A One Night Session for Schools

ACTIVITIES

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2013

The Estimating Jar – Various Items

Materials:

- estimating jar (100 - 125 ml)filled with:
  - teddy-shaped snack (5 – 10)
  - stones (20 – 30)
  - bingo chips(30 – 40)
  - Shreddies from the jar (10 - 20)
  - feathers (10-15)
  - paper clips (20 - 30)
  - Doublemint gum (15 - 25
  - measuring tapes (10 – 15)

(For health reasons feathers should be purchased. For mathematical reasons feathers should be purchased so that they are the same size)

- number line – 3 or 4 legal sized pieces of paper joined horizontally

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

- post-it notes (12.5 cm by 7.5 cm or 4 by 6 inches)
- 10 frames – 3 or 4
- markers

Note: the length of the numberline and the number of 10 frames will be determined by the number of items in the jar

Instructions:

1. Leader holds up jar and asks families to think about how many bears there are in the estimating jar. Stress that we are not counting yet…we are **estimating or making our best guess**.
2. Families are given a post-it note. They **do not put their name on it** as anonymity encourages risk taking. Participants place the post-it above or below the numbers on the number line to indicate their range or zone of estimated answer. The post-it note will cover a range of approximately 3 numbers.
3. Stress that we are trying to be "in the zone".
4. Stress that we are not counting. We are estimating.

Where's the Math?

Estimating develops a sense of number. This skill is developed through practice and reflection. The more we do it and the more we think about why we do it, the better we become. This activity also develops risk-taking, problem solving and the idea that there is a range of possible answers when estimating. Finding a reasonable answer demonstrates an understanding of number.

For the first attempt at this activity choose a small number of "things" in the jar to give families a greater chance of success.

"Opportunities can be found daily to encourage children to reflect on and extend their understanding of mathematics as it occurs in their everyday activities, play and conversation"   The Kindergarten Program p 41

Remind children and parents that bigger items take up more space than smaller items. How will that affect the amount?

Referring back to previous experiences helps to reinforce the idea that concepts are developed and learned over a period of time and that repeated practice is needed to understand a concept.

Curriculum Expectations:

Kindergarten:

NS1.6 • begin to use information to estimate the number in a small set

Mathematical Processes • Problem Solving and Communicating

Grade One:

N(s) • estimate the number of objects in a set

The Estimating Jar - The count

Materials:

- • Teddy-shaped snacks from the jar (more than 5, less than 10)
- • estimating jar (100 - 125 ml)
- • Teddy-shaped snack (5 – 10)   or   feathers

- • Stones (20 – 30)   or   paper clips (12 – 18)
- • Bingo chips   or   doublemint gum
- • Shreddies from the jar (between 10 - 20)
- • number line
- • transparent overlay (15 cm)

Instructions:

1. Leader briefly reminds families of the guesses/estimations of the number of items they made at the beginning of the evening.
2. Leader puts transparent overlay on the number line where most post-it notes are placed.
3. Leader places one, two or three 10 frames beneath the number line with the first one under the 0 – 9 range, the second under the 10 – 19 range and the third one under the 20 – 30 range. The number of 10 frames will depend on the number of items in the estimating jar.
4. Leader takes about half the items out of the jar and places them in the 10 frames starting on the top left, filling the top row, returning to the bottom left and filling the bottom row (using a left to right progression).
5. The other leader points to the corresponding numbers on the number line while the families count.

X	*X*	*X*	*X*	*X*							

With this number of items the leader will say, "How many items are there?" How many more would we need to make 10? (Add items to the 10 frame to fill it)

6. Leader then asks families if they wish to move the transparent overlay and responds to the general consensus of the group by moving the overlay as directed. This strategy will reinforce the idea of refining estimations.
7. Leader takes the rest of the items out of the jar and places them to fill the first 10 frame and then moves on to the next 10 frame. The other leader continues to count the corresponding numbers on the number line.

$\mathcal{X}$	$\mathcal{X}$	$\mathcal{X}$	$\mathcal{X}$	$\mathcal{X}$
$\mathcal{X}$	$\mathcal{X}$	$\mathcal{X}$	$\mathcal{X}$	$\mathcal{X}$

$\mathcal{X}$				5

With this number of items the leader will say, "We had one 10 frame filled. How many is that? How many are in the next frame? How many items are there altogether?"

