

## Pre/Post Assessment

Use this assessment to discover how much your students already know about animal behavior and training before you begin this unit, and later as a conclusion to your study.

- ◆ Name some animals that can be trained to perform in marine life shows. Describe the kinds of things they do in the ocean and the kinds of things they do in a show.
- ◆ What does *behavior* mean? Give some examples of human behavior.
- ◆ Why do animals make sounds? Give some examples of how vocalizing is a behavior that helps animals survive.
- ◆ Describe how you might be able to communicate with someone who doesn't speak your language.
- ◆ Why do we use money? Why is money a positive reinforcer?
- ◆ Explain how you think a trainer might teach a sea lion to do a backflip in the air.

## NATIONAL SCIENCE EDUCATION STANDARDS

*SeaWorld and Busch Gardens education programs and publications support the National Science Education Standards. The Animal Behavior and Training Teacher's Guide for grades 4–8 includes connections to the following standards:*

### *Life Sciences*

- ◆ Characteristics of organisms
- ◆ Life cycles of organisms
- ◆ Organisms and environments

### *Personal and Social Perspectives*

- ◆ Types of resources
- ◆ Changes in environments
- ◆ Science and technology in local challenges

### *History and Nature of Science*

- ◆ Science as a human endeavor

### *Science as Inquiry*

- ◆ Abilities necessary to do scientific inquiry
- ◆ Understanding about scientific inquiry

### *Unifying Concepts and Processes*

- ◆ Systems, order, and organization
- ◆ Evidence, models, and explanation
- ◆ Change, constancy, and measurement
- ◆ Evolution and equilibrium
- ◆ Form and function

National Research Council. *National Science Education Standards*. Washington, D.C.: National Academy Press, 1996.



## Covers

*Front (clockwise from upper left):* bottlenose dolphin (*Tursiops truncatus*), beluga whale (*Delphinapterus leucas*) and friend, Asian small-clawed otter (*Aonyx cinerea*), California sea lion (*Zalophus californianus*).

*Back (clockwise from upper left):* California sea lion, bottlenose dolphin, killer whales and trainer, SeaWorld Adventure Campers and a performer in the "Pets Rule" show at SeaWorld San Diego.

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# Animal Behavior and Training

## 4–8 Teacher’s Guide

A SEAWORLD PUBLICATION

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### To the Teacher

The *Animal Behavior and Training* Teacher’s Guide for grades 4–8 was developed at SeaWorld to help you teach your students – in an active, hands-on way – about animal behavior and how we train animals. Our goal is to integrate science, mathematics, social studies, and language. SeaWorld curriculum supports the National Science Education Standards.

The brief background information in this Guide was written for you, the teacher. It will help you do these activities with your students. We suggest you also refer to some of the materials listed on page 24 for more in-depth information. SeaWorld strives to provide teachers with up-to-date information and activities that motivate students to appreciate and conserve wildlife, the oceans, and the natural world.

Do you have comments or suggestions regarding the activities in this Teacher’s Guide? We’d love to hear your opinion. Write the SeaWorld San Diego Education Department, email us at [SWC.Education@seaworld.com](mailto:SWC.Education@seaworld.com), or call 1-800-23-SHAMU.

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## Goals of the Animal Behavior and Training Unit

Students will observe and recognize behavior patterns of humans and marine animals. They will become aware of how animals can be trained through reinforcing desired behavior.

### Objectives

After completing the unit, the student will be able to ...

1. Define the word *behavior*.
2. Observe and document an animal's behavior.
3. Observe and document human behavior.
4. Discuss survival advantages of producing sounds.
5. Use data to solve math problems about marine mammal behavior.
6. Demonstrate ways to communicate with another individual without using words.
7. Discuss the role and significance of money as a reinforcer for human behavior.
8. Share his or her learning experience with family and friends.

## Vocabulary

**anthropomorphize** (an-through-puh-MOR-fize) – to attribute human characteristics or emotions to animals.

**behavior** – the way an animal acts.

**bow** – a leap out of the water by an animal such as a dolphin, penguin, or sea lion. The animal enters the water again head-first as in a dive.

**breach** – a behavior in which a whale, dolphin, or sea lion jumps out of the water and lands on its side or back.

**environment** – the total surroundings and forces that act upon an organism, including other plants and animals as well as physical factors such as light, heat, weather, and soil.

**ethology** (ee-THAHL-uh-jee) – the study of animal behavior.

**flukes** – the horizontal lobes of the tail of a whale, dolphin, or porpoise, made of connective tissue (not bone).

**genetic** – having to do with the science of heredity and how characteristics are passed from one generation to the next.

**husbandry behaviors** – behaviors that an animal is trained to do in order to facilitate caring for that animal.

**learned behavior** – behavior that results from experience.

**learning** – the process by which a change in behavior occurs as a result of experience.

**Least Reinforcing Scenario (LRS)** – at SeaWorld, the consequence that follows undesired behavior, combined with the trainer's signal for the animal to emit calm behavior. The scenario has two parts: (1) no reinforcement of the unde-

sired behavior, and (2) the trainer's relaxed signal for the animal's calm behavior. Following an LRS, the animal is reinforced for calm, attentive behavior.

