



# Bat Feelers



## Topic Area

Pre-assessment of knowledge and appreciation of bats

## Introductory Statement

Students will demonstrate their understandings and indicate their questions about bats through three pre-assessment tools.

## Math

Graphing

## Science

Life science  
bats

## Math/Science Processes

Communicating  
Comparing  
Representing data



## Materials

For the class:

sponge-like ball or other soft, indoor-type ball  
class graph (see *Management*)  
tape recorder and blank cassette

For each student:

light colored construction paper ( 9" x 12")  
scissors  
3" x 5" piece of white construction paper

## Key Questions

1. What do you know about bats?
2. How do you feel about bats?
3. What do you want to know about bats?

## Background Information

While these activities are assessments, they are also fun. Hopefully, they will provide the motivation for students to want to learn more about bats.

## Management

1. There are three activities included in this pre-assessment:
  - a. A ball toss in which students are tape recorded as they relate what they know about bats.
  - b. Students draw pictures of bats and graph them according to whether or not they like bats.
  - c. Students make flap booklets in which they write questions about bats and possible answers to those questions.

All three activities are to be revisited at the end of the bat study to assess learning which has occurred.

2. Prior to the activities, enlarge the *How Do You Feel About Bats?* graph which will be used in *Pre-assessment II*.

## Pre-assessment I: Information Ball

1. Help students form a circle in an open-space area of the classroom.
2. Place the tape recorder in the middle of the circle.
3. Explain to your students that the ball will be tossed around the circle. (Some classes have difficulty controlling the ball toss idea and passing the ball around the circle may be more effective.) When students catch the ball they should tell something they know about bats. Students should have the right to say "pass."
4. Turn the tape recorder on, indicate the date and year. You may also wish to indicate that this is a pre-assessment. Ask the first *Key Question*: What do you know about a bats?
5. After students catch the ball, allow some time for them to respond to the *Key Question*.
6. At this time, do not stop and clarify misconceptions.
7. When all students have had the opportunity to share, stop the tape recorder.
8. Save the tape for *Bat Feelers Revisited* (a post-assessment) at the end of the study.
9. Explain that the students will be exploring concepts about bats in the next few weeks and they will learn more about bats and discover that some of their ideas may be true and some may not be true.

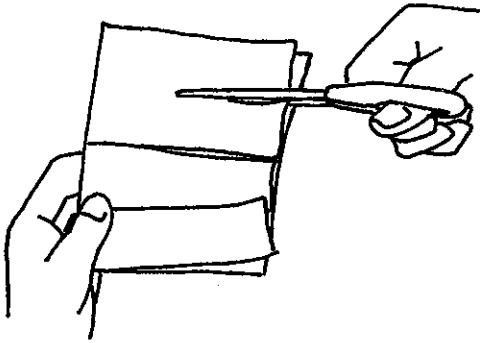
## Pre-assessment II: How Do You Feel About Bats? (Graph)

1. Give each student a 3" x 5" piece of white construction paper. Ask each student to draw a picture of a bat. When they have completed their pictures, allow them to come up and place their bats on the graph indicating how they feel about bats.
2. After placing all the bats on the graph ask students to tell three things that are true about the graph. (Example: More of us think we like bats than those that do not. Lots of us don't know how we feel about bats.)
3. Ask students to observe the details in the pictures that were drawn. Encourage them to notice the similarities and differences in these illustrations.
4. Save the graph for use at the end of the study.

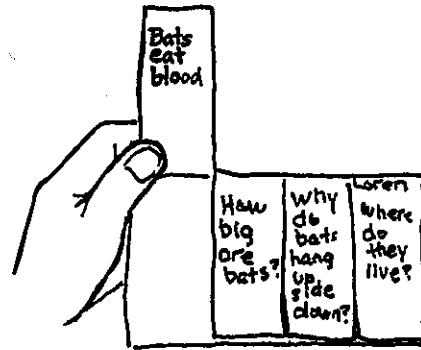
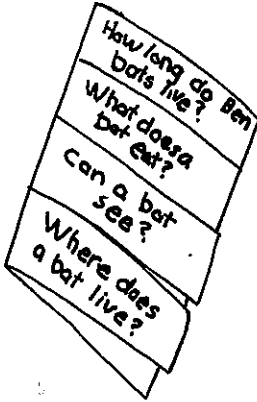
## Pre-assessment III: Asking a Good Question (Flap Booklets)

1. To make the flap booklet, have students fold a 9" x 12" piece of construction paper in half lengthwise.
2. Students should then fold this long, slender rectangle in half and in half again.

- Open your paper to the original fold. Place this fold line away from you and open flap. Cut along the other three fold lines up to the original lengthwise fold. You should end up with four flap doors.



- Have student write a question about bats on the top of each of the four flaps. When they have written their questions, have them open the flap and write information they may know about the question on the inside top of the flap.



- At this time, do not have the students write anything on the lower interior part as this will be used as a post-assessment for the activities in the book.
- Have the students write their names on the back side of the booklets and collect them for later use.

#### Discussion

- How can we find answers to these questions?
- Do you think we know very much about bats?
- Has anyone seen a live bat?
- Why do you think it may be important to learn about bats?



# How do you feel about bats?

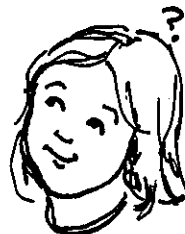
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I like  
bats



I don't  
like bats



I'm not  
so sure

## BAT INFORMATION



Bats are unique animals.

- They are the only mammals that are true fliers.

- They have specialized wings that are made of tough skin and have "fingers"

that spread and support the wings. The skeleton and soft anatomy in the wing

of a bat may be directly compared to the arm and hand of a human.

- Bats live on all continents except Antarctica.

- They make up nearly one quarter of all mammals on earth. There are nearly

1,000 species of bats.

Due to their uniqueness, scientists have placed bats in a mammal group of

their own called chiroptera, meaning "hand-wing." All bat species belong to one of

two main groups, megachiroptera (megabat) or microchiroptera (microbat).

Megabats are fruit-eating bats that live

in tropical areas. They are larger in size than

the microbats with some having wing spans

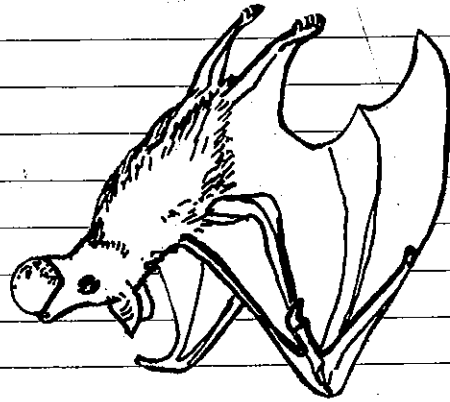
of nearly six feet. Often megabats are re-

ferred to as "flying foxes" because their

facial characteristics resemble those of

foxes. Megabats have large eyes and do not

depend on echolocation to fly or find food.



There are nearly 800 species of microbats,

forty-two of which live in the United States and

Canada. All North American bats are microbats.

Microbats are small in size, ranging from the

smallest known mammal, the bumblebee bat of

Thailand which weighs less than a penny, to as

much as eight ounces. Most North American

bats range in weight from one quarter ounce to

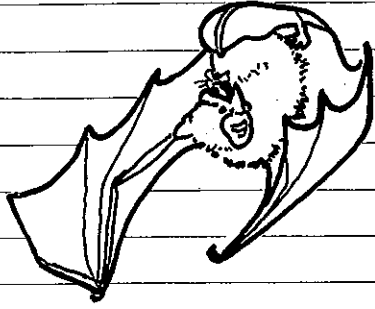
one ounce. Microbats eat mainly insects, but this group also includes several

species that lap blood, a species that catches frogs, one that scoops fish out of

the water, and some that catch birds and rats. Microbats can see with their

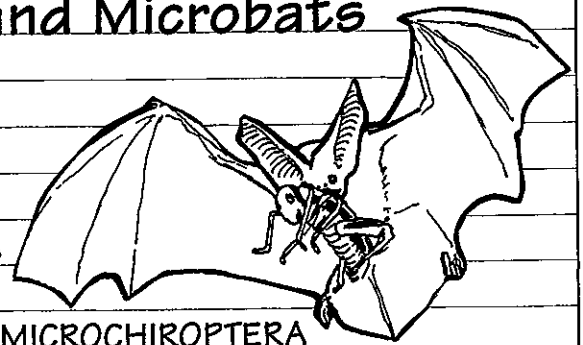
small eyes, but most rely upon the use of echolocation to help navigate at night

and to catch their food.



# Comparing Megabats and Microbats

## CHIROPTERA



### MEGACHIROPTERA

#### (Megabat)

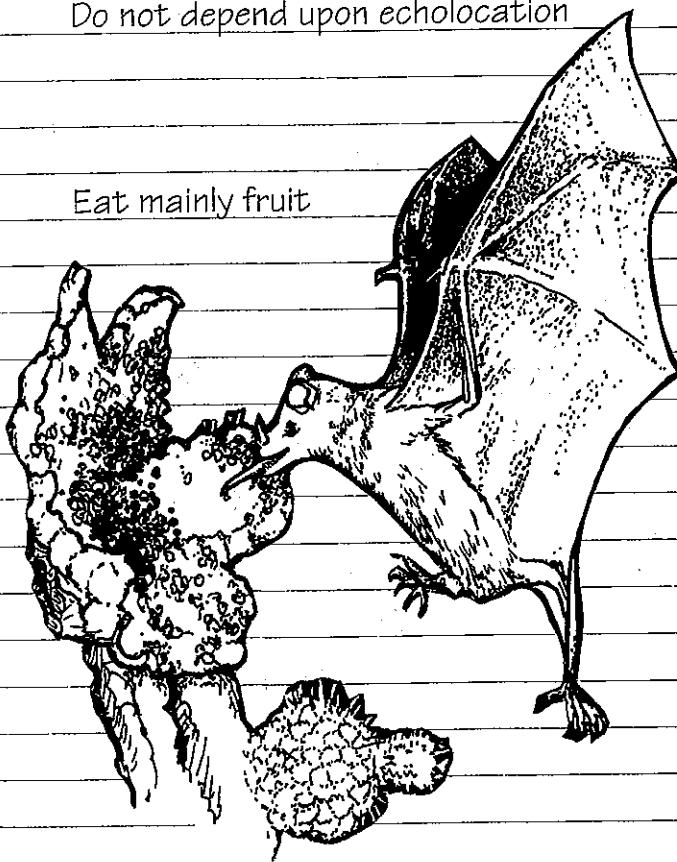
About 200 known species  
Live in tropical areas of Asia  
and Africa

Large in size with wing spans  
up to six feet

Large eyes which see very well

Do not depend upon echolocation

Eat mainly fruit



### MICROCHIROPTERA

#### (Microbat)

About 800 known species  
42 species live in U.S. and  
Canada. All North American bats  
are microbats.