8. **If appropriate** leader discusses the estimates with questions such as:

- Were you in the zone? How could you be closer?
- The items are all about the same size. Does that make it easier or harder to estimate?
- Why did we keep the zone the same? **or** Why did we make a change?

9 Remind families that when you get larger numbers it is harder to "find the zone".

10. Encourage families to keep challenging themselves in estimating.

Where's the Math?

Estimating develops a sense of number. This skill is developed through practice and reflection. The more we do it and the more we think about why we do it, the better we become. This activity also develops risk taking, problem solving and the idea that there is a range of possible answers when estimating. Finding a reasonable answer helps build an awareness of number. Reinforce with parents that estimation is a life skill related to mathematics. To be successful children must have many opportunities to practice estimation and to learn from their previous experiences e.g., refining the zone. Parents should be encouraged to remind children of strategies that they have used in the past or that they heard about tonight.

An activity such as this one is also useful when it comes to more formal mathematics such as finding volume. Finding how many units cover the base, and multiplying by the number of layers (area of base x height) is an excellent formula for the volume of many solids. Children will see the one to one correspondence as the Teddy-shaped snacks are matched to the number line. Counting will occur. As we check for reasonableness, remember that we want to try to be "in the zone", not have the exact answer. Celebrate everyone's participation. Reinforce that the more you try to estimate, the better you become.

Strategies of chunking (relating a known part to the greater whole) and using prior knowledge (using what you have learned from similar situations in the past to shape your estimation) may be employed. Remind parents of the value of these strategies.

Note the strategy of using new knowledge – e.g., the fact that feathers (from Location 2) are approximately the same size as paperclips (from Location 4) but feathers can be squished – can be a useful strategy for estimation.

Children can be coached to understand that the smaller the item the more will fit in the jar. Success in estimation and all areas of mathematics comes from discussion and refinement of thinking, not memorization.

Children will see the one to one correspondence as the items are matched to the numberline. Counting will occur.

Children will see the grouping of ten as an anchor or "friendly" number which is a basic understanding of place value and our base ten system.   Children will see the grouping of ten in the 10 frame as well as on the number line. Reminding children of their 10 fingers and 10 toes will make further links to this key number in place value.

Celebrate everyone's participation. Reinforce that the more you try to estimate and talk about the strategies you use the better estimator you will become.

Curriculum Expectations:

Kindergarten:
> NS1.3   • begin to make use of one-to-one correspondence in counting objects and matching groups of objects *(e.g., one napkin for each of the people at the table)*
> DM5.2   • collect objects and data and make representations of their observations, using concrete graphs
> Mathematical Processes   • Problem Solving and Communicating

Grade One:
> N(s)   • demonstrate, using concrete materials, the concept of one-to-one correspondence between number and objects when counting
> • estimate the number of objects in a set, and check by counting
> • relate numbers to the anchors of 5 and 10

# Counting and Patterning
with Teddy-shaped Snack

Materials:
- one package of Teddy-shaped snacks per child
- paper Teddy shapes approx. 15 cm high
- stick tack

Table Talk: some sample questions
How many do you have?
What will come next in your pattern?
Is there another way to make a pattern?
Mom or Dad, can you tell your child's patterning rule?

Repeat each pattern at least 2 times
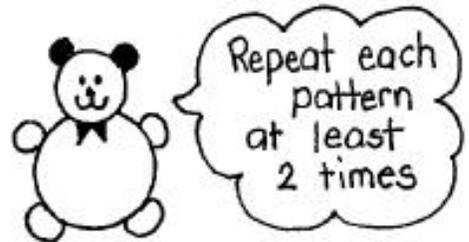
Instructions:
1. Leader counts the cut-out bears encouraging the families to take part.
2. Leader demonstrates an up, down pattern with the cut out bears. If there is no appropriate place to stick the bears, the floor can be used.
3. At the tables families count the Teddy-shaped snacks in their box.
4. At the tables families make a pattern with their Teddy-shaped snacks.
5. At this point leaders should encourage individual creativity and exploration with patterns. (e.g., up, sideways, down; 2 up, 1 down etc.)
6. Children keep box of Teddy-shaped snacks for snack time at the end of the session.

10 9 8 7 6 5 4 3 2 1
STOP. Hands on head.
Leader waits for full attention of group.

