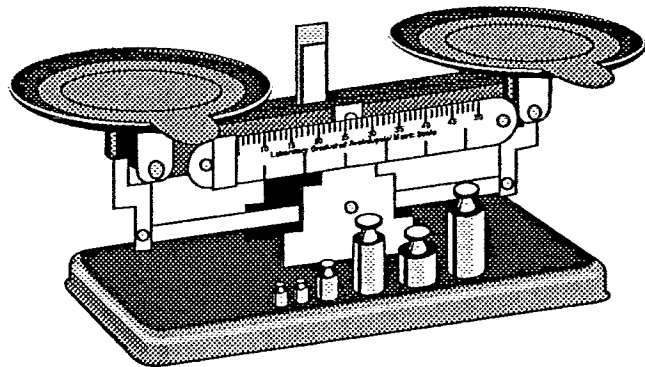
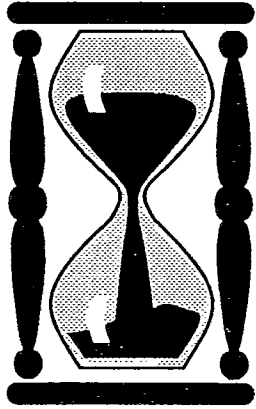
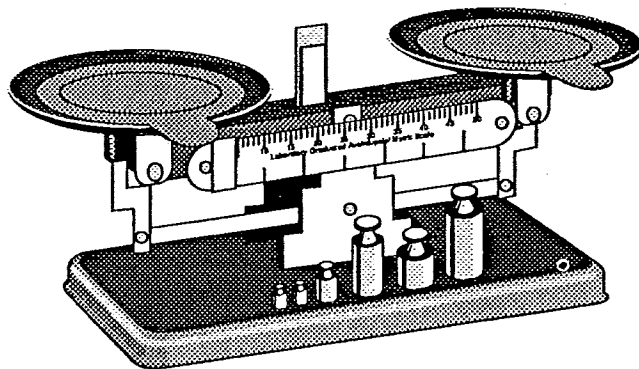


MEASUREMENT AND ESTIMATION





¡ESTIMA
LA MEDIDA!





WEIGHING IS "WAY IN"

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To develop an understanding of object weights by using terms *heavier than*, *lighter than*, and *about the same*.



ESTIMATED TIME:

Setting up: Time to gather materials
Doing activity: About 10–15 minutes for activity
Cleaning up: About 5–10 minutes, depending on the age group



AGE GROUPS:

K-3 4-6 7-8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

- ◇ 2 paper clips
- ◇ 11 dominos
- ◇ 1 penny
- ◇ 2 toothpicks
- ◇ 2 150-ml (2-oz.) plastic cups
- ◇ 2 8-inch (20 cm) pieces of string
- ◇ 2 activity sheets



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

For the bilingual child who is not familiar with the terminology and the pairing of the words *heavier than*, *lighter than*, and *about the same*, it is critical that teachers stress the use of these word pairings each time the object's weight is discussed. The Spanish (and English) equivalent should be used interchangeably, using a variety of other test objects. Students can make a list comparing objects they have at home.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◇ Activity is adaptable for students with hearing impairments.
- ◇ Students with visual impairments can feel the objects selected without picking up the objects.



BEFORE YOU BEGIN:

- ◇ Lay out test objects (paper clips, pennies, dominos, toothpicks) on a table.
- ◇ Cut pieces of string, 8 inches (20 cm) in length.
- ◇ If scale activity (*Weigh We Go*) will be done concurrently, allow additional time (10–15 minutes) and check materials list for that activity.
- ◇ Copy activity sheets.
- ◇ Make sure work areas are clear.
- ◇ Introduce weight activities by briefly discussing weight and how it is measured.



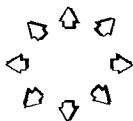
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ◇ What is your definition of weight?
- ◇ Why is it important to know the weight of objects?
- ◇ What ways did you use to find the weights of the objects?



CLEAN UP:

Collect all materials. For dominos, make sure to keep same colors together.



WHERE CAN I GO FROM HERE?

Family Math has a varied selection of activities (see Book List). In addition, *Math Power* presents activities for older children.



WHY IT'S IMPORTANT:

In our everyday lives, an understanding of weights helps us determine how we organize objects as we might in packing our suitcases (selecting items to include by both volume and weight) and deciding how much weight we can or should carry, as we do in packing and carrying our groceries. The fact is that an understanding of weight and how to use it as a tool assists many professionals in their work. For example, an engineer will assess the weight of tram cars in order to build the structures that support the tram as it travels throughout the city, and a doctor will examine a patient's weight to help determine the status of his/her health.



WEIGHING IS "WAY IN"

ACTIVITY SHEET

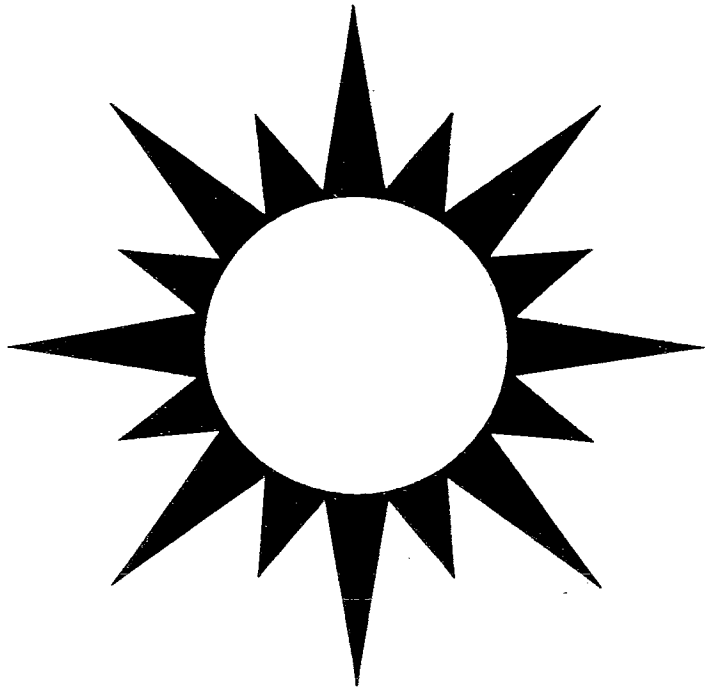
1. With your partner, select four objects to test. Divide the objects so that each of you has two objects (for example: a paper clip and a penny).
2. Without picking up your objects, which object do you think is heavier? Without talking, write down your answer.
3. Test your estimate. Pick up one object in one hand and another object in the other hand. Which object feels heavier? Were you or your partner right about the objects you thought were heavier?
4. Trade one of your objects with your partner. Write down which of those two objects is heavier. Discuss with your partner your estimates. Why were these objects heavier? What can you use to help you check each of the objects' "real" weight?
5. Discuss the following with your partner: If you were talking to a friend over the phone, what would you say to describe the weight of the objects?
6. Repeat #1– #3 with different objects. Compare objects you tested. Write down your answers on the back of the activity sheet.
Example:
A paper clip is *heavier than* string, and a toothpick is *lighter than* a penny.
7. Place the objects in order from lightest to heaviest. Are there objects that appear to weigh *about the same*?
8. Describe a situation where you would have to arrange objects as in #7. (Example: In packing a bag of groceries.)



¡COMO PESA!

HOJA DE ACTIVIDADES

1. Usted y su compañero tienen cuatro objetos para hacer la prueba. Divida los objetos de manera que cada uno de ustedes tenga dos objetos (por ejemplo: una presilla o clip y una moneda de un centavo).
2. Sin tocar los objetos. ¿cuál cree usted que es más pesado? Sin hacer comentarios, escriba su respuesta.
3. Pruebe su estimación. Agarre un objeto con una mano y otro objeto con la otra mano. ¿Cuál se siente más pesado? ¿Quién señaló correctamente los objetos más pesados usted o su compañero?
4. Intercambie uno de los objetos con su compañero. Escriba cuál objeto le parece más pesado entre los dos. Discuta su estimación con su compañero. ¿Por qué era ese objeto más pesado? ¿Qué puede utilizar para encontrar el peso de los objetos?
5. Discuta lo siguiente con su compañero: Si habla con un amigo por teléfono, ¿cómo le describiría el peso de los objetos?
6. Repita, del ejercicio #1 al #3, utilizando diferentes objetos. Compare los objetos que ha utilizado en la prueba. Escriba su respuesta en la parte de atrás de la hoja de actividades. (Por ejemplo: una presilla o clip es más pesada que una cinta o cordón; un palillo es menos pesado que un centavo).
7. Coloque los objetos en orden, comenzando con el más liviano y terminando con el más pesado. ¿Hay objetos que le parecen aproximadamente del mismo peso?
8. Describa una situación en la que tiene que colocar los objetos como en el ejercicio #7. (Por ejemplo: empaquetando.)





WEIGH WE GO

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To define *weight* and develop an understanding of how to measure weight by constructing a scale.



ESTIMATED TIME:

Setting up: About 5–10 minutes, depending on the activities
Doing activity: Introduction, about 5–10 minutes. Activity, about 5–10 minutes.
For younger students, do activity as a class
Cleaning up: About 5–10 minutes, depending on age group



APPROPRIATE AGE GROUPS:

K–3 4–6 7–8



DO ACTIVITY IN GROUPS OF: 2



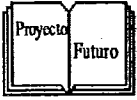
MATERIALS NEEDED (per group of 2 students):

- ◇ 2 100-ml (3-oz.) plastic cups
- ◇ 11 dominos
- ◇ 2 8-inch pieces of string
- ◇ 1 ruler
- ◇ 10 paper clips
- ◇ 1 clothes hanger
- ◇ 1 penny
- ◇ 10 toothpicks
- ◇ 2 activity sheets
- ◇ 4 paper cups



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

Make sure to explain what a *scale* is. Use the Spanish equivalent, *escala*, as you continue with the introduction. Have students explore how scales have been used throughout history.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◆ Activity is adaptable for students with hearing impairments.
- ◆ For students with visual impairments: For #3, the students should select an object and place it in the cups. At the same time, the students' hands can rest lightly in the middle of the scale to judge the balance level.



BEFORE YOU BEGIN:

- ◆ Lay out materials for scale: hangers, rulers, string, cups, and paper clips.
- ◆ Lay out test objects separately: dominos, pennies, paper clips, and toothpicks.
- ◆ Copy activity sheets.
- ◆ Make sure work areas are clear.



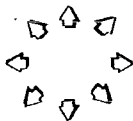
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

(See the questions throughout the Activity Sheet.)



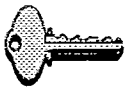
CLEAN UP:

- ◆ Collect rulers and cups.
- ◆ Collect dominos; make sure same colors remain together.
- ◆ Test objects should be returned to plastic bags.



WHERE CAN I GO FROM HERE?

Family Math and the NCTM publications, *Arithmetic Teacher* and *Mathematics Teacher*, all provide many activities and ideas for all age groups (see Book List).



WHY IT'S IMPORTANT:

(See *Weighing is "Way In."*)



HOW IT WORKS:

As the children construct a scale, the concept of balance will be discussed, that is, what will make the hanger even (balanced) is when both sides of the hanger hold equal weights. The sensitivity of the balance scale is highlighted as children begin to test their scale. Lighter objects will be harder to measure using their scale. In order to highlight differences, children can increase the number of objects (10 paper clips or 10 toothpicks).