Small in size. The bumblebee  
bat of Thailand is the smallest  
known mammal.

Small eyes, large ears, and odd-  
looking noses.

Use echolocation to fly,  
to communicate with other bats,  
and to catch insects.

Feed mostly on insects.

## Bats and Their Young

Most bats have only one baby a year. Before giving birth, many species of female bats group together in nursery colonies. Because so many babies can be crowded into such a small area, the temperature of the nursery portion of the

cave may be raised to 100°F creating a

warm and humid environment which pro-

fects the blind and furless newborn

bats that won't become independent

for one to three months. Female bats,

like other mammals, nurse their babies

with milk produced by their bodies. In

nursery colonies of some species,

mother bats identify their young,

called pups, by sight, sound, smell, or

position. This allows them to locate

and care for pups even though they are

crowded into groups from several dozen

to millions.



## Usefulness

Bats help us in many ways: They decrease the insect population; They pollinate

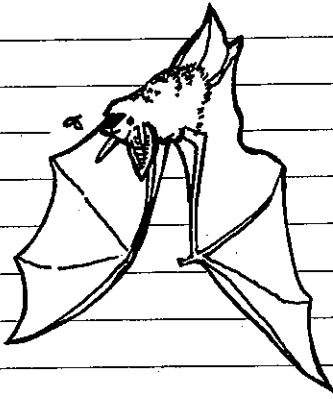
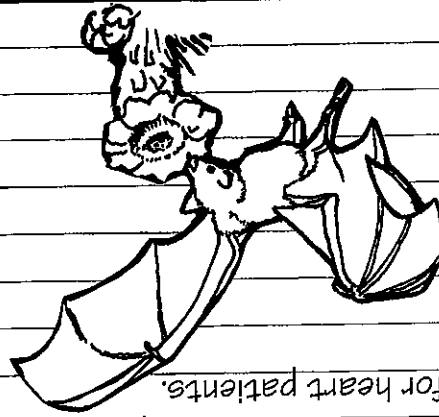
plants as well as disperse seeds excreted in flight; The floors of caves supply us

with bat droppings (guano) which are used for fertilizer. By studying bat behav-

ior, scientists are finding more ways to assist the blind in moving about indepen-

dently. Research with vampire bats may lead to formulas for blood-thinning

drugs for heart patients.



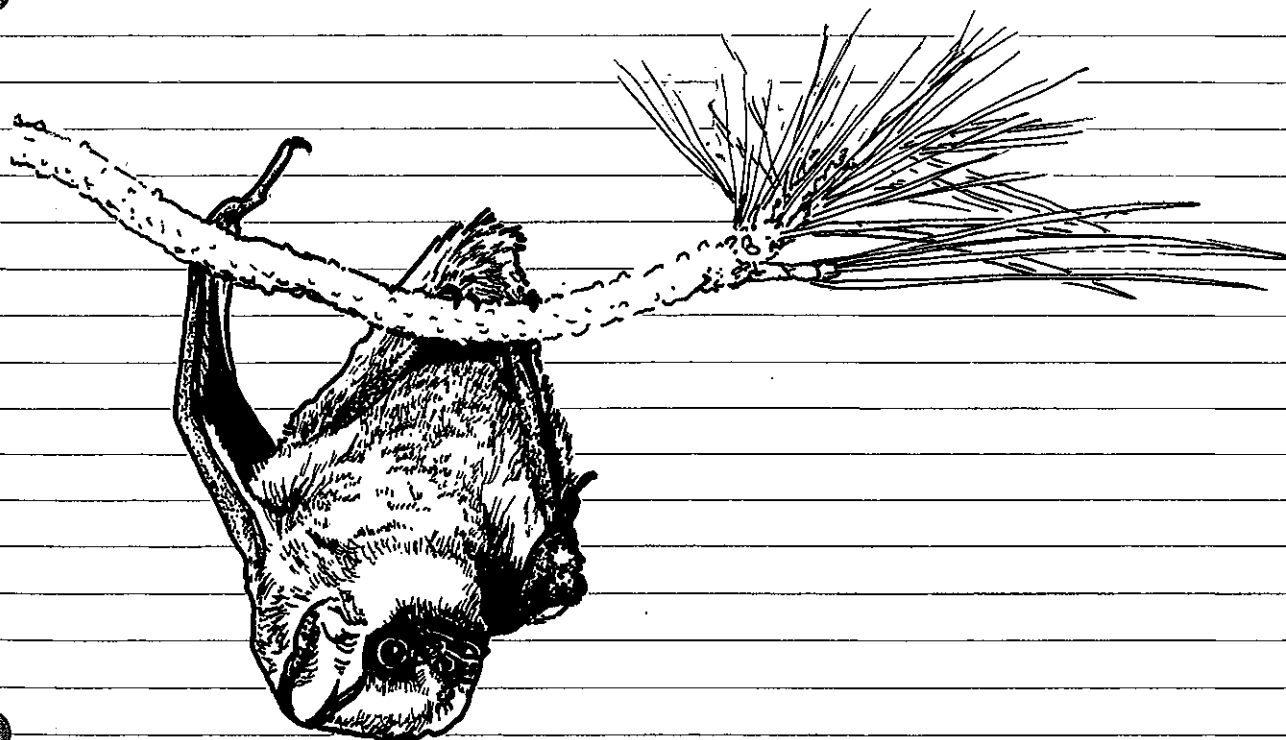
## A Need for Preservation

Major causes of declining bat populations include:

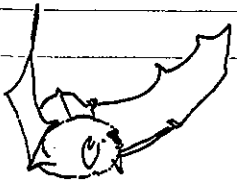
- disturbing of bats during hibernation and the pup-rearing season
- destruction of natural habitats
- senseless killing of bats through "bat shoots"
- hunting of bats for food in some countries
- poisoning by pest control companies
- encroachment upon their territories by human expansion



To effectively preserve bats, it is necessary to change the public's image of the bat, to better educate ourselves about bat populations, and to illustrate the vital role bats play in natural habitats.



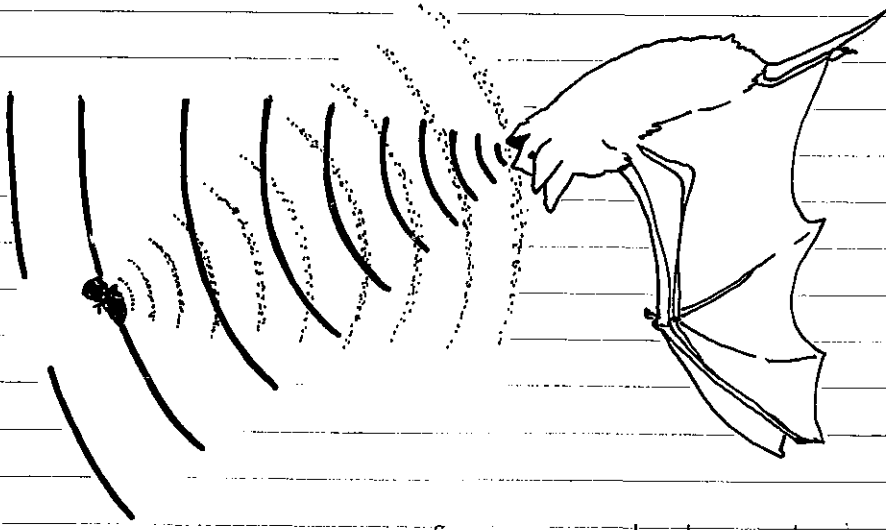
## Echolocation Locating by Echoes



Echolocation is a method of sensory perception by which certain animals orient themselves to their surroundings, detect obstacles, communicate with others, and find food. In echolocation a series of short, high-pitched sounds are emitted by an animal. These sounds travel out away from the animal and then bounce off objects and surfaces in the animal's path creating an echo. The echo returns to the animal, giving it a sense about what is in its path.

Echolocation is used by most microbats. Each species of microbat that uses echolocation has its own unique sound that is produced in the voice box. The frequencies of these sounds extend beyond the range of human hearing. One species of megabat, the Egyptian Fruit Bat, uses tongue clicks to echolocate. The sounds are emitted in short pulses which are repeated at varying rates. These rates vary from one pulse per second to several hundred per second when a bat is close to a target. By listening to and analyzing the echoes from these pulses, a bat can determine an object's size, shape, direction, distance, and motion. This echolocation system is so accurate that bats can detect insects the size of gnats and objects as fine as a human hair.

Most echolocating bats appear to emit signals through their opened mouths. Knowing this helps to explain why many photographs of bats show them in flight with their mouths open. Other species emit their signals through their nostrils. These bats fly with their mouths closed but usually have elaborate facial characteristics such as nose leaves which help direct the sound pulses. Scientists would like to know more about how bats use echolocation so they can help blind people detect objects with sound.



# Sensational Ears

Topic Area  
Echolocation

Introductory Statement

In this simulation activity, students will attempt to catch a moving object using only their sense of hearing.

Science

Life science

adaptations

Math/Science Processes

Observing

Predicting

Comparing and contrasting

Generalizing

Communicating

Materials

For each group:

lid from paper box (see Management)

marble

For each student:

bat ears

a 5-ounce paper cup

Key Question

How can an insect-eating bat catch its prey using only its sense of hearing?

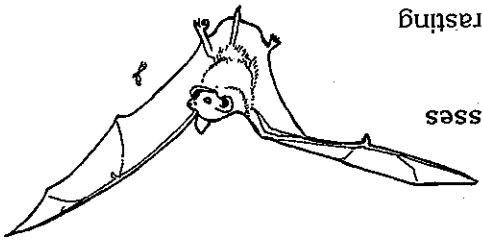
Background Information

Insect-eating bats locate their prey utilizing echolocation. They emit sounds from their mouths and noses. These sounds bounce back as echoes. The bats' sensitive hearing allows them to hear variations in pitch which help them locate their prey. Echolocation enables the bats to figure the speed and direction the insects are flying. Some bats which use echolocation also have other body adaptations which enable them to use their wings and tail to scoop up insects and place them into their mouths while flying.

In this simulation, the students cannot use echoes to locate a moving object; they can, however, use the actual sounds made as an object moves to attempt to locate it while they have their eyes closed.