Where's the Math?
This is a safe introduction to patterning because children at all levels of mathematical development and understanding will find success. This activity reinforces the importance of using concrete materials to make sense of abstract ideas.

Curriculum Expectations:
Kindergarten:
P(s)23   • identify, extend, reproduce, and create repeating patterns through investigation, using a variety of materials
Grade One:
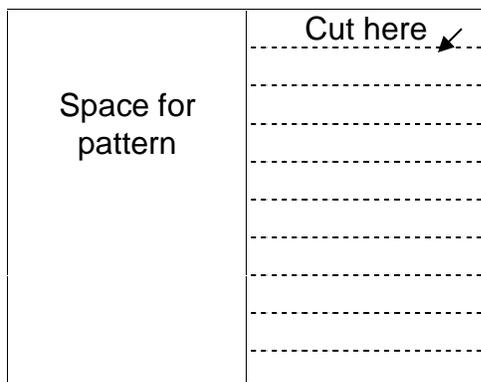P&A(s)   • create a repeating pattern involving one attribute

Ten in the Bed

Materials:
- piece of light coloured construction paper per child cut as in diagram
- markers

Key Words
how many?
pattern   next

```
Space for
pattern
                    Cut here ↙
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Table Talk: some sample questions
How many are in the bed? out of the bed?
How many of the children have smiling faces? How many don't?
What can you tell me about the pattern on your quilt?

Instructions:
1. Leader introduces the activity by singing "Ten in the Bed".

Ten in the bed and the little one said, "Roll over." They all rolled over and one fell out.	Eight in the bed ...	Four in the bed ...
	Seven in the bed ...	Three in the bed ...
Nine in the bed and the little one said, "Roll over." They all rolled over and one fell out.	Six in the bed ...	Two in the bed ...
	Five in the bed ...	One in the bed and the little one said, "At last!!"

2. While singing, encourage all to participate with their fingers counting back from 10.
3. Explain that everyone is going to make a bed so that they can act out the song.
4. Leader models different kinds of faces that can be put on the flaps to represent the 10 people in the bed.
5. Leader also models different patterns that can be put on the bedspread.
6. Families make their own beds.

> **10 9 8 7 6 5 4 3 2 1**
> **STOP. Hands on head.**
> (*Leader waits for full attention of group.*)

Where's the Math?
Children at this age must have concrete materials in order to make sense of abstract concepts such as addition and subtraction. This activity is an enjoyable way to accommodate this need and is adaptable to different developmental levels. The concept that patterns cover areas, not just lines (e.g., the bedspread), is introduced and practised.

Curriculum Expectations:
Kindergarten:
- N(s)12 • investigate addition and subtraction in everyday activities through the use of manipulatives
- P(s)23 • identify, extend, reproduce, and create repeating patterns through investigation, using a variety of materials

Grade One:
- N(s) •solve a variety of problems involving the addition and subtraction of whole numbers

Making a Turtle

Materials:

- completed turtle to demonstrate possible pattern
- paper plates cut in half
- circles and rectangles pre-cut by leaders
  (The rectangles must be double squares)

- construction paper
- stapler and staples
- glue

Table Talk: some sample questions
Tell me about your pattern.
What is your rule for your pattern?
Which shape have you used most? least?
