CHAPTER 8:

ORGANIZING INFORMATION

It is imperative that children learn ways to organize information so they can begin to see relationships, draw conclusions and make predictions about future related events. This chapter will discuss two ways to organize information: sorting and classifying and graphing.

The process of sorting and classifying begins during infancy when babies unconsciously sort people, objects and events in their environment by their sensory experiences (touching, smelling, tasting, hearing, seeing). Their ability to distinguish differences and/or similarities becomes more refined as they grow and have more experiences. Children make better sense out of their world and handle increasingly complex relationships as they further develop the ability to sort out and classify the necessary information.

Graphing develops naturally from sorting and classifying experiences. Graphs enable children to gather more specific quantitative information from sorting experiences. In addition, graphs help children learn to organize data in ways which permit generalizations to be made from the gathered information.

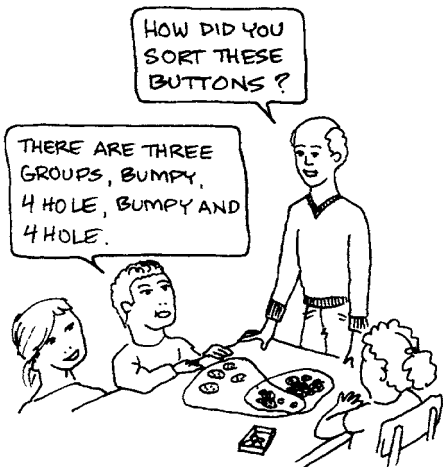
Learning to sort and graph effectively also involves the abilities to: search for patterns; make reasonable estimates; and use statistics to predict probable outcomes. As children's sorting and graphing abilities develop, they begin to use skills to think clearly and logically about problems and situations that naturally occur.

SORTING AND CLASSIFYING

HOW TO BEGIN

Utilize everyday occurrences to develop sorting and classifying concepts and vocabulary. The first classroom sorting and classifying activity could be something as simple as tidying up and putting classroom items back in the proper places.

Begin to formally address sorting and classifying with whole group activities such as People Sorting (MTW, p. 61), Sorting on the Overhead Projector (MTW, pp. 59-60) and Descriptions (MTW, pp. 74-75). Schedule time for small group sorting activities throughout the year (see NL, pp. 8.3 - 8.6).



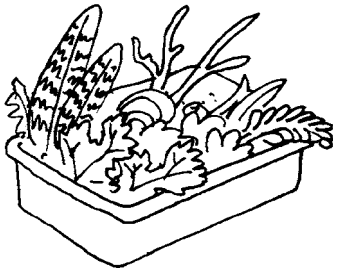
Venn Diagrams

The children's level of sorting sophistication increases when they are surrounded with a variety of experiences. The first sorting experiences usually consist of sorting by one type of attribute (e.g., either color, texture, size, smell…). After repeated experiences, children begin to sort by two or more types of attributes at one time (e.g., color and size).

There are occasions when an item might fit into more than one of the categories being sorted. Let's say the children are sorting pebbles according to whether they are rough or smooth. Some pebbles might be rough on one side and smooth on the other. Venn diagrams (see MTW, p. 85) help organize overlapping groups. By placing two yarn circles around the sorted groups, the overlapping category of stones that are both rough and smooth are distinguished.

Venn diagrams are also useful when something is being sorted into groups by two or more distinctly different attributes (e.g., a group with two-hole buttons and a group with small buttons). A third overlapping group of small buttons with two holes may occur when sorting out the small buttons and the two-hole buttons. A fourth group might be all the buttons that do not have two holes and are not small. This group would be outside the yarn groups.

REAL-LIFE SORTING ACTIVITIES



Sorting Items Collected on a Class Trip

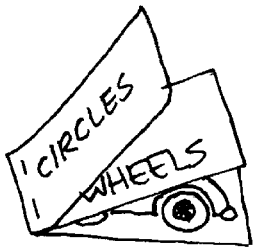
Materials: Items collected on a class trip

Take advantage of events like nature walks and class trips to collect items from the children's environment to sort and classify.

For instance, perhaps the class collected items on a trip to the beach. Once back in the classroom, the class could sort the collected material in a variety of ways. The first classification might simply be shells, sea glass, stones, wood, leaves, flowers, feathers…. The next time it might be by size, color, or texture. As the children's sorting abilities develop, they may choose to sort by two attributes at one time (e.g., color and texture).