Management

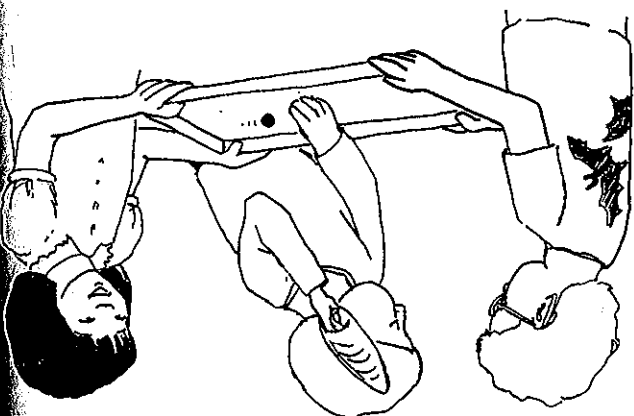
1. Copy-paper box lids, cardboard trays, or other shallow boxes are suitable for use in this activity.
2. The students should not be able to see the marble roll in this activity. Blindfolds interfere with the student's hearing and the bat-ear placement. It is easiest just to ask the student who is designated the "bat" to close his or her eyes.



3. Students in small groups of three or four will be assigned jobs and the jobs will be rotated after each turn. The "bat" (with eyes closed) will attempt to catch the marble as it is rolled gently across the bottom of the box lid. The two other students will be assigned as "movers." They should each take one end of the box lid and gently raise and lower the ends to make the marble roll. In groups of four, the fourth person will be the observer to check that the rules are followed for snatching the marble.
4. It must be emphasized that the "bat" must quickly snatch at the marble and use only the fingers and thumb of one hand (not the palm of the hand or the arm) when attempting to catch the marble.
5. Allow about 15-20 minutes to complete this activity.
6. Bat ears are most effective and durable if copied on card stock or tag. Prior to the activity students should cut out the front and back of the ear. The front and back part of the ear should be glued around the perimeter leaving an opening where indicated.
7. Prior to the activity, the teacher should gather the box lids, marbles, and duplicate the bat ears for each student.

Procedure

1. Ask the Key Question: How can an insect-eating bat catch its prey using only its sense of hearing?
2. Direct students to think about whether it would be hard to catch something they could not see. Show them a box lid and marble. Roll the marble in the box lid and ask students if they can hear it. Tell them that the person chosen to be the "bat" will have to close his or her eyes so the marble cannot be seen. Demonstrate how to use the bat ears by sliding the hand into the ear like a mitt. The hand will cup the back of their ear. Because the student will have to rely upon the sense of hearing, "bat ears" supported by the cupped hand will help to funnel the sound.



3. Distribute the box lid, marbles, and bat ears to each group.

4. Have students choose jobs.
5. Without closing their eyes, let students practice catching the marbles by snatching them with their thumbs and fingers.
6. After the practice period, instruct students who are the "bats" to first put on their bat ears. You may want to help them decide which hand to use for catching the marble. They probably will have greater dexterity using their dominant hand.
7. Instruct the "movers" to gently tip the box lid allowing the marble to roll. After the "bat" catches the marble, rotate jobs until all students have had an opportunity to catch the marble.
8. After the discussion, ask students to write on the front of their bat ears (lines are provided) how it felt to catch the marble using only their sense of hearing.

#### Discussion

1. Was it as easy for you to catch the marble with your eyes closed as when you could see it? Explain.
2. Did anyone develop a strategy to help you find the marble while you had your eyes closed? What was the strategy?

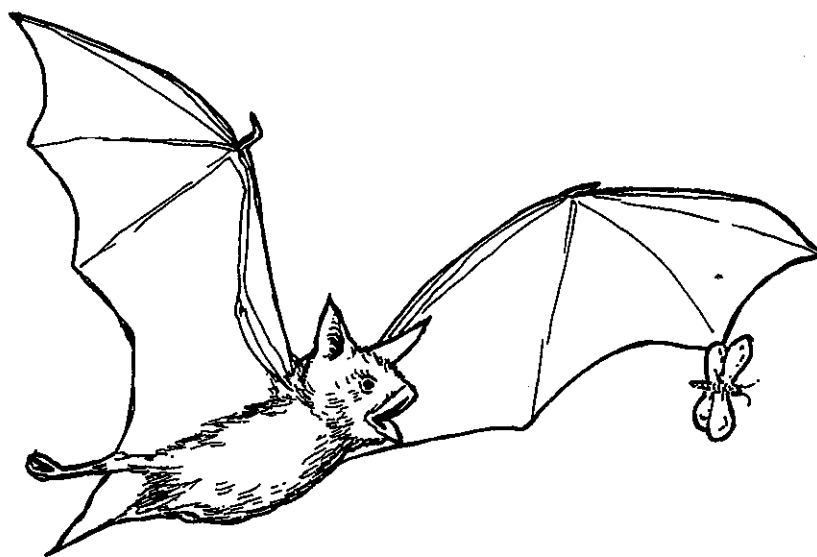
3. What do you know about the physical characteristics of bats that use echolocation? [they have large ears]
4. How do the large ears help them locate their food?
5. Explain in your own words how bats use echolocation.

#### Extensions

1. Use hard round candy instead of marbles and the "bats" can eat their food.
2. Cover ears, close eyes, and let students attempt to catch the marble.
3. Research and draw ear and head shapes of bats that use echolocation as the means of catching their prey.

#### Major Conceptual Components

- Bats live in diverse habitats where their unique structures allow them to meet their basic needs.
- Bats have unique structures which allow them to meet their basic needs.
- Bats have unusual facial characteristics such as nose leaves, enormous ears, and intricate faces which allow them to find and eat their food.
- Some bats use sound to help them communicate and navigate.

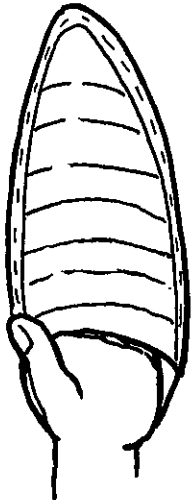


Front of bat ear



SENSATIONAL  
EARS

*Back of bat ear*



# Classy Caves



## Topic Area Caves

### Introductory Statement

Students will create caves to better understand the structure of caves and their role as one type of bat environment.

### Math

Measuring  
Estimating  
Problem solving

### Science

Earth science  
cave structures

### Math/Science Processes

Observing  
Comparing and contrasting



### Key Question

What are caves like?

### Materials

For each group of ten:

- shredded newspaper
- 1 quart liquid starch
- 8 cups flour
- 2 quarts water
- 10 small strawberry baskets
- 10 squares of lightweight cardboard, 10" X 10"
- stapler
- 1 5-gallon bucket
- Optional: black and/or brown tempera paint and ten paint brushes

### Background Information

Many bats dwell in caves. Cave can be ideal environments for bats because they provide food sources for many bats, the necessary conditions for a stable temperature, protection from harsh weather conditions and enemies, and rough surfaces on which bats can roost. Some caves or cave areas are used for nurseries where up to 5000 baby bats can occupy an area of one square yard on the cave's ceiling. For bats in cold environments that do not migrate during the winter, caves provide a place for hibernation that is neither too hot nor too cold where they can hang for three or four months living off their stored fat.

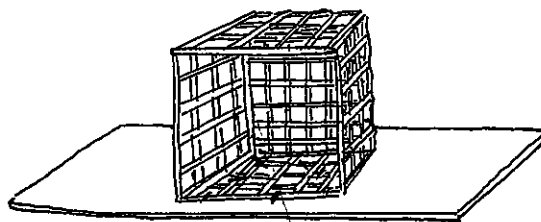
### Management

- 1 Collect and display pictures and resource books about different caves.
2. This activity is written for groups of ten students.

3. 20-30 minutes are required for cave construction. More time may be required if you have the students make various other aspects of terrain.
- 4 Prior to doing the activity, make a mixture of one quart liquid fabric starch with eight cups of flour. Add water until the mixture is the consistency of pancake batter.

### Procedure

1. Give each student one strawberry basket and 1 piece of cardboard.
2. Place the basket on its side in the center of the cardboard square. Staple the basket to the cardboard.

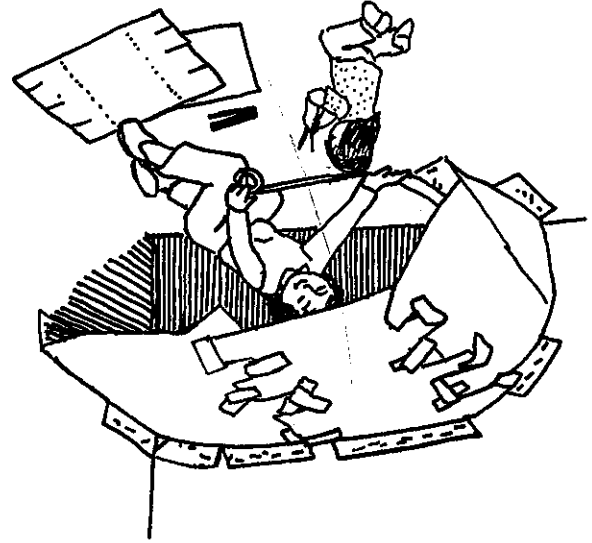
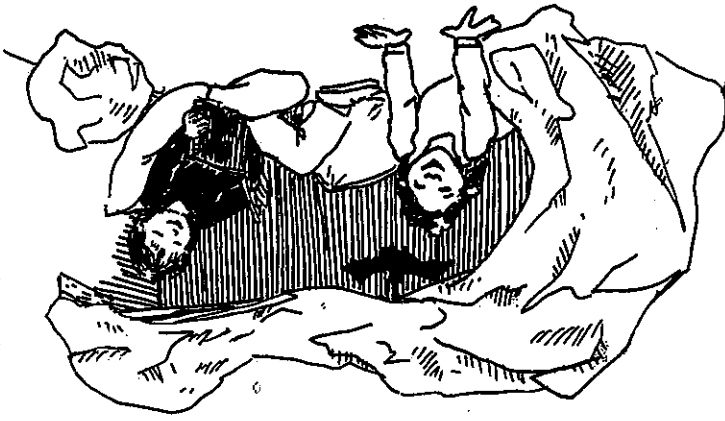


3. Have the students dip separate pieces of newspaper in the flour, water, and starch mixture, scraping off any excess.
4. Direct the students to place the dipped newspaper piece over and around the basket (inside and outside) to create a cave. Have the students leave the front of the basket open as a cave entry.



5. Set caves aside to dry for approximately three days.
6. After drying, caves may be painted with tempera paints. Students may create interior and exterior variations for the caves. Cave settings may also be designed to fit on the cardboard or on top of the cave. Some ideas include using river rocks,





Collect large pieces of cardboard for the size and shape of the desired classroom cave. Anchor one side of the cardboard to the wall to establish the frame size of the cave. Dove tail additional pieces of cardboard extending out from the wall. For added strength, staple or duct tape these connections to the original frame. Attach the cardboard to the floor by bending the ends out creating "feet" to be stapled or taped down. Once the form is created from cardboard, cover with brown, green and black butcher paper to create a land-like exterior.

**Extension**

Build a classroom cave:

1. What are characteristics of caves?
2. Why do bats choose caves as shelters?
3. How did you make your cave one that bats would enjoy visiting?
4. What would it be like to live in a cave?