How did you make a ...(shape) from a ... (shape)?

Instructions:

1. Leader models that a circular plate has been cut in half to make the turtle shell.
2. Leader shows a completed turtle and shows the use of shapes to create a pattern.
3. Leaders asks families what shapes they may wish to use and elicits answers such as squares, circles, rectangles, triangles.
4. Leader shows pre-cut circles and rectangles and challenges families to consider how to get other shapes.
5. Discuss and demonstrate how to fold and cut to make other shapes. Some possibilities are:
   - circle ➜ half circle
   - rectangle ➜ square
   - square ➜ triangle
6. Families go to tables to make a turtle and pattern the shell.
7. After turtles are completed Leader briefly discusses the following questions:
   - Which shape did you use the most when you made your turtle?
   - Which shape did you use the least?
   - How many more …(shape) did you use than ….(shape)?

Where's the Math?

Children and families will examine the properties of geometric shapes through exploration and problem solving.

Curriculum Expectations:

Kindergarten:

G(s)19   • compose pictures and build designs, shapes, and patterns in two-dimensional shapes, and decompose two-dimensional shapes into smaller shapes, using various tools or strategies

Grade One:

G(s)   • compose patterns, pictures, and designs, using common two-dimensional shapes

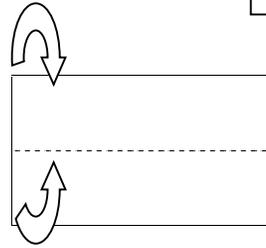# Paper Airplanes
Predict, Discover, Discuss

Materials:
- paperclips
- one piece of 81/2 x 11 inch piece of paper per family **pre-creased**

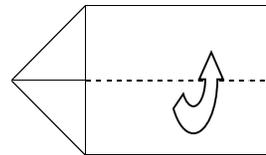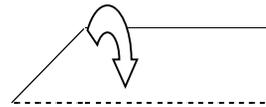Instructions for pre-creasing paper

1. Fold the paper in half lengthwise to make 2 rectangles .

2. Unfold the paper. At one end, fold in each corner so that they meet at the centre line crease. Two (right-angled) triangles are formed.
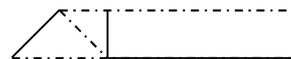
3. Refold in half again along the middle crease. The triangles are hidden on the inside.
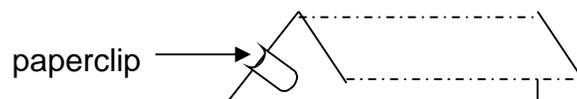
4. With the folded edge towards you, fold the top (open) edge toward you so that it meets the fold at the bottom.
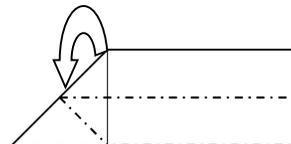
5. Flip over and repeat on the other side

6. Open wings. Add a paper clip to the nose of the plane. It is ready to fly.

paperclip

Instructions:

1. Leader demonstrates how to make paper airplanes.
2. Leader hands out pre-creased paper airplane sheets.
3. Families follow the leader's instructions and make their own paper airplanes.
4. After having previously decided on a landing area for the planes that is away from people and potential hazards, the leader models **Predict, Discover, Discuss** by:
   - talking with the group to get them to predict where the landing spot will be while using terms such as "more than, less than/closer than, further than" etc.
   - pacing 10 steps and throwing the plane to land near that spot.