Sorting Walk Books

Sorting books can be made after taking a sorting walk on the playground, at home, or perhaps on a class trip and even after a stroll around the classroom (see MTW p. 72). Sometimes the children contribute to a class sorting book. Other times an individual child or a pair of children might chose an attribute and make a sorting book. Children love to share their books with each other.



Materials: 6" by 9" plain white paper to draw a picture of the sorted item; 6" by 9" lined paper to write a word or sentence to describe the item; 6" by 9" construction paper for the front and back covers

Assemble the book as follows: Use construction paper for the front and back cover. Alternate the inside pages beginning with a lined piece of paper followed by a plain piece.

Procedure: Choose an attribute to search for on the walk. Write a word or a sentence describing the item on the lined paper and draw a picture of the item on the blank paper following the description. Kindergarten teachers may have to record the word(s) or sentence for their children.

Sorting Items from Home

Materials: Items from home; storage box

Note: Vary the materials throughout the year. Once the children have had time to sort the items in a variety of ways, send the materials home and ask for a new item with a different attribute.

Whole Class Sorting: Ask the class to bring in an item from home with a predetermined attribute — i.e., "Bring something from home that is blue (has a pattern; is metal…)." Sort the items together with the class several different ways. Keep track of the ways the children have sorted the material by recording the ways on a large piece of chart paper.

Independent Sorting: Store each set of items in its own box. Encourage the children to search for new ways to sort the materials or choose one of the listed methods during their free time. Add the new sorting categories to the list as they are discovered.

JUNK BOX SORTING

One of the objectives of the following lessons is to extend children's thinking and creativity. The children are asked to sort junk into two groups. The first time the lesson is introduced, they may want to sort into more than two groups. Allow time at the beginning of the lesson for the children to freely sort into two or more groups before asking them to focus on two-group sorting.

The class progresses through the sorting levels throughout the school year. The first two levels are the most important for young children. Repeat these levels several times with different types of junk.

Levels:
- ❏ Teacher-directed small group lesson
- ❏ Small group sorting
- ❏ Student-generated sorting cards
- ❏ Mixing the sorting cards
- ❏ Guess presorted categories

Materials: Choose junk that can be sorted in many ways. Some good

junk boxes for this lesson are: buttons, shells, bread tags, keys, nuts & bolts, etc. Be sure the children have had ample opportunities to free explore the junk beforehand.

Note: The following activities can be adapted to other sorting materials (e.g., attribute blocks).

Step One:Teacher-Directed Small Group Lesson

Divide the class into groups of five or six children, according to levels of verbal ability (i.e., a group with the most verbal, a group with the least verbal children, and so on). When the more verbal children are mixed randomly with children who are less verbal, the former tend to dominate the group.

If you work with one group of five or six children for an entire work period each day (20 - 30 minutes), you will be able to work with every child in the class within a week's time. (See MTW, pp. 64-68)

Materials: 1 junk box

Procedure: Take a small handful of junk from the junk box and set the junk box aside. Ask the children in the group to describe some of the attributes of the junk on the table. Then sort the objects by the attributes mentioned. For example, if the junk box is the button box and a child says that some of the buttons are bumpy, move the bumpy buttons into one pile and leave all the non-bumpy buttons in their own pile.

After the handful of junk is completely sorted into two categories, use both hands to frame the individual sorted groups and say: "These are the (group response)." The children supply the missing word(s), — e.g., bumpy buttons, not bumpy buttons. Try to draw another word from the group's vocabulary describing "not bumpy". "What's another word to describe buttons that are not bumpy?" Children may respond with "smooth", "plain", "soft"....

When the sorted groups have been described, push the piles back into one group and say, "Think of a different way to sort the junk." This helps the children stretch their vocabulary. New language will develop from the children when the same junk is sorted many different ways.

Step Two: Small Group Sorting Level

Materials: 1 junk box per group of children

Work with all the groups at once at this level. Randomly place the children into groups of four or five. The more verbal children serve as models for the less verbal ones.

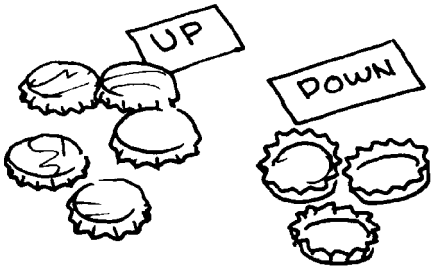
Procedure: Ask each group to choose one person to take out a handful of junk and then put the junk box aside. Tell the groups to sort their junk into two categories. Each group discusses how it wants to sort its junk the first time. Once the group has sorted the junk into the agreed-upon categories and everyone agrees how to describe each category, the group members raise their hands to let you know they are finished.