**lobtail** – to slap the tail flukes on the surface of the water.

**marine mammal** – a mammal adapted to live in the marine environment and dependent on the ocean for food.

**pod** – a social group of whales or dolphins.

**predator** – an animal that eats other animals.

**prey** – *v*: to hunt and eat other animals.  
*n*: an animal eaten by another animal.

**reinforce** – to strengthen the occurrence of a behavior by delivering a positive stimulus or consequence.

**reinforcer** – a stimulus that strengthens behavior.

**response** – an activity of an animal that results from a change in the environment.

**reward** – a reinforcer.

**shaping** – the step-by-step process of training complex behavior.

**signal** – a motion, sound, or circumstance that communicates to an animal a request to perform a particular behavior.

**social** – living together in an organized group, preferring to be among others.

**spyhop** – to rise vertically out of the water so that the eye is above the surface.

**stimulus** – environmental change that brings about a response from an animal.

**target** – a focal point that directs an animal toward a position or direction.

## About Animal Behavior

### What is behavior?

*Behavior* is the way an animal acts. Any action an animal does, or any *response* to a *stimulus* is a behavior. Walking, swimming, flying, eating, blinking, and breathing all are examples of behavior. Animals behave in certain ways for four basic reasons:

- ◆ to find food and water
- ◆ to avoid *predators*
- ◆ to reproduce
- ◆ to interact in *social* groups

### Behaviors help animals survive.

Animal behaviors mostly are strategies for survival. Some behaviors, such as eating, or escaping predators, are obvious survival strategies. But other behaviors, which also are important for survival, may not be as easily understood. For example, why does a flamingo stand on one leg? By tucking the other leg close to its body, the bird conserves heat that would otherwise escape.

An animal survives by responding and adapting to a changing environment. In some cases, the animal learns which responses get desired results, and changes its behavior accordingly.

### What is *learned behavior*?

Animals learn some behavior through experience. In fact, scientists define *learning* as a change in behavior as a result of experience. For the most part, learning occurs gradually and in steps.

An animal's *genetic* makeup and body structure determine what behaviors are possible for it to learn. An animal can learn to do only what it is physically capable of doing. A dolphin can't learn to ride a bike because it has no legs to

work the pedals, and no fingers to grasp the handlebars.

### Animals aren't human.

*Ethology* is the scientific study of an animal's behavior in the wild. It is easier to observe and record behavior than it is to interpret it. When studying animal behavior, observers must take care not to *anthropomorphize* (attribute human characteristics or motivations to animals).

### Are marine mammals intelligent?

Sometimes people think that an animal is intelligent if it can be trained to do certain behaviors. But accurately rating the intelligence of animals is difficult. Trying to measure animal intelligence using human guidelines would be inappropriate. In fact, a reliable and consistent intelligence test for humans has yet to be developed.



For a flamingo (Family Phoenicopteridae) standing on one leg conserves body heat.

## About Animal Training

**People have trained animals for thousands of years.**

Falconers have trained hawks. Dogs have been trained for hunting, for herding live-stock, and for pulling sleds. Elephants have been trained to pull and carry logs. Horses and camels have been trained for riding and hauling. Today, people still train animals.

*Marine mammal* training is a relatively new field. SeaWorld animal trainers began training bottlenose dolphins (*Tursiops truncatus*) in 1963, before the first park opened.



At SeaWorld, a killer whale presents its pectoral flipper for examination and measurement. Such *husbandry behaviors* help trainers and veterinarians care for animals.

### Why do we train animals?

Through the years, millions of people have visited zoological parks to see animals. Most people do not have the opportunity to observe these animals in the wild. Visitors are not only entertained, but also educated. The unique

opportunity to observe and learn directly from live animals increases public awareness and appreciation of wildlife.

Marine mammals at SeaWorld are trained to hold still and remain calm and to present body parts for examination, measurement, and blood sampling. They get on a scale, and even urinate when signaled to do so for routine health checks.



A trained killer whale (*Orcinus orca*) presents its tail *flukes* for a blood draw at SeaWorld.

Animal training has benefitted research for many years. By training animals to respond to various stimuli in their *environment*, researchers can gather scientific information that would not otherwise be available. The information gathered at SeaWorld, combined with the results of field observations, has contributed to the body of knowledge about many types of animals. For four decades, SeaWorld parks have led the way in marine mammal training and research.

## Marine Mammal Training at SeaWorld

### Trainers *reinforce* desirable behavior.

When an animal performs a behavior that produces a positive result, the animal is likely to repeat that behavior. The positive result is termed a positive *reinforcer* because it reinforces, or strengthens, the behavior.

Humans learn by the same principles. Consider the behavior of students answering questions in a classroom. If the behavior is reinforced by attention and praise, students are likely to repeat the behavior (even if the answer is not correct). If no reinforcement (positive attention) were to follow, repeating that behavior would be less likely.

Marine mammal training at SeaWorld is based on reinforcing desired behaviors with a variety of *rewards*. Such rewards are one way for SeaWorld trainers to communicate with animals. They let an animal know when it has performed a desired behavior.

### What rewards are given to animals?

For animals, one of the most common rewards is food. Food is an example of a primary reinforcer: it's inherently favorable, so an animal doesn't have to learn to "like" it. But to keep training sessions interesting and rewarding for the animals, SeaWorld trainers use a variety of different reinforcers. Many animals seem to enjoy having their skin or fur stroked. Other rewards include squirts from a water hose, chunks of ice, and lots of positive attention.

### Learning occurs in steps.

Most behaviors cannot be learned all at once, but develop in steps. This step-by-step learning process is called *shaping*. Many human behaviors are learned through shaping. For example, when children learn to ride a bicycle, most begin on a tricycle, go on to ride a two-wheeler with training wheels, and

eventually master a larger bicycle. Each step toward the final goal of riding a bicycle is reinforcing. To train an animal to do a behavior, trainers usually break down the behavior into small steps.

### Signals communicate desired behavior.

At SeaWorld, animals are trained to associate a *signal* with each behavior they learn. The signal – which may be visual, auditory, or tactile – is the stimulus for the animal to do a particular behavior.



A SeaWorld trainer asks Shamu to slide out.