   - discussing why the plane landed where it did (e.g., it was too heavy; I threw it too high/low; etc.)
5. Leader asks families to "predict, discover, discuss" for themselves.
6. Families repeat the "predict, discover, discuss" process after changing landing distance, adjusting the folds of the airplane, or making another type of alteration that could change the prediction and result.

10 9 8 7 6 5 4 3 2 1
STOP. Hands on head.
Leader waits for full attention of group.

Where's the Math?

This is a rich mathematical activity because there are many strands involved (e.g., geometry, number sense and numeration, measurement). The focus is on probability as evidenced in the modelling. All three strands should be addressed through math talk at tables.

Prediction involves the same risk taking skill as already introduced in the estimating jar activities. "Predict, discover, discuss" is an important parenting skill as well as an excellent teaching strategy.

Curriculum Expectations:

Kindergarten:
  DM&P(s)28   • use mathematical language in informal discussions to describe probability (e.g., chance, never, sometimes, always)
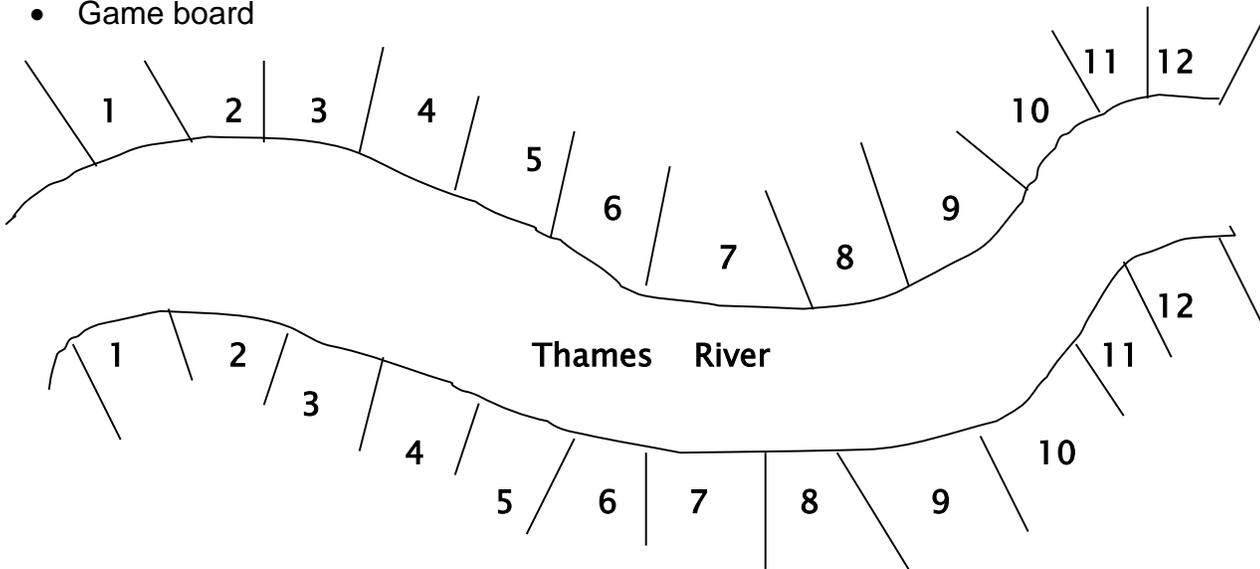
Grade One:
  DM&P(s)   • describe the likelihood that everyday events will occur, using mathematical language (i.e., impossible, unlikely)

Crossing the River

<u>Materials</u>

- Between 8 and 12 small counters per person to place in the docks as boats
- Container to hold counters
- Game board

Rules of the Game:

- Each player is given a number of "boats" to place on their side of the river. Between 8 and 12 counters works best.
- The boats can be placed on any "dock".
  Players can put as many boats as they wish in each dock.
- Players take turns rolling two dice.
  The numbers on the dice are added together.
- If the player who rolled the dice has a boat in the dock with that number (s)he can remove it – "Cross the River".
- If they have several boats in that dock, they can only remove one each time they roll that sum.
- The boats that cross go into the container.
- The first person to remove all boats is the winner.

Notes:

This game helps children understand some basic ideas of probability. Certain numbers are more likely (e.g., 6, 7, or 8). Other numbers are rolled very infrequently (e.g., 2 and 12). Therefore it is best to keep your boats around the centre.

Where's the Math

Some primary addition facts are needed to add the numbers on the two dice, but the main purpose of this activity is to introduce children to early ideas about probability.
They should recognize which numbers are most likely (6, 7 and 8 because there are more combinations of numbers on the dice that add to these numbers).
They should also understand which number could never come up. (That number would be one.)

# Curriculum Expectations:

Grade 2

  DM&P (s): – describe the probability that an event will occur, through investigation with simple games and probability experiments and using mathematical language