**Discussion**

7. After caves are completed, display them and have the class discuss their similarities and differences.
- tissue paper flowers, or toothpick stalactites and stalagmites.

Allow students to make and create the interior and exterior of the cave. Additions such as stalagmites, stalactites, and rocks may be added at this time. Students may go into the cave to "get the cave feeling" for reading, writing, or quiet time.

**Home Link**  
Students may bring in pictures of various kinds of homes for people. Discuss why people created them and what special, useful features they contain that make our lives better.

**Major Conceptual Components**

- Bats live in diverse habitats where their unique structures allow them to meet their basic needs.
- Some bats live in caves while others live in the foliage of trees, tree bark, eaves of houses or burrows. Caves are formed by the interactions of water, minerals, time and stress in the earth's crust.
- Some caves are made by chemical reactions with limestone.

# Logic and Language

## Bat Haunts, Let's Eat!, Four In A Row, and Bats In Order

### Topic Area

Logic and problem solving

### Introductory Statement

Students will use word clues about bats to solve logic problems.

### Math

Using logical reasoning  
Sequencing  
Using problem solving



### Science

Life science

### Math/Science Processes

Comparing  
Organizing  
Applying  
Communicating

### Materials

Sentence strips with clues (see *Management*)

### Key Question

How can you use word clues to solve a problem about bats?

### Background Information

These logic activities provide opportunities for young students to use logic and reasoning skills to solve problems using manipulatives. Logic is useful outside the areas of math and science and is a key to problem-solving skills. Students use logical thinking to draw conclusions based upon given information. Thinking in sequences is another element of logic and an important reading comprehension skill. At a more advanced stage, students learn to make a chain of logical arguments to reach valid conclusions.

Because logic has a unique language, students need to know how to use it. For example, look at the word *only* in the following. "Only large bats eat fruit." *Only* puts strict limitations on the implications of the statement. From those limitations many things can be determined. It means that small bats do not eat fruit. There is also the suggestion that large bats may eat things other than fruit. Another tact is to know that small bats must eat; if they don't eat fruit, they must eat something else. Other words that are used as clues to help solve the puzzles are: *and*, *not*, *or*, *with*, *can*, and *cannot*.

### Management

1. Prior knowledge of microbats and megabats is necessary for solving these logic problems. It may be necessary to review their respective eating habits.

2. Before beginning these activities, write the clues on sentence strips.
3. Remind students to read all the clues in each logic puzzle.
4. The teacher may wish to use students to act as models and recreate the problem. Students can wear labels, and as logic clues are read, the class can explain the moves the students should make.
5. Each student may process the problem differently; therefore, the path to the answer may be different for each student. For example, students who are more intuitive may solve problems without the use of manipulatives, while others will need to process the problems with more verbalization and use of manipulatives.
6. Adults or cross-age tutors may read the clues to students who may have difficulty reading or use sentence strips to read with the entire class during the activity.



### Procedure

1. Students should cut out markers for *Bat Haunts* and *Let's Eat!* The logic problem *Four In A Row* requires students to color each bat a different color: black, brown, gray, orange and then cut out.
2. Read the clues from the sentence strips.
3. Have students proceed through the problem and draw their conclusions.
4. Re-read the clues to verify the correct solution for each problem.
5. Have student record and discuss their conclusions.

### Discussion

1. What clue helped you to solve the puzzle?
2. How did it help you?
3. Was there any unnecessary information?
4. Which words helped you solve the problem?
5. What does a sentence with the word *not* in the clue tell us?
6. Try making your own clues to a bat logic problem.

### Extensions

Students can write or tell stories about a bat on an adventure finding food.

### Curriculum Correlations

*Computers and Technology:*

1. *Patterns* by MECC
2. *Gertrude's Secrets* by The Learning Company
3. *Gertrude's Puzzlers* by The Learning Company

### Clues to Logic Problems

**Home Link**  
 Send home bat figures and have students write problem clues with their parents to try out in class.

- Language Arts:**
1. Have students read stories which emphasize sequences: *This is the House that Jack Built, The Three Bears...*
  2. Read stories which involve logical thinking, such as *Are You My Mother?*

- Major Conceptual Components**
- Bats live in diverse habitats where their unique structures allow them to meet their basic needs.
  - Bats live in diverse habitats and eat a variety of things.
  - Some bats live in caves while others live in the foliage of trees, tree bark, eaves of houses or burrows.

### Bat Haunts

(Please inform your students that a haunt is a place visited often or continuously.)

- Use the clues to find where each bat lives.
1. Three bats live in different places. One likes to live in caves, one in trees, and one in the eaves of buildings.
  2. The microbat lives in rock formations.
  3. The nectar-eating bat does not live in the eaves of the building.

### Let's Eat!

- Read these clues to find out what the bats like to eat.
1. Three bats eat different kinds of food. One eats insects, one eats fruit, and one nectar.
  2. The largest bat likes to eat only fruit. The smallest one does not eat nectar.

## Four In A Row

Color each bat a different color: one black, one brown, one orange, and one gray. Cut them out and arrange them in the proper order.

Four bats flew into a cave to rest after a night of hunting. They flew up to the ceiling of the cave and landed in a row. Read the clues to see in what order the bats were resting.

1. The black bat was not first.
2. The brown bat was between the black and orange bats.
3. The gray bat was next to the black bat.
4. The gray bat was last.

## Bats In Order

Set #1:

Use the clues to find which bat ate first.

1. Three bats want to eat in the evening.
2. The flying fox ate last.
3. The microbat ate after the nectar-eating bat.

Set #2:

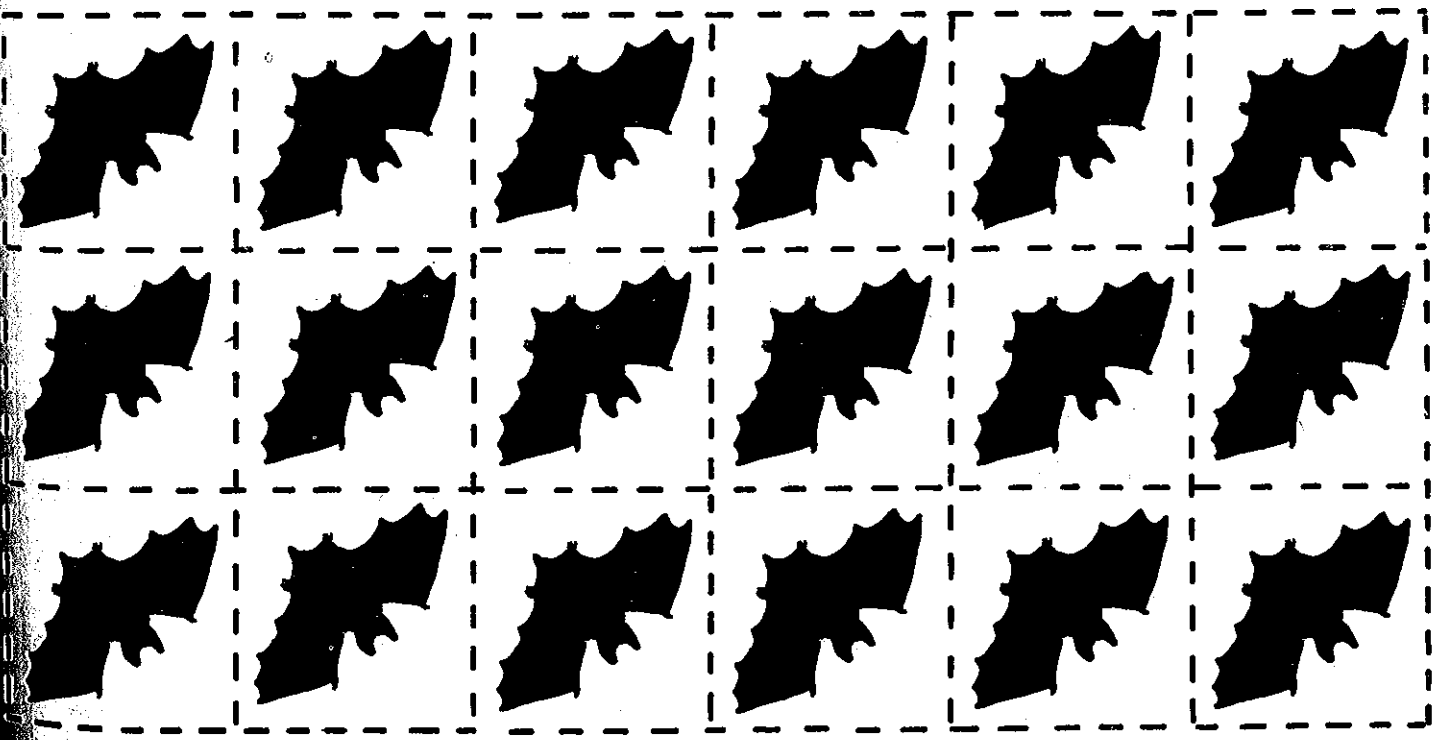
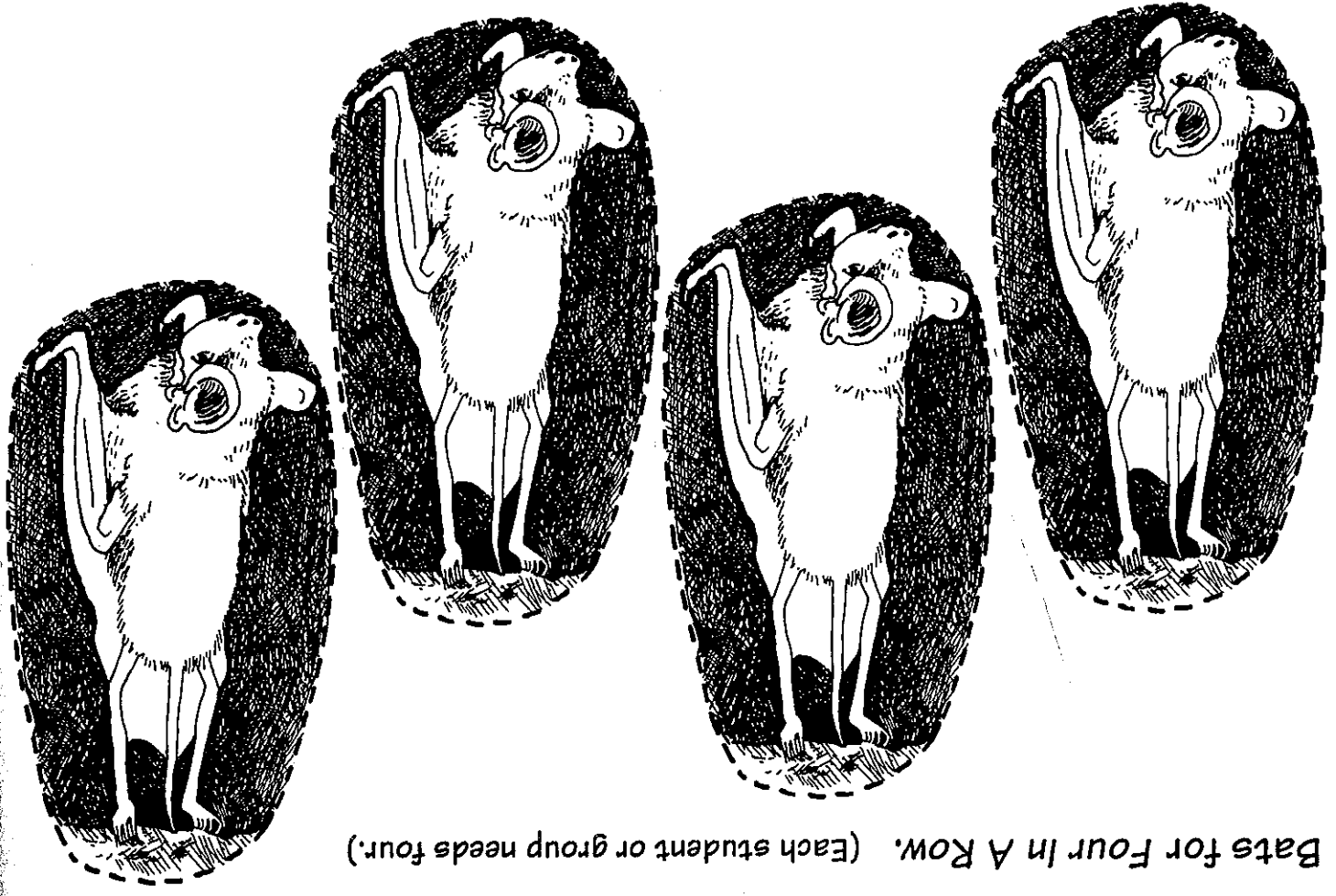
Use the clues to find when the bats arrived.

