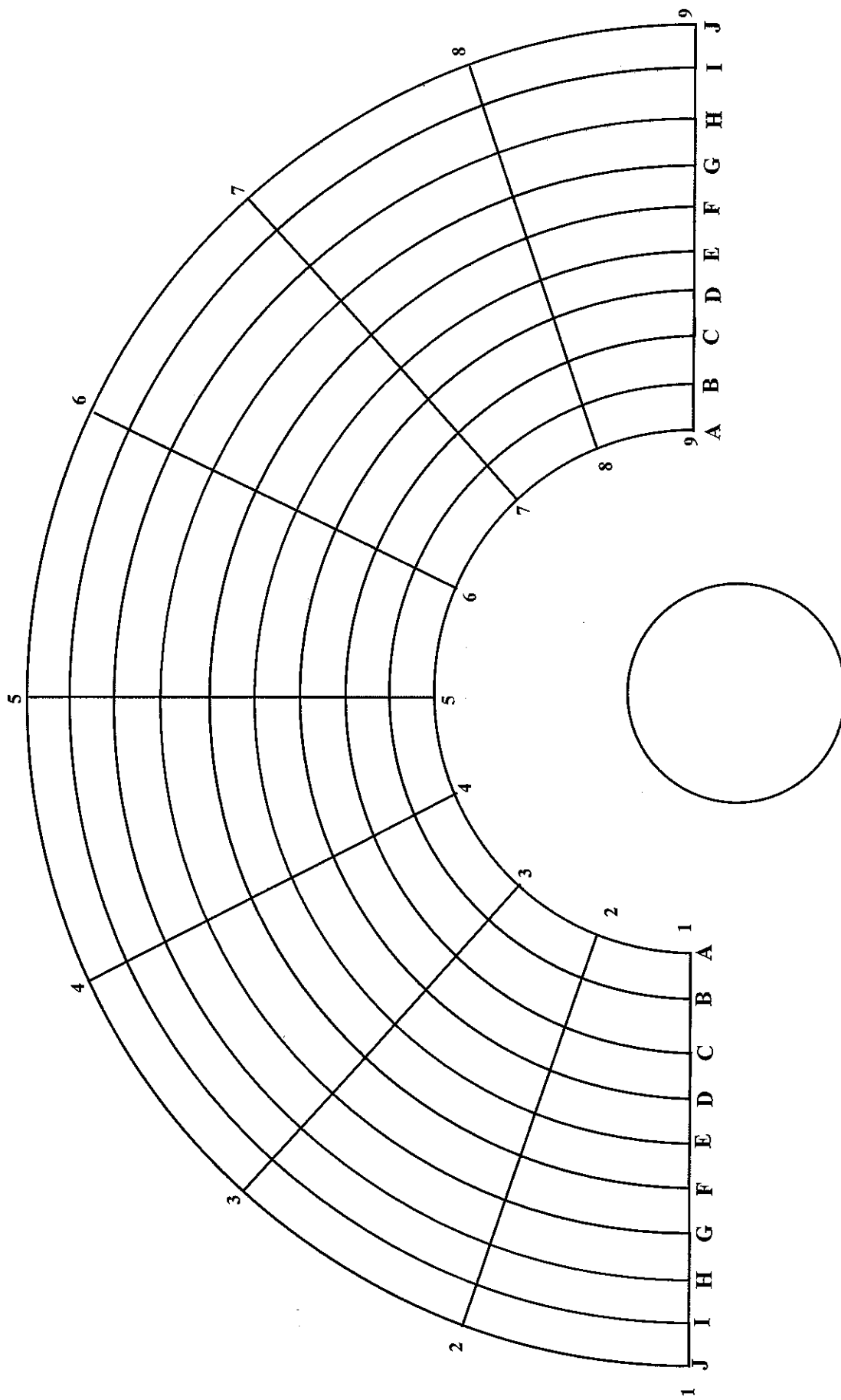
Take a simple pattern such as your name, a house, cat, or snowman and plot it on the square grid using the lines and corners as guides. With a pencil first transfer (or copy) the pattern from the square grid onto the curved grid. Use the letters and numbers to guide you and ensure the pattern is copied correctly. For example, a point on A1 will be transferred from the square grid onto the curved grid of A1. Once you have plotted the points on the curved grid, you will then use a thick marker to draw and connect the lines, keeping the image you have drawn.

Now the magic will happen. Take your cylindrical mirror (your tube or bottle covered with Mylar paper), and place it on the circle below the grid. You will be able to see your image projected perfectly on the Mylar paper.

## **How it Works**

For this project, the rule for mirrors is “angle in, angle out” or “the angle of incidence is equal to the angle of reflection.” Images reflected from flat mirrors look like the real objects, are undistorted. When the mirror is curved, as are mirrors in a fun house, the reflections become distorted. Students may notice that the image of their initials, when viewed in the curved mirror, is reversed from the original, and that the grid numbers and letters are backward. In flat and positively curved (convex) mirrors, such as cylindrical mirrors, images are always reversed left/right. Negatively curved (concave) mirrors, such as the bowl of a reflective spoon, can have un-reversed images. (A parabolic mirror, a special case of a concave mirror, can make a perfect real image.)



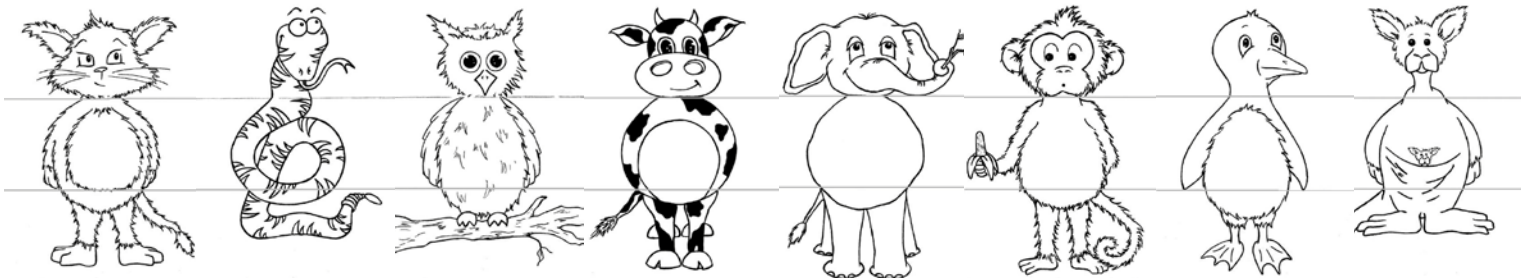


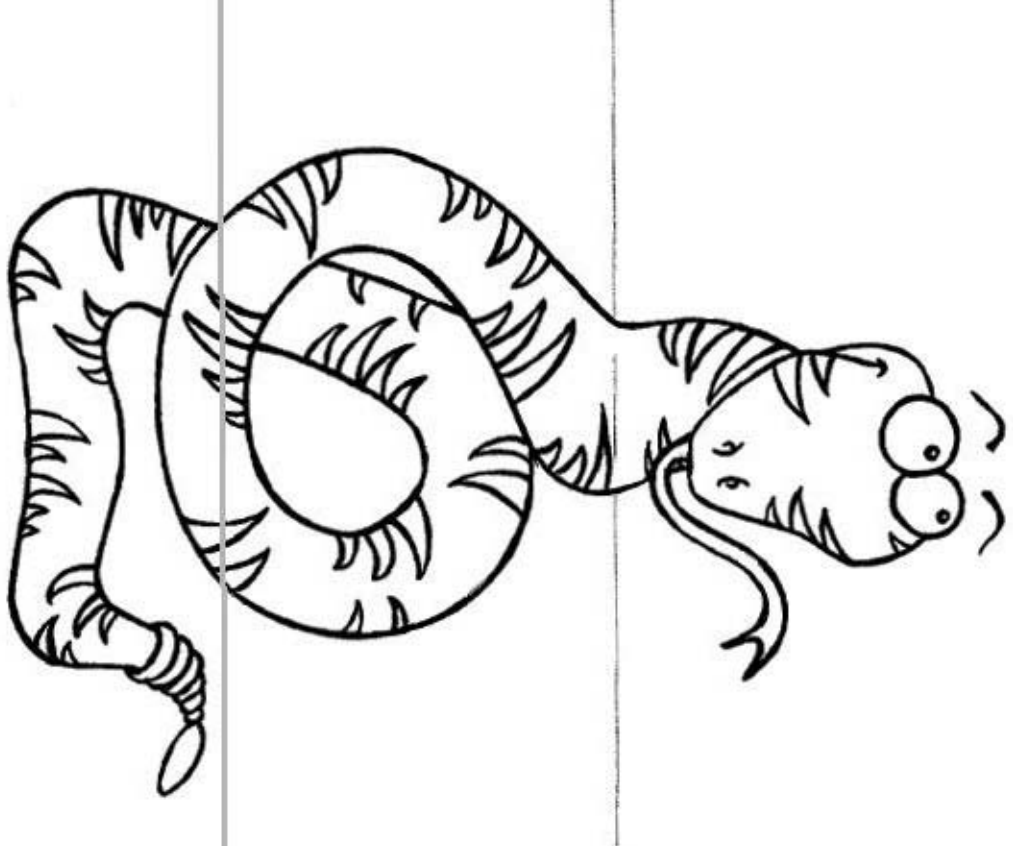
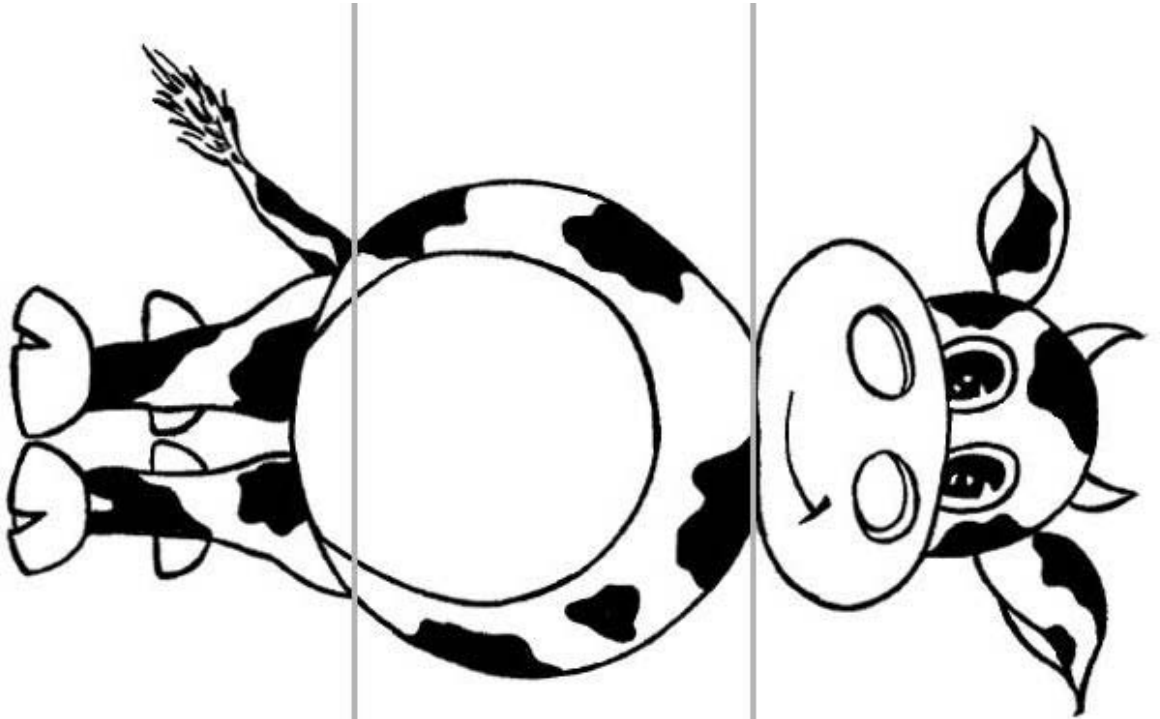
## Book of Permutations

A small number of items can be grouped to give a large number of permutations. By making a book of eight pictures, each divided into three sections, you can see how the permutations increase with each additional page. Templates are provided for you to enlarge and copy.