4. Name two things you found important in constructing a scale. How could you improve your scale?

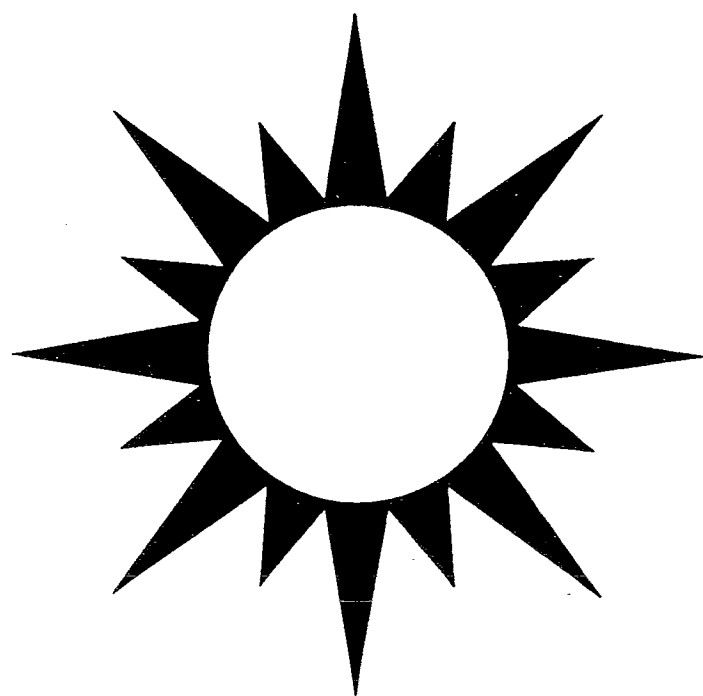
Challenge

5. Using your scale, measure the weight of a paper clip, and then of two paper clips. How did you measure the weight of each?

4. Nombre dos cosas que piensa son importantes para construir una balanza. ¿Cómo puede perfeccionar su balanza?

Reto

5. Utilizando su balanza encuentre el peso de una presilla, y después de dos presillas. ¿Cómo hizo para encontrar el peso de cada una?





CAPACITY AND VOLUME

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To develop an understanding of volume and volume relationships.



ESTIMATED TIME:

Setting up: Time to gather materials

Doing activity: Introduction, about 10 minutes; activity: About 10 minutes for each activity

Cleaning up: About 5–10 minutes, depending on the activities



APPROPRIATE AGE GROUPS:

 X K–3

 X 4–6

 X 7–8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

Capacity and Volume I

- ◇ 25 paper clips
- ◇ 11 dominos
- ◇ 25 pennies
- ◇ 1 2-oz. (50-ml) plastic cup
- ◇ 1 9-oz. (260-ml) cup
- ◇ 25 dried beans
- ◇ 2 activity sheets
- ◇ water (optional)

Capacity and Volume II

- ◇ 9 wooden cubes
- ◇ 2 activity sheets



SAFETY CONSIDERATIONS:

If water is used, be sure to keep paper towels ready.



ENRICHMENT FOR BILINGUAL STUDENTS:

Have children explore volume using different containers they bring from their homes. Discuss containers that are typically used in their culture and have them estimate the liquids that each holds.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ✧ Activity is adaptable for students with hearing impairments.
- ✧ Students with visual or motor impairments may need to work with nondisabled partners. Allow additional time to explore shapes of objects and containers.



BEFORE YOU BEGIN:

- ✧ Set out paper clips, pennies, cups, and beans for *Capacity and Volume I*, and/or wooden cubes for *Capacity and Volume II*.
- ✧ Copy activity sheets.
- ✧ Make sure work areas are clear.



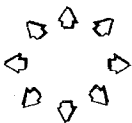
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ✧ Did the volume stay the same when you changed containers?
- ✧ Is the volume the same in the tower you built as in the row of cubes you assembled?



CLEAN UP:

- ✧ Collect paper clips and pennies and seal plastic bags of each.
- ✧ Collect and separate cups.
- ✧ Collect cubes.



WHERE CAN I GO FROM HERE?

Family Math provides additional activities. Other sources to check: *How to Teach Perimeter, Area, and Volume* by Vern Beaumont, Roberta Curtis, and James Smart (see Book List).



WHY IT'S IMPORTANT:

Experiences with volume, measuring with nonstandard units, and comparing and measuring with standard units are valuable to help develop an intuitive understanding of volume and skills in estimating and calculating volumes.



CAPACITY AND VOLUME I

ACTIVITY SHEET

1. Place 25 paper clips in the small cup. Have your partner carefully pour the paper clips into the larger cup. Is the volume of paper clips in the larger cup the same as it was in the smaller cup?

2. Slowly pour the paper clips back into the small cup. What happened?

3. Repeat #1 with 25 dried beans. Did the beans fill the small cup? Is the volume the same or different from the paper clips?

4. Place 25 pennies in the small cup. Did the pennies fill the cup? Is the volume of the pennies the same or different from the beans? Why?

5. Name two ways to describe volume.
 - a.
 - b.

Challenge

6. If you poured the pennies into the large cup, how full would the cup get? Estimate and write down your estimate by drawing the cup in the space below and marking a line to indicate how full the pennies would make the cup. Try it. Were you right?



CAPACITY AND VOLUME II

ACTIVITY SHEET

1. Using all the cubes you and your partner have (nine total), build a cubic structure. Count the number of blocks to record length, depth and height. Multiply the three numbers to discover the volume; that is, $\text{length} \times \text{depth} \times \text{height} = \text{volume}$.

Length =

Depth =

Height =

Volume =

2. Build a tower with four of the cubes. Have your partner lay out on the table the other five cubes in a straight line. Does the tower have the same number of cubes as are on the table in a straight line? What do you need to do in order to have the tower and the line be equal in cubes? Would the volume be the same? Knock down your tower and compare.

Challenge

3. Build a structure that is:

Length = 2 cubes

Depth = 2 cubes

Height = 2 cubes

What is the volume?



CAPACIDAD Y VOLUMEN I

HOJA DE ACTIVIDADES

1. Llene el vaso pequeño con presillas o clips. Pídale a su compañero que ponga cuidadosamente los clips dentro del vaso grande. El volumen de presillas o de clips, que ahora se encuentran en el vaso grande, ¿es el mismo? ¿Por qué?

2. Lentamente, coloque las presillas de nuevo en el vaso plástico. ¿Qué encontró?

3. Repita el ejercicio #1 con los frijoles. ¿Llenaron el vaso plástico? ¿Es el volumen el mismo?

4. Llene el vaso con centavos. ¿Está el vaso plástico lleno de centavos? Es el volumen el mismo o es diferente esta vez? ¿Por qué?

5. Describa dos características del volumen.
 - a.
 - b.

Reto

6. Si pone los centavos en el vaso grande, ¿hasta dónde llenarán el vaso? Haga una estimación y escríbala dibujando el vaso en el espacio más abajo y marcando una línea para señalar hasta donde cree que los centavos llenarán el vaso. Haga la prueba. ¿Acertó?



CAPACIDAD Y VOLUMEN II

HOJA DE ACTIVIDADES

1. Haga una estructura con todos los cubos, mientras su compañero mide el volumen contando el número de cubos en la figura. Lleve un registro del número de cubos que utilizan para construir el largo, la profundidad y la altura de la figura. Multiplique los tres números para encontrar el volumen. Es decir, $\text{largo} \times \text{profundidad} \times \text{altura} = \text{volumen}$.

Largo =
Profundidad =
Altura =
Volumen =

2. Usando la mitad de los cubos, haga un torre alta. A la misma vez, haga que su compañero coloque los otros cubos en una línea. ¿Tienen la torre y la línea el mismo número de cubos? ¿Qué necesita hacer para que sean iguales? Entonces, ¿Es igual el volumen? Compare los volúmenes poniendo los cubos de cada estructura en dos líneas.

Reto

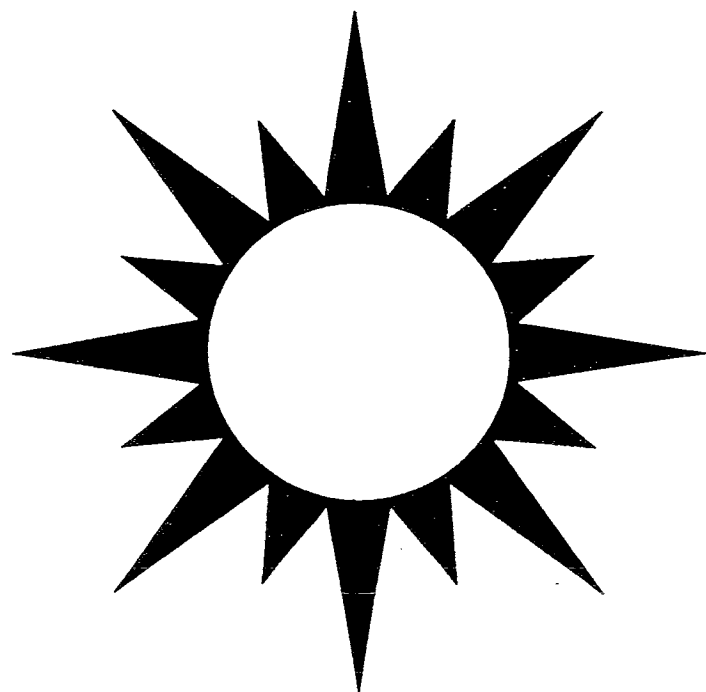
3. Construya una estructura con estas medidas:

Largo = 2 cubos

Profundidad = 2 cubos

Altura = 2 cubos

¿Cuál es el volumen de esta estructura?





TOOTHPICK AND DOMINO UNITS

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To develop an understanding of the meaning of measurement by using nonstandard units.



ESTIMATED TIME:

Setting up: Time to gather materials

Doing activity: Brief introduction, about 5–10 minutes. Activities, about 10 minutes for each

Cleaning up: About 10 minutes



APPROPRIATE AGE GROUPS:

 X K–3

 X 4–6

 7–8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

Toothpick units

- ◆ 15 toothpicks
- ◆ 11 dominos
- ◆ 2 activity sheets

Measuring with dominos

- ◆ 11 dominos
- ◆ 2 activity sheets



SAFETY CONSIDERATIONS:

Children should be careful with the sharp ends of the toothpicks.



ENRICHMENT FOR BILINGUAL STUDENTS:

As the Mayas, Incas, and Aztecs constructed buildings and bridges with their own standard units of measurement, ask children to build a structure such as a paper bridge using a nonstandard unit of measurement and explain what they used to measure length and height.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◆ Activity is adaptable for students with hearing impairments.
- ◆ Allow time for a student with visual impairments to familiarize himself/herself with the materials (toothpicks/dominos) and the surface area of the desk.
- ◆ Both students with visual impairments and those with mobility impairments may need to work with partners.



BEFORE YOU BEGIN:

- ◆ Copy activity sheets.
- ◆ Set out toothpicks and dominos.
- ◆ Make sure work areas are clear.



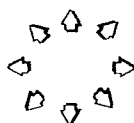
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ◆ What did you do in each of the activities to estimate?
- ◆ Was it harder to work with toothpicks or dominos? Why?



CLEAN UP:

- ◆ Make sure to collect all dominos and keep them separated by color.
- ◆ Throw away toothpicks that are damaged.



WHERE CAN I GO FROM HERE?