1. One night three bats flew looking for food: the microbat, the fruit-eating bat, and the nectar-eating bat.
2. The fruit-eating bat arrived last.
3. The microbat was not first.

Set #3:

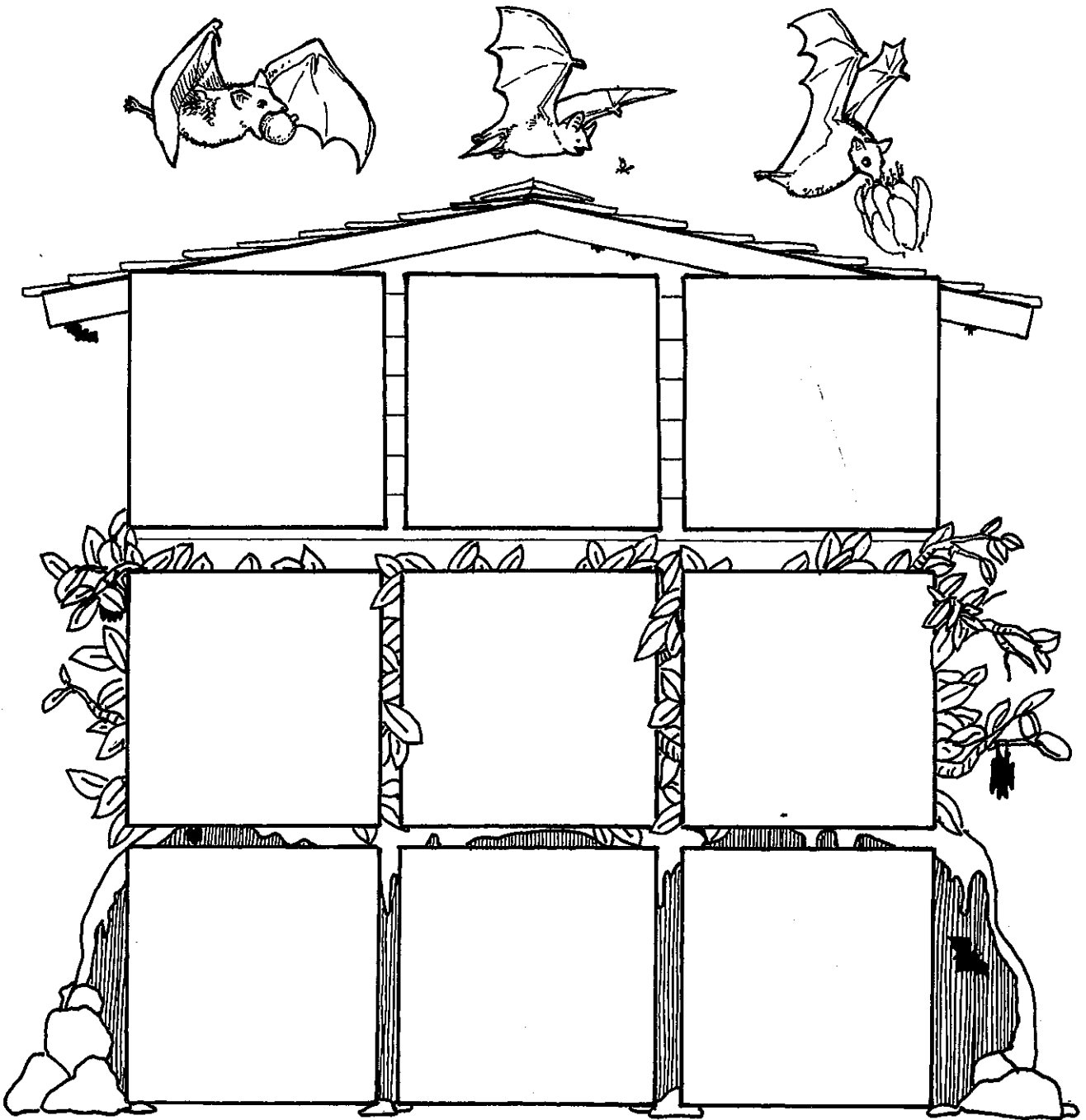
Use the clues to find which bat woke up last.

1. Early in the evening, three bats were awakening for their nightly hunt.
2. The medium-sized bat woke up earlier than the smallest bat, but later than the largest bat.



Puzzle Markers for Bat Haunts and Let's Eat!  
(Each student or group needs nine markers.)

# BAT HAUNTS



The fruit-eating bat lives \_\_\_\_\_

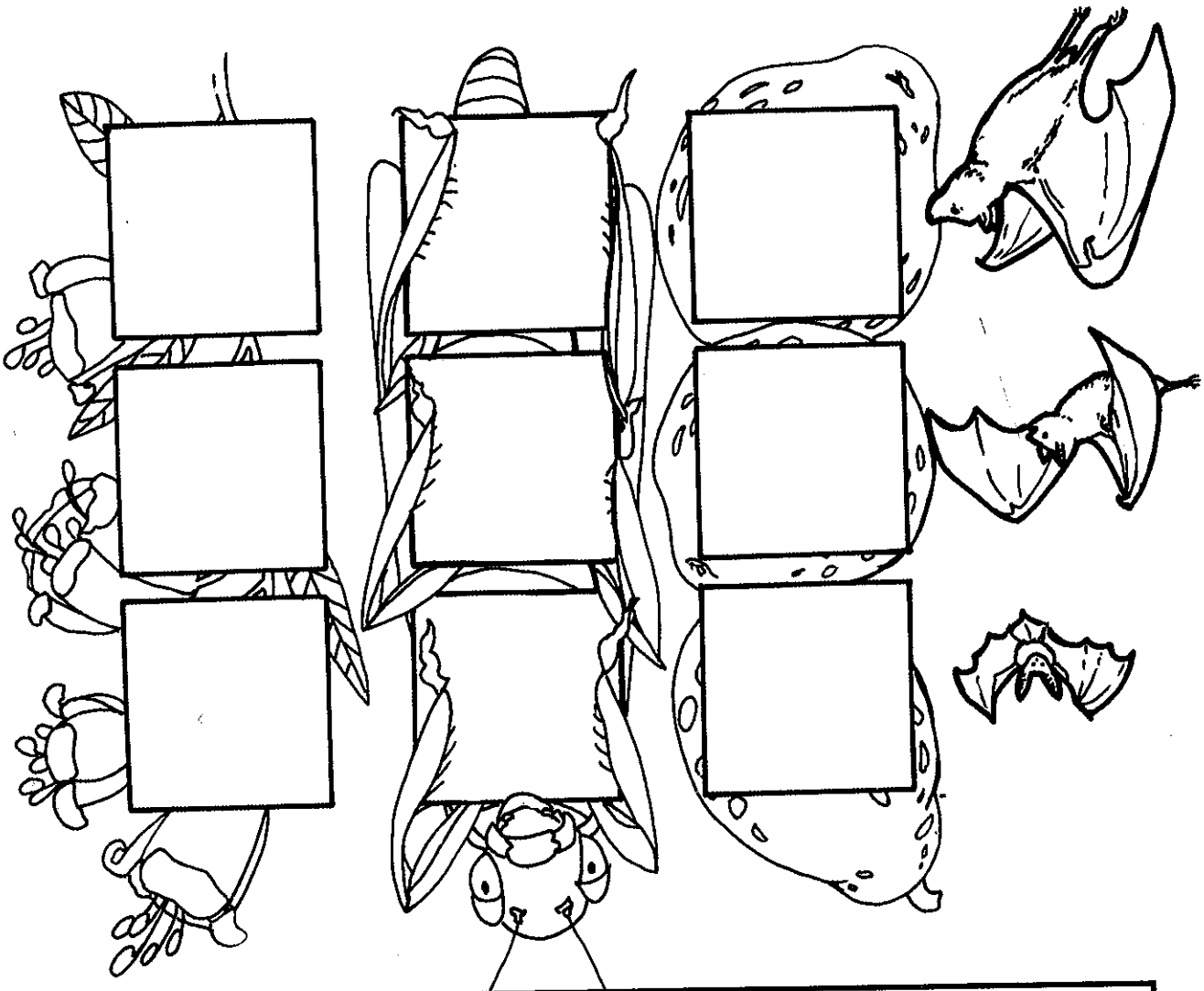
The insect-eating bat lives \_\_\_\_\_

The nectar-eating bat lives \_\_\_\_\_

A large bat eats

A medium bat eats

A small bat eats

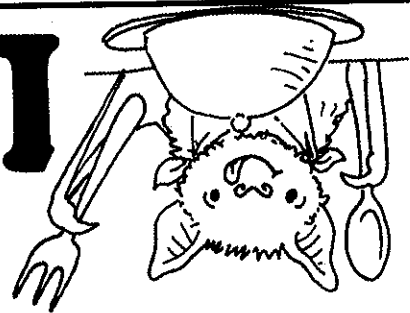


Read these clues to find out what the bats like to eat.