When a group of children is ready, go to the table, surround one group of junk with your hands and ask the group members to verbalize the category for the surrounded group.

The groups repeat this procedure over and over, attempting to sort the objects in as many ways possible in the time allowed.

Note: Some teachers keep track of the number of different ways a group has sorted by giving them a Unifix cube each time they sort a different way. The reason for this is to inspire the children within each group, not to place the groups in competition with each other. The teacher collects the Unifix cubes at the end of the session without drawing attention to or making comparisons between the total number of Unifix cubes collected by each group.

Step Three: Student-Generated Sorting Cards

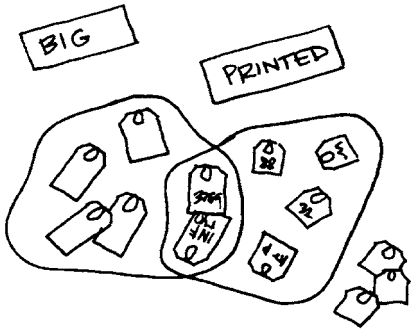


Materials: junk boxes, 2"x 6" manila paper, pencil

Procedure: Randomly group the children at this level. Ask the children to sort a handful of junk in the usual manner. This time write down the children's descriptions of the sorted groups on pieces of paper (one attribute description per piece of paper). Second graders may be able to do the writing.

Note: Sorting is a worthwhile activity for children at any grade level. Some teachers invite older children from other grades (fourth through sixth) to participate in this activity. The language and cooperation skills developed as a result of sorting activities are enriched by combining classes of primary and intermediate children. The older children act as the recorders for their group.

Step Four: Mixing the Sorting Cards



Materials: junk, papers with descriptions on them, yarn

In this activity, the children sort the junk into two groups according to the descriptions on the paper generated at the previous level. There may be overlapping categories. Allow the children time to solve this situation. This lesson may lead into a discussion of Venn diagrams.

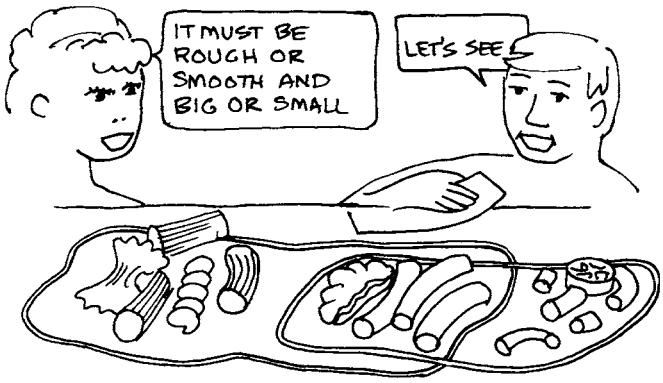
Procedure: The children begin by shuffling all the sorting cards at their table and drawing two cards from the pile. The group sorts their junk according to the two categories. Some categories may not to be related at all. Ask the children to surround the groups with the yarn. Junk with both attributes form an overlapping group. Some material may be outside the yarn because it doesn't have either attribute.

Step Five: Guess Presorted Categories

Materials: junk boxes; papers or cards with attributes written on them; yarn

Procedure: After the group has sorted at least three different ways using the cards, ask the groups to leave their last sorting intact. The children turn the cards face down on the table beside its appropriate sorted group of junk.

The groups move to a different table. Ask them to try to figure out how the junk was sorted at that table. When the group agrees on how they think the material was sorted, they may lift the card to peek and check their guess. The groups move to a different table with presorted junk and repeat the process.



ADDITIONAL CLASSIFICATION ACTIVITIES

Small Group Activities

Mathematics Their Way

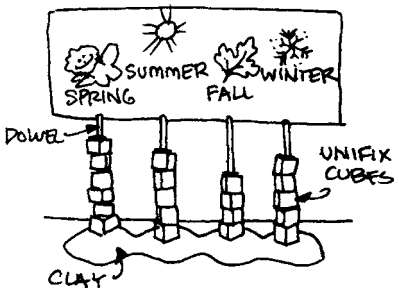
Independent Activities

Advanced Activities

GRAPHING

Graphing is a way of organizing data so the information can be compared quantitatively. Children become more flexible thinkers when they experience many different ways to graph information. It is important that graphing experiences are provided all year long. The graphing suggestions in Mathematics Their Way (Chapter 6) will help you get started.