  R&P - apply developing reasoning skills (e.g., pattern recognition, classification) to make and investigate conjectures (e.g., through discussion with others);

Grade 5

  DM&P (s): –   determine and represent all the possible outcomes in a simple probability experiment

  R&P - develop and apply reasoning skills (e.g., classification, recognition of relationships, use of counter-examples) to make and investigate conjectures and construct and defend arguments;

Docks

1 2 3 4 5 6 7 8 9 10 11 12

Thames River

Docks

1 2 3 4 5 6 7 8 9 10 11 12
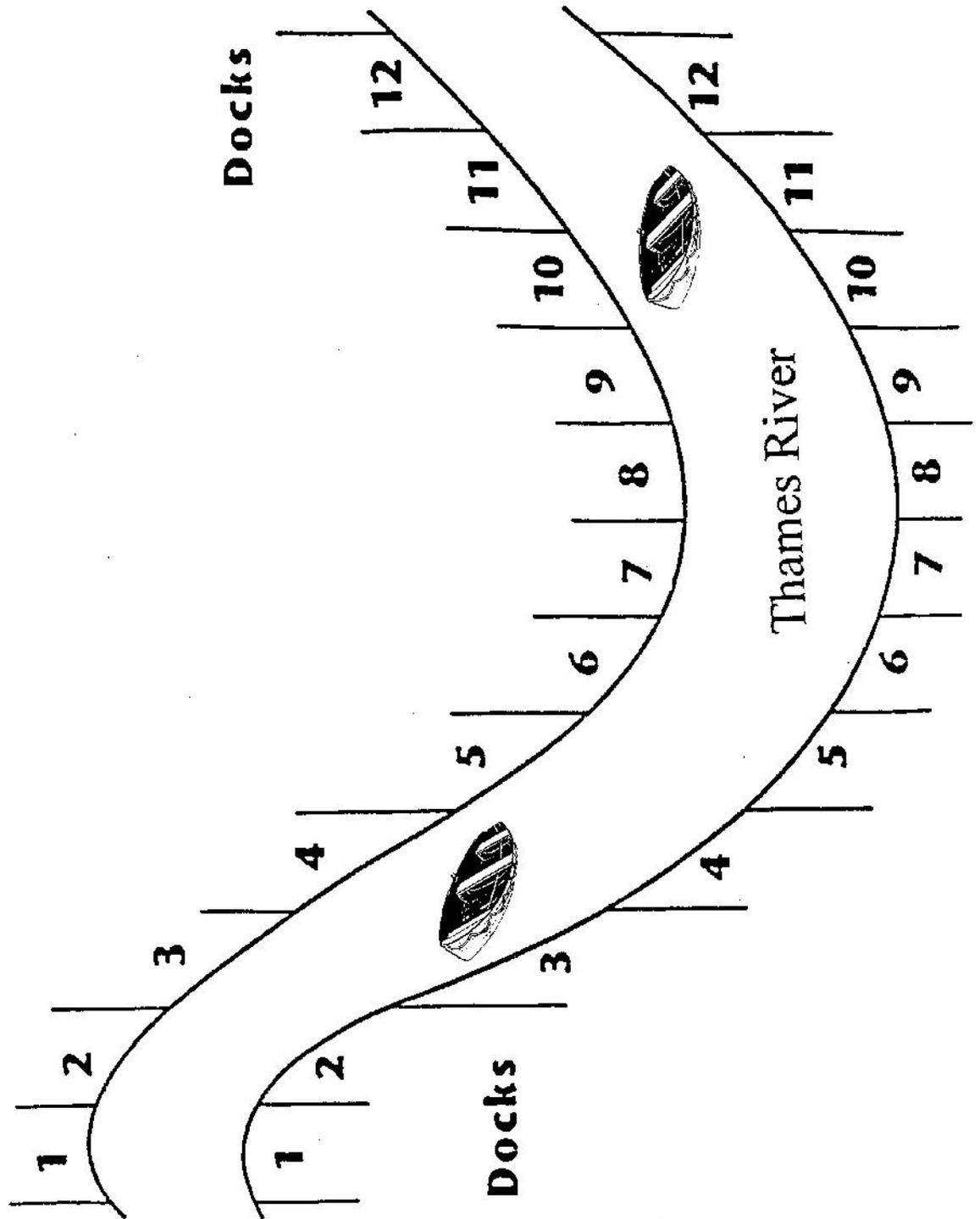
Double the Fun

Knowing "doubles" facts helps children learn their addition facts and the related subtraction facts. Think of:

$$16 - \_ = 8 \qquad\qquad 8 + \_ = 16$$

Once children know their doubles, they can learn to add numbers like 6 + 7 by thinking of 6 + 6 + 1 or 7 + 7 – 1

The books "Box Cars and One-Eyed Jacks" by Joanne Currah, Jane Felling and Cheryl MacDonald has lots of excellent card and dice games. They have given nicknames to some of the more difficult doubles.

$6 + 6 = 12$	*Farmer's double*	*(12 eggs)*
$7 + 7 = 14$	*Valentine's double*	*(14th of February)*
$8 + 8 = 16$	*Sweet sixteen*	
$9 + 9 = 18$	*Grownup double*	

Other names could be:

$5 + 5 = 10$	*Handy double*	*(10 fingers)*
$4 + 4 = 8$		
$3 + 3 = 6$		
$2 + 2 = 4$		
$1 + 1 = 2$		

Materials

- Deck of cards from Ace to 10 (remove J, Q, K)
- Doubles Chart

Rules of the Game:

- Two or three players can play.
- Remember Ace = 1.
- Turn over one card from the pile of cards.
- Players must double the number.
- The first player to say the answer out loud gets the card.
- In the case of a tie, the card goes in the middle.
- Play continues until someone is first to say the double. That person gets the cards in the middle plus the card for that turn.
- The winner is the one with the most cards.

Challenge 1: Play double plus one (e.g., 8 + 8 + 1)

Challenge 2: Play double minus one (e.g., if the card is 8, the answer is
$8 + 8 – 1 = 15$)

Adapted from "Box Cars And One-Eyed Jacks" materials

Where's the Math

Discuss the importance of doubles for helping with other facts.
         e.g., 6 + 7   Think 6 + 6 + 1

This strategy enables children to learn about one third of the addition facts they should be able to recall immediately. This strategy also promotes learning of subtraction facts, and helps students learn the more difficult addition facts.

Curriculum Expectations

G2   N(s)   - solve problems involving the addition and subtraction of whole numbers to 18, using a variety of mental strategies

G2   PM & P(s)   - identify, describe and create, through investigation, growing patterns and shrinking patterns, involving addition and subtraction

G5   N(s) – solve problems involving the addition, subtraction, and multiplication of whole numbers, using a variety of mental strategies

Doubles Chart

$$9 + 9 = 18$$

$$8 + 8 = 16$$

$$7 + 7 = 14$$

$$6 + 6 = 12$$

$$5 + 5 = 10$$

$$4 + 4 = \ 8$$

$$3 + 3 = \ 6$$

$$2 + 2 = \ 4$$

$$1 + 1 = \ 2$$

Cut A Card

Materials:
- square piece of cardstock
- scissors