Family Math and *A Collection of Math Lessons* both contain a variety of measurement activities (see Book List).



WHY IT'S IMPORTANT:

Measurement is an abstract concept that children will need to use in everyday life and in a variety of professions. A scientist may use an eyedropper to help him/her estimate how many eyedroppers of water to put into a solution (unit of measure = eyedropper). A cook will estimate the number of bowls of soup that a full kettle will serve (unit of measure = bowl). When moving you will estimate how many books you can fit into a box (unit of measure = book width or height). While stacking towels or clothes on a shelf, you decide whether there is room for one more towel to fit (unit of measure = height of a folded towel).



LID RATIOS

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To develop an understanding of the concept of π , that is, the mathematical relationship between the circumference (perimeter) of a circle and its diameter (distance across).



ESTIMATED TIME:

Setting up:	Time to gather materials
Doing activity:	Introduction, about 15 minutes. Activity, about 15–20 minutes. Discussion, 10 minutes
Cleaning up:	About 5 minutes



APPROPRIATE AGE GROUPS:

___ K-3 X 4-6 X 7-8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

- ◇ 4 lids of different sizes
- ◇ 1 2-foot (60-cm) piece of string
- ◇ 1 tape measure
- ◇ ~~1 bottle of school glue~~
- ◇ 2 activity sheets
- ◇ 4 pieces of tape

* 1 Scissors



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

- ◇ Using reference books (see *Hispanic Culture: Past and Future*), students can explore how the Incas used the circle in construction. For example, circles were used in the architecture of El Caracol in Chichen Itza.
- ◇ Have children find the circumference of a tortilla and/or sombrero.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◇ Activity is adaptable for students with hearing impairments.
- ◇ Students with visual disabilities should work with nondisabled students. Mark measuring tape with fingernail polish or use string with knots to make hash marks. Allow student time to familiarize himself/herself with objects. Have student measure lids using marked tape. Have students use marked tape or string to compare measurements.



BEFORE YOU BEGIN:

- ◇ Set out string (cut into 2-foot or 60-cm sections).
- ◇ Set out glue, lids, and measuring tape.
- ◇ Copy activity sheets.
- ◇ Make sure work areas are clear.



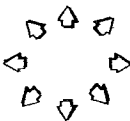
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

See questions in student activity sheet.



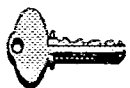
CLEAN UP:

- ◇ Collect tape measures and rubber band together.
- ◇ Collect string and tie together.
- ◇ Collect bottles of glue; be sure tops are shut tight.
- ◇ Collect lids.



WHERE CAN I GO FROM HERE?

Besides *Family Math*, there are two NCTM publications—*The Arithmetic Teacher* and *Mathematics Teacher*—that are good resources.



WHY IT'S IMPORTANT:

Circumference is an important concept in measurement; consequently, children need opportunities to explore it in a variety of ways. Hispanic heritage, clothes, and buildings provide opportunities for children to see how this measurement has been and is applied in everyday life. Architects and civil engineers must apply this principle in



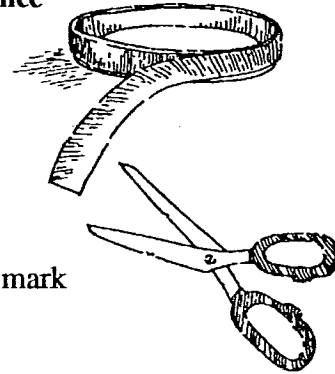
LID RATIOS

ACTIVITY SHEET

You will need:

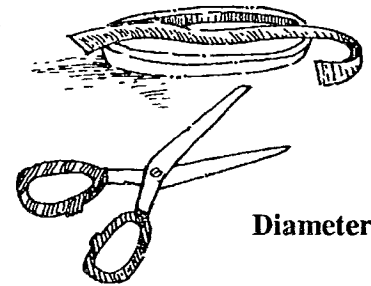
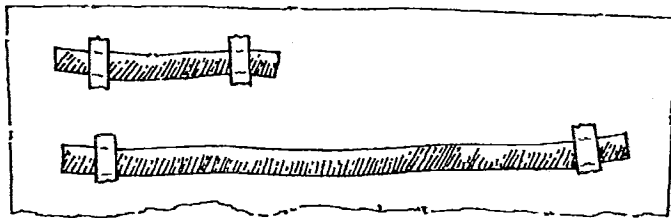
- ◇ 4 circular lids
- ◇ ribbon, yarn, or string
- ◇ scissors
- ◇ pen or pencil
- ◇ measuring tape
- ◇ 4 pieces of tape

Circumference



1. Choose a lid to measure. Measure the circumference of a lid with a string (if you use yarn, don't stretch it tight). With your pen make a mark on the string to show your measurement.

2. With another piece of string, measure the diameter. Mark this on the string with your pen. Tape both strings on the piece of paper next to each other (don't stretch the yarn). What did you find?



Diameter

3. Repeat #1 and #2 using different lids and a new piece of string. Tape the strings next to each other. What did you find?
4. Study the circumference and diameter strings for the lids you measured.
 - a. About how many times longer is the circumference ribbon than the diameter ribbon?
 - b. How many diameter ribbons would fit along the circumference ribbon?

Challenge

5. Review each formula for calculating the circumference:

$$\text{Circumference} = \pi \times \text{diameter}$$

$$C = \pi d$$

or

or

$$\text{Circumference} = 2 \times \pi \times \text{radius}$$

$$C = 2\pi r$$

Note: the *pi* ratio of about 3.1416 is the same for every circle.

6. Using the measuring tape, measure the length of the circumference and diameter of each of the lids your group chose. Using the formula above, calculate and compare with your measurements.



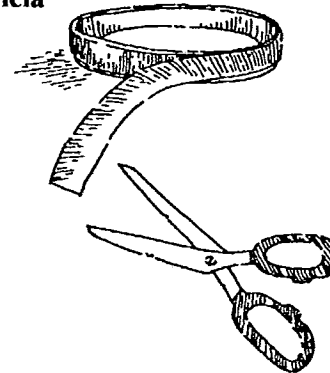
RADIO DE LAS TAPAS

HOJA DE ACTIVIDADES

Se necesita:

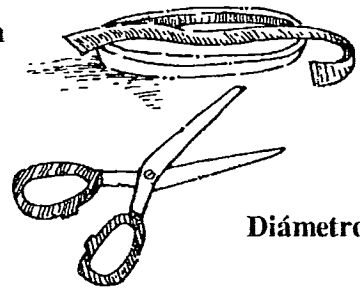
- ◆ 4 tapas circulares de diferentes tamaños
- ◆ cinta o cordón
- ◆ tijeras
- ◆ pluma o lápiz
- ◆ cinta de medir
- ◆ 4 piezas de cinta adhesiva

Circunferencia

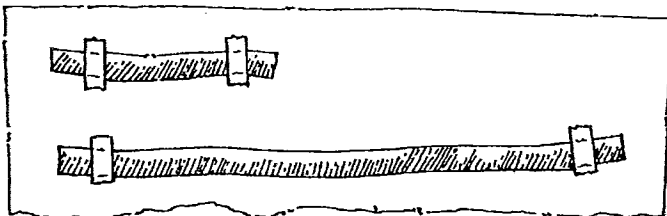


1. Escoja una tapa para medir. Con una cinta o un cordón mida la circunferencia de una tapa. Marque su medida con una pluma.

2. Con otra cinta o cordón mida el diámetro. Marque su medida con una pluma. Pegue la cinta con que midió la circunferencia y el diámetro en una hoja grande de papel. ¿Qué encontró?



Diámetro



3. Repita los ejercicios #1 y #2 con otras tapas. Pegue estas cintas en su hoja. ¿Qué encontró?

4. Estudie las cintas que tienen la medida de la circunferencia y el diámetro de las tapas.

- a. ¿Cuántas veces es más grande la cinta que mide la circunferencia, de la cinta que mide el diámetro?
- b. ¿Cuántas medidas del diámetro caben en la medida de la circunferencia?

RETO

Estudie la fórmula para calcular la circunferencia.

$$\text{Circunferencia} = \pi \times \text{diámetro} \qquad C = \pi d$$

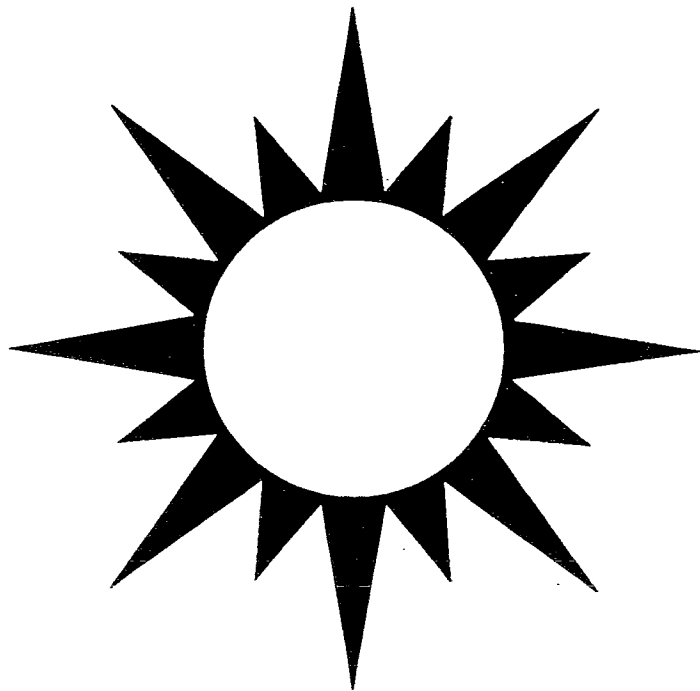
ó

ó

$$\text{Circunferencia} = 2 \times \pi \times \text{radio} \qquad C = 2\pi r$$

Nota: El radio representado por π (*pi*), es aproximadamente 3.1416, y es el mismo para cada círculo.

6. Con la cinta de medir, mida el largo de las cintas de la circunferencia y del diámetro de cada tapa.





FINDING YOUR WAY

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To explore ideas about maps, distance, measurement, and estimation.



ESTIMATED TIME:

Setting up:	Time to gather materials
Doing activity:	Introduction, about 10 minutes for each activity Activity, about 10–15 minutes. Discussion, 10 minutes
Cleaning up:	About 5 minutes



APPROPRIATE AGE GROUPS:

 K–3 X 4–6 X 7–8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

Finding Your Way I

- ◆ 2 sheets of graph paper
- ◆ 1 ruler
- ◆ 2 activity sheets

Finding Your Way II

- ◆ 1 map section from city or state street maps. (Note: These are often available for free from state boards of tourism or city chambers of commerce.)
- ◆ 1 ruler
- ◆ 2 activity sheets



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

For older children locate the hometowns of contemporary Hispanic role models. Using a U.S. map, ask children to construct a map that shows how to travel to each role model's home. They should show states they would travel through, main roads, and landmarks and cities they would use to get to the town where a role model lives. For Hispanic role models in science, mathematics, and engineering, see the *Introduction* for ordering information on the AAAS book, *Stepping Into the Future*.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ✧ Activity is adaptable for students with hearing impairments. Students with mobility impairments may need to work with partners.
- ✧ Students with visual impairments can construct a three-dimensional map using "rip and tear" construction with cardboard or poster board. For the second activity, prepare a three-dimensional road map by gluing split peas to cities and yarn to major roads. Students should work with partners. Glue beans to highlight towns/cities. Glue string to highlight roads.