HOW TO BEGIN



Begin with simple two-category real graphs. Model a variety of ways to graph two categories and gradually introduce real graphs with more categories. Real graphs may lead to representational graphs (e.g., picture graphs) and symbolic graphs. While representational and symbolic graphing activities are necessary and meaningful, keep in mind that real graphing experiences are the most important for young children.

After the children have placed the items on a graph, start the discussion by asking the class: "What can you tell me about the results of the graph?" Graphing questions (see MTW, p. 145) and summary statements can be modeled within the context of the discussion. Word problems can also be created about the graphs. Be careful not to narrow the range of discussion. Children need chances to make statements and ask questions as well.

Questions, summary statements and word problems can be recorded by the teacher or children who are comfortable with writing.

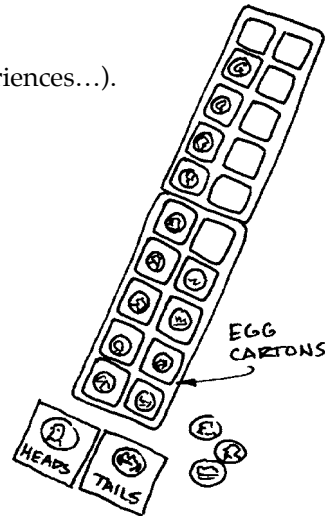
A graph might be used to:

❏ Ask opinions.
Do you think ____ or ____?
Do you like ___ or ____ ?
Do you ____? (Yes / No)

❏ Organize predictions and estimates.

❏ Record results
(check estimates, probability experiences…).

❏ Categorize sorted information.
(e.g., by attributes)



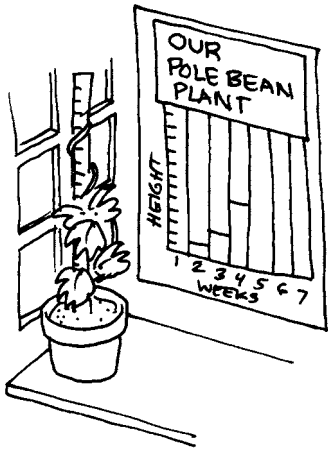
GRAPHING EXPERIENCES

People Graphs

Children are always anxious to participate in activities involving something about themselves. It's a wonderful way to get acquainted with the class. People graphs can evolve spontaneously from other activities — like people sorting, word problems or classroom events.

To form a people graph, the children involved sort themselves into groups according to a predetermined attribute (see NL, 5.6). Each group forms a line. To match the people in each group one-to-one, each child shakes hands with the person opposite in the other line. If the groups are not equal, some children will not have partners.

Extension: Give each child a piece of construction paper to stand on. When the graph is completed, the children step off the papers. A representation of the graph remains for the children to discuss.

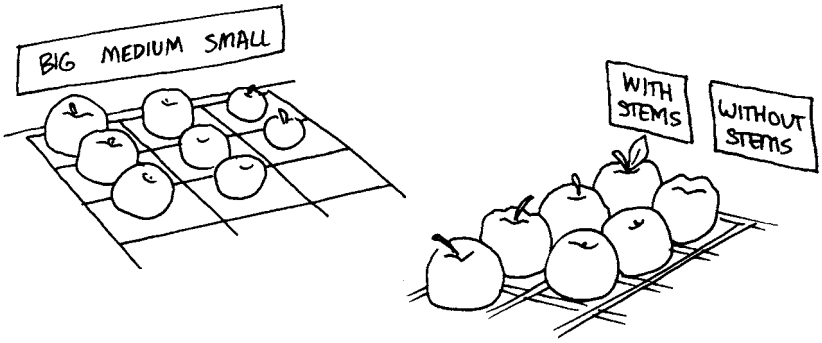


Ongoing Classroom Graphs

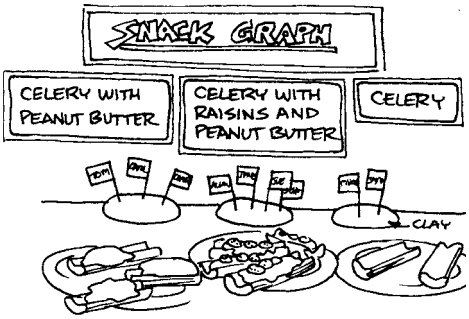
There are various types of ongoing graphs modeled in the Opening Activities (NL, Chapter 4): the days in the month are tallied; the teeth lost in a month and birthdays are recorded on monthly scatter graphs; and the weather and temperature are recorded on bar graphs.