## Marine Mammal Training at SeaWorld

### Trainers teach animals to “target.”

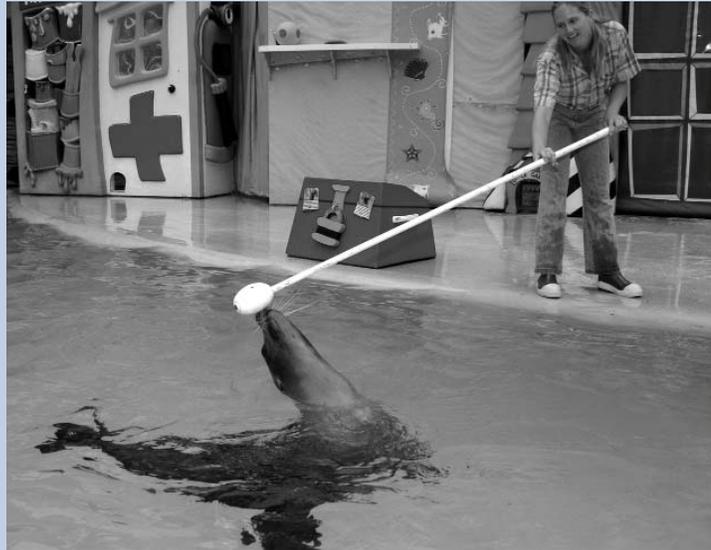
Trainers use their hands as a focal point: animals are trained to come to the trainer’s hand, touch it, and await the next signal. When a behavior takes place farther away, a tool called a *target* is used as an extension of the hand.

Just as a flagstick is a target that directs a golfer toward a golf hole, a target directs an animal toward a position or direction. For most animals, trainers use a target that is a long pole with a foam ball on one end. Other targets include a tap on the glass at the side of the pool or an ice cube tossed into the water.

A trainer gently touches the target to the animal, then reinforces the animal. The trainer repeats this several times. The animal learns that when it touches the target, it gets reinforced. The next step is to position the target a few inches away from the animal and wait for the animal to touch the target. When the animal moves toward the target and touches it, the trainer immediately reinforces the animal. After several repetitions, the target is moved still farther away. Each time the animal touches it, the trainer reinforces the animal. Eventually the animal will follow the target.

### Here’s an example of how a sea lion might be trained to do a jump:

First, the sea lion is reinforced for touching a target on the water surface. Next, the trainer raises the target a few inches above the water. The sea lion must rise up to touch it, and is reinforced by the trainer. As the sea lion



This California sea lion has learned to follow a target.

successfully masters each step, the trainer continues to raise the target higher and higher above the water. Eventually the sea lion jumps entirely out of the water.

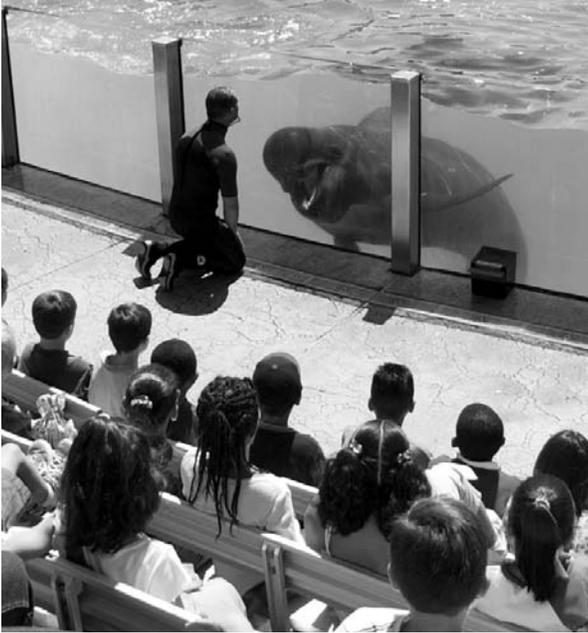
### What about unwanted behavior?

If a trainer requests a particular behavior and the animal does not respond, or the animal responds with undesired behavior, the trainer uses a technique called the *Least Reinforcing Scenario* (LRS).

The LRS has two parts. The first part is a consequence for incorrect behavior: the trainer does not reinforce the animal. The second part is a stimulus providing an opportunity for reward: for two or three seconds the trainer is relaxed and attempts no change in the environment. (Changes in the environment may accidentally reinforce the behavior.) This brief time period is a stimulus to the animal to remain calm and attentive. Following an LRS the animal is reinforced for calm, attentive behavior.

## SeaWorld Stars

Use these cards to help your students get started exploring the behavior of some marine mammals. Here are ideas for ways to use these cards in your classroom:



- ◆ Use the facts to help you prepare lesson plans and lead discussions in class.
- ◆ Copy and cut apart the cards. Distribute a different card to each cooperative learning group or to each student. Learn more about the animals by visiting the school library or go to the SeaWorld/Busch Gardens ANIMALS Web site at [seaworld.org](http://seaworld.org). Groups may even adopt their animal as a “mascot” while working on the Animal Behavior and Training Unit.
- ◆ Copy and cut apart the cards. Distribute a complete set to each student or group of students. Students compare similarities and differences among various animals and determine which animals can do similar behaviors.