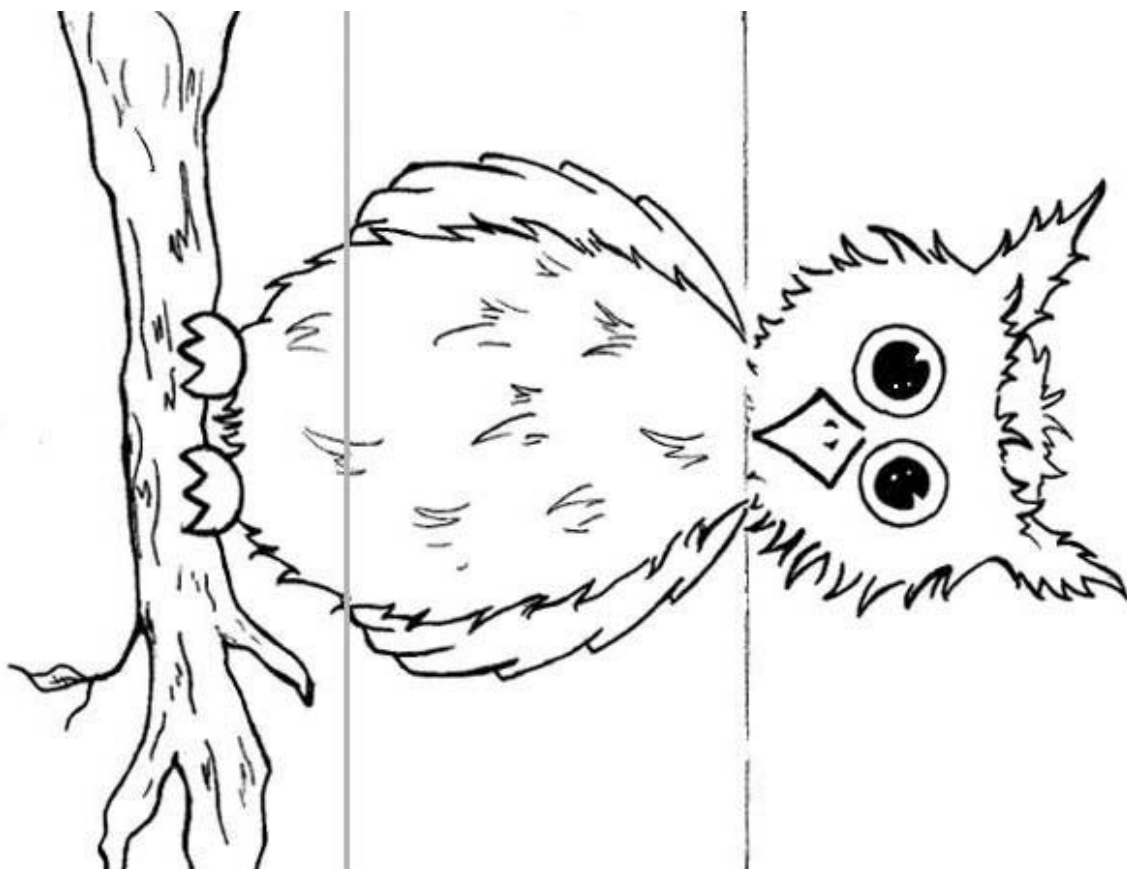
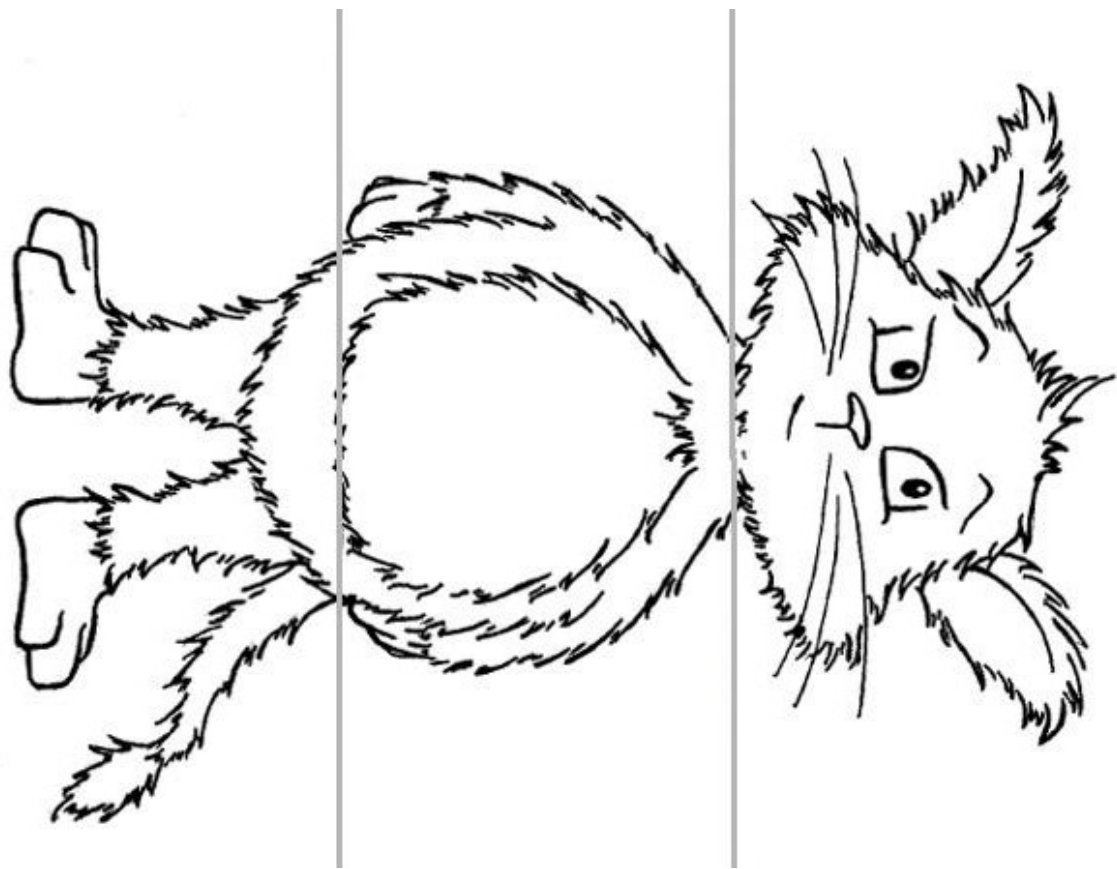
1. Cut eight pieces of paper to the same size. With a ruler, draw pencil lines across the paper to divide each sheet into three equal horizontal sections. Using poster board or thicker paper, make two covers the same size as the pages.
2. On each page, draw one animal making sure to leave space at the left for the book's spine. Using the ruler lines as guides will help each shape fit within the sections on the page. This will help the pages line up when they are cut.
3. If needed, draw guide lines on the two horizontal lines to match up where tops and bottoms of animals will meet. This will ensure that the animal bottoms will all be the same size and all meet up with the middle body sections.
4. Colour the animals as you wish and place all the pages between the two pieces of poster board or thick paper. Line up all of the edges and staple through to the other side to make the book.
5. Using scissors, cut along the horizontal lines of the drawings (leave the cover untouched). You can now open the pages at random and create different images.

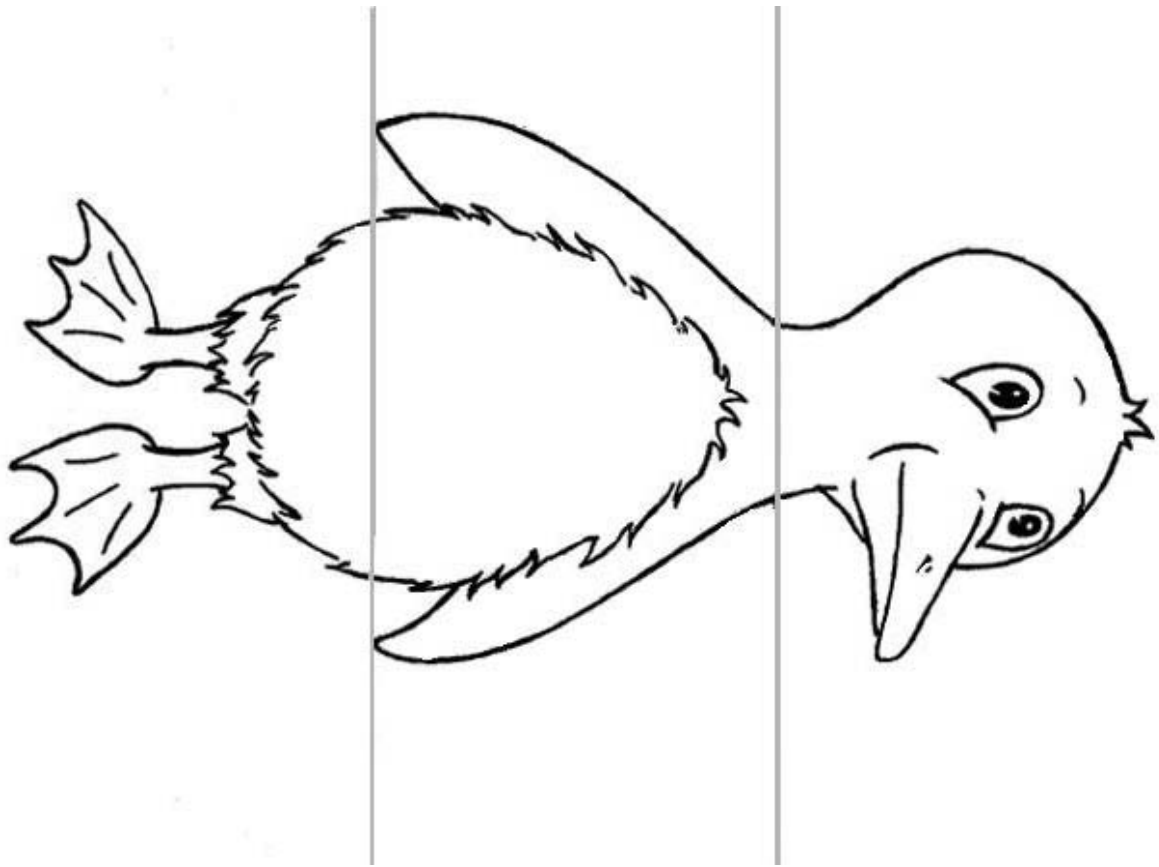
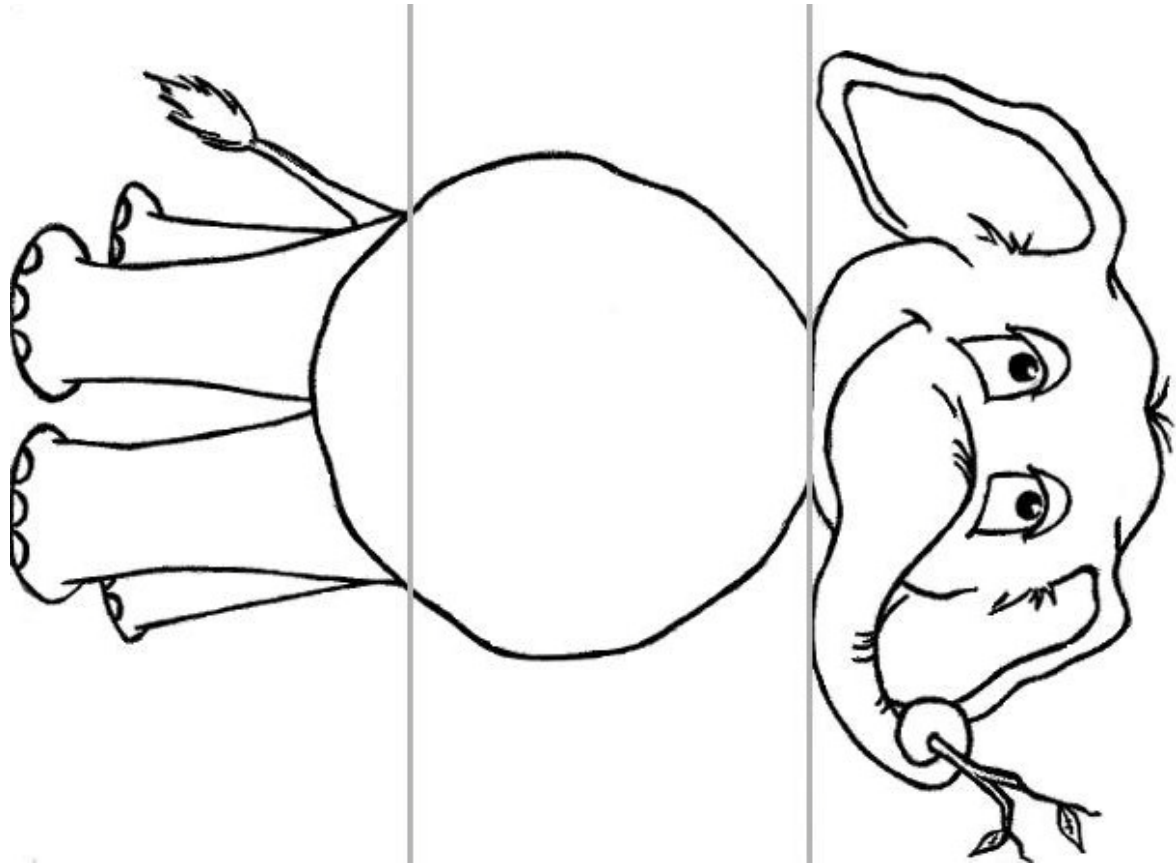
Question: Can you work out mathematically how many different types of animals you can make?