BEFORE YOU BEGIN:

- ✧ Set out map sections and graph paper.
- ✧ Copy activity sheets.
- ✧ Make sure work areas are clear.



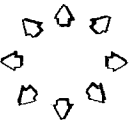
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ✧ What symbols are important on maps? Why?
- ✧ What things did you consider in choosing a route?
- ✧ What was critical in writing out directions?



CLEAN UP:

Collect and store materials.



WHERE CAN I GO FROM HERE?

Try some of the *Challenge of the Unknown* activities. *Math Power* concentrates on problem solving for middle school students. See the Book List for information on both books.



FINDING YOUR WAY I

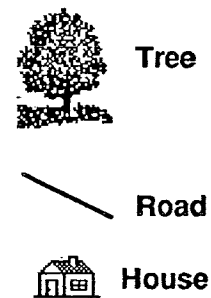
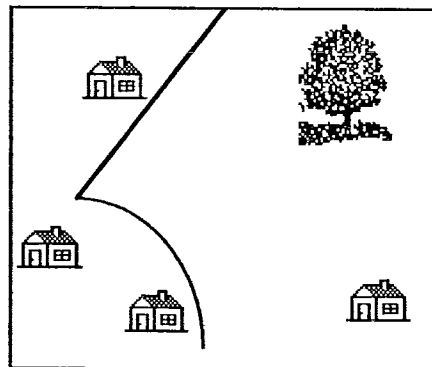
ACTIVITY SHEET

Making a map

1. Choose an area in your classroom for making a map, for example, the reading corner or a closet. A rectangular space is easier to draw and to measure.
2. Start by measuring the length and width of the space to be mapped. If it is a large space, this could be done using the "pacing" method. Find out how long your "pace" is, then count the number of steps it takes you to walk across the space.
3. Now take a sheet of graph paper and decide how the map will fit on the paper.
 - a. How many **squares** long is the graph paper?
How many **feet** long is the space?
 - b. How many feet should go with each graph paper square?
Remember, you want to use most of the paper, but leave some room around the edges.
Try one or two other values; decide which one is best.
4. Do the same thing for the width of the space. Finish drawing the rectangle on the graph paper, outlining the space to be mapped.
5. Identify the objects on the map such as tables and doors. What symbols will you use to show these things on your map?

Example:

Neighborhood Map



6. Make measurements, then place the symbols on your map. Make sure the symbols are located accurately on the map. For example, an object is a certain number of feet east, and a certain number of feet north of a corner; therefore, it should be a certain number of squares east and north of a corner on the map.



FINDING YOUR WAY II

ACTIVITY SHEET

1. With your partner, study your section of road map.
2. What things are missing from your map? What should you add in order to read the map easily? How are roads different? Are distances marked? How?
3. Pick two major cities or towns. What route would you choose to go from one city to the other?
4. List two things you considered in choosing your route.
 - a.
 - b.
5. Write out, step by step, directions to show how to get to the city or town you selected.
6. What's the distance between the two cities or towns on the route that you took? Will you be able to answer this if your map does not have a scale?
7. Without telling them the destination, give your directions and map to another group. Tell them what city to start from and see if they can follow your directions to reach the correct city. Can you follow their directions for their map?

Challenge

8. Draw a map of your neighborhood on your graph paper.

What things will you need to consider? (List four things.)

a.

b.

c.

d.



DONDE ESTA EL CAMINO I

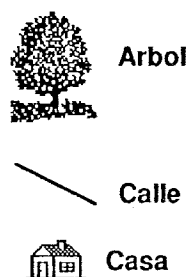
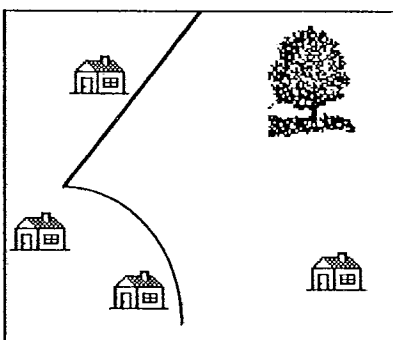
HOJA DE ACTIVIDADES

Cómo elaborar un mapa

1. Escoja un área en su clase para elaborar un mapa. Puede ser un armario/gabinete ó una zona de la clase. Un espacio de forma rectangular sería conveniente.
2. Comience por medir el largo y el ancho del espacio del cual va a hacer el mapa. Si el espacio es grande, puede medirlo contando el número de pasos.
3. Ahora, tome la hoja de papel gráfico y vea como puede representar el mapa en el papel.
 - a. ¿Cuántos **cuadrados** de largo tiene el papel de gráfico?
¿Cuántos **pasos** de largo tiene el espacio?
 - b. ¿Cuántos **pies** deben ir en cada cuadrado de papel gráfico?
(Recuerde: usted debe utilizar casi todo el papel, pero deje cierto espacio alrededor de los bordes). Pruebe con uno o dos valores diferentes, escoja el mejor.
4. Haga lo mismo con el ancho del espacio. Termine de dibujar un rectángulo sobre el papel gráfico, señalando el espacio del que va a hacer un mapa.
5. Ahora, identifique los objetos en su mapa (por ejemplo, mesas, puertas). ¿Qué símbolos va a usar para mostrar estas cosas en el mapa?

Ejemplo:

El mapa de la
vecindad



6. Por último, tome las medidas y luego coloque los símbolos de manera correcta sobre el mapa.
(Por ejemplo, un objeto se encuentra a cierto número de pies al este, y a cierto número de pies al norte de una esquina.)



DONDE ESTA EL CAMINO II

HOJA DE ACTIVIDADES

1. Con su compañero, estudie el mapa.

2. ¿Qué cosas se necesitan para leer el mapa?
¿Qué falta en su mapa? ¿Están marcadas las distancias? ¿Cómo?

3. Escoja dos ciudades. ¿Qué ruta tomaría para ir de una ciudad a la otra?

4. Escriba dos cosas que consideró cuando escogió su ruta.
 - a.
 - b.

5. Escriba exactamente cada paso que tiene que tomar para que un amigo pueda ir de una ciudad a otra.

6. ¿Qué distancia hay entre las dos ciudades que seleccionó? ¿Puede contestar esta pregunta si no tiene una escala?

Reto

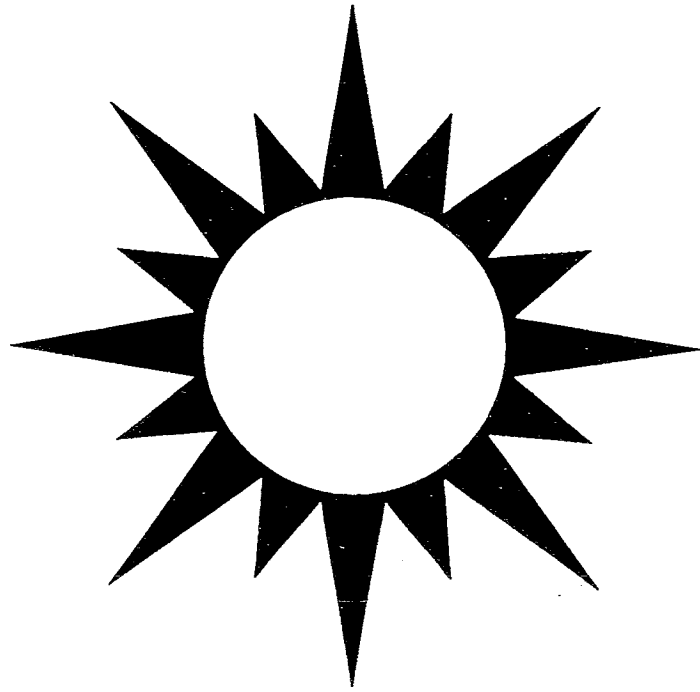
7. Dibuje un mapa usando el papel gráfico. ¿Qué cosas tendrá que considerar para poder dibujar el mapa?

a.

b.

c.

d.





PROBLEM SOLVING WITH GEOBOARDS

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To create two-dimensional geometric figures and find their area; to use geometric properties and terminology to solve logic problems.



ESTIMATED TIME:

Setting up: Time to gather materials
Doing activity: Introduction to Geoboards, about 5–10 minutes. Activity, about 10–15 minutes, depending on age. Discussion, 10 minutes
Cleaning up: About 5 minutes



APPROPRIATE AGE GROUPS:

___ K-3 X 4-6 X 7-8



DO ACTIVITY IN GROUPS OF: 2



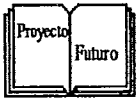
MATERIALS NEEDED (per group of 2 students):

- ◆ 1 geoboard (see *Supplies and Suppliers* for ordering information)
- ◆ 14 rubber bands, combination of medium, large, and small (preferably of mixed colors)
- ◆ 2 activity sheets



SAFETY CONSIDERATIONS:

Geoboards are solid and are built with safety features in mind. However, if boards are dropped or stored incorrectly, pegs can become bent or loose. Make sure to check geoboards before using.



ENRICHMENT FOR BILINGUAL STUDENTS:

- ◇ Stress vocabulary—*area* and *perimeter* in English and Spanish—as students do the activity.
- ◇ Have children use rubber bands to construct a model of the ruin at Monte Alban Building J and find its area. Children can construct other ruins with rubber bands on the geoboard and find their area (see *Hispanic Culture: Past and Future* for references).



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◇ Activity is adaptable for students with hearing impairments.
- ◇ Working with a nondisabled student, the student with a visual disability should not have any difficulty. Time should be allowed to become familiar with the geoboard. Once the student becomes familiar with the shapes that can be built on the geoboard, he/she can take part in creating the shapes and finding area and perimeter. Instruct his/her partner to describe the drawing of the figure and allow the student with the visual impairment to create the structure on the geoboard.
- ◇ Students with mobility impairments may need to work with partners.



BEFORE YOU BEGIN:

- ◇ Unpack geoboards. (Set styrofoam backings aside.)
- ◇ Set out rubber bands. (Open boxes and separate large from small.)
- ◇ Copy activity sheets.
- ◇ Make sure work areas are clear.



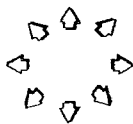
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ◇ What did you do in order to get the area of irregular or odd figures?
- ◇ What is similar between separating the rectangle diagonally and separating the rectangle by inserting a triangle in the middle?



CLEAN UP:

- ◇ Repack geoboards with styrofoam.
- ◇ Have students collect rubber bands, keeping small bands separated from large ones.



WHERE CAN I GO FROM HERE?

The activities presented in this section were taken from the *Arithmetic Teacher*, a valuable resource for all types of mathematics activities. Other resources are the *Mathematics Teacher* and the *Challenge of the Unknown: Community Leader's Guide* (see Book List for references).



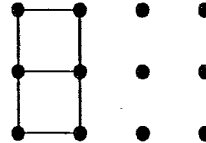
PROBLEM SOLVING WITH GEOBOARDS I

ACTIVITY SHEET

1. Stretch a rubber band on the geoboard pegs to produce a shape composed of eight squares. What is the area? Note: Each square should join together, at least on one side, with another square.

Example:

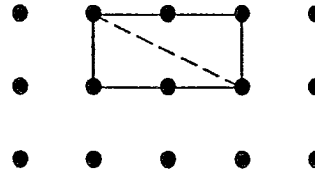
Squares with one side joining together



2. Stretch a rubber band to produce a rectangle with an area of six square units. Stretch and anchor a second rubber band (use a different color if you have one) diagonally to form two triangles.