### killer whale

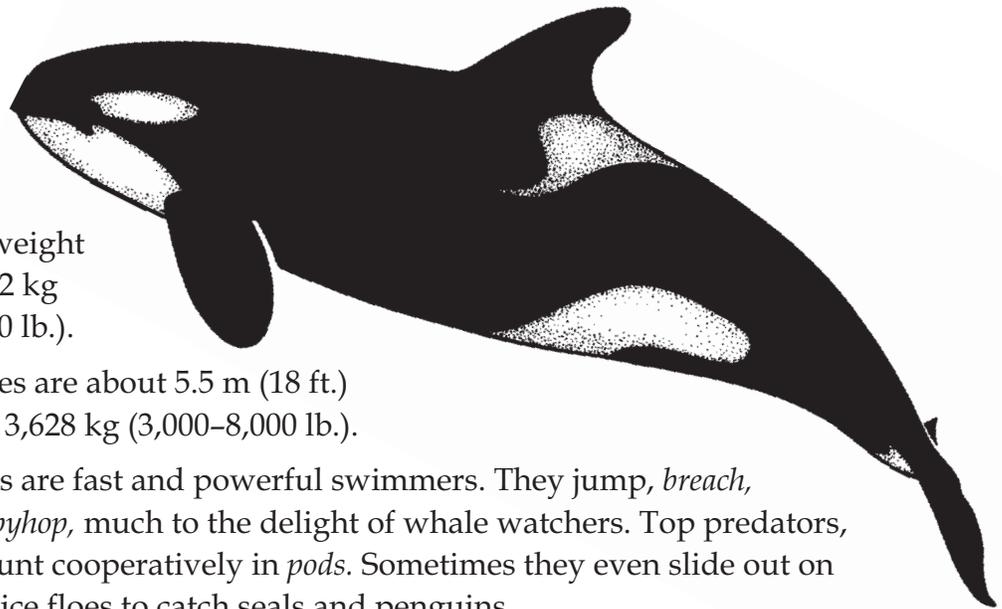
*Orcinus orca*

**size\*:** Males reach about 6.1 m (20 ft.) and weight 3,628 to 5,442 kg (8,000–12,000 lb.).

Adult females are about 5.5 m (18 ft.) and 1,361 to 3,628 kg (3,000–8,000 lb.).

**behavior:** Killer whales are fast and powerful swimmers. They jump, *breach*, *lobtail* and *spyhop*, much to the delight of whale watchers. Top predators, they often hunt cooperatively in *pods*. Sometimes they even slide out on sandbars or ice floes to catch seals and penguins.

At SeaWorld, Shamu and friends inspire awe and thrill crowds as they demonstrate their adaptations for living in the sea. Their powerful jumps and breaches soak enthusiastic audiences.

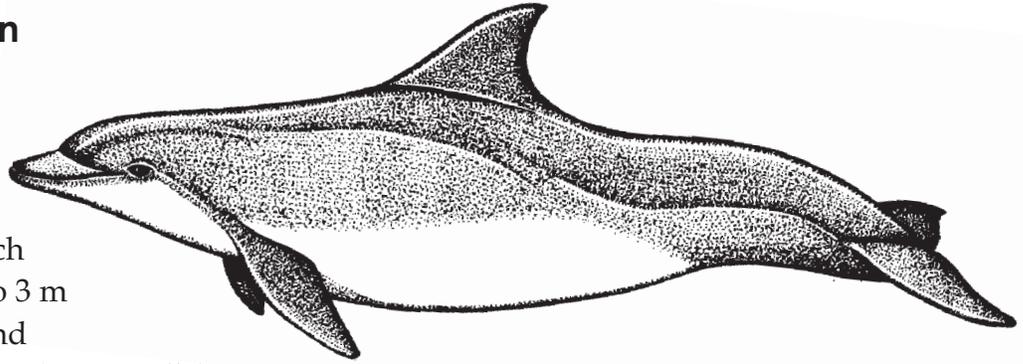


\* killer whales in the North Atlantic

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## bottlenose dolphin

*Tursiops truncatus*



**size:** Adults reach about 2.5 to 3 m (8-10 ft.) and 136 to 295 kg (300-650 lb.). Males are usually larger than females.

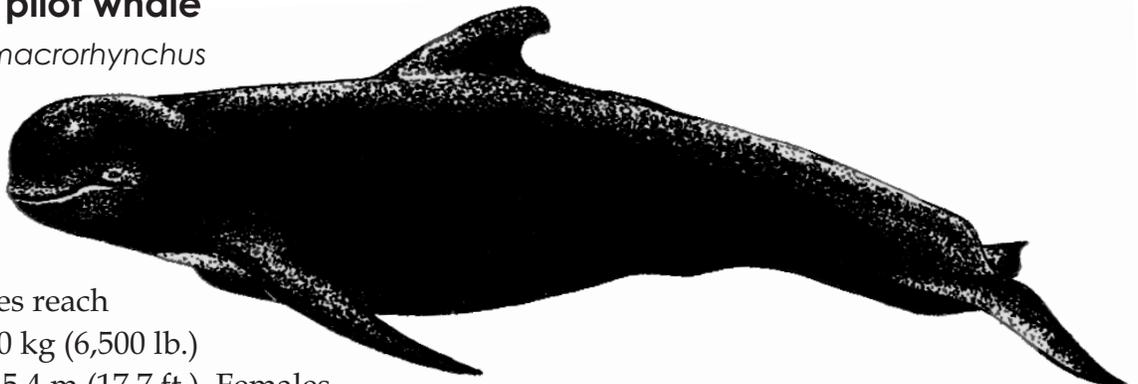
**behavior:** Dolphins are social mammals that live in groups called pods. Dolphins in a pod interact and communicate with each other. Several pods may temporarily form larger groups that travel together. At sea, bottlenose dolphins chase one another, toss seaweed, jump, and “surf” ocean swells. Sometimes they ride the bow and stern wakes of boats.

At SeaWorld, bottlenose dolphins perform in the Dolphin Show, where they jump, splash, and interact with each other and their trainers.