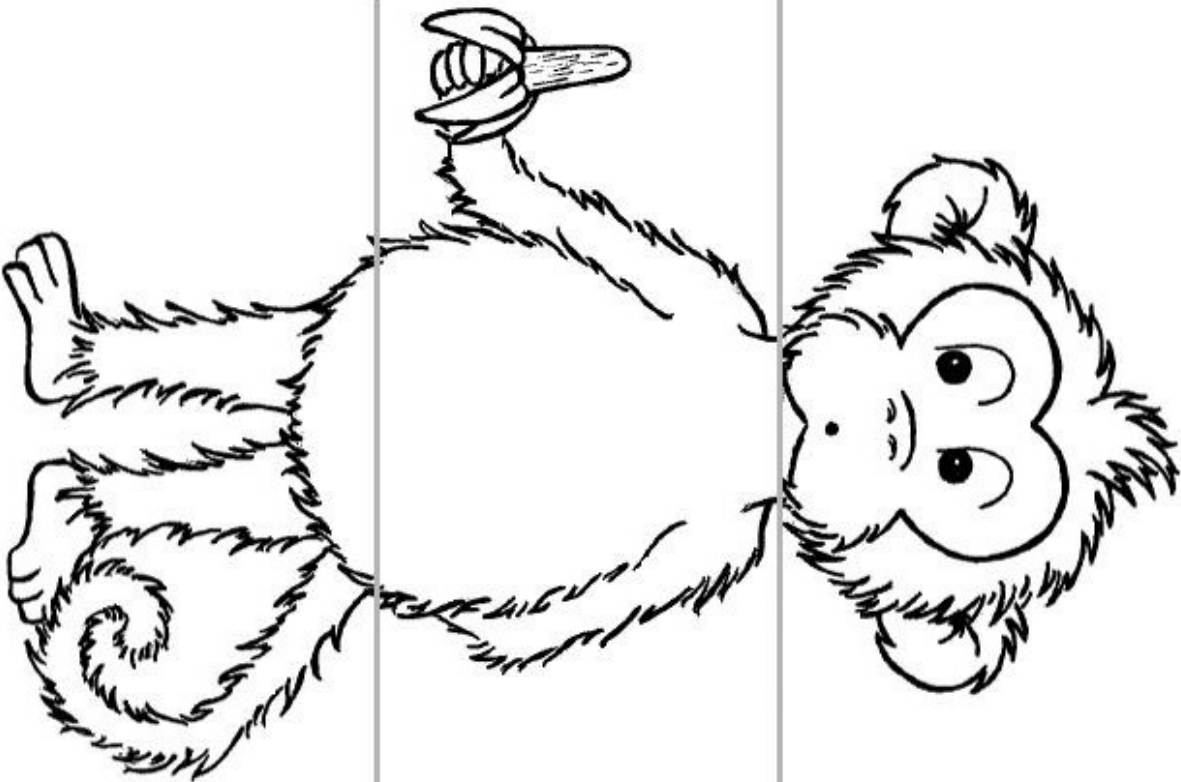
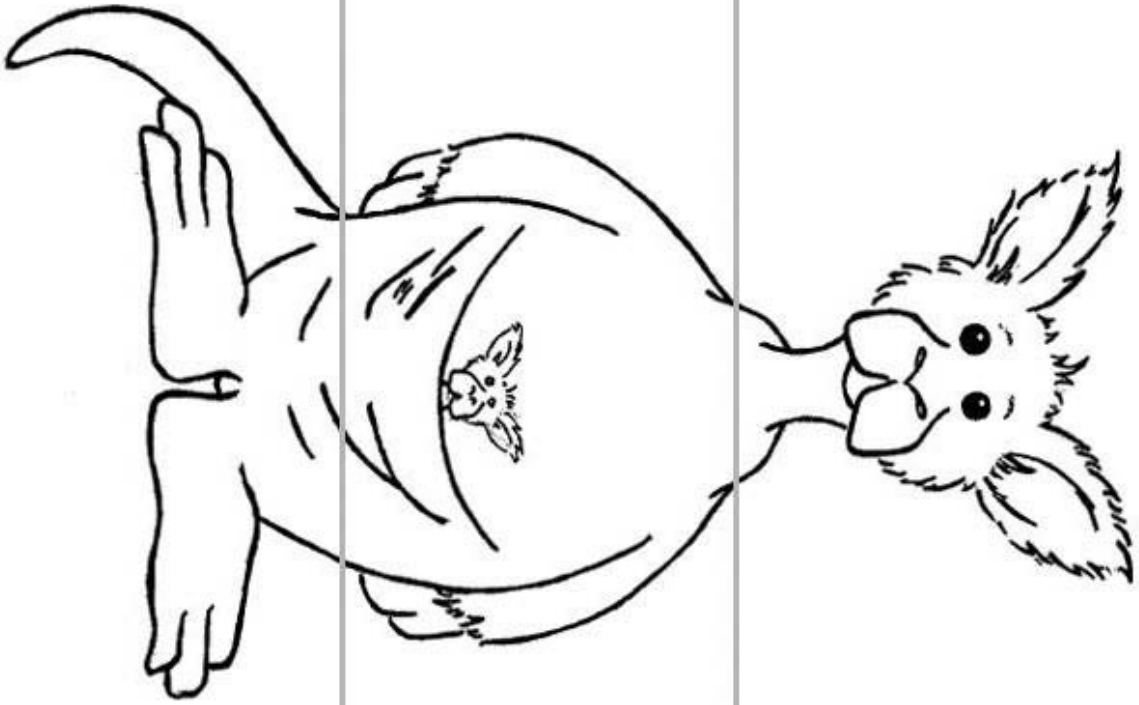








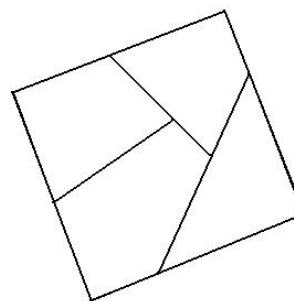




## Creating Your Own Puzzle

This Activity Covers:




- Geometry
- Looking at different shapes
- Solving puzzles



You will need:

- Scissors
- Cardboard (cereal boxes work best)
- Old calendars or magazine pictures
- Glue

Activity Steps:

1. Cut out two squares from a piece of cardboard, one for each person. Each piece should be six-inches, but can be made larger. If you are using a cereal box, your cardboard squares already have an image on them; you may skip steps two and three if you wish.
2. If you do not already have an image on your cardboard, cut two square pictures from a magazine or old calendar the same size as your cardboard. Be sure the pictures and cardboard squares are the same size.
3. Line the picture up to the square and glue it the square. Let the squares dry for a few minutes.
4. Cut the square once in any direction. 
5. Cut the square a second time:  
After the second cut, fit the three pieces together to make sure you can solve the puzzle. 
6. Cut the square a third time, scramble the pieces, and try to put your
7. puzzle together. 
8. Exchange your puzzle with a partner and try to solve their puzzle.  
For a challenging, flip the pieces over to the blank side and try to solve.

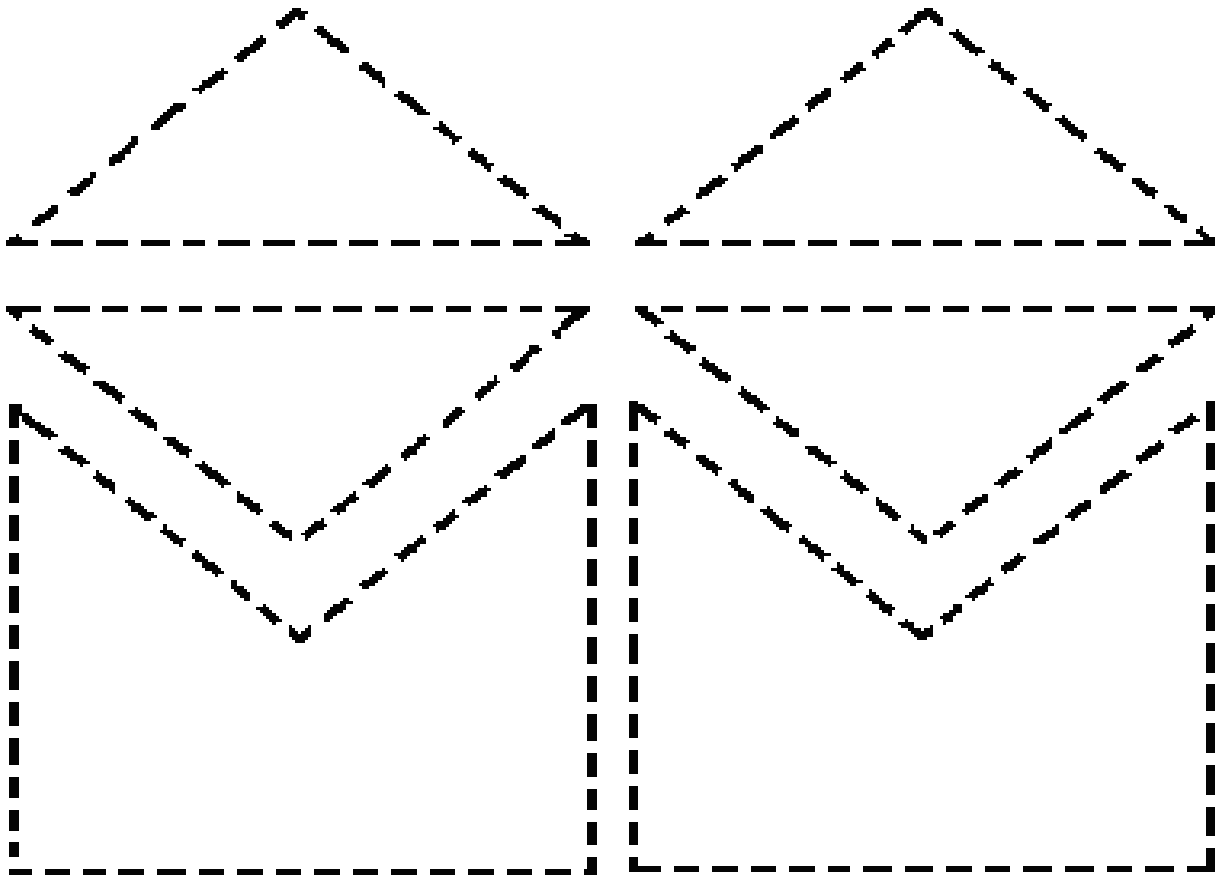
Note:

When cutting out the picture squares from old calendars or magazines, cut out two squares side-by-side. This way when you put your puzzle together with your partner's, they create a connected picture.