Example:

A rectangle with an area of two square units and divided to form two triangles

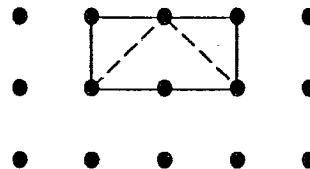


- What is the area of the rectangle?
- What does the rubber band diagonally stretched do to the rectangle?
- What is the area of the triangle?

3. Remove the diagonal rubber band and stretch your rubber band to form an eight square unit rectangle. Stretch a second rubber band (another color) to form a triangle in the middle of the rectangle.

Example:

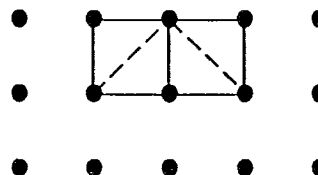
A rectangle with an area of two square units and with a triangle in the middle



4. Divide the rectangle and triangle down the middle with a third rubber band (another color) to form two squares.

Example:

- What is the area of each square?
- What is the area of the middle triangle?
(Clue: see #2.)
- What is the area of the other triangles?



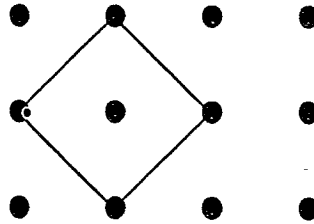
Challenge

Use your geoboard. Find the perimeter and area of the following figures.

area of 1 unit = 1 square inch

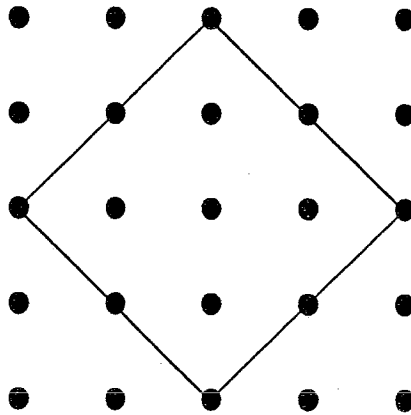
Perimeter = _____ inches

Area = _____ square inches



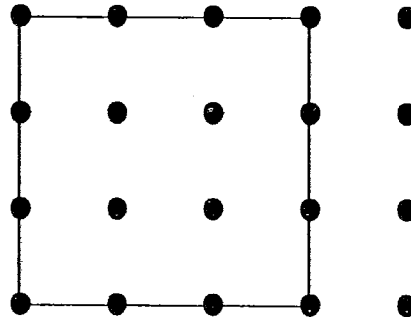
Perimeter = _____ inches

Area = _____ square inches



Perimeter = _____ inches

Area = _____ square inches

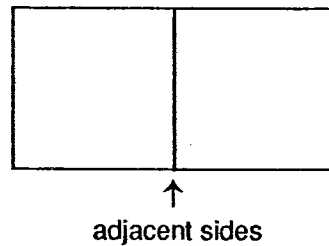
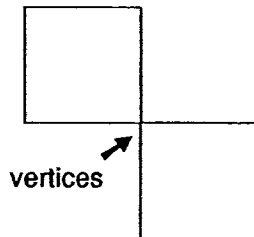




PROBLEM SOLVING WITH GEOBOARDS II

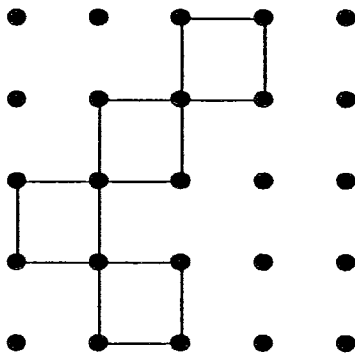
ACTIVITY SHEET

1. Stretch a rubber band to produce a figure with area of 10 square units. Rule: Your figure should have only whole squares and the squares must be connected by adjacent sides or vertices as shown.

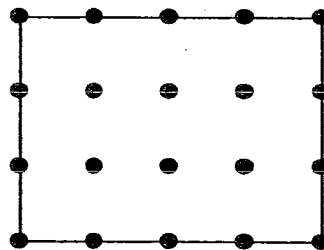


- a. What is the area of the figure? What is its perimeter?
- b. Try to produce a different figure with the same area. Is the perimeter the same? Count the units to see.

2. Construct the following figures on the geoboard. Be sure to give the area of each.



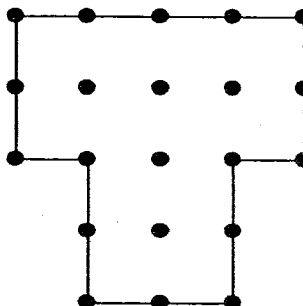
Area = _____



Area = _____



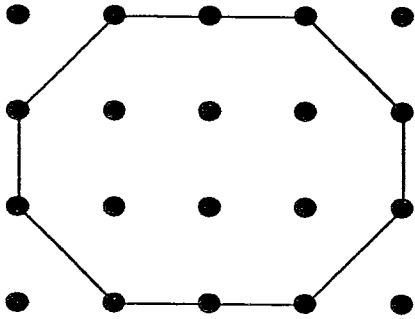
Area = _____



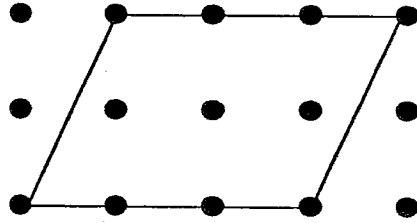
Area = _____

Challenge

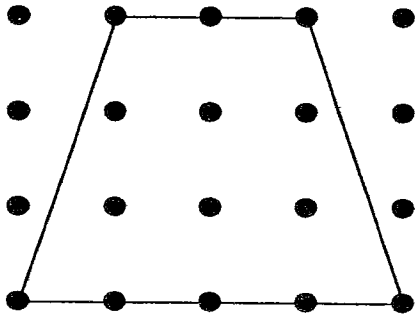
3. Construct the following figures using your geoboard and figure out the area.



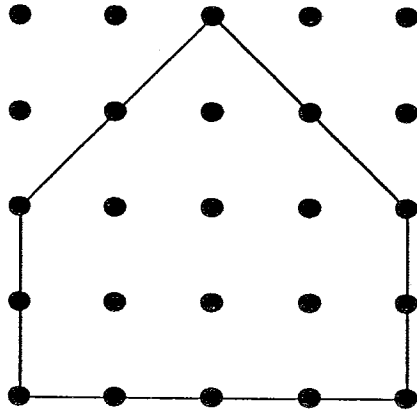
Area = _____



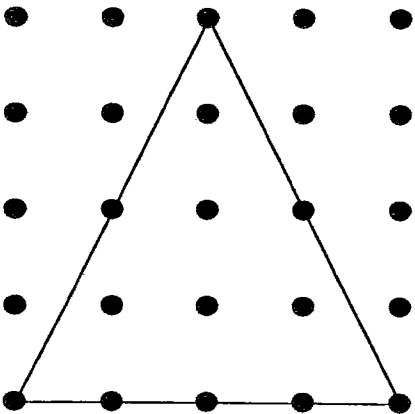
Area = _____



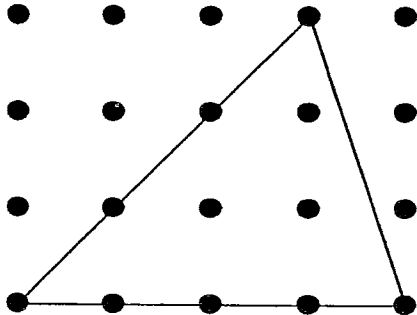
Area = _____



Area = _____



Area = _____



Area = _____



COMO SOLUCIONAR PROBLEMAS CON GEOBOARDS I

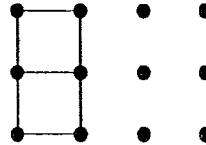
HOJA DE ACTIVIDADES

1. Estire un elástico sobre el geoboard, de manera que cree una figura que tenga ocho cuadrados, cada cuadrado unido, al menos por un lado, con otro cuadrado.

¿Cuál es el área?

Ejemplo:

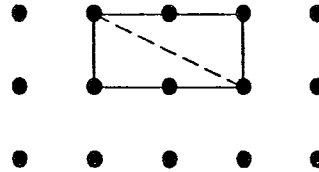
Cuadrados con lados conectados



2. Estire un elástico de manera que construya un rectángulo con un área de seis unidades cuadradas. Estire y ajuste otro elástico de diferente color en dirección diagonal, de manera que forme dos triángulos.

Ejemplo:

Rectángulo con un área de dos unidades cuadradas, dividida para formar dos triángulos

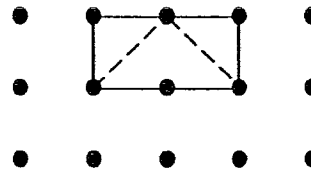


- a. ¿Cuál es el área del rectángulo?
- b. ¿Qué forma la diagonal del rectángulo?
- c. ¿Cuál es el área del triángulo?

3. Quite el elástico diagonal y estire los elásticos de manera que construya un rectángulo con 8 unidades cuadradas. Estire otro elástico, de otro color, para formar un triángulo en el medio del rectángulo.

Ejemplo:

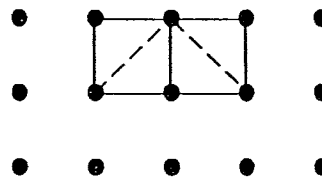
Rectángulo con un área de dos unidades cuadradas y con un triángulo



4. Divida el rectángulo y el triángulo por el medio con un tercer elástico, de diferente color, de manera que forme dos cuadrados.

Ejemplo:

- a. ¿Cuál es el área de cada cuadrado?
- b. ¿Cuál es el área del triángulo?
(Ayuda: vea el ejercicio #2.)



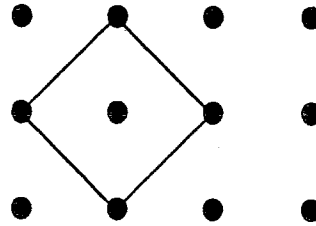
Reto

¿Cuál es el área y el perímetro de las siguientes figuras?

el área de una figura de cuatro puntos = una pulgada cuadrada

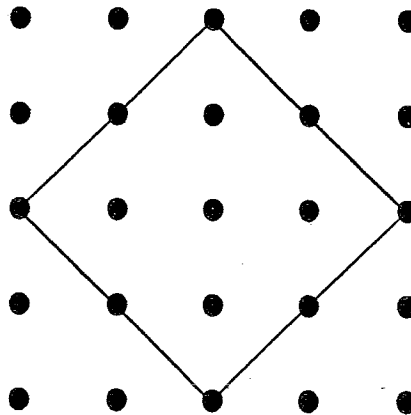
el perímetro = _____ pulgadas

el área = _____ pulgadas cuadradas



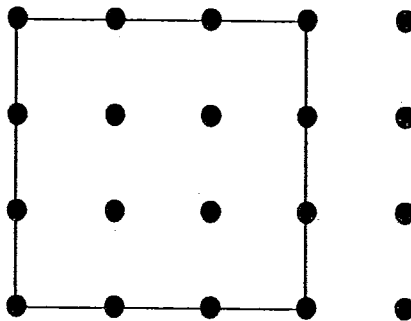
el perímetro = _____ pulgadas

el área = _____ pulgadas cuadradas



el perímetro = _____ pulgadas

el área = _____ pulgadas cuadradas

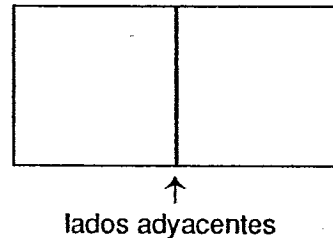
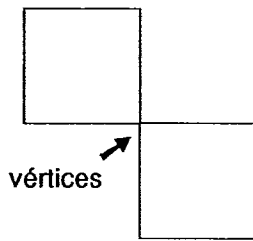




COMO SOLUCIONAR PROBLEMAS CON GEOBOARDS II

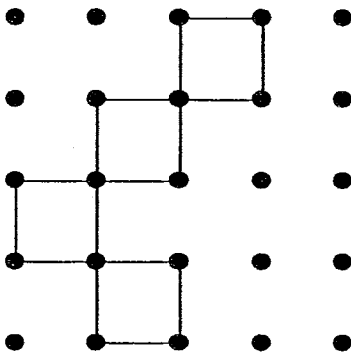
HOJA DE ACTIVIDADES

1. Estire un elástico de manera que forme una figura con un área de 10 unidades cuadradas. Nota: la figura que haga debe tener solo cuadrados completos y los cuadrados deben conectarse por los lados adyacentes o vértices, como se muestra en el dibujo.