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## short-finned pilot whale

*Globicephala macrorhynchus*



**size:** Males reach 3,000 kg (6,500 lb.) and 5.4 m (17.7 ft.). Females reach 1,200 kg (2,600 lb.) and 4 m (13.1 ft.)

**behavior:** Short-finned pilot whales are found throughout temperate and tropical oceans, where they live and travel in groups of a few to several hundred. At sea they often associate with bottlenose dolphins. Their seasonal movements probably coincide largely with the movement of their primary prey: squid.

SeaWorld San Diego is the only place in the world where pilot whales are trained to perform. They are featured in the Dolphin Show, where they perform alongside their natural companions, the bottlenose dolphins.

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## Asian small-clawed river otter

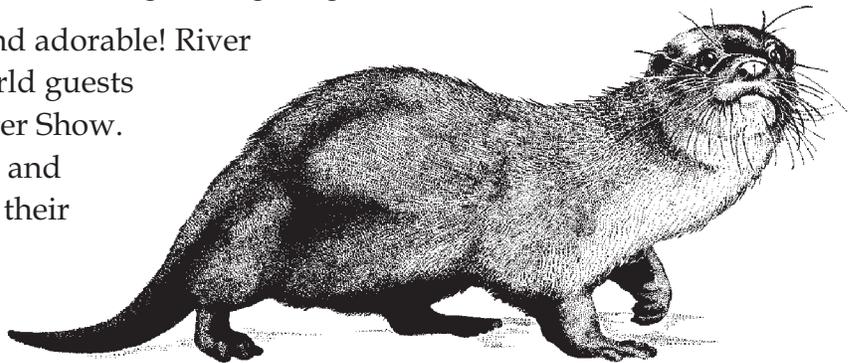
*Aonyx cinerea*

**size:** The smallest of all the otters species, these otters reach about 65 to 94 cm (26–37 in.) and 1 to 5 kg (2.2–11 lb.).

**behavior:** Some river otter behaviors look like “play.” River otters chase one another in the water, tackle each other on shore, and slide down muddy or snowy banks. These actually are adaptive behaviors that reinforce social bonds and encourage young animals to practice hunting and fighting skills.

They're small, furry, and adorable! River otters entertain SeaWorld guests in the Sea Lion and Otter Show.

They run, climb, wave, and carry show props with their dextrous front paws.



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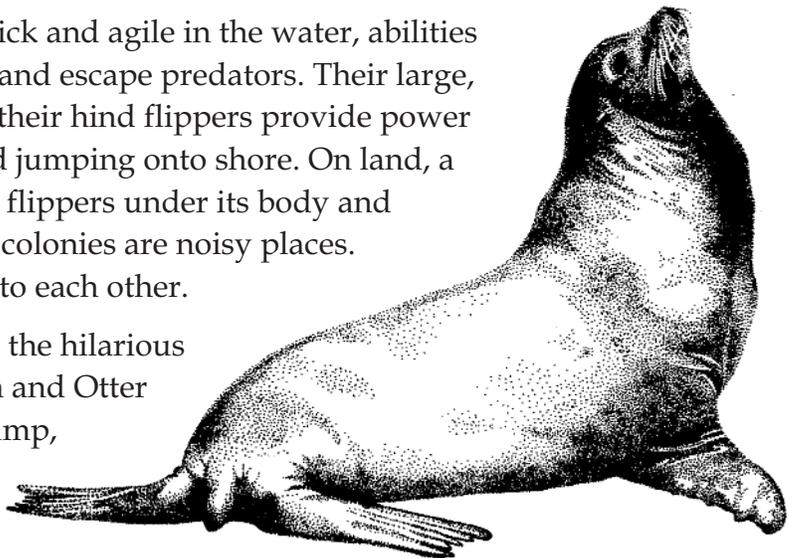
## California sea lion

*Zalophus californianus californianus*

**size:** Adult males are about 2 to 2.5 m (6.5–8 ft.) and 200 to 400 kg (440–880 lb.).  
Adult females are about 1.5 to 2 m (5–6.5 ft.) and 50 to 110 kg (110–240 lb.)

**behavior:** California sea lions are quick and agile in the water, abilities that help them catch prey and escape predators. Their large, winglike foreflippers and their hind flippers provide power for swimming, diving, and jumping onto shore. On land, a sea lion can rotate its hind flippers under its body and walk on all fours. Sea lion colonies are noisy places. Sea lions often call loudly to each other.

At SeaWorld, sea lions are the hilarious performers in the Sea Lion and Otter Show. They swim, dive, jump, “bark,” and clamber about with their trainers.



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# Sounds for Survival

## OBJECTIVES

Students explore the survival advantages of producing sounds.



## MATERIALS

- ❑ blindfolds
- ❑ noisemakers – one for each student, two of each kind (*examples: whistles, clickers, kazoos, small containers of seeds, two pencils to tap together*)

Producing sound is an important behavior for many animals. Many marine mammals use sound to locate their offspring.



## ACTION

1. Discuss animal vocalization as a behavior. Ask students to infer some survival advantages of creating sound. (If necessary, prompt students by asking them how individual animals might locate each other in a dark ocean or on a crowded beach.)
2. Divide students into two equal groups and place them on separate sides of the room or field. Distribute one of each type of noisemaker to one group, and then distribute matching noisemakers to the other group.
3. Blindfold students.
4. Students move across the room or playing field making noise. Each student tries to locate his or her “partner” by listening for the matching sound.
5. When all students have paired up, have them remove their blindfolds and discuss the experience. How did students find their partners?
6. Repeat the simulation with the following twist: Select one or two students to be blindfolded “predators.” As the pairs are trying to locate each other, the predators attempt to find (by sound) and “catch” prey. If a predator locates and tags a student, the student is “out” and must remain silent.
7. Ask students what they can infer about animal vocalizations. Make a list of questions that get raised during discussion. Ask students to brainstorm ways to design experiments that might further our knowledge of the role of animal vocalizations.
8. Students use reference materials such as books, periodicals, and the Internet to investigate the role of vocalizations in mother/pup recognition and mate recognition for various animals. (*Research has increased our understanding of the role of vocalizations in bats, fur seals, and penguins, for example.*)

## Communication: Sights and Sounds

### OBJECTIVES

Students find ways to communicate with each other individual without talking. They demonstrate sounds and gestures they can use to communicate.