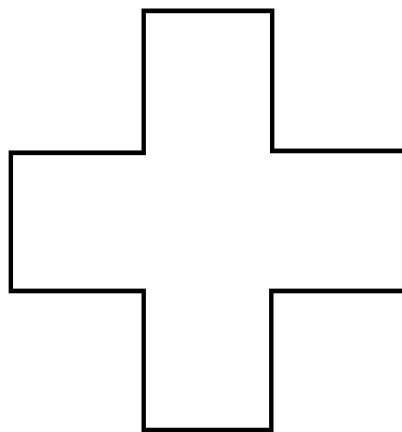
### **INSIGHT**

Exploring the attributes of different shapes by building and solving puzzles helps children to develop their spatial visual skills.

# Addition Sign Puzzle



Using the pieces provided, can you create an addition (plus) sign?

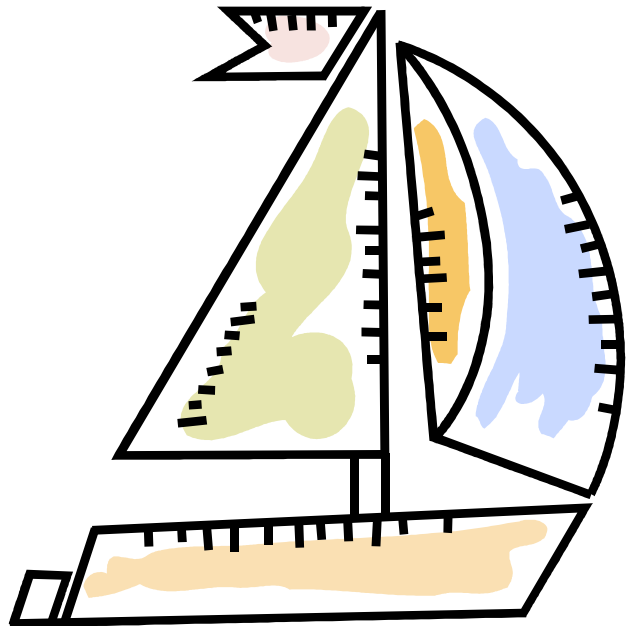
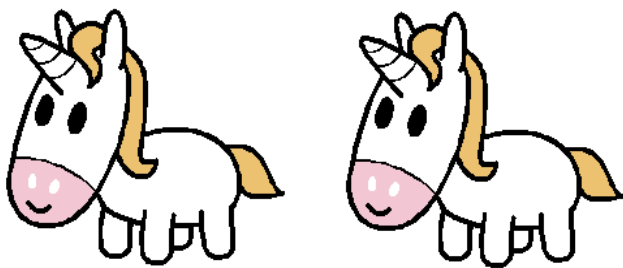


## Get Across the Lake to the Island!

One day 2 unicorns and 4 mice met at the beach. None of these animals could swim or fly and they all needed to get across the lake to visit their friends on the island. One mouse suggested that they use a boat to get them across the lake.

The only problem was that the boat could only fit one unicorn and two mice at once. Also, the boat could not drive itself, so one animal would have to remain on board until everyone was on the island.

How did all the animals get across safely? How many trips did they have to make in the boat? Who was on each trip?



## Solutions

### Calculator Riddles pgs. 23-25

1. A hole. When you take away more dirt, the hole gets larger!
2. A goose. A goose has 2 legs but no goose has 4 legs!
3. Ellie. They are her parents, so she must be one of their children!
4. 16 legs (the decimal point separates numbers and words).  
One of the four singers is a tenor and  $10 + 2 + 2 + 2 = 16$ !
5. 9 eels, because 9 eels were not sold!
6. Lee, the butcher. He weighs meat all day long!
7. 1 h (hour). The third pill will be taken one hour after the first pill!
8. (\$) 100 bill. It is worth \$99 more than the new one (\$1)!
9. Bob scored higher on the math test because glasses improve *di vision*!
10. 12s (seconds). January second, February second, March second, etc.!
11. Holes, so 75 kilograms of water leaked out!
12. Leslie. She was more exhausted because of all the numbers that she had to carry!  
Bill, because of all the borrowing that he had to do!  
Bess, because she was so *productive*!
13. A googol. It has 101 digits!
14. His boss is right. All of the months have at least 28 days!
15. 8.9 (seven ate nine)!
16. The number 5317. It lies when it is resting on its back!
17. 0. No matter how you turn the calculator, there is no dirt in a hole!
18. 2 eggs. You took 2 eggs so you have 2 eggs!
19. His legs, because he puts down 3 and carries 1!

### Caesar's Box Cipher pg. 26

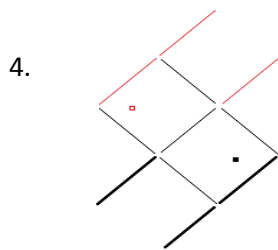
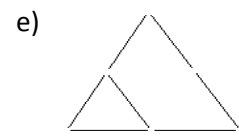
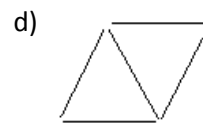
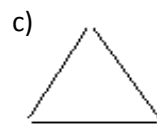
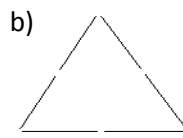
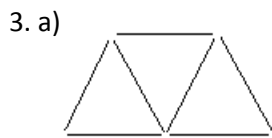
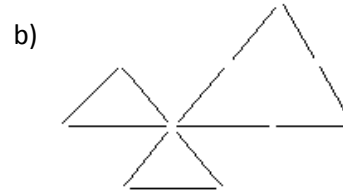
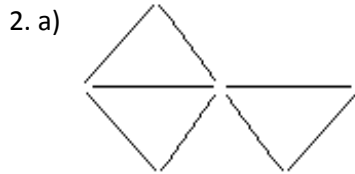
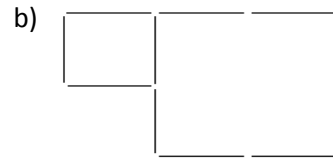
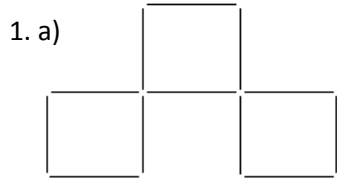
1. MATH CAN BE MAGICAL 2. ATTITUDE IS A LITTLE THING THAT WILL MAKE A LARGE DIFFERENCE 3. WITHOUT GEOMETRY A LIFE WOULD BE POINTLESS

### Fraction Surprise pgs. 44-45

2. the 3. one 4. who 5. finishes 6. this 7. you 8. will 9. have  
10. good 11. luck 12. all 13. day

Magic Puzzle: mathemagic

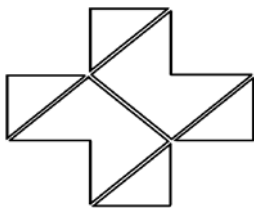
**Toothpick Math Answers pg. 49**



**Book of Permutations pg. 74**

A book of 8 pages split into three equal section would give 512 ( $8 \times 8 \times 8$ ) different permutations.

**Addition Puzzle pg. 76**



**Get Across the Lake to the Island pg. 77**

It should take at least 13 trips.



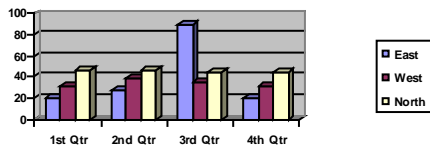
# GLOSSARY

**Area:** The size of the surface of a shape. There are many different formulas to calculate area, depending on what shape you are working with.

For example, the area of a rectangle is  $\text{area} = \text{length} \times \text{width}$ .

**Bar Chart:** A chart or graph which represents information with bars

For example:



**Cartesian Oval:** A shape like an egg

**Cipher:** A secret code or message. It can be represented by symbols or letters.

**Counter:** Any item that can be counted. Items such as beads, buttons, marbles and toothpicks make great counters. They come in handy for games that require items to be marked or covered up, or to have piles that are added to or taken from. Bingo chips or similar items from board games are also great counters.

**Decimal:** A number between two whole numbers. For example: 2.4 is between 2 and 3

**Decimal Point:** Represents the value of a number. If a number lays on the right side of a decimal they are larger than 1. If numbers are located to the left of a decimal they are less than 1.

**Estimation:** An educated guess

**Fraction:** 2 integers that sit on top and below of a flat line. These integers represent a ratio. The top number is named the numerator and the bottom number is named the denominator. The denominator represents the number of parts making up the whole. For Example:  $\frac{1}{2}$  1 represents the numerator and 2 represents the denominator. There are two whole parts in total. The 1 means that we there is 1 part of the 2.

**Mean:** The mean is an average for a set of numbers. In order to calculate the mean, find the sum of all the numbers and then divide the sum by how many numbers are in your set. For example:

Take the numbers 3, 8, 8 and 9.

$$3 + 8 + 8 + 9 = 28.$$

$$28 \div 4 = 7.$$

**Measurement:** Standard or non standard measurement. Standard measurement examples include measuring things using length, width, grams, seconds, litres, etc. Non standard measurement includes using items to measure that are non-standard. For example: “I can fit 8 paper clips across my paper. My paper is 8 paper clips long”.

**Median:** The number or item that falls in the middle of the sequence. For example: In the number 5389879 the 9 is in the middle of the sequence.

**Mode:** A number or item that occurs the most frequent. Example: 12233444448 the mode is 4 because there are 5 four’s.

**Net:** A 2D outline of a shape that can be folded and made into its 3D shape.

**Number Sense & Numeration:** An understanding of numbers. Examples may include solving computations, counting, problem solving, and solving number patterns

**Origami:** Folding paper into shapes or objects. This art form originated from Japan.

**Patterning & Algebra:** Repeated designs and when numbers are represented by letters

**Percentage:** A number out of 100. The sign which represents percent looks like this: %

**Pi ( $\pi$ ):** Pi is an irrational number (a number that is cannot be expressed as an exact fraction or decimal) used to calculate the circumference of a circle. It has an infinite number of decimal places, but generally calculated at 3.412.

**Pie Chart:** A circular chart which has “pie pieces” that represent parts of a whole (part of a whole pie). Each “pie piece” represents different information. When you consider each piece of information together it forms a relationship.