1. Three bats eat different kinds of food. One eats insects, one eats fruit, and one eats nectar.

2. The largest bat likes to eat only fruit. The smallest one does not eat nectar.

# Let's Eat!



Name \_\_\_\_\_

# Four in a Row

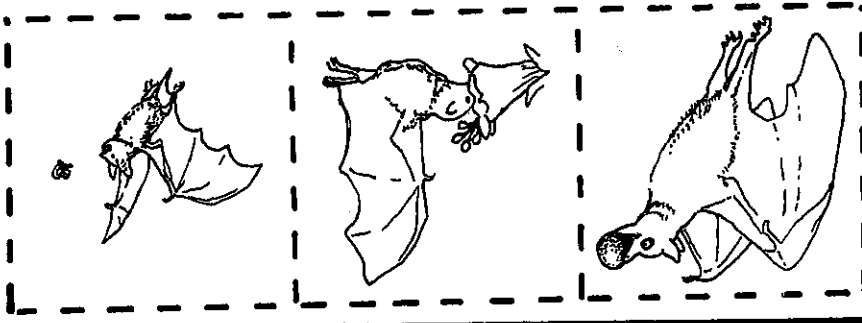


Name \_\_\_\_\_

Four bats flew into a cave to rest after a night of hunting. They flew up to the ceiling of the cave and landed in a row. Read the clues to see in what order the bats were resting.

Color each bat a different color: one black, one brown, one orange, and one gray.

1. The black bat was not first.
2. The brown bat was between the black and orange bats.
3. The gray bat was by the black bat.
4. The gray bat was last.



Handwriting practice area consisting of six sets of horizontal lines. Each set includes a solid top line, a dashed middle line, and a solid bottom line.



Describe how you solved the logic problems.  
Which words helped you. Why?

First \_\_\_\_\_

Last \_\_\_\_\_

# BATS IN ORDER



Name \_\_\_\_\_

# Save the Bats

## Topic Area

Bat conservation

## Introductory Statement

Students will play a game to learn why bats are necessary in nature.

## Math

Counting  
Measuring  
time  
Grouping



## Science

Environmental science

## Math/Science Processes

Observing  
Comparing  
Recording and representing data  
Communicating

## Materials

For each "bat" child:

lunch bag or other small container

For the class:

150 unifix cubes of 4 different colors (600 total)  
4 containers to store the cubes  
4 pieces of chart paper  
stopwatch  
whistle

## Key Questions

1. Why are bats important in nature?
2. What would happen to the insect population if all or most bats were destroyed?

## Background Information

Bats make up a quarter of the world's population of mammals. Most of those are insect-eating bats. Without bats, insect pests multiply. A little brown bat can catch up to six hundred mosquitoes in one hour. Bats are the only major predator of nocturnal flying insects. Besides mosquitoes, bats also eat other crop-damaging insects such as beetles, moths, grasshoppers, and katydid. Without insect-eating bats, farmers would have to use more chemicals to save their crops from the damages caused by insects. An increase in the use of chemicals can create environmental problems for us.

Our world would be very different if we lost the fruit-eating bats (megabats). Many plants would disappear without them. They help spread seeds and pollinate the plants they visit. According to Merlin Tuttle in the book *Batman*, there are more than three hundred plant spe-

cies in the Old World tropics alone that rely on the pollinating and seed dispersal services of bats. Without fruit-eating bats, there would be no wild peaches, dates, bananas, carob, mangoes, figs, avocados, balsa wood, cashews, cloves, or kapok, which is used in making bandages and life preservers. Bats are often referred to as a "keystone species" because so many other species of life would be threatened without them.

Bats are useful in other ways, too. Bat droppings, called guano, make an excellent fertilizer used by farmers and gardeners. Scientists study the bacteria found in the guano as they may have potential in helping to clean lakes and streams that are polluted by industrial wastes. The guano also serves as nutrients for other creatures living in the cave.

By studying bats, scientists have found ways to help blind people be more mobile. There is the medical hope that by studying vampire bats a blood-thinner may be discovered that will help people who have heart attacks and strokes.

Despite all the good things bats do, they are being killed every day because of misconceptions that they are a threat to health or crops that are valued as food. It has been proven that bats are neither a health hazard nor are they a major cause of crop damage. It is important for all of us to realize that even unusual looking animals can be invaluable in nature.

## Management

1. Separate the 600 unifix cubes into 4 color groups of 150 each. (You may want to use more or less cubes depending on the size of your class.) Store the sets of 150 cubes in separate containers labeled: First Hunt, Second Hunt, Third Hunt, and Fourth Hunt.
2. It is more effective to explain the procedure to the whole class before going outdoors.
3. The *Background Information* covers both insect-eating bats and fruit-eating bats, but this activity only focuses on the dangers to insect-eating bats.
4. Label the four pieces of chart paper with: First Hunt, Second Hunt, Third Hunt, and Fourth Hunt. Each piece of chart paper should be divided into three columns.

## Procedure

1. Select three students to be "hunters". Their job will be to tag the bats, thereby eliminating them from further gathering in that round. The rest of the children will be "bats."
2. Give all the "bats" paper bags. These represent the bats' stomachs where the insects (cubes) will be placed.
3. Take the class outside to a basketball court or comparably sized area.

4. Have the "bats" and "hunters" stand on the sideline.
5. Spread the first set of 150 cubes randomly over the court.
6. At the sound of the whistle, the "bats" are to run around the court and gather cubes ("catch insects") and put them in their bag. Allow 1 minute.
7. Blow the whistle again to have all bats return to the sideline.
8. Have students observe and comment on how many insects (cubes) are left on the court. (All cubes will probably be picked up.) Have students dump their bags of collected cubes onto the chart labeled "First Hunt." Have a few students quickly connect the cubes into as many groups of tens as possible and place groups of tens and single cubes in the appropriate columns on chart labeled "First Hunt." If any unifix cubes are left on the court, remove them and store in the container.
9. Spread the second set of 150 cubes randomly over the court.
10. At the sound of the whistle, the "bats" are to run around the court and gather cubes again. After 30 seconds blow the whistle twice. This is the cue for the first "hunter" to run onto the court and tag as many "bats" as possible in 30 seconds. Every "bat" tagged must go to the sidelines and sit down.
11. Blow the whistle and all remaining "bats" and "hunter" are to return to the sidelines.
12. Have all students observe and discuss the number of insects left on the court. Again, have them dump their collected cubes on the chart labeled "Second Hunt." Ask a few students to quickly connect the collected cubes into as many groups of tens as possible and place them and the leftover single unifix cubes in the appropriate columns on the chart labeled "Second Hunt." Remove any unifix cubes that were left on the playing surface and store in the container.
13. Repeat steps 9, 10, 11, and 12 two more times using 150 cubes each time and adding one more "hunter" to the chase each time. Usually, by the fourth round, all or most of the "bats" will have been eliminated. Make certain that the students put the cubes onto the "Third Hunt" and "Fourth Hunt" charts and clear the playing area.



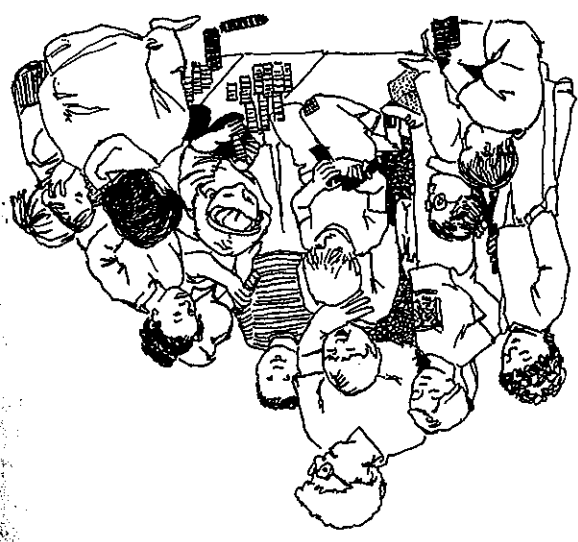
**Extensions**

1. Have the students write about the conclusions they have drawn about bats.
2. Have the students design *Save the Bats* posters or banners.
3. Have the students research how the fruit-eating bat is being endangered. Remind students of what they learned about the pollination role of the fruit-eating bat from the activity *Noses For Nectar*. Students may wish to discuss the difference in the pollination process if predators were introduced.

**Discussion**

1. What happened to the insect population after the first hunt?...second hunt?...third hunt?...fourth hunt? [they kept increasing] How does our graph confirm this? [the number of insects caught decreases]
2. What would have prevented the insect population from growing?
3. Why are bats important?
4. How can you help protect bats?
5. How did grouping the unifix cubes help you to interpret the data?

16. Have students make their graphs on the activity sheet provided. This is very open-ended and allows the students the opportunity to invent a method for representing the data. Teachers may wish to discuss various ways to represent the data. For example: A picture of an insect may represent ten insects caught with X's representing leftover ones. Another way, students may use all X's, or they may want to draw the unifix cube columns and singles.
17. The whole game can be repeated with new "hunters." Compare the results of the games.



14. Pairs of students can carry each chart into the classroom. Place the charts where all students can see them.
15. Compare and contrast the data that were gathered.

### **Curriculum Integration**

1. Research as a class where in your community bats live now or have lived in the past.
2. Read from the bottom line of page 28 through page 30 of *Batman* by Lawrence Pringle.

### **Home Links**

1. Students should be encouraged to take their graphs home and explain to their families the importance of bats in the world.

2. Families can repeat the procedure of the game by using beans or pasta for the cubes and the kitchen table for the playing area. Encourage families to create a graph to represent their experiences.

### **Major Conceptual Components**

- Bats live in diverse habitats where their unique structures allow them to meet their basic needs.
- Bats are vital to some ecosystems.
- Bats are the major predator of night-flying insects.
- Many plants depend on bats to carry pollen and disperse seeds.



number of insects caught

Hunt 1

number of hunters

Hunt 2

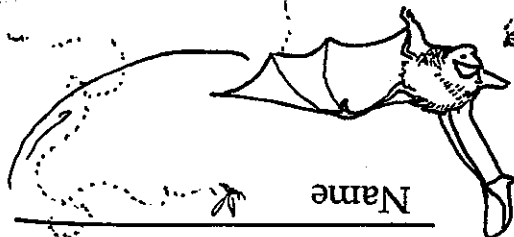
number of hunters

Hunt 3

number of hunters

Hunt 4

number of hunters

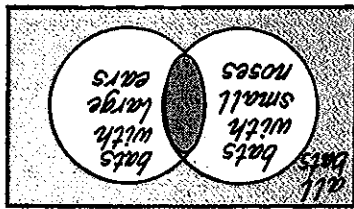


Name

SAVE THE BATS

# Just Between Bats

All bats would be found in the rectangle, but a special set of bats with large ears would be located in the circle. Another Venn diagram may show two sets of the bats, each defined by a different attribute:



The shaded area where the circles overlap illustrates data on those bats that have both large ears AND small noses.