Instructions
1. Cut the card into two pieces of any size or shape. (Surprisingly, straight cuts are more difficult than curved lines.)
   Shake the two pieces in your hands; drop them on the table and put the square back together.
2. Take one of the two pieces and cut that piece in two (any size, any shape).
   Shake the three pieces in your hands; drop them on the table and put the square back together.
3. Take the other piece and cut that in two.
   Shake the four pieces in your hands and drop them in front of the person to your left. Have them put it back together.
4. Using the pieces that are now in front of you, cut one of the pieces.
   Shake the five pieces in your hands and give them back to the owner so that the owner can put them back together to make a square
5. Distribute the Tangram Pattern (on the following page) and discuss the challenges for families to try at home.

Note:
   This "Cut A Card" activity is quite difficult if both sides of the cards are blank. You can either use cards that have lines on one side, or have the children draw a picture on one side. They can then put together either the picture side or the blank side.

Where's the Math
An important aspect of elementary geometry is "Motion Geometry" or "Transformational Geometry". In this activity children slide, turn and flip (if both sides are blank) the pieces. They also learn which pieces fit together and thereby develop spatial skills.
The Tangram puzzle is an old Chinese puzzle that helps children develop spatial ability and creativity.
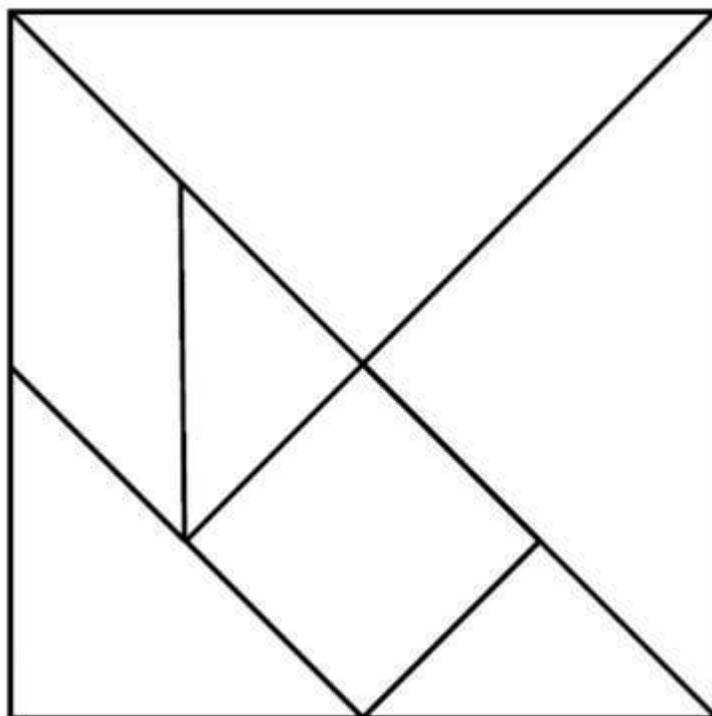
Curriculum Expectations
Grade 2
   G(s) - explore and identify two-dimensional shapes using concrete materials and drawings
   G(s) - identify transformations, such as flips, slides and turns, using concrete materials and drawings
Grade 5
   G(s) - describe the effect of a translation, reflection, and rotation
   G(s) - use mathematical language to describe geometric ideas

Tangram Pattern

1. Cut out the pattern.
2. Try these activities:
    - Put it back together as a square.
    - Make some alphabet letters from it. (Try a C to start.)
    - Make house.
    - Read the book Grandfather Tang's Story by Ann Tompert. Make the animals in the story.
    - Find other challenges for yourself.

A Pair of Hands

Materials:

- scissors
- construction paper
- markers

Table Talk: some sample questions
In your family, who is the tallest? shortest?

Instructions:

1. Leader traces and then cuts out his/her hands.
2. Optional - The fingers are then numbered 1 – 2 – 3 ... 10
3. Leader demonstrates how to use the hands as a non-standard unit of measurement by using a volunteer and showing how to place and move the hands to find how many hands tall the person is.
4. The leader models **Predict, Discover, Discuss** by:
   - talking with the group to get them to predict how many hands tall the volunteer is.
5. At the table the families are asked to cut out a pair of hands to use for measurement and to number the fingers.