For example:



**Probability:** The chance that an outcome will or will not occur.


**Ratio:** A relationship represented by numbers separated by a colon ( : ).  
For example: 2:4 which means 2 parts to 4 parts

**Rectangle:** a shape with 4 sides and 4 vertices that meet each side.

**Soroban:** A Japanese abacus. It is used to help with manipulation of numbers.


**Spatial Sense & Geometry:** The relationship of space. Shapes, lines, curves, etc. and how they relate to their space.

**Sphere:** A 3d shape with no edges, no vertices, and no faces. It can roll and is a circular shape.

**Square:** A shape with 4 vertices and 4 equal. 

**Strands:** The Ontario math curriculum is made up of five ‘strands’ or categories. There are 5 strands: Data Management & Probability; Measurement; Number Sense & Numeration; Patterning & Algebra; Spatial Sense & Geometry.

**Sum:** The sum is the total of an addition operation. So in  $4 + 3 + 2 = 9$ , the sum is 9.

**Triangle:** A shape with 3 sides and 3 vertices that meet each side. 

## Websites to Explore

### MATH FOR PARENTS AND FAMILIES

**Figure This! Math Challenges** <http://www.figurethis.org/challenges/toc.htm>

This fun, interactive web-site provides interesting math-based questions that the family can do together. The site offers printable activities available in both English and Spanish. The unstructured and animated format of the website, while not geared toward the structure of typical math categories, allows the family to explore the ‘fun’ behind mathematically-based ‘real world’ questions. Includes tips for families and family support brochures that provide practical information on providing a positive, encouraging atmosphere in which to encourage math skills and development in children.

**Helping Your Child Learn Math** <http://www2.ed.gov/pubs/parents/Math/index.html>

Practical ideas for families to incorporate math into the everyday home environment with activities that involve shopping, cooking and travelling. Discusses what a parent can do to help a child achieve in math. Describes what a parent should look for in an effective math classroom.

**Kid Source Online** [http://www.kidsource.com/kidsource/Content/learnmath\\_index.html](http://www.kidsource.com/kidsource/Content/learnmath_index.html)

Provided by the U.S. Department of Education, this guideline offers practical ideas for parents to help instil an appreciation of math in their children while exploring elementary ‘everyday’ math in their world. It offers guidance to parents in gaining an understanding that each child learns differently and that wrong answers leave an opportunity for learning and growth. It emphasizes the requirement for math in the pursuit of career options and the importance of a positive attitude as an example to the child.

**Mathematics TEKS Toolkit** <http://www.utdanacenter.org/mathtoolkit/support/look.php>

A highly relevant article produced by the Mathematical Sciences Education Board of the National Research Council which gives parents insight into the new way math is being taught as opposed to the more traditional approaches in which parents may have learned math as a student.

## **MATH FOR STUDENTS**

**AIMS Math Puzzles** <http://www.aimsedu.org/Puzzle/>

For people of all ages that love puzzles ! Choose from puzzles using numbers, logic, toothpicks and geometric shapes. Puzzles are rated on a scale of difficulty so there is something for everyone ! Also includes puzzles using optical illusions and visual paradoxes.

**Brainbenders**

[http://www.enchantedmind.com/html/puzzles/brainbenders/brainbender\\_puzzles.html](http://www.enchantedmind.com/html/puzzles/brainbenders/brainbender_puzzles.html)

This website, Enchanted Mind, rich with advanced, creative mathematics will stretch the mind of any math student and provide challenges such as puzzles and word problems. Definitely for the math lover with advanced math skills, try the Brainbenders for some mental gymnastics !

**Calculation Nation** <http://calculationnation.nctm.org>

A game-based website developed for upper elementary and middle grades math curriculum. Students can challenge themselves or others while learning about fractions, factors, multiples, symmetry, while improving basic skills like multiplication and calculating. Its bright, colourful and simply-designed website make it visually appealing and approachable for the math enthusiast who is up for a challenge !

**CoolMath4Kids** <http://www.coolmath4kids.com>

Math games, brain benders, tessellations, and more! This fun-filled site includes activities for all ages and is guaranteed to keep you busy for hours! For ages 3 – 12. Also includes a section for parents which provides tips on how to help with homework and how to get pre-school children ready for kindergarten math by finding math in everyday activities. Includes a link for students aged 13+ which features higher level math concepts. (<http://www.coolmath.com/>)

**Funbrain** <http://fun.funbrain.com/kidscenter.html>

Educational site with multi-level math games geared toward the primary and junior grades. Games have a simple design with limited steps and allow younger children to easily navigate to games such as Soccer Shootout, Mathcar Racing and Change Maker. Various skill levels are available and useful for practicing basic math functions like counting or more advanced functions like fractions and place value. Measurements are available in metric units and 5 different currencies are available !

**IXL** <http://www.ixl.com>

Excellent, interactive website with free practice math questions arranged by grade level. Although this is an American-based site, it organizes the grade levels by skills and categories, allowing for ease of finding the appropriate questions required for practice. Website is easy to navigate, even for the younger students. Fee-based membership option tracks progress reports and are available to both teachers and parents.

**Math Dictionary for Kids** <http://www.amathsdictionaryforkids.com/>

This site is a MUST for every math student ! Colourful, animated and easy to use, this site provides over 600 definitions for everything math from A to Z ! Definitions include illustrations, examples and interactive tools which allow students to practice their new math term ! Australian-based but still includes metric measurement definitions. You'll want to 'bookmark' this one !

**Math Frog** [www.mathfrog.ca](http://www.mathfrog.ca)

A place for parents, teachers, and students in grades 4, 5, and 6, this site offers many great games and tools that make math more fun! Topics include fractions, decimals, patterning, money, and more. This one is purely Canadian as the site offers both English and French instruction.

**Math Games and Online Practice** <http://www.softschools.com/math/games/>

Whether you enjoy time-pressure and competitive games or prefer something more relaxed, this educational site has it all! Interactive games and activities are available for every elementary grade level that will help you perfect your math skills in a fun way ! Game favourites include: Fishing Addition Game, Math Lines Game, Math Man.

**Math is Fun** <http://www.mathsisfun.com>

The math and logic puzzles make this site worth the visit ! Puzzles include number, logic, algebra, card, measurement and symmetry as well as an 'Einstein' puzzles to challenge eager math minds ! Also includes a sample of Sam Lloyd puzzles, the 'prince' of puzzles, known as the greatest puzzle creator of all time. This site is organized by all the different strands in math and is loaded with several games and activities which prove that MATH IS FUN!

**Math Playground** <http://www.mathplayground.com/>

Weigh the Wangdoodles, Space Boy to the Rescue, Mancala, and Battleship are just a few of the games that you can enjoy on this action-packed interactive math site. Games and activities are suitable for children at the elementary school level. Who are we kidding? Parents can enjoy this one too !

**Math Worksheets** [http://worksheets-for-math.com/html/free\\_math\\_worksheets.html](http://worksheets-for-math.com/html/free_math_worksheets.html)

Looking for fun worksheets to keep the mathematical mind engaged? Look no more! This site offers an abundance of free and fascinating printable worksheets in the realms of addition, subtraction, multiplication, and division. With games like Secret Code, Monster Wheels and Dot-to-dot Rock, these worksheets take the boring out of the 'practice makes perfect' routine !

**PBS.Org** <http://pbskids.org/games/math.html>

A variety of math games to entertain children while educating them! Lively and interesting games guide the student through activities involving counting, balancing, measurement and more! Primary students will be easily engaged and this site allows students to explore concepts that would otherwise require manipulatives.

**Pentominoes** <http://www.pentominoes.net>

The name says it all ! Flash pentomino puzzle where your goal is to tile the box pentominoes without overlapping and without gaps. How many can you successfully fit on the grid ?

**Primary Games** <http://www.primarygames.com/math.htm>

As the names suggests, this educational site is geared specifically toward the primary level. These colourful, animated math games use graphics which are both amusing and entertaining and likely to capture the attention of the most math-resistant child. Games involve elementary math concepts such as counting, shapes and patterning, as well as more advanced concepts like spatial relations, logic or geometry. The curriculum guide provided is very useful in categorizing the games by math strand and grade level and ranges from grades JK – 4.

**Sudoku** <http://www.websudoku.com>

Complete with tutorials, downloads and more variations of Sudoku than you thought existed ! Site offers four language options: English, French, Dutch and Spanish. For beginners and experts alike, the site offers four levels of difficult, including easy, medium, hard and evil ! Enjoy !

**Word Problems for Kids** <http://www.mystfx.ca/special/mathproblems/>

This simply designed Canadian-based website offers challenging but engaging 'real world' word problems for students in the Grade 5 – 12 range. The style of the problems are adapted from the Canadian Mathematics Competitions but, unlike the competitions, these questions come with hints and answers ! Definitely challenging but interesting and fun for the math-loving student !

## **MATH FOR TEACHERS**

### **E Workshop** <http://www.eworkshop.on.ca/edu/core.cfm>

This online resource, developed by the Ontario Ministry of Education for elementary teachers, includes modules on numeracy and provides lesson plans, activity sheets and more. The modules are organized by topic and the site's accessible design allows for easy and quick access. The site includes videos with reflections by teachers about what makes a successful teaching experience.

### **Illuminations** <http://illuminations.nctm.org>

A wealthy resource of teaching-based activities and lesson plans complete with assessment suggestions and reflection questions. In addition, it boasts 724 links to math resources on the web. This standards-based site is suitable for teaching number and operations, algebra, geometry, measurement and data analysis and probability. Searchable by grade level, this website requires the use of software such as Acrobat Reader, QuickTime, Java Run-Time and Flash Player. (Bonus: Highlighted lesson featuring the tricky difference between Histograms and Bar Graphs).

### **Math Central** <http://mathcentral.uregina.ca/>

Resource site primarily for teachers; contains a glossary and a 'problem of the week'. Website is divided in elementary, middle and secondary levels. Useful for students but must be old enough to navigate site effectively. Links to community outreach programs are provided for parents. Available in English, French or Spanish.

### **Math Forum** <http://www.mathforum.org>

Resource site designed primarily for teachers includes free searchable database organized by grade, activities, lesson plan, stories, etc. Students can ask a question to Dr. Math on math topics anywhere from the elementary to the college level. Useful website links for parents including what to look for in a math classroom and a link to an internet mathematics library.

### **National Library of Virtual Manipulatives** <http://nlvm.usu.edu>

This website offers virtual manipulatives for K-12 in Number & Operations, Algebra, Geometry, Measurement and Data Analysis & Probability. Although the website is simple in design, it offers an opportunity to use manipulatives with an emphasis on tracking assessment, which would otherwise be challenging with standard manipulatives. Additionally, it may provide an opportunity for special education students with dexterity limitations to engage in using manipulatives (i.e. geoboards, capacity containers, etc.).



**NRICH Mathematics** <http://nrich.maths.org/public/>

This website specializes in enrichment of math ideas while providing free mathematics enrichment materials (problems, games, etc.) on a categorized, searchable database for students aged 5 and beyond. The aim of the program is to enrich the mathematical experience of all learners and has a focus on providing professional development for teachers wishing to embed rich mathematical tasks into everyday classroom practice. The site includes word problems, games, and articles including a weekly math problem.

**Thinkfinity** <http://thinkfinity.org/home.aspx>

An abundant resource site for teachers with lesson plans, interactive activities and worksheets categorized by grade level with an easy to use drop-down menu. (Click on 'math' to narrow down subject area). Links for students provide highly dynamic exercises on everything from times tables to the Tower of Hanoi. The 'exploration' feature which accompanies each activity guides the student through with logic and reasoning to reach the final solution. Appropriate for K-12 and beyond !

## Book List

This is a list of math related books that you can read with you children. The majority of these books can be found in local libraries. Keep in mind that any book can be math related! When reading with you child, look at the words and pictures. Look for patterns, shapes, things you can count, estimation you can make or compare sizes.