### MATERIALS

- ❑ American Sign Language (ASL) alphabet on page 15

### BACKGROUND



People use a variety of silent gestures to communicate. Such gestures can be an important type of communication.

One way hearing-impaired people can communicate is by using sign language. Here in the United States, American Sign Language (ASL) is a common language.

At SeaWorld, trainers communicate with trained animals by using rewards, targets, and signals.

A SeaWorld trainer communicates with a trained Asian small-clawed river otter.



### ACTION

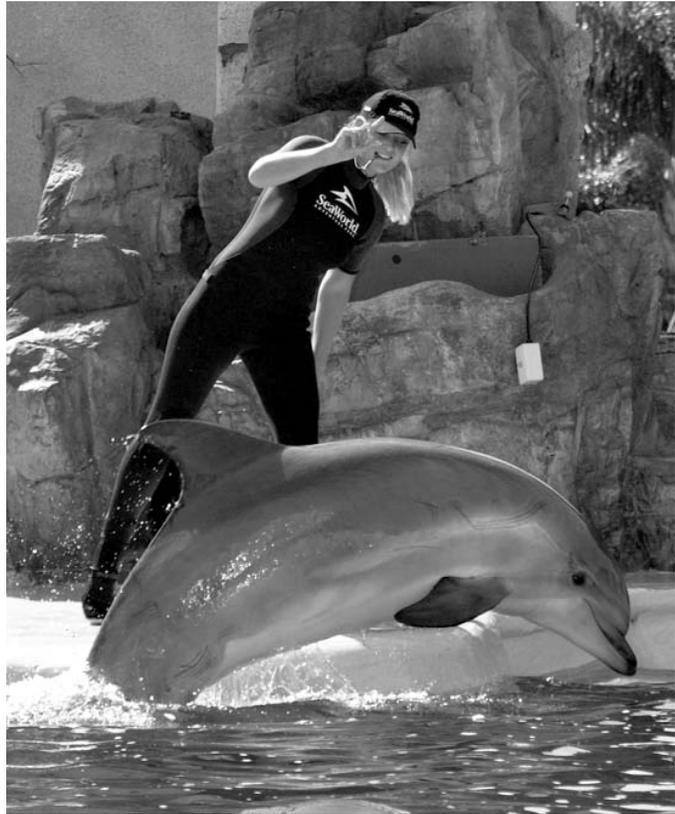
1. Have students think of sounds (other than words) that have a meaning associated with them. On the board, make a list of the sounds they name. (Examples: The doorbell means someone is at the door. The phone ringing means someone wants to talk to you. A gunshot starts a horse race. A whistle stops action in a basketball game. A fire alarm tells people to go outside. A bell tells students to line up after recess.)
2. Next, ask students to think of gestures that have a meaning associated with them. On the board, make a list of the gestures they name. (Examples: a
3. Discuss ways that people who don't speak the same language can communicate with each other.
4. Explain that ASL is a non-verbal language that's used by many hearing impaired people (and others). Teach students the ASL alphabet. Help them learn to finger-spell their names and other words.

- As a class, make up your own signs for some of the things that you frequently need to communicate to each other. (For example, students can make up signs for you to tell them to line up, to sit down, or to wash their hands. They can make up signs for telling you that they are finished with a project, that they have a question, or that they need an object.) Try using the signs instead of talking.

**DEEPER DEPTHS**

Find out if any of your students (or other teachers, staff, or volunteers at your school) know sign language. If so, have them teach the class some signs.

Find a sign language book at the library. Teach students some signs.



This trained bottlenose dolphin knows what the trainer's hand signals mean.

**ASL FINGER-SPELLING ALPHABET**

(Signs show the receiver's view on the left and the signer's view on the right.)

<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>
<b>h</b>	<b>i</b>	<b>j</b>	<b>k</b>	<b>l</b>	<b>m</b>	<b>n</b>
<b>o</b>	<b>p</b>	<b>q</b>	<b>r</b>	<b>s</b>	<b>t</b>	<b>u</b>
<b>v</b>	<b>w</b>	<b>x</b>	<b>y</b>	<b>z</b>		

## Design a Sea Lion

### OBJECTIVES

Students investigate sea lion adaptations and create a sketch that illustrates a sea lion's body parts and adaptations.



### MATERIALS

- drawing paper
- pens or pencils
- Design a Sea Lion* funsheet on page 15
- reference materials—such as books, periodicals, and the Internet—about sea lions

A sea lion resting in the water often holds one or more of its long flippers up in the air. Warm-blooded animals lose heat more slowly in air than in water, and this behavior helps a sea lion conserve body heat.