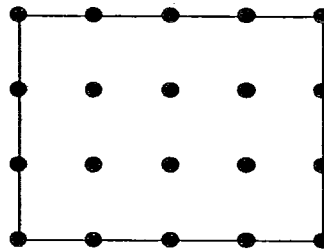


- a. ¿Cuál es el área de la figura? ¿Cuál es el perímetro?
- b. Construya una figura diferente con la misma área.
¿Tiene el mismo perímetro?

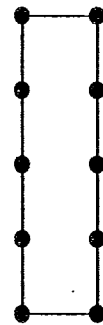
2. Construya las siguientes figuras en el geoboard. Asegúrese de decir el área que corresponde a cada una.



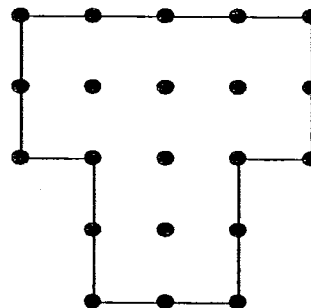
área = _____



área = _____



área = _____

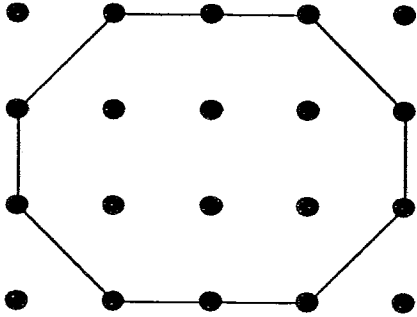


área = _____

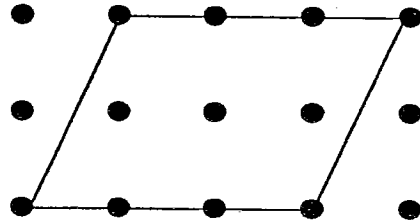
13-24

Reto

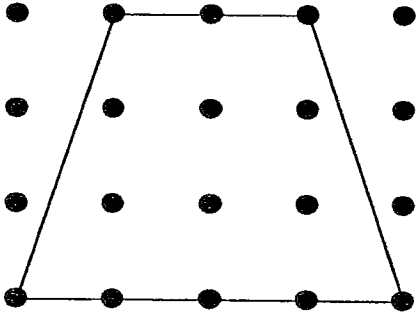
3. Construya las siguientes figuras en el geoboard y encuentre el área.



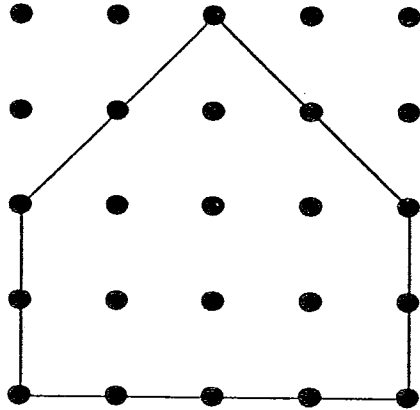
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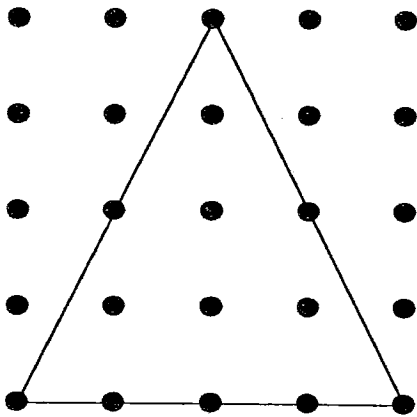
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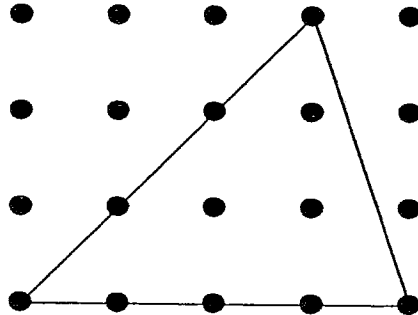
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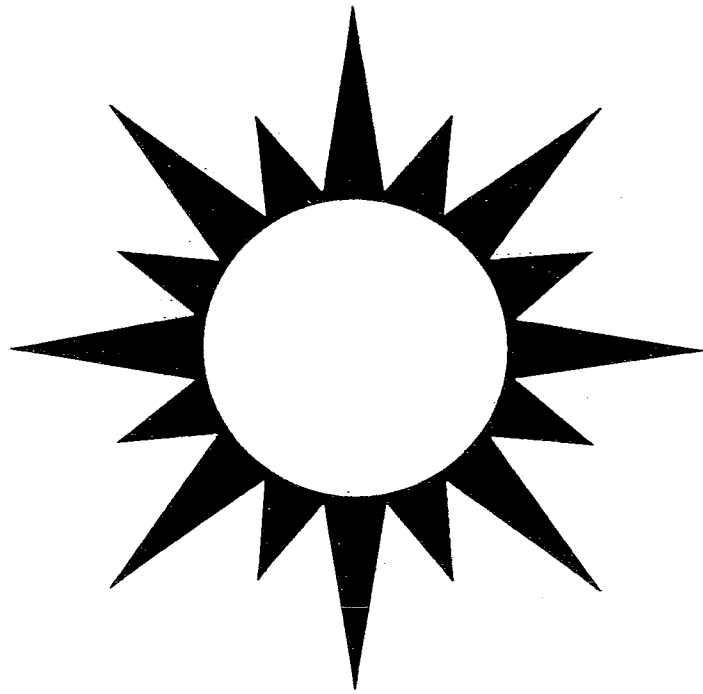
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ACTIVITIES WITH AREA

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To provide experiences in finding the surface area of many two-dimensional objects using a variety of units.



ESTIMATED TIME:

Setting up: Time to gather materials
Doing activity: Introduction, about 10–15 minutes with younger children.
Activity, about 20 minutes, depending on age. Discussion, 10 minutes
Cleaning up: About 5 minutes



APPROPRIATE AGE GROUPS:

K-3 4-6 7-8



DO ACTIVITY IN GROUPS OF: 2



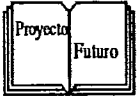
MATERIALS NEEDED (per group of 2 students)

- ◇ 2 sheets of each kind of graph paper
 - ½ inch
 - 1 inch
 - 1 centimeter
- ◇ 2 tangram sets (see *Supplies and Suppliers* for ordering information)
- ◇ 2 activity sheets



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

See *Problem Solving with Geoboards*, "Enrichment For Bilingual Students."



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◇ Activity is adaptable for students with hearing impairments.
- ◇ Students with visual impairments should work with nondisabled students. Use a geoboard and rubber bands to create figures and find the area.



BEFORE YOU BEGIN:

- ◇ Make sure you have extra copies of each graph paper.
- ◇ Set out tangrams in color piles.
- ◇ Copy activity sheets.
- ◇ Make sure work areas are clear.



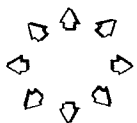
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ◇ What do you do to figure out area?
- ◇ How do you figure the area of an irregular or odd-shaped figure?



CLEAN UP:

- ◇ Collect extra graph paper.
- ◇ Have students count tangram pieces (seven pieces per set) before pouches are sealed; be sure to store same colors together.



WHERE CAN I GO FROM HERE?

There are a number of sources to use for further activities on area: *Family Math*, *Arithmetic Teacher*, *How to Teach Perimeter, Area and Volume*, and *Math Power* (see Book List for references).



WHY IT'S IMPORTANT:

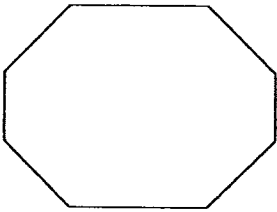
Understanding area allows mathematicians, engineers, and designers to calculate and plan in their work. In our everyday lives, we use estimates of area to help us utilize space efficiently or to help us decide on a house or furniture to purchase.



ACTIVITIES WITH AREA

ACTIVITY SHEET

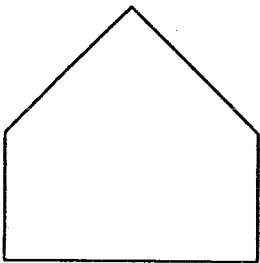
1. Take turns tracing your tangram pieces on $\frac{1}{2}$ -inch, 1-centimeter, and 1-inch graph paper. Are there differences in the area of each shape? Why?
2. Draw each shape on your 1-inch graph paper and find the area. Record the area next to the shapes below.



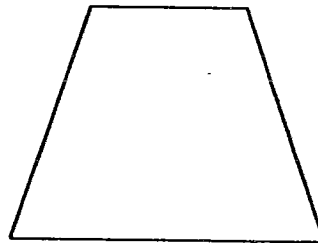
Area = _____



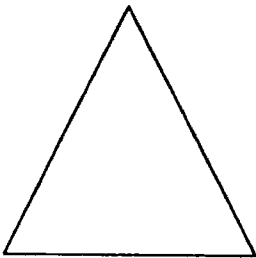
Area = _____



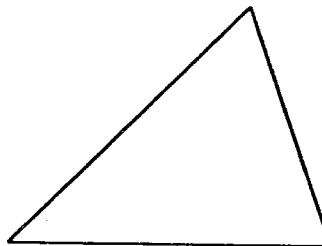
Area = _____



Area = _____



Area = _____



Area = _____

Challenge

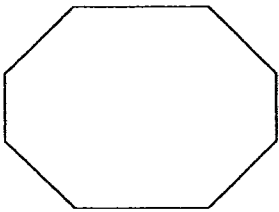
3. Estimate the area of this sheet of paper. Figure the area and test your estimation. What can you do to find the area quickly?



ACTIVIDADES CON EL AREA

HOJA DE ACTIVIDADES

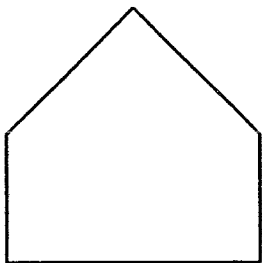
1. Coloque las piezas del tangrama sobre un papel gráfico de $\frac{1}{2}$ pulgada, 1 centímetro y también de una pulgada. Se observan diferencias en el área de cada figura? ¿Por qué?
2. Señale el área de cada figura y escríbala al lado de la figura en el papel gráfico de una pulgada.