Adler, David A. Fraction Fun  
Ahlberg, Janet. Each Peacn Pear Plum  
Aker, Suzanna. What comes in 2's, 3's, and 4's ?  
Allen, Pamela. Who Sank The Boat ?  
Anno, Masaichiro. Anno's Mysterious Multiplying Jar  
Anno's Math Games  
Axelrod, Amy. Pigs Will Be Pigs  
Aytüre-Scheele, Z. Beautiful Origami  
Barrett, Judi. Cloudy With a Chance of Meatballs  
Barry, Sheila Anne. Giant Book of Card Games  
Baum, Arline. Opt  
Briggs, Raymond. Jim and the Beanstalk  
Bruce, Colin. Conned Again, Watson! Cautionary Tales of Logic, Math and Probability  
Burns, Marilyn. The Greedy Triangle  
Christelow, Eileen. Five Little Monkeys Jumping on the Bed  
Christelow, Eileen. Five Little Monkeys Sitting in a Tree  
Clements, Andrew. A Million Dots  
Coerr, Eleanor. Sadako and the Thousand Paper Cranes  
Cohen, Miriam. First Grade Takes a Test  
Crews, Donald. Ten Black Dots  
Daniels, Patricia. From Head to Toe, Body Math  
Dee, Ruby. Two Ways to Count to Ten  
Demi. One Grain of Rice  
Emberley, Barbara. Drummer Hoff  
Enzenberger, Hand Magnus. [The Number Devil: A Mathematical Adventure.](#)  
Ernst, Lisa Campbell. Sam Johnson and The Blue Ribbon Quilt  
Flournoy, Valerie. The Patchwork Quilt  
Gardner, Martin. Mathematical Carnival : from penny puzzles, card shuffles and tricks of lightning calculators to roller coaster rides into the fourth dimension  
Geringer, Laura. A Three Hat Day

Giganti, Paul. Each Orange Has 8 Slices – A Counting Book  
Goennel, Heidi. Odds and Evens: A Numbers Book  
Grifalconi, Ann. The Village of Round and Square Houses  
Hart, Christopher. Draw a Triangle, Draw Anything !  
                    Draw a Square, Draw Anything !  
                    Draw a Circle, Draw Anything !  
Hoban, Tana. Is it Larger? Is it Smaller?  
                    Let's count  
                    Cubes, Cones, Cylinders and Spheres  
                    So Many Circles, So Many Squares  
Hong, Lily Toy. Two of Everything  
Hopkins, Lee Bennett. Marvelous Math: A Book Of Poems  
Hulme, Joy N. Wild Fibonacci: Nature's Secret Code Revealed  
Hutchins, Pat. The Doorbell Rang  
Jonas, Ann. Round Trip  
Juster, Norton. The Phantom Tollbooth  
Kasza, Keiko. The Wolf's Chicken Stew  
Kenda, Margaret. Math Wizardry for Kids  
Koller, Jackie French. One Monkey Too Many  
LaFosse, Michael G. Making Basic Origami Shapes Step by Step  
Lasky, Kathryn. The Librarian Who Measured The Earth  
Lottridge, Celia B. One Watermelon Seed  
Mahy, Margaret. 17 Kings and 42 Elephants  
Martin, Bill. Chicka Chicka 1, 2, 3  
                    Polar Bear, Polar Bear, What Do You Hear ?  
Masaichiro, Anno. Anno's Mysterious Multiplying Jar  
McKissack, Pat. A Million Fish...More or Less  
Mollet, Tolowa M. My Rows and Piles of Coins  
Murphy, Stuart J. Too Many Kangaroo Things to Do  
                    Divide and Ride  
                    The Grizzly Gazette  
                    Beep, Beep, Vroom, Vroom!  
                    The Best Vacation Ever  
Nagda, A.W. Tiger Math: Learning to Graph from a Baby Tiger  
Namioka, Lensey. Yang the Youngest and His Terrible Ear  
Neuschwander, Cindy. Sir Cumference and the Dragon of Pi  
                    Sir Cumference and the First Round Table  
                    Sir Cumference and the Sword in the Cone  
Nottingham, Ted. Chess for Children  
Peters, Julie Anne. The Stinky Sneakers Contest

Peterson, Ivars. Math Trek: Adventures in the Math Zone.  
Pinczes, E.J. One Hundred Hungry Ants  
Pittman, Helena Clare. A Grain of Rice  
Reid, Margarette S. The Button Box  
Rissman, Rebecca. Shapes in the Garden  
    Shapes in Sports  
    Shapes in Music  
    Shapes in Buildings  
    Shapes in Art  
Sayre, April P. One is a Snail, Ten is a Crab  
Scarry, Richard. Richard Scarry's Best Counting Book Ever.  
Schwartz, David M. How Much is a Million?  
    If You Made A Million  
    Millions To Measure  
    On Beyond a Million  
Scieszka, Jon. Math Curse  
Silverstein, Shel. The Giving Tree  
Strauss, Stephen. How Big is Big  
Swift, Jonathan. Gulliver's Travels  
Tang, Greg. The Grapes of Math: Mind-Stretching Math Riddles  
Vaughan, Marcia. The Secret to Freedom  
Viorst, Judith. Alexander, Who Used to Be Rich Last Sunday  
Winter, Jeanette. Follow the Drinking Gourd  
Zaslavsky, Claudia. Math Games & Activities From Around The World  
Zolotow, Charlotte. Some Things Go Together

# 1, 2, 3 Books!



*Here is a list of math related books that you can read with your children. All of these books can be found in branches of the Kingston Frontenac Public Library. Many books can be math related! When reading with your child, look at the words and pictures for patterns, shapes, and things you can count.*

## *Number Sense and Numeration: Primary*

### **Aker, Suzanne. *What comes in 2's, 3's, and 4's?***

Introduces the numbers two, three, and four by enumerating the ways in which they occur in everyday life, from your two eyes and two arms to the four seasons of the year.

### **Axelrod, Amy. *Pigs Will Be Pigs***

Meet Mr. Pig, Mrs. Pig, and the piglets. Here's a family that must add, subtract, multiply, and divide, and think about the way money works in order to satisfy their big pig appetites.

### **Christelow, Eileen. *Five Little Monkeys Jumping on the Bed***

A counting book in which one by one the little monkeys jump on the bed only to fall off and bump their heads.

### **Clements, Andrew. *A Million Dots***

Shows what a million dots looks like and includes interesting facts such as how many shoe boxes it would take to make a stack to Mount Everest

### **Crews, Donald. *Ten Black Dots***

A counting book which shows what can be done with ten black dots--one can make a sun, two a fox's eyes, or eight the wheels of a train.

### **Giganti, Paul. *Each Orange Has 8 Slices – A Counting Book***

An illustrated introduction to counting and simple addition

### **Hulme, Joy N. *Wild Fibonacci: Nature's Secret Code Revealed***

Introduces the Fibonacci sequence, the pattern of numbers in which each number is the sum of the two numbers before it, and relates it to curves found in nature, including elephant tusks, tiger claws and seahorse tails

### **Hutchins, Pat. *The Doorbell Rang***

Each time the doorbell rings, there are more people who have come to share Ma's wonderful cookies

### **Kasza, Keiko. *The Wolf's Chicken Stew***

A hungry wolf's attempts to fatten a chicken for his stew pot have unexpected results.

### **Koller, Jackie French. *One Monkey Too Many***

Adventurous monkeys have a series of mishaps and escapades involving a bike, a canoe, a restaurant, and a hotel.

**Martin, Bill. *Chicka Chicka 1, 2, 3***

An alphabet rhyme/chant that relates what happens when the whole alphabet tries to climb a coconut tree

**Mollel, Tolowa M. *My Rows and Piles of Coins***

A Tanzanian boy saves his coins to buy a bicycle so that he can help his parents carry goods to market, but then he discovers that in spite of all he has saved, he still does not have enough money.

**Murphy, Stuart J. *Too Many Kangaroo Things to Do***

A surprise birthday party planned for a kangaroo by his friends provides many opportunities for the reader to add and multiply various things.

**Pinczes, E.J. *One Hundred Hungry Ants***

One hundred hungry ants head towards a picnic to get yummys for their tummies, but their stops to change their line formation cause them to lose both time and food in the end.

**Reid, Margarette S. *The Button Box***

A child examines the many different buttons in Grandma's button box

**Sayre, April P. *One is a Snail, Ten is a Crab***

A counting book featuring animals with different numbers of feet

**Scarry, Richard. *Richard Scarry's Best Counting Book Ever***

Introduces the numbers and counting from one to one hundred as Willy Bunny counts all the things he sees in one day.

**Schwartz, David M. *How much is a Million?, If You Made A Million***

*Number Sense and Numeration: Junior*

**Adler, David A. *Fraction Fun***

A basic introduction to the concept of fractions.

**Anno, Masaichiro. *Anno's Mysterious Multiplying Jar***

Simple text and pictures introduce the mathematical concept of factorials.

**Dee, Ruby. *Two Ways to Count to Ten***

A retelling of a traditional African tale in which King Leopard invites all the animals to a spear-throwing contest whose winner will marry his daughter and succeed him as king.

**Demi. *One Grain of Rice***

A reward of one grain of rice doubles day by day into millions of grains of rice when a selfish raja is outwitted by a clever village girl.

**Hopkins, Lee Bennett. *Marvelous Math: A Book of Poems***

Presents mathematically-themed poems by such writers as Janet S. Wong, Lee Bennett Hopkins, and Ilo Orleans

**Juster, Norton. *The Phantom Tollbooth***

A journey through a land where Milo learns the importance of words and numbers provides a cure for his boredom.

**Schwartz, David M. *How Much is a Million?, On Beyond a Million***

**Viorst, Judith. *Alexander, Who Used to Be Rich Last Sunday***

Alexander and his money are quickly parted yet he realizes there are many things a dollar can do.

*Patterning and Algebra: Primary*

**Ernst, Lisa Campbell. *Sam Johnson and the Blue Ribbon Quilt***

While mending the awning over the pig pen, Sam discovers that he enjoys sewing the various patches together but meets with scorn and ridicule when he asks his wife if he could join her quilting club.

**Vaughan, Marcia. *The Secret to Freedom***

Great Aunt Lucy Tells a story of her days as a slave, when she and her brother, Albert, learned the quilt code to help direct other slaves and, eventually, Albert himself, to freedom in the north.

Measurement: Primary

**Allen, Pamela. *Who Sank the Boat?***

The reader is invited to guess who causes the boat to sink when five animal friends of varying sizes decide to go for a row.

**Hoban, Tana. *Is it Larger? Is it Smaller?***

Photographs of animals and objects in larger and smaller sizes suggest comparisons between the two.

**McKissack, Pat. *A Million Fish...More or Less***

During an outing on the mysterious Bayou Clapateaux, Hugh Thomas catches a million fish.

**Neuschwander, Cindy. *Sir Cumference and the Dragon of Pi***

When Sir Cumference drinks a potion which turns him into a dragon, his son Radius searches for the magic number known as pi which will restore him to his former shape. Part of the Sir Cumference series of books.

**Schwartz, David M. *Millions to Measure***

**Strauss, Stephen. *How Big is Big***

Math Concepts: Weights and Measures, Juvenile literature.

*Measurement: Junior*

**Lasky, Kathryn. *The Librarian Who Measured the Earth***

Describes the life and work of Eratosthenes, the Greek geographer and astronomer who accurately measured the circumference of the Earth

**Schwartz, David M. *Millions to Measure***

*Spatial Sense and Geometry*

**Burns, Marilyn. *The Greedy Triangle***

Dissatisfied with its shape, a triangle keeps asking the local shape shifter to add more lines and angles until it doesn't know which side is up.

**Grifalconi, Ann. *The Village of Round and Square Houses***

A grandmother explains to her listeners why in their village on the side of a volcano the men live in square houses and the women in round ones.