## Management

1. This activity is best done by modeling the use of Venn diagram with entire class observing and discussing two of the four pictures provided. The remaining two pictures may be used for small group work.
2. Teacher may wish to enlarge the two pictures of bats used for class observation and discussion and for continued reference when modeling use of Venn diagram. Additional pages of smaller bat pictures have been provided to stimulate a discussion about bat characteristics.
4. Approximate time to complete this activity is 30-45 minutes.

## Procedure

- Day 1: Developing observational skills using the physical characteristics of bats*
1. Provide the students with a set of the 12 smaller pictures of bats.
  2. Students should cut along the black lines to separate the bats. Ask students to find which of the 12 bats are eating [3, 4, 5, 12] by separating the pictures into two stacks, eating and not eating. Another category would be flying and not flying. Ask students to provide other categories.
  3. Direct them to look at the pictures and discuss observable characteristics with a partner.
  4. As a class, share the characteristics they observed. Teacher may wish to enhance discussion by providing appropriate bat terminology.

## Day 2: Using Venn diagrams to illustrate physical characteristics of bats

1. Have students select two pictures of bats in flight from the page with four pictures.
2. Allow time for students to observe the pictures of the two bats they chose.
3. Discuss the similarities and differences of the bats. [large ears, small noses, etc.]

## Topic Area

Physical characteristics of bats

## Introductory Statement

Students will complete a Venn diagram by comparing and contrasting physical characteristics of two bats.

## Math

Using Venn diagram

## Science

Life science

physical characteristics of bats

## Math/Science Processes

Observing

Comparing and contrasting

Classifying

Recording

## Key Question

How are species of bats alike and how are they different?

## Materials

For the class:

unlined chart or butcher paper for the practice class

Venn activity

felt pen for recording

For each group:

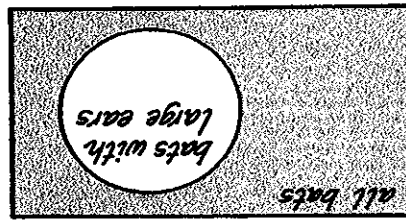
pictures of various species of bats for observation,

sorting and classifying

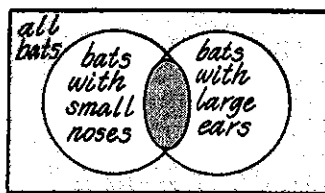
4 pictures of bats in flight for use in Venn activity

## Background

There are nearly 1000 different species of bats in the world. Bats come in a wide variety of sizes and shapes. The body and facial features are uniquely adapted to the bats' environment and its needs for survival. A dozen pictures of bats are provided for observation and discussion. During this introductory activity students should begin to observe physical attributes such as ears, body, tails, wing span, and their relative size, shape and number. The Venn diagram is a way to illustrate sets and the relationships between sets. A Venn diagram may look like this:



- The teacher will provide practice in the use of a Venn diagram by leading them to properly record the attributes in Set A, Set B, or the Intersection of Sets A and B.



A = Characteristics unique to bats in Set A  
 B = Characteristics unique to bats in Set B  
 Intersection of A and B = characteristics common to Sets A and B

- Form small groups and repeat procedures, using the remaining pictures of bats in flight. Each group will discuss and then record their observations on their own Venn diagrams.
- Students should write the name(s) of the bat(s) in the appropriate areas of the Venn diagrams.

#### Discussion

- What characteristics do most bats have in common?
- Which characteristics are unique to only certain bats?
- Some people fear bats. What characteristics do you think make them seem scary and why?

- How are bats similar to other animals? . . . different?
- Describe why a bat would or would not make a good pet.

#### Extensions

- Use the smaller bat pictures and record observations on a new Venn diagram.
- Students may use pictures cut out of magazines and repeat the Venn procedure.

#### Curriculum Correlations

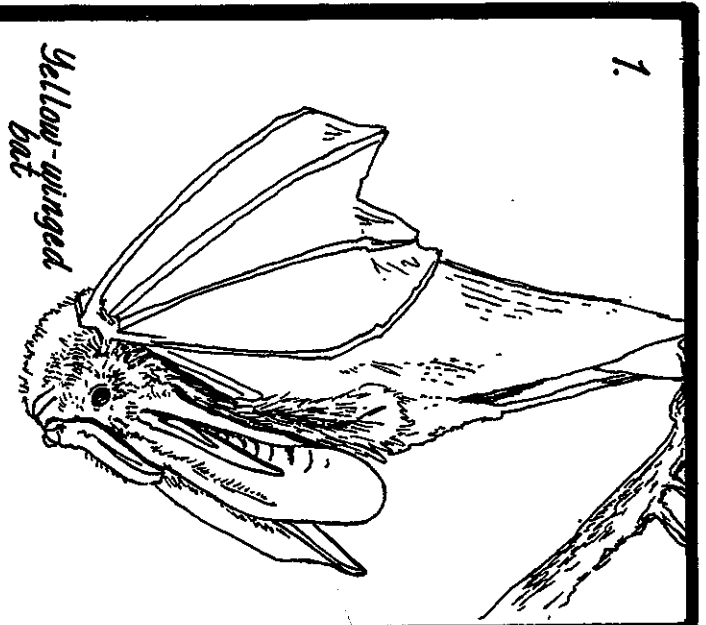
- Students could write about their observations of bats.
- Write a story or draw a picture that shows how a bat might or might not be a good pet.

#### Home Link

Photocopy pictures of different species of bats. Allow each child to have two pictures and a blank Venn diagram to complete at home for homework.

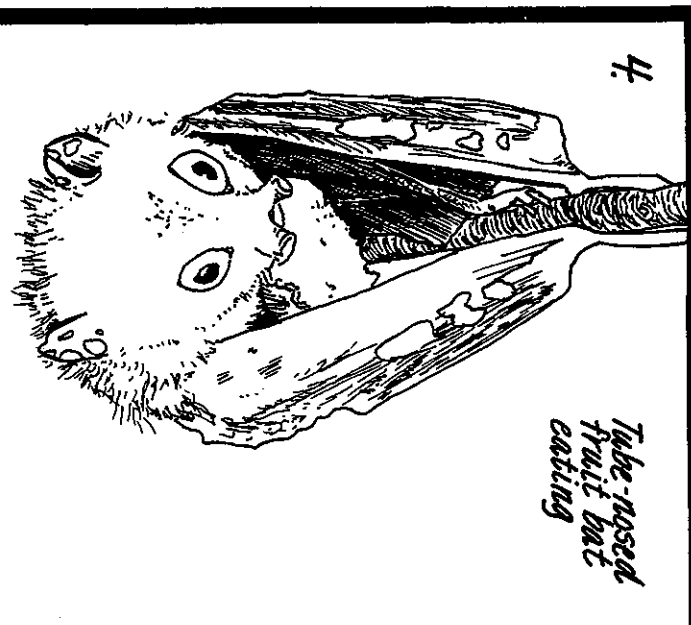
#### Major Conceptual Components

- Bats live in diverse habitats where their unique structures allow them to meet their basic needs.
- Bats have unique structures which allow them to meet their basic needs.
- Bats have unusual facial characteristics such as nose leaves, enormous ears, and intricate faces which allow them to find and eat their food.



*Yellow-winged bat*

1.



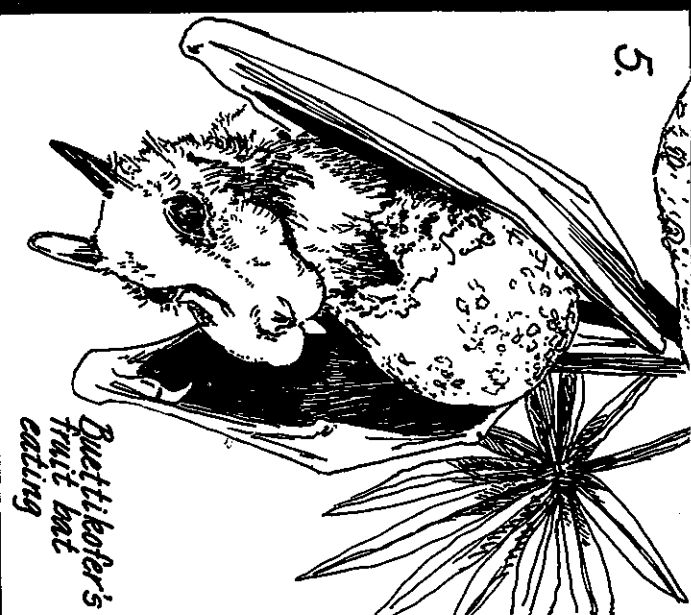
*Tube-nosed fruit bat eating*

4.



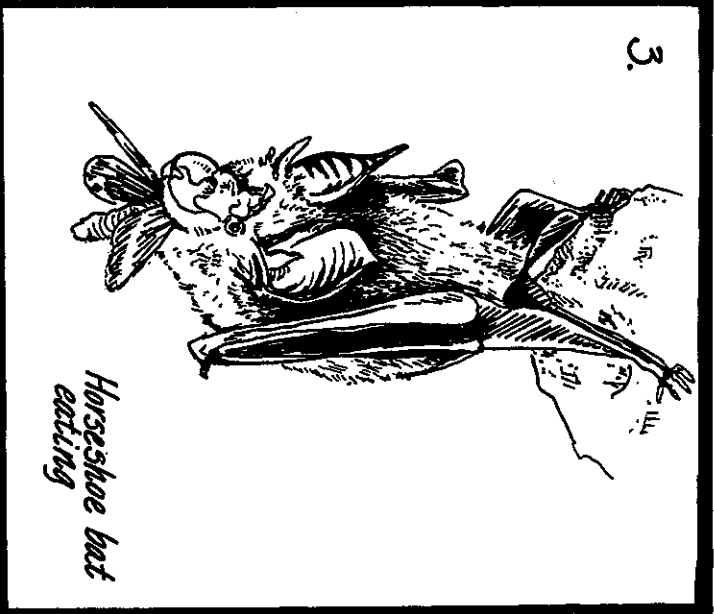
*Mexican tree-tailed bat*

2.