### ACTION

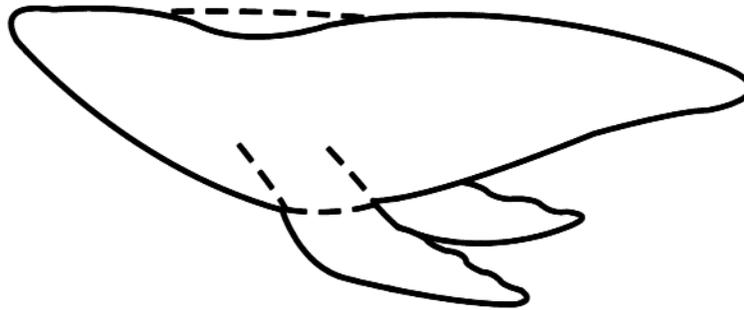
1. As a class, brainstorm challenges that humans would face if we were put in the middle of the ocean. How would we stay warm, see in the water or in bright sunlight, or find food?
2. With these challenges in mind, discuss the adaptations sea lions have to survive in the sea.
  - ◆ pointed teeth to capture prey
  - ◆ vibrissae (whiskers) to explore surroundings and detect prey
  - ◆ a mucous tear to protect their eyes from sea water and sunlight
  - ◆ blubber for insulation, streamlining, and a reserve energy source
  - ◆ fur as a body covering
  - ◆ pectoral flippers for swimming and walking on land
  - ◆ hind flippers for steering in the water and walking on land
3. Distribute *Design a Sea Lion* funsheet, pencil and paper. Students read the directions and sketch a sea lion. They label the sea lion's body parts.
4. Discuss how an animal's physical adaptations help define its repertoire of behavior. Students consult reference materials such as books, journals, and the Internet to investigate sea lion survival behaviors. Invite them to sketch some of the following:
  - ◆ holding one or more flippers out of the water
  - ◆ hauling out (climbing or jumping out of the water onto land)
  - ◆ diving
  - ◆ catching prey
  - ◆ avoiding a predator
  - ◆ vocalizing

## Design a Sea Lion

Draw the torpedolike shape of a sea lion. Blubber helps streamline the sea lion's body. A streamlined shape produces less resistance and helps a sea lion conserve its energy as it swims.



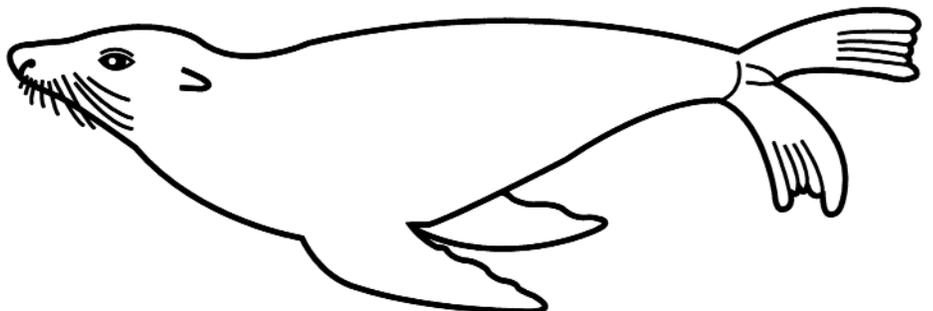
Add the pectoral (front) flippers. They are broad, furless, and very strong. A sea lion uses its pectoral flippers to swim in the water and to walk on land.



Draw the hind flippers. Like the front flippers, each has five toes or digits similar to those in our hands and feet. Hind flippers help a sea lion walk on land. Add a small tail.



Add eyes, which are large; whiskers, which are sensitive; ear flaps, and a nose. Sea lions can open and close their nostrils.



## What's Your Reaction?



Humans of different ages respond differently to the same object; they manipulate the object in the way that's most reinforcing for them.

### OBJECTIVES

Students make and test predictions, record information, and collaborate to compare and contrast data.

### MATERIALS

- Any object of your choice
- What's Your Reaction?* observation worksheet on page 17
- pens or pencils

### ACTION

1. Select a simple object such as a book, a ball, or a toy. (You may want to have several duplicates of the same object.) Pass it around the class so that each student gets to hold it. Explain to students that they will be gathering data about how various individuals may respond differently to the same object. Each individual will manipulate the object in the most personally reinforcing way.
2. Ask students to predict how people of various ages will respond to the object. You might want to use these age categories. (Add or combine categories if you wish.)
  - 2 years or younger*
  - 3 to 4 years old*
  - 5 to 10 years old*
  - 11 to 15 years old*
  - 16 years or older*
3. Each student takes the object home and uses the *What's Your Reaction* observation worksheet to record how various family members or friends respond when presented with it. Assign students to observe subjects in each age category.
  - ◆ The student records the subject's age and what the subject does with that object for a set time period (example: 3 minutes).
  - ◆ Students should include how the subject uses his or her senses during the observation time and how the subject manipulates the object.
  - ◆ Encourage students to use detail in their observations.
4. Students summarize their data and report back to the rest of the class. Combine class data and compare it to the predictions. Discuss how development, experience, and ability with respect to age help determine behavior. Did any patterns emerge?

# What's Your Reaction?

## Observation Worksheet

Date: \_\_\_\_\_

Observer's name: \_\_\_\_\_

Subject's name: \_\_\_\_\_ Age: \_\_\_\_\_ M or F

Object: \_\_\_\_\_

*Complete the following about your observation:*

Location description: \_\_\_\_\_

Observation start time: \_\_\_\_\_

Observation end time: \_\_\_\_\_

Total observation time: \_\_\_\_\_

Subject's response to object:

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## Splash of Math

### OBJECTIVES

Student practice problem-solving skills to break complex real-life problems into simpler parts. They make decisions about how to approach problems and use math skills, concepts, and strategies to find solutions.