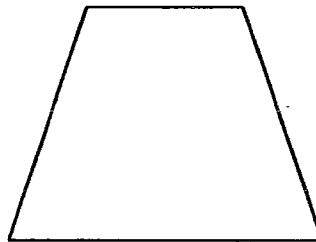
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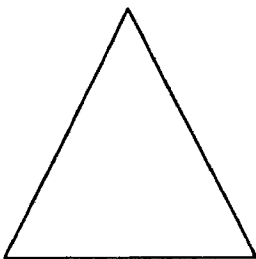
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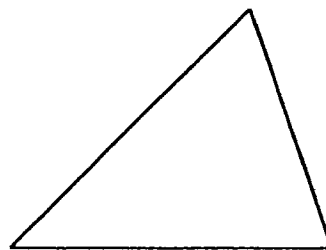
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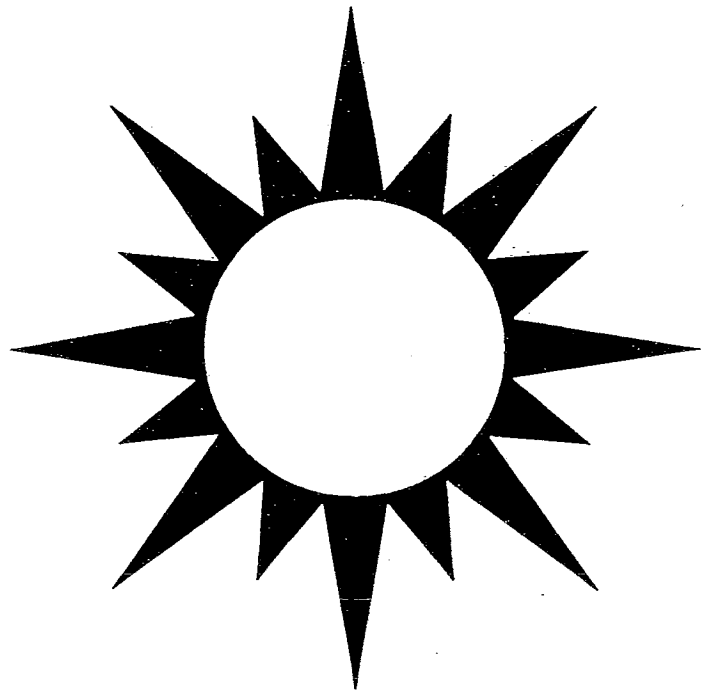
área = _____



área = _____

Reto

3. Haga una estimación del área de este papel. Pruebe su estimación. ¿Cómo se puede estimar el área de este papel rápidamente?





TANGRAMS

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To develop an understanding of spatial relationships using triangles, squares, and parallelograms.



ESTIMATED TIME:

Setting up: About 5 minutes
Doing activity: Introduction to tangrams, 5 minutes. Activity, about 5 minutes, longer for younger children. Discussion, 5 minutes
Cleaning up: About 5–10 minutes, depending on the activity and age group



APPROPRIATE AGE GROUPS:

K-3 4-6 7-8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

- ◆ 1 tangram set (7 pieces) (For younger children, 2 sets)
- ◆ 1 exploration chart
- ◆ 2 activity sheets



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

- ✧ Although the word *tangram* will be as unfamiliar to a bilingual child as to an English-speaking child, the ESL child may think he or she is the one not familiar with the word. It's important to emphasize that is not the case. All children will find the word *tangram* different, but the activity will be like working on puzzles.
- ✧ Discuss how fitting different figures together to form patterns is a large part of Spanish architecture. Explain that Mayans, Aztecs, and Incas displayed these types of reconfigurations in their building.



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ✧ Activity is adaptable for students with hearing impairments.
- ✧ For the student who is vision impaired: Allow time for the student to become familiar with tangram pieces. Students with sight impairment can work with nondisabled students.



BEFORE YOU BEGIN:

- ✧ Copy activity sheets.
- ✧ Take out tangrams. Make sure to keep tangram sets of the same color together.
- ✧ Distribute or have students pass out tangram sets alternating colors in each group.
- ✧ Have books (see background section for book references) on hand that demonstrate Maya, Aztec, and Inca construction.



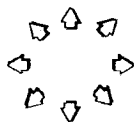
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ✧ What did you discover about triangles?
- ✧ What process did you use to figure out the shapes?
- ✧ How is a parallelogram different from a trapezoid (refer to tangram exploration chart)?



CLEAN UP:

Students should count tangram pieces (7 per set) and return same color pieces to pouches. Make sure pouches are sealed.



WHERE CAN I GO FROM HERE?

For younger children, *Family Math* and *A Collection of Math Lessons* offer other activities. Similarly, for middle school children, *Math Power* (see reference) is a good resource. See the Book List for references.



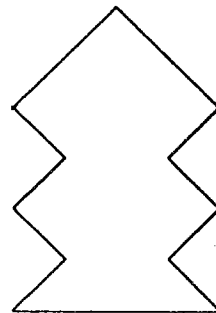
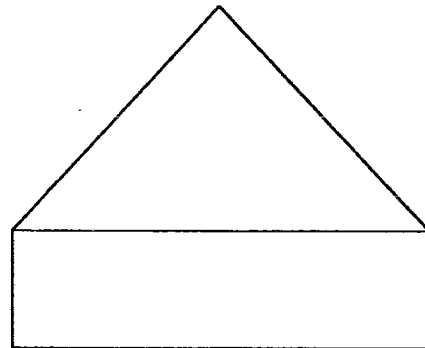
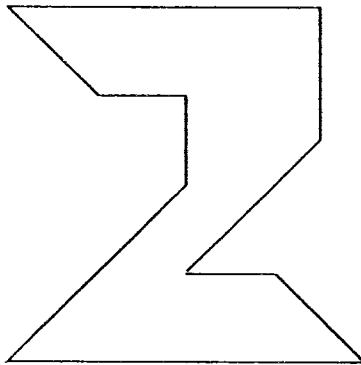
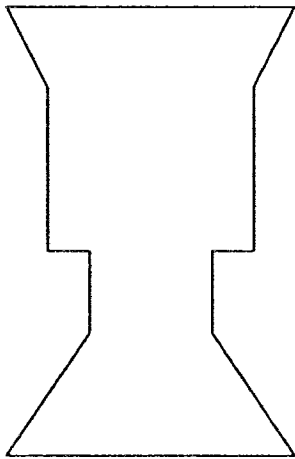
TANGRAMS

ACTIVITY SHEET

1. Count the numbers of sides on each of your tangram pieces. Write down the numbers of sides below.

SHAPE	# OF SIDES
Square	4
Triangle	
Parallelogram	

2. Work with your partner to complete the Tangram Exploration Chart. Are you able to make all of the shapes? What is the highest number of tangram pieces you can use in creating a shape?


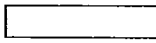

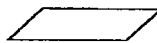





TANGRAM EXPLORATION CHART

ACTIVITY SHEET

Draw each shape, showing the tangram pieces used, in the boxes below.

Number of Tangram Pieces	SHAPES TO MAKE				
	Triangle 	Rectangle 	Square 	Parallelogram 	Trapezoid 
1					
2					
3					
4					
5					
6					
7					



TANGRAMAS

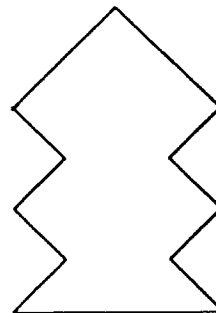
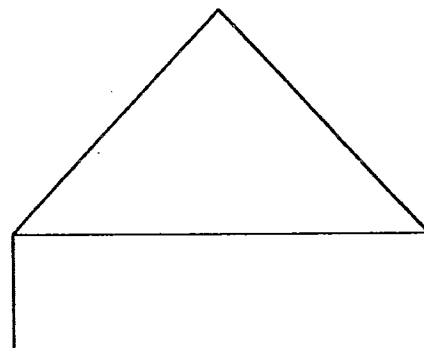
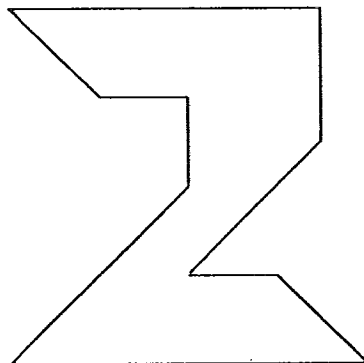
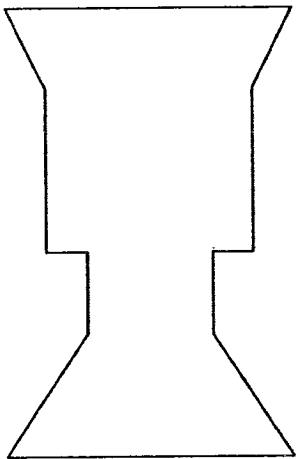
HOJA DE ACTIVIDADES

1. Cuente los lados de las piezas de su tangrama. Escriba el número de lados.

FIGURAS	# DE LADOS
Cuadrado	4
Triángulo	
Paralelogramo	

2. Trabaje con un su compañero y complete la tabla. ¿Pudo hacer todas las figuras? ¿Cuál fue el mayor número de piezas del tangrama que utilizó para crear una figura?

3. ¿Cuántas de estas figuras puede hacer usando todas las siete piezas del tangrama?








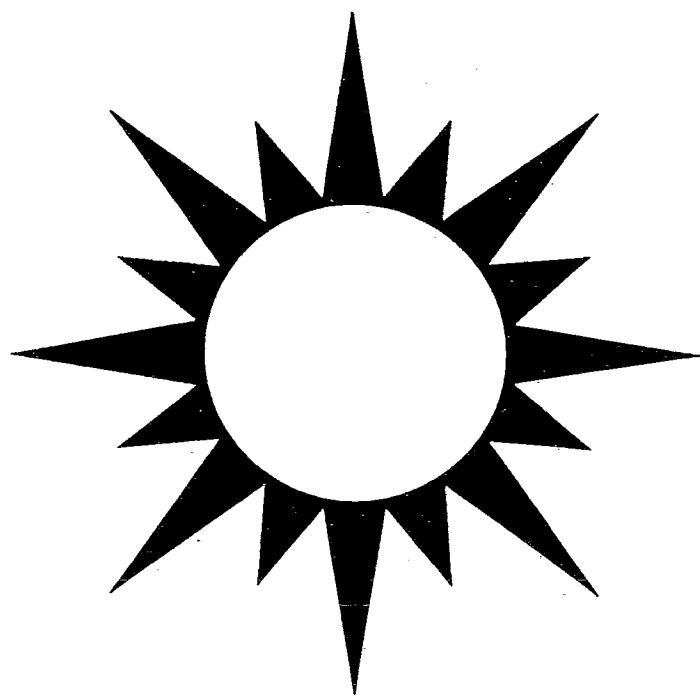


TANGRAMA

HOJA DE FIGURAS DEL TANGRAMA

¿Qué figuras puede hacer con las piezas del tangrama? Dibuje la solución.

Número de piezas utilizadas	FIGURAS A ELABORAR				
	Triángulo 	Rectángulo 	Cuadrado 	Paralelogramo 	Trapezoide 
1					
2					
3					
4					
5					
6					
7					





MAKING ESTIMATES

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To practice estimation and to develop an understanding of surveys.