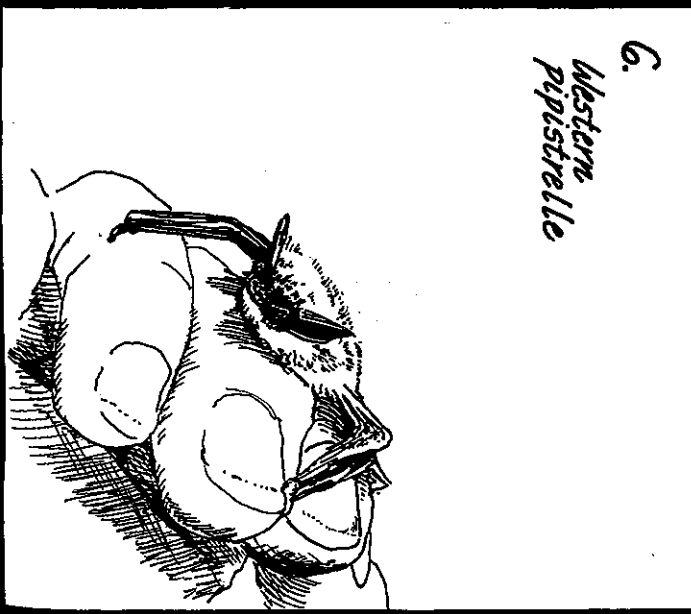
*Quillcofer's fruit bat eating*

5.



*Horseshoe bat eating*

3.



*Western pipistrelle*

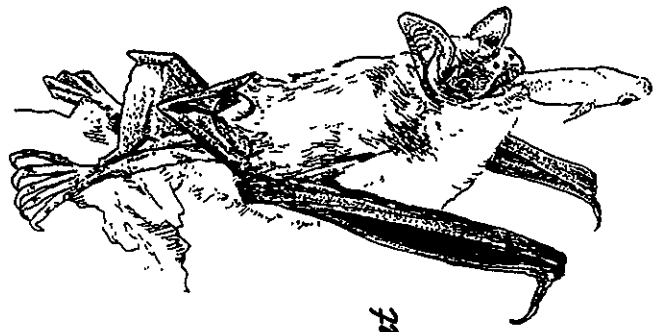
6.

9.



*Rafinesque's  
Big-eared bat*

12.



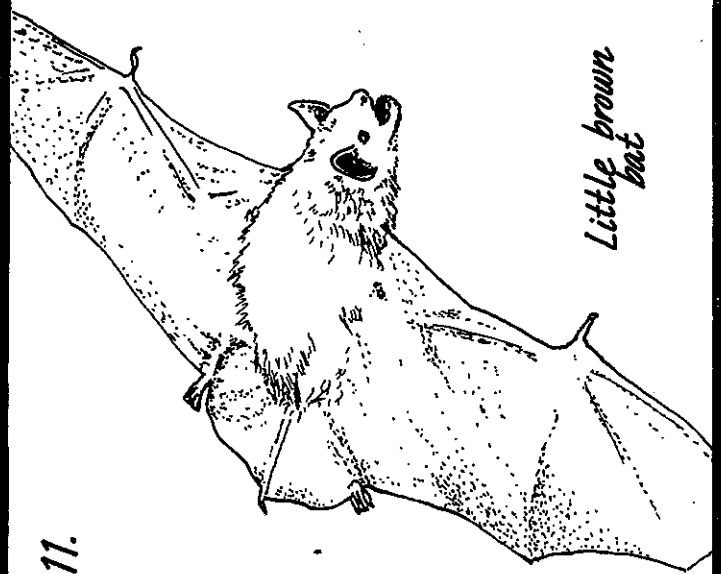
*Mexican  
fishing bat*

8.



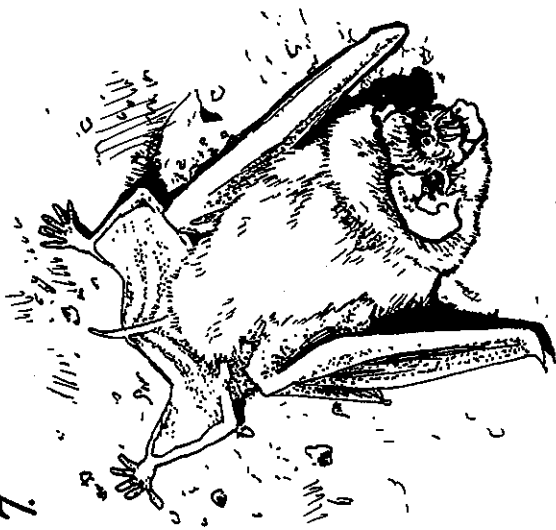
*Lesser long-nosed  
bat*

11.



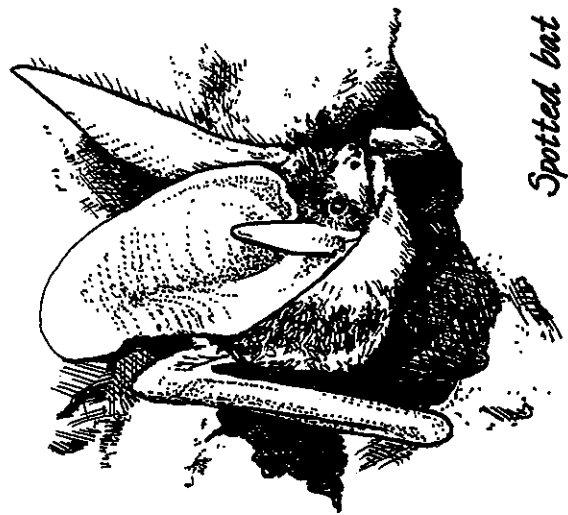
*Little brown  
bat*

7.



*Leaf-chinned  
bat*

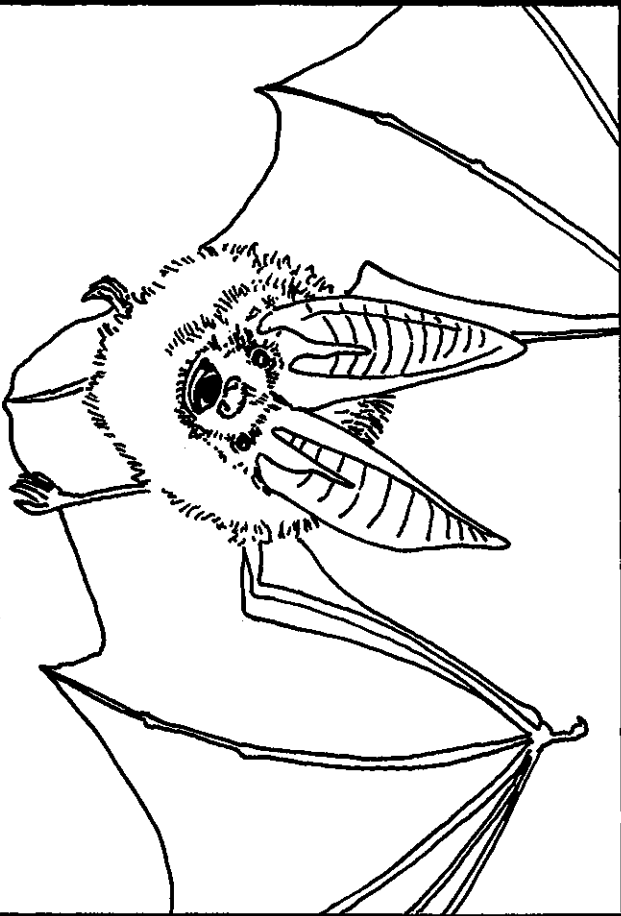
10.



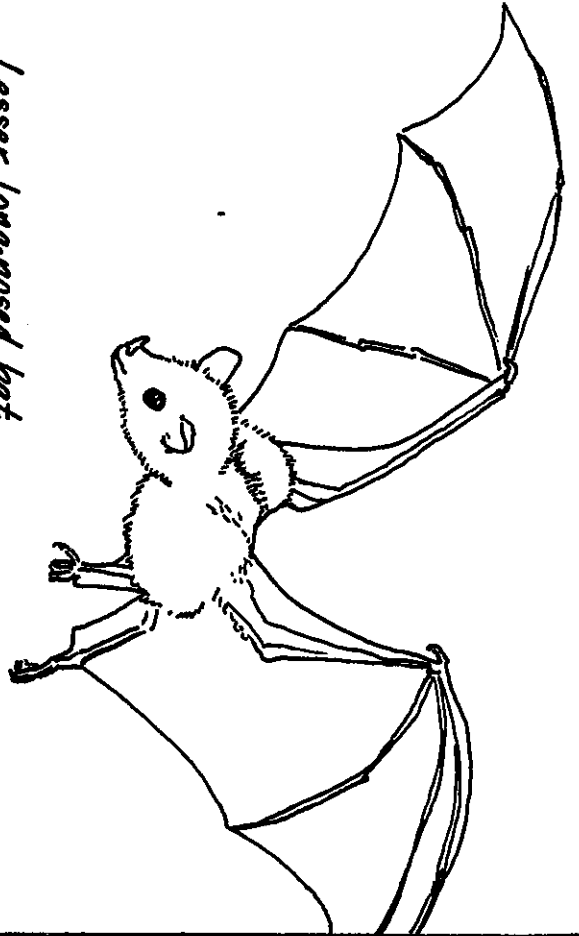
*Spotted bat*



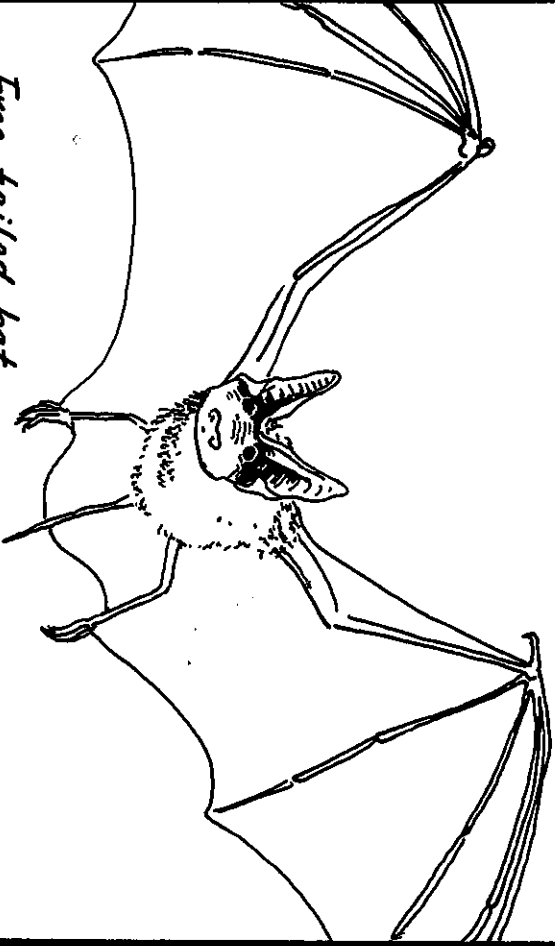
*Horseshoe bat*



*Long-eared bat*



*Lesser long-nosed bat*



*Free-tailed bat*