### MATERIALS

- copies of the *Splash of Math* funsheet on pages 20–21
- pencils
- calculator

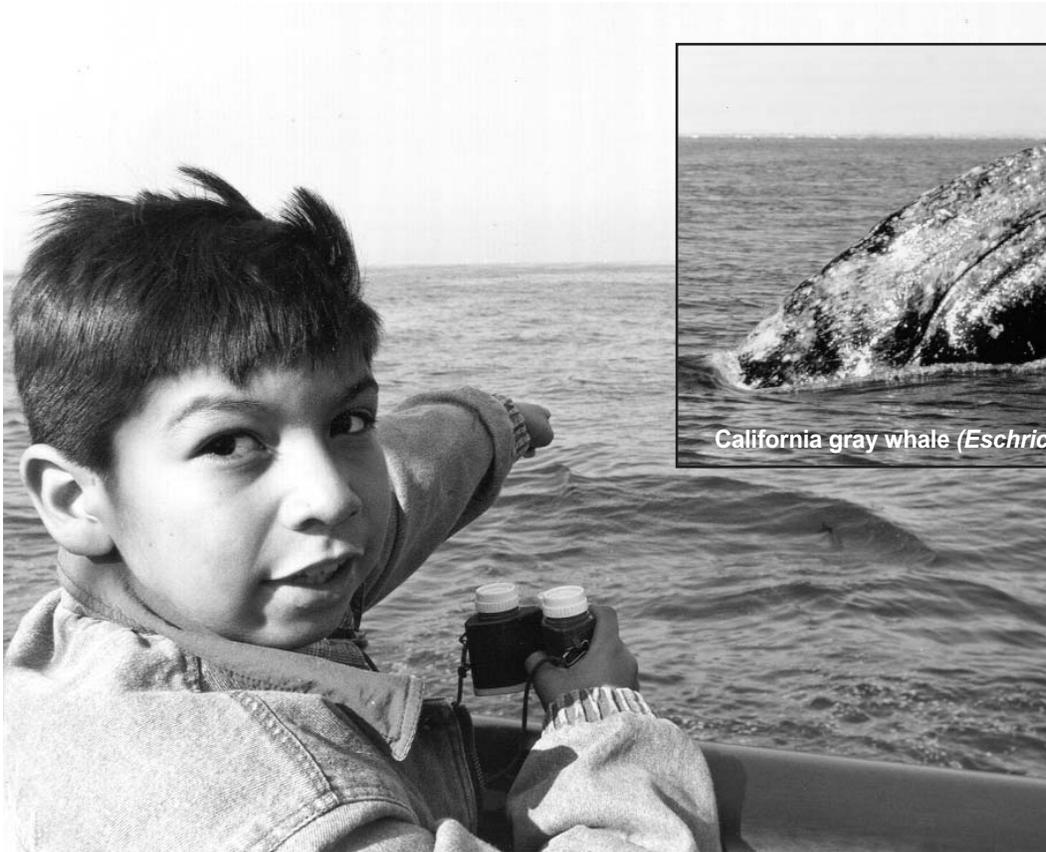


### ACTION

1. Distribute the *Splash of Math* funsheets to your students. Explain any new vocabulary words before students begin. Correct answers are on page 19.

#### DEEPER DEPTHS

Students write their own story problems using animal behavior.



This young ethologist is looking for gray whales off the coast of California.

**ANSWERS**

1.  $10,460 \text{ km (6,500 miles)} \div 56 \text{ days} = 187 \text{ km per day (116 miles per day)}$   
 $187 \text{ km (116 miles)} \div 24 \text{ hours} = 7.8 \text{ or } 8 \text{ km per hour (4.8 or 5 miles per hour)}$

2.  $187 \text{ km (116 miles)} \times 7 \text{ days} = 1,309 \text{ km (812 miles)}$

3.  $1 \text{ minute at the surface} + 4 \text{ minutes diving} = 5 \text{ minutes}$   
 $1 \text{ minute} \div 5 \text{ minutes} = 0.2 = 20\%$

4.  $(10 \text{ sec.} \times \text{total breaches}) + (10 \text{ sec.} \times \text{total bows}) = n \text{ sec.}$   
 $(10 \times 10) + (10 \times 22) = n \text{ sec.}$   
 $100 + 220 = 320 \text{ sec.}$

5. total time  
 $2 \text{ hr.} \times 60 \text{ min.} \times 60 \text{ sec.}$   
 $= 7,200 \text{ sec.}$

lobtail time:  
 $24 \text{ lobtails} \times 3 \text{ sec.} = 72 \text{ sec.}$   
 $72 \text{ sec.} \div 7,200 \text{ sec.} = 0.01 = 1\%$

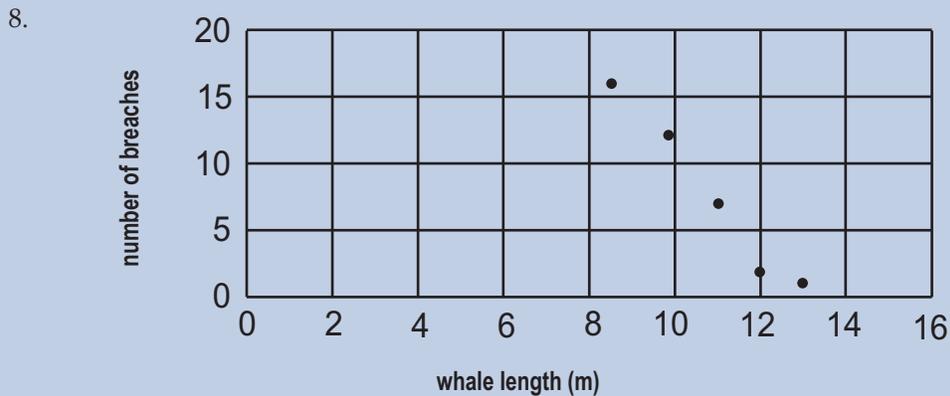
6.  $57 \text{ contacts with other dolphins}$   
 $\times 3 \text{ sec.} = 171 \text{ sec.}$

time swimming alone  
 $= \text{total time} -$   
 $(\text{breaches} + \text{bows} + \text