Graph One Item Several Different Ways

Choose something that has many attributes (e.g., junk, shoes, apples, children in the classroom). Discuss all the ways that items can be graphed. Choose several of the suggestions and graph the items. Discuss the result.

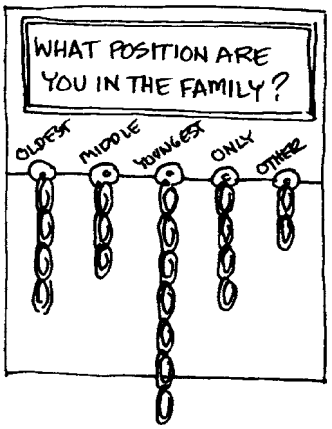


Classroom Management



Graphs can be incorporated as a classroom management tool — e.g., attendance; choice in snacks; hot lunch or cold lunch; what type of transportation the child uses to get to school.

Leave a description of the classroom graphs in your substitute folder. This will enable the substitute to quickly look at the transportation chart and tell which child travels on which bus, walks home, or is picked up by a parent; refer to the daily attendance graph which indicates who is present or absent, etc.



Poll Other Classrooms or Family Members

Information gathered on a class opinion graph can be very useful in generating related graphs. Ask the class to predict whether the results for their graph would be the same for a graph of other people. Then ask neighboring classrooms to participate in gathering information for the same graph. The children could poll their family members and record the results on a separate graph. The class can then compare the results of the graphs.

Patterns sometimes develop when additional data is gathered. Sometimes the results show no apparent pattern. Encourage the class to discuss why there was or was not a pattern.

Writing about Graphing Experiences

Materials: chart paper; writing paper

The class can gather information about the graphs they experience. Ask the children, "Who can tell me something about this graph?" Record the class's responses on large chart paper. When it seems that the information is recorded ask, "Can you make predictions or draw any conclusions from the information gathered?" Record their responses. Display the chart where the children can review the information. Allow them to add to the list if they think of additional information about the graph.

Encourage the class to gather graph information, either in small group discussions, or individually. The children who are ready may want to record the information.

ADDITIONAL GRAPHING ACTIVITIES

Graphing Ideas

Mathematics Their Way

Real Graphs (Two Column)	pp.	146 - 147
Real Graphs (Four Column)	p.	150
Picture Graphs (Two Column)	pp.	148 -149
Picture Graphs (Four Column)	p.	151
Symbolic Graphs	pp.	152 - 154
Other Graphs	pp.	155 -157

Mathematics …a Way of Thinking

Representational Graphs	pp.	221 - 235

Counting

Summary Newsletter	p.	5.6

Homework

Summary Newsletter	pp.	2.9 - 2.10

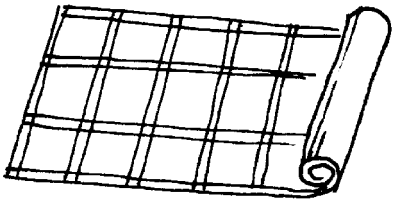
Integrating Mathematics into the Curriculum

Summary Newsletter

Opening Graphs	pp.	4.13 - 4.15
Pattern	p.	9.5

GRAPHING MATERIALS

It's helpful to have the following items available in the classroom for graphing experiences.



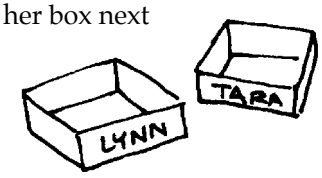
Graphing Plastic

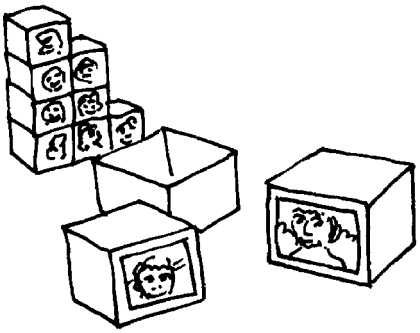
This graph usually has two to three columns on one side and five columns on the backside. A window shade (old or new) makes a nice floor graph. It's light and easy to store in the classroom. Some teachers have two sizes of graphing grids — a small grid that fits on the table top or bulletin board and a large floor grid (see MTW, p. 361).

Graphing Boxes

There are two types of milk carton graphing boxes.