**Jonas, Ann. *Round Trip***

Black and white illustrations and text record the sights on a day trip to the city and back home again to the country. The trip to the city is read from front to back and the return trip from back to front, upside down.

**Neuschwander, Cindy.** *Sir Cumference and the first round table*

Part of the Sir Cumference series of books.

**Rissman, Rebecca.** *Shapes in the Garden, Shapes in Sports, Shapes in Music, Shapes in Buildings, Shapes in Art*

*Data Management and Probability*

**Barrett, Judi.** *Cloudy With a Chance of Meatballs*

Life is delicious in the town of Chewandswallow where it rains soup and juice, snows mashed potatoes, and blows storms of hamburgers--until the weather takes a turn for the worse.

**Geringer, Laura.** *A Three Hat Day*

A hat collector is having a very bad day until he meets his true love in the hat section of the department store.

**Nagda, A.W.** *Tiger Math: Learning to Graph from a Baby Tiger*

Describes the growth of an orphan Siberian tiger cub, by means of words and graphs

*General Books of Interest:*

**Gardner, Martin.** *Mathematical Carnival: From penny puzzles, card shuffles and tricks of lightning calculators to roller coaster rides into the fourth dimension*

A new roundup of tantalizers from Scientific American with elegant mathematical commentaries and after thoughts by Mr. Gardner, back talk from readers, and 115 pictures and diagrams.

**Goennel, Heidi.** *Odds and Evens: A Numbers Book*

Counts to thirteen in terms such as one-horse town, six of one, eight ball, and baker's do

**Hart, Christopher.** *Draw a Triangle, Draw Anything !*

Starting with a triangle, this book includes step-by-step instructions on how to create drawings. Watch as a triangle becomes an elephant, a witch, a rocket ship, a dragon and lots more cool characters and goofy animals.

**LaFosse, Michael G.** *Making Basic Origami Shapes Step by Step*

**Namioka, Lensey.** *Yang the Youngest and His Terrible Ear*

Recently arrived in Seattle from China, musically untalented Yingtao is faced with giving a violin performance to attract new students for his father when he would rather be working on friendships and playing baseball

**Nottingham, Ted.** *Chess for Children*

Uses the revolutionary Lincolnshire system to explain how to play, enjoy, and master chess and recounts anecdotes about notable players in the history of the game.

**Peters, Julie Anne.** *The Stinky Sneakers Contest*

A class visit to the Gross-Me-Out exhibit at the science museum inspires Stink Moody to create a variety of terrible smells to put on the sneakers he plans to enter in the World's Worst Super-Stinky Sneaker contest.

**Peterson, Ivars.** *Math Trek: Adventures in the Math Zone*

Explores various mathematical concepts--such as knots, fractals, secret codes, and chaos theory--and relates them to everyday life.



**Pittman, Helena Clare. *A Grain of Rice***

A reward of one grain of rice doubles day by day into millions of grains of rice when a selfish raja is outwitted by a clever village girl.

**Scieszka, Jon. *Math Curse***

When the teacher tells her class that they can think of almost everything as a math problem, one student acquires a math anxiety which becomes a real curse.

**Silverstein, Shel. *The Giving Tree***

An endearing story of the life of a man and tree. The tree gives everything it has to the man and the man gives companionship to the tree.

**Swift, Jonathan. *Gulliver's Travels***

Due to a series of mishaps he winds up on uncharted islands among unusual people and animals. Many Math concepts presented.

**Tang, Greg. *The Grapes of Math: Mind-Stretching Math Riddles***

Illustrated riddles introduce strategies for solving a variety of math problems in using visual clues.

**Zaslavsky, Claudia. *Math Games & Activities From Around the World***

Presents more than 70 games, puzzles and projects from different countries and cultures that teach a variety of basic mathematical concepts.





# La magie de la calculatrice

Savez-vous que votre calculatrice est un appareil remarquable, capable non seulement de calculer des problèmes mieux que des êtres-humains, mais aussi capable de vous parler.

Je suis votre calculatrice et je veux m'introduire. Appuyez sur les touches suivantes pour savoir mon nom. Appuyez sur les touches  $123 \times 98 \times 3 + 1557$ , et puis retournez votre calculatrice pour le savoir.

L'alphabet suivant va vous aider à trouver la bonne réponse si vous retournez votre calculatrice après avoir appuyée la touche =.

*L'alphabet que votre calculatrice connait est le suivante:*

Les chiffres à l' envers	0	1	2	3	4	5	6	7	8	9
sont les lettres:	O	I	Z	E	h	S	g	L	B	G

**Essayer les devinettes suivantes:**

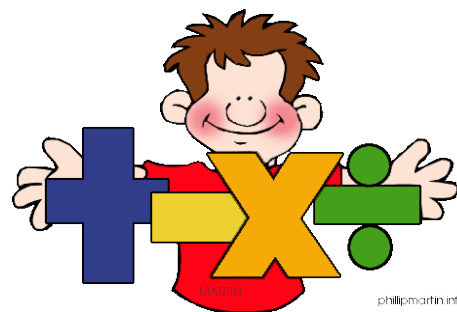
1. Envisager la monnaie canadienne: une pièce de cinq sous, une de dix, et un sou. Les parents de Belle ont 3 enfants; un s'appelle Nicolas, un autre Penelope. Comment s'appelle le troisième enfant?  
 $.05 \div .01 \div .10 \times 3 \times 246 + 838 =$

2. Dans un magasin il y avait 17 bols. Tous sauf neuf ont été vendus. Combien en restent-ils?

$$10 \times 5 \times 2 \times 20 \div 2 \times 50$$

3. Qui pèse plus, Lee le boucher qui mesure 152 cm ou Bob le lutteur qui mesure 213 cm?  
 $5 \times 7 \times 10 - 13 =$

4. Un médecin vous donne trois pilules et dit qu'il faut en prendre chaque demi-heure. Combien de temps dureraient-elles ces pilules?  
 $3 \times .5 + 2.6 =$



5. Pendant 20 minutes Gille a soustrait les chiffres, Belle les a multipliés, et Leslie les a ajoutés. En terminant qui était le plus épuisé?

$$9 + 57 + 868 + 7\,920 + 93\,208 + 215\,475 =$$

6. Qui était encore en pleine forme?

$$17\,865 - 9\,876 \times 5 - 2226 =$$

7. Qui travaille bien fort?

$$836 \times 50 - 200 - 5000 + 1138 =$$

8. Quelle est le plus grand chiffre que vous pouvez voir apparaître?

$$99\,999\,999 \div 9 - 11\,100\,555 + 50 =$$

9. Un Américain dit qu'il n'y a qu'un mois qui a 28 jours, mais le Belge n'est pas d'accord. Qui a raison?

10. Combien de terre y a-t-il dans un trou qui mesure 2 mètres de profondeur, 55 cm de largeur et 1 mètre 50 de longueur?

$$5 \times 2 \times 3 - 30 =$$



### Les solutions:

1. Belle. Les parents sont les siens.
2. 8 bols
3. Lee, parce qu'il pèse la viande pendant toute la journée.
4. 1 h (heure). La troisième pilule était prise une heure après la première pilule.
5. Leslie.
6. Gille.
7. Belle
8. Gogol. Il y a 101 chiffres.
9. Le Belge. Il y a 28 jours dans chaque mois.
10. 0. Il n'y a pas de terre dans un trou.

# Soroban ou boulier japonais & Chisenbop

Le Soroban est un abaque japonais, d'origine chinois. C'est un ancien outil mathématique, utilisé pour faire des calculs. L'abaque est un des plus vieux instruments à calculer et datent de 3000 ÈC. Plusieurs variations de l'abaque ont été utilisées par des Grecs, des Russes, des Égyptiens, des Mexicains, des Indiens, etc. Les plus vieux abaques étaient des tablettes faites en marbre ou en bois avec des cailloux comme des jetons, ou des tablettes en cire avec un style en fer ou en os pour compter. Plus tard les bouliers étaient portables et faits en bois et en métal comme aujourd'hui.

Les boules de l'abaque glissent des hauts et des bas sur les tiges. L'abaque est divisé horizontalement en deux par une barre. La partie supérieure consistante d'une boule par tige est le "Ciel" et la partie inférieure consistante de quatre boules par tige est la "Terre". La boule de la partie supérieure vaut **5** et les boules de la partie inférieure valent **1**. La valeur des boules est croissante quand les boules s'approchent de la barre, et la valeur des boules est décroissante quand elles s'éloignent de la barre. Les boules de la "Terre" s'appellent les unaires, et celles du "Ciel" les quinaires.

Sur votre Soroban il y a 4 tiges. Vous devez faire les calculations de droit à gauche.

<b>Tige 4</b>	<b>Tige 3</b>	<b>Tige 2</b>	<b>Tige 1</b>
Milliers (1000s)	Centaines (100s)	Dizaines (10s)	Unités (1s)

Dans le premier exemple ci-dessous, le valeur sur le Soroban est zero (0), parce qu'aucunne boule s'est deplacée vers la barre.



Dans le deuxieme exemple, la valeur sur le Soroban est **3**, parce que 3 boules de "Terre" se sont deplacees ver la barre.



Dans le troisieme exemple, la valeur sur le Soroban est **11**, parce qu'on a deplace une boule unaire sur le tige des unites et une boule unaire sur le tige des dizaines.



Dans le quatrième exemple la valeur sur le Soroban est **3 708**, car il y a 3 unaires et 1 quinares sur le tige des unités, rien sur le tige des dizaines, 2 unaires et un quinares sur le tige des centaines, et 3 unaires sur le tige des milliers. (3 milliers + 7 centaines + 0 dizaines + 8 unites = 3708).



### Ajoutant avec votre Soroban

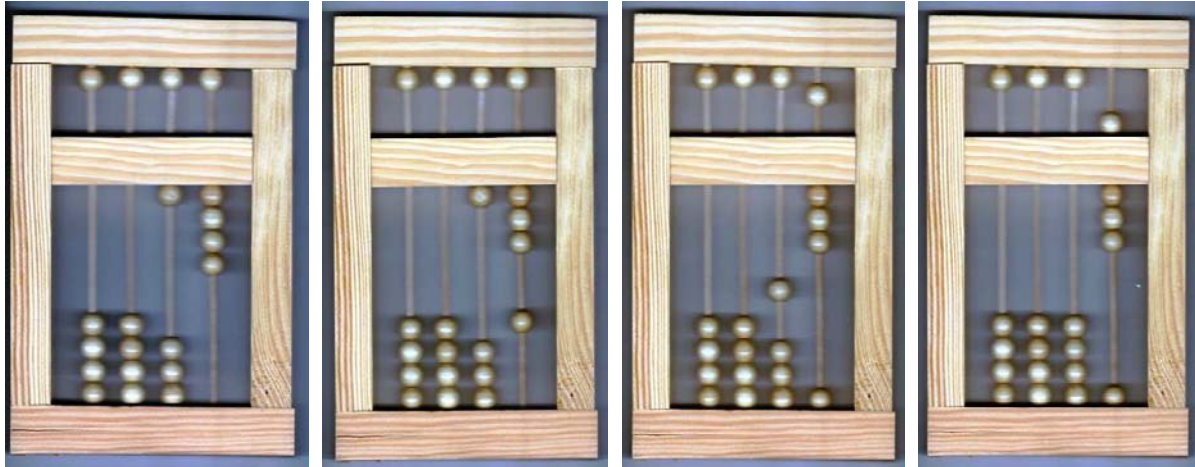
C'est facile d'ajouter avec votre Soroban! Pour calculer  $8 + 6$ , on fait d'abord  $8 + 1$ , puis pour ajouter 5, on fait  $+ 10 - 5$ . Essayez! 3 unaires plus un quinaire = 8, puis ajoutez 6. Pour le faire il faut ajouter 1 unites plus 1 dizaines moins un quinaire, et voila, **14**. Maintenant pratiquez pour devenir bien fort.