ESTIMATED TIME:

Setting up: Time to gather materials

Doing activity: Introduction, 10 minutes, depending on age group to, discuss surveys. Activity, about 15 minutes. Discussion about estimation, 10 minutes

Cleaning Up: About 5 minutes



APPROPRIATE AGE GROUPS:

K-3 4-6 7-8



DO ACTIVITY IN GROUPS OF: 3



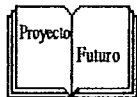
MATERIALS NEEDED (per group of 3 students):

◆ 3 activity sheets



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

◆ Surveys are new to many students. Help to expand vocabulary using the word *survey* both in English and Spanish.

◆ Have students do surveys on beans (the types or number of times they eat in a week) and rice (the number of times they eat rice in a week).



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ◇ Adaptable for students with hearing impairments.
- ◇ Pair students with visual impairments with nondisabled students. Read questions aloud.



BEFORE YOU BEGIN:

- ◇ Copy activity sheets.
- ◇ Make sure work areas are clear.



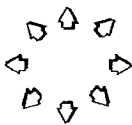
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ◇ What did you think the answers would be and why?
- ◇ What's the difference between a guess and an estimate?
- ◇ How did you organize the information you gathered?



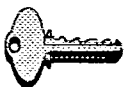
CLEAN UP:

Surveys should be turned in or put away in designated area for children to refer to later.



WHERE CAN I GO FROM HERE?

Have students practice estimation. This activity, adapted from *Family Math*, is presented with questions that the children can work with at home and practice estimation. Other resources are *A Collection of Math Lessons* and *Math Power* (see Book List).



WHY IT'S IMPORTANT:

Estimation is part of our everyday life. Understanding and using estimation gives us a powerful tool to solve problems in mathematics and in our daily lives.



MAKING ESTIMATES

ACTIVITY SHEET

Estimate an answer for each of the questions below and then try to find the answer for each.

1. How many pennies do each of your classmates have?
Ask 10 of your classmates. How close were you?
2. How many pages does your classroom's dictionary have?
If there is more than one dictionary, estimate what the average would be.
3. How many books does your classroom have?
For starters, count the number of books that you have in your desk and then count the number of desks in your classroom.
4. Survey five of your classmates to see what they answered for #2, #3, and #4. What did you find out?
5. Define *estimation*. How can you make an estimate better?

Challenge

6. Make up your own problem to estimate and trade with your partners.



ESTIMACION DIARIA

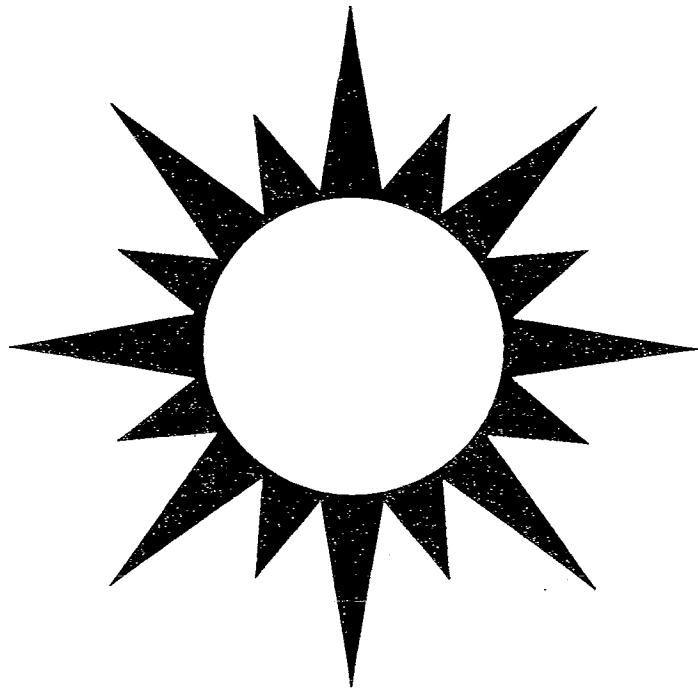
HOJA DE ACTIVIDADES

Haga estimaciones para cada una de las siguientes preguntas y luego trate de encontrar la respuesta correcta.

1. ¿Cuántos centavos tiene cada uno de sus compañeros de clase? Pregúnte, por lo menos, a diez personas.
2. ¿Cuántas páginas tiene el diccionario de su clase? Si tiene más de un diccionario, estime un promedio.
3. ¿Cuántos libros hay en su clase? Para comenzar, cuente los libros que tiene en su pupitre, luego cuente el número de pupitres en su clase.
4. Pregúntele a cinco estudiantes por las respuestas a las preguntas #2, #3, y #4. ¿Qué encontró?
5. ¿Cuál es la definición de estimación? ¿Qué puede hacer para obtener una estimación mas precisa?

Reto

6. Cree su propio problema de estimación e intercámbielo con sus compañeros.





SHAPES AND SIZES

SUGGESTIONS FOR TEACHERS



WHAT'S THE POINT?

To explore ideas about three-dimensional shapes.



ESTIMATED TIME:

Setting up: Time to gather materials
Doing activity: About 10 minutes to discuss what is meant by three-dimensional shapes. Activity, about 15 minutes, depending on age group.
Discussion questions, 5–10 minutes
Cleaning up: About 5 minutes

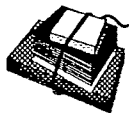


APPROPRIATE AGE GROUPS:

 K-3 X 4-6 X 7-8



DO ACTIVITY IN GROUPS OF: 2



MATERIALS NEEDED (per group of 2 students):

- ◇ 40 cubes
- ◇ 2 sheets of dot paper (available at each supply stores)
- ◇ 2 activity sheets
- ◇ *Challenge of the Unknown* videotape (optional, see Book List)



SAFETY CONSIDERATIONS:

None



ENRICHMENT FOR BILINGUAL STUDENTS:

- ✧ Stress vocabulary while students work on the activity. Have them repeat the words as they progress through the activity.
- ✧ With older children, have students explore how Mayas, Incas, and Aztecs used their knowledge of three-dimensional shapes to construct their structures (see *Hispanic Culture: Past and Future* for reference books).



ADAPTATIONS FOR PARTICIPANTS WITH DISABILITIES:

- ✧ Activity is adaptable for students with hearing impairments.
- ✧ Using dominos along with cubes will emphasize ideas about three-dimensional shapes for students with visual impairments. Student can demonstrate cut lines using string or toothpicks. Team students with nondisabled partners.



BEFORE YOU BEGIN:

- ✧ Set out cubes and dot paper.
- ✧ Arrange for VCR, if videotape is to be used.
- ✧ Make sure work areas are clear.



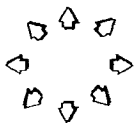
QUESTIONS TO ASK AS YOU DO THE ACTIVITY:

- ✧ Ask students to demonstrate sides, edges, and corners (vertices).
- ✧ How many faces are there? (6)
- ✧ What shape is each face? (square)
- ✧ How many edges are there? (12)
- ✧ How many corners (vertices) are there?



CLEAN UP:

- ✧ Collect all cubes and dominos (be sure to keep same color dominos together).
- ✧ Collect extra dot paper.



WHERE CAN I GO FROM HERE?

The primary source for this activity was the *Challenge of the Unknown: Community Leader's Guide*, based on the *Challenge of the Unknown: Teaching Guide*. Both sources, along with *Math Power*, offer a wide variety of activities (see Book List).



WHY IT'S IMPORTANT:

The ability to visualize three-dimensional shapes is important in advanced mathematics. Providing opportunities to explore three-dimensional shapes in early grades will enhance students' understanding of shapes and assist in the development of concepts.

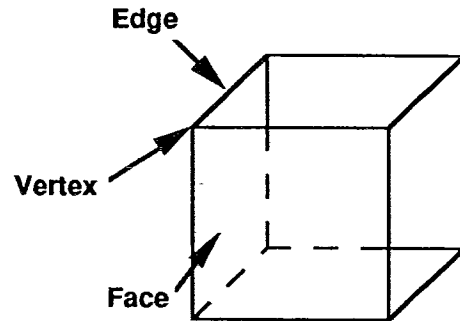


SHAPES AND SIZES

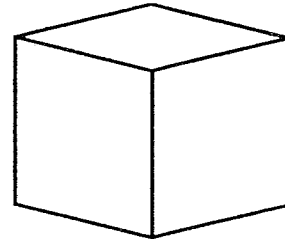
ACTIVITY SHEET

Studying cubes

1. Look carefully at the cubes:
 - a. Find a side (*face*).
 - b. How many faces are there?
 - c. What shape is each face?
 - d. Find an edge.
 - e. How many edges are there?
 - f. Find a corner (*vertex*).
 - g. How many corners (*vertices*) are there?

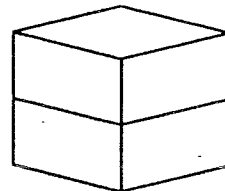


2. Draw a picture of a cube using your dot paper.
3. Compare your picture with your partner's picture. Are there differences?
4. Draw a cube, and label a face, an edge, and a vertex.



Cutting cubes

5. Draw lines on your picture to show where you could cut so the cube would be cut exactly in half.



Halves

Can you find at least two ways to cut the cube in half? Show the cuts in a drawing on your dot paper.

6. How can the cube be cut in thirds? Make a drawing on your dot paper.
7. Find two ways to cut the cube in fourths. Make a drawing on your dot paper.
8. How would you cut the cube in #7 into eighths?

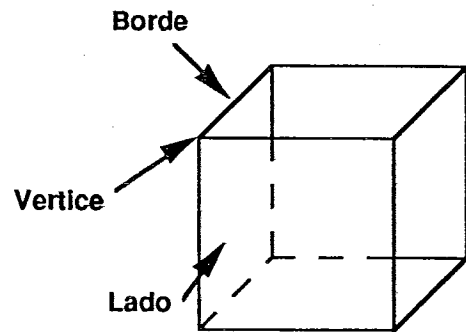


CUBOS

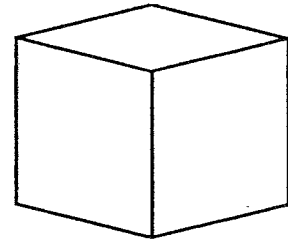
HOJA DE ACTIVADES

Cómo estudiar los cubos

1. Estudie los cubos cuidadosamente:
 - a. Encuentren un lado o cara.
 - b. ¿Cuántos lados o caras hay?
 - c. ¿Qué forma tiene cada cara?
 - d. Encuentre los bordes.
 - e. ¿Cuántos bordes hay?
 - f. Encuentre una esquina.
 - g. ¿Cuántas esquinas (vértices) hay?

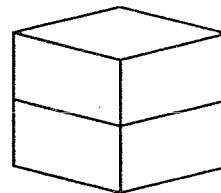


2. Dibuje un cubo usando papel gráfico.
3. Compare su dibujo con el de su compañero.
¿Hay diferencias?
4. Dibuje un cubo que demuestre su borde, vertice y lado.



Cortando los cubos

5. ¿Puede encontrar dos maneras de cortar el cubo por la mitad? Muestre los cortes en el dibujo.
6. ¿Cómo puede cortar el cubo en tercios? Haga un dibujo.



Mitad

7. ¿Cómo puede cortar el cubo en cuartos? Haga un dibujo.
8. ¿Cómo puede cortar el cubo en octavos?