The items being graphed can be placed inside the first type of box (see MTW, p. 363). The boxes can either be lined up into a graph or placed onto a floor graphing plastic. This technique can be used when there is a choice in snack. The child places his or her box next to the snack he or she choses. The children who are responsible for preparing the snack place the appropriate snack in the boxes.

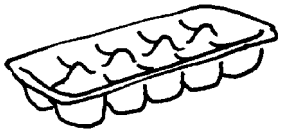


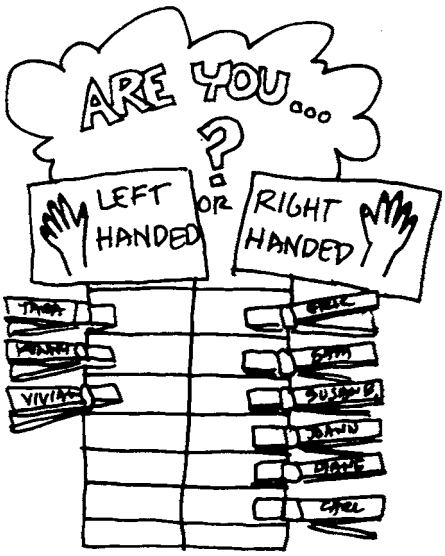


A photo of each child is placed on the second type of milk carton graphing box — usually a cut-off 1/2 gallon milk carton (see MTW, p. 362). When the children graph opinions, they can stack their box in the category they choose. They may construct a milk carton graph after they've created a real people graph.

Egg Carton Graphs

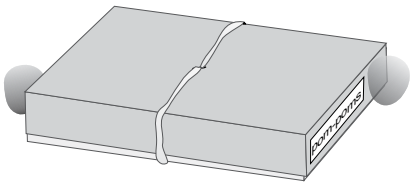
Egg cartons (see MTW, p. 361) are great for real and representational two-column graphs. Small real items (e.g., cookies) can be placed in egg cartons. Or the children could place an object (e.g., a wooden or Unifix cube) in the appropriate category to represent their choice.





Two-Column Chart

This chart is great for yes/no or either/or representational graphs. The grid is two columns. There should be enough spaces on each side for the number of children in the class. The children attach either a clothespin with their name written on it or a paper clip on the appropriate side.



Junk Boxes

Suggested boxes to use for junk boxes: It's helpful if all the junk boxes are the same size. Some teachers use old check boxes, pencil boxes that hold a gross of pencils, Wet Ones and Baby Wipe boxes. Ask parents to save boxes for your class. Junk boxes are also available through the Center for Innovation in Education.

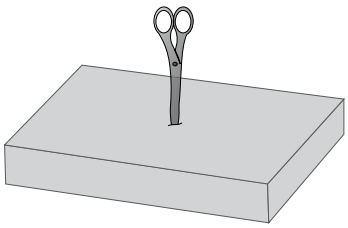
Directions to Assemble Junk Boxes

Materials: junk boxes; paper clips; rubber bands or round elastic sewing thread; filament tape; scissors

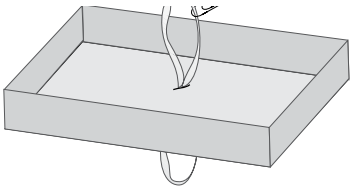
Fold the sides of the box's top and bottom along the pre-scored edges and tape the corners with filament tape. (The bottom of the junk box has wider flaps than the top of the box.)

Attach a rubber band or tie a length of round elastic sewing thread (from a dime store) into a circle and attach it to the box lid in the following manner:

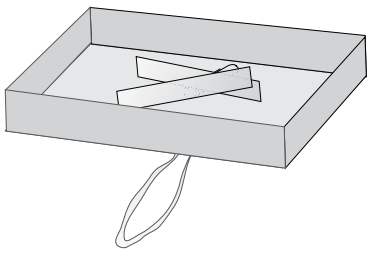
- Poke a small hole in the center of the lid using the point of your scissors
- Thread the elastic or rubber band onto the paper clip.



Using the paper clip as a needle, thread the needle and the end of the elastic or rubber band through the lid from the outside to the inside.



Tape the paper clip securely to the inside of the lid with filament tape. On the outside stretch the rubber band around the box. This will keep the lid firmly in place to prevent spills in the inevitable event that a box is dropped by a child.



Note: If you wish to cover your boxes with contact paper, it's best to make the boxes first, cover the lids with contact paper (covering the bottom is optional), and then punch a hole in the lid for the rubber band.