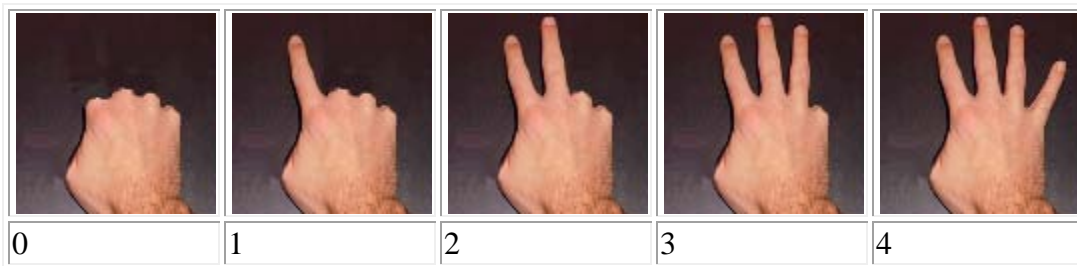
## Soustraire avec votre Soroban

La soustraction est simple avec le Soroban, parce que vous faites le contraire de l'addition. Pour calculer  $14 - 6$ , on fait d'abord 14, puis vous enlevez 1 unités, puis enlevez une dizaine, et ensuite ajoutez un quinaire et voila 8.

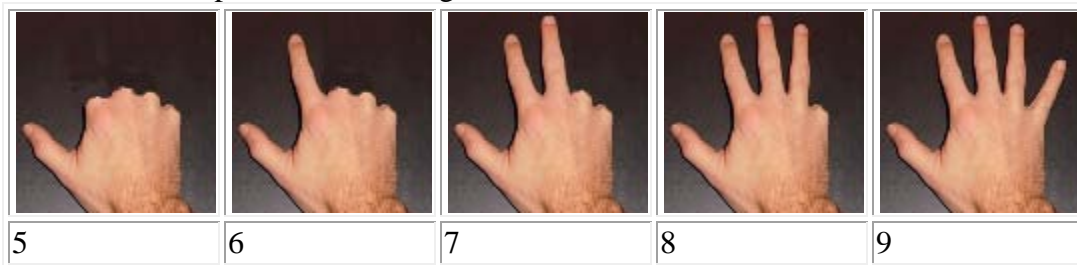


## Chisenbop






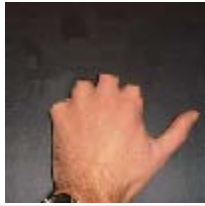




Chisenbop is a method of doing basic mathematics using your fingers. It was created in Korea and works very similar to counting on a Soroban. The key to understanding Chisenbop is learning the counting technique. The right hand stands for the values zero through nine. Each digit counts as one, and the thumb counts as five. Here's an illustration:



As you can see, digits 0 through four are pretty self explanatory. The thumb counts as five, so here's how to represent five through nine:



The left hand represents multiples of ten, with the right thumb representing 50. Here's how the left hand works:

				
0	10	20	30	40
				
50	60	70	80	90

# Kingston Compte!

Une célébration de mathématique pour toute la famille



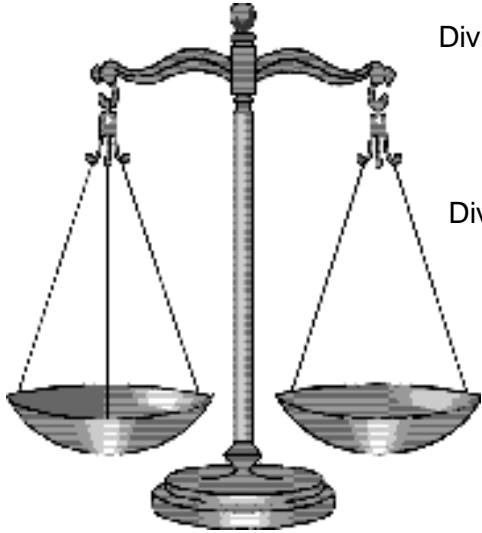
## Mathématique chez vous

**Par:**

**Marguerita Drayton, Hilary Gale, Jenny Goncalves, Jennifer Graham,  
Ashley Joy, Lisa King, Kaitlyn Kuipers, Katharine McWhirter,  
Ashley Morrison, Kristen Parker, Adam Swanson  
(Faculté d'éducation 2009-2010)  
(La première édition, April 2010)**

# Mesurer à la quincaillerie

On sait que ce récipient peut contenir 240 g de clous.  
On a une balance, mais pas de contrepoids.  
Mesurez 90 g de clous pour un client.



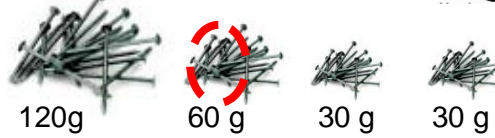
Divisez les clous par deux.



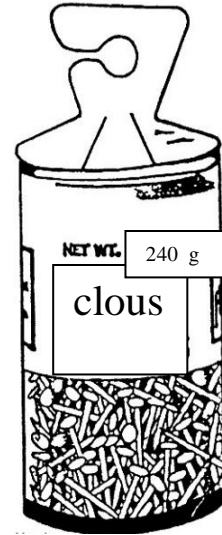
Divisez une pile par deux.



... et encore



les enigmes de mesure



# Diviser les perles également

Il y a un assortiment de perles pour faire l'artisanat, et une balance, mais pas de contrepoids. Comment peut-on partager ces perles également? Il est acceptable qu'il en restent quelques-unes, tant que chaque personne reçoit le même nombre.



---

4 personnes:

---

5 personnes:

---

8 personnes:

---

15 personnes:

---



## La pièce de monnaie fautive est plus légère. Laquelle est-elle?

On a trois pièces de monnaie. Deux sont bonnes, mais une est fautive et moins lourde. Comment peut-on l'identifier par moyen d'une balance?



Faites une comparaison entre la première et la deuxième pièce de monnaie. Si leurs poids sont les mêmes, la troisième pièce de monnaie est fautive, autrement c'est la moins lourde des deux qui est fautive.

On a 9 pièces de monnaies, donc 8 sont bonnes, mais une est fautive et plus légère. Pouvez-vous la trouver en juste 2 pesages?



les énigmes de mesure



## La pièce de monnaie fautive est plus pesante. Laquelle est-elle?

On a 3 pièces de monnaie. Deux sont bonnes, mais une est fautive, et pèse plus.  
En pesant la monnaie juste une fois, pouvez-vous trouver laquelle est fautive?



On a 9 pièces de monnaies, donc 8 sont bonnes, mais une est fautive, et plus pesante.  
Pouvez-vous la trouver en juste 2 pesages?



*Le défi:* Pouvez-vous trouver la pièce de monnaie fautive parmi les 27 pièces, en juste 3 pesages.





# Mesurer avec une balance



Vous avez 3 paquets de barres de chocolat et une balance. Chaque barre de chocolat pèse 200 grammes. Dans un paquet, il y a une barre de chocolat qui ne pèse que 150 grammes. En n'utilisant la balance qu'une fois, pouvez-vous trouver le paquet avec la barre de chocolat qui ne pèse que 150 grammes?

*Le défi:* Si vous savez que dans un paquet il y a une barre de chocolat plus légère, mais vous ne connaissez pas le poids ni de la barre de chocolat légère, ni celle de format courant, combien de fois faut-il utiliser la balance pour trouver le poids des barres de format courant et celui de la barre légère?



les enigmes de mesure



# Mesurer avec un pèse-personne.

On a 100 oranges dans une lourde boîte en carton. Comment pouvez-vous trouver le poids des oranges sans boîte, en utilisant un pèse-personne?

Les pèse-personnes ne sont pas normalement très précis pour peser des choses moins de 15 kilos, ou plus de 100 kilos. Comment pouvez-vous peser un bébé de 5 kilos en utilisant un pèse-personne?

Comment pouvez-vous peser précisément les 100 oranges en utilisant un pèse-personne en estimant que les oranges pèsent entre 10-20 kilos et en estimant que la boîte en carton pèse environ 2 kilos?

Peut-on trouver avec précision le poids d'une personne qui pèse entre 100-150 kilos, en utilisant un pèse-personne?



## Des devinettes à propos de la mesure.

### Les instructions

Pour chacune des devinettes ci-dessus, ton équipe doit travailler ensemble pour trouver les bonnes réponses. Il y a diverses stratégies que vous pouvez utiliser pour trouver les bonnes réponses. Les essais par tâtonnements sont encouragés.





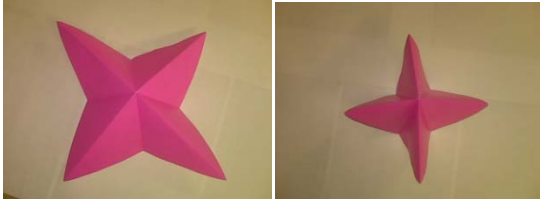

Votre équipe doit choisir la meilleure solution et expliquer pourquoi.

Il existe par tout, des choses qui peuvent être mesurées. Utilisez la "mesure" en tout temps comme les exemples mentionnés ci-dessus.

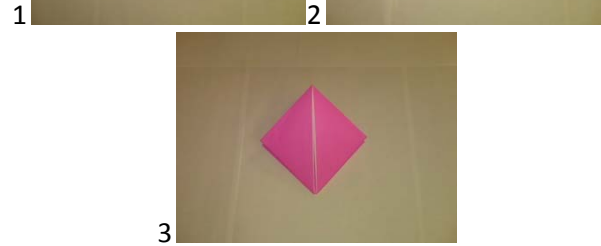
# Les formes de l'origami

Origami, d'origine chinoise, est devenu célèbre au Japon. Ceci est la raison pour laquelle le nom est japonais. Origami est l'art du pliage du papier: "oru" signifie "plier" et "kami" signifie "papier". Ceci est exactement ce qu'on va faire; Nous allons plier du papier. Commencez avec une feuille de papier carrée que vous allez transformer en animal, plante ou forme géométrique. Découvrez le plaisir de l'origami.

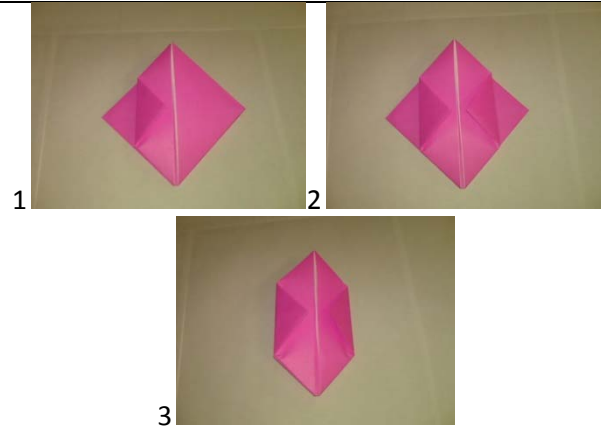
## Étape par étape: Un ballon

1. Commencez avec une feuille de papier carrée.	
2. Faites un triangle en pliant le carré diagonalement, de pointe à pointe. Dépliez et pliez à l'envers des plis existants en faisant la même chose.	
3. Pliez en deux. Dépliez et pliez à l'envers des plis existants en faisant la même chose.	
4. Dépliez votre papier et le voilà!	
5. Puis faites un pli aplati.	
6. et vous aurez un triangle aplati.	

7. Maintenant pliez chacun des 4 coins vers le haut.



8. Puis, pliez les 4 coins horizontaux vers le centre.



Une extension: S'il vous reste du temps, utilisez votre doigt pour élargir la petite poche. Vous devez rentrer chacun des rabats dans les poches. Les rabats doivent être pliés en 2 pour en faire assez petits pour les poches.