6. Families repeat the "predict, discover, discuss" process for each family member measured.
7. If time predicts families can use some available item as the unit of measure and find how many of this item are equal to the height of each person..

10 9 8 7 6 5 4 3 2 1
STOP. Hands on head.
Leader waits for full attention of group.

Where's the Math?

Familiar, non-standard units of measure are used so that children gain an understanding of measurement in real and meaningful ways. Placing the unit of measure (hand or other item) repeatedly and accurately along an object, and counting the number of units is a necessary, concrete beginning for comprehending linear measure.

Curriculum Expectations:

Kindergarten:
M(s)16   • demonstrate, through investigation, a beginning understanding of the use of non-standard units of the same size
Grade One:
M(s)   • estimate, measure (i.e., by placing nonstandard units repeatedly, without overlaps or gaps), and record lengths, heights, and distances

Try this at home!

Take a small handful of pasta (more than 1 but less than 30) and put it into your estimating jar. What kind of pasta did you use?

Leave your pasta in the jar for other people to look at and guess. At the end of the week, take it out and count it using the ten frames. Did you have more than 10 or less than 10? Try a different kind of pasta or try paperclips, cereal, crackers, building blocks, beads ...

Circle one   My guess was   My estimate was   I was **In the Zone!**
              too small.   too big.   I was close.

Some Good Books
For Math

Baylor, Byrd. Everybody Needs a Rock. New York: Aladdin Paperbacks, 1985.

Boynton, Sandra. Blue Hat, Green Hat. New York: Simon and Schuster, 1984

Clement, Rod. Counting on Frank. Milwaukee: Gareth Stevens Publishing, 1991.

Cuyler, Margery. 100th Day Worries. New York: Simon & Schuster, 1999.

Grifalconi, Ann. The Village of Round and Square Houses. New York: Little, Brown and Company, 1986.

Inkpen, Mick. The Blue Balloon. New York: Little, Brown and Company, 1989

Keats, Ezra Jack. Over in the Meadow. New York: Puffin Books, 1971.

Lobel, Arnold. Frog and Toad are Friends. New York: Harper Collins, 1970.

Murphy, Stuart. The Best Bug Parade. New York: HarperCollins Children's Books, 1996

Murphy, Stuart. A Pair of Socks. New York: HarperCollins Children's Books,

Rosen, Michael and Helen Oxenbury. We're Going on a Bear Hunt. New York: Simon and Schuster, 1989.

Walsh, Ellen Stoll. Mouse Count. Singapore: Harcourt Brace & Company, 1991.

Adams, Pam. There Was An Old Lady Who Swallowed A Fly. Child's Play International, 2007

Lester, Helen. Tacky the Penguin. Houghton Mifflin, 2006

Numeroff. If You Give a Mouse a Cookie. Harper Collins, 1985.

Raffi. Wheels on the Bus. Crown Books,1998.

Sayre. One is a Snail, Ten is a Crab. Candlewick, 2006.

Tompert, Ann. Grandfather Tang'sStory. Crown Publisher, Inc. 1990

Wood, Audrey. The Napping House. Harcourt Trade Publishers, 2000.

Yolen, Jane. How Do Dinosaurs Say Good Night?. Blue Sky Press, 2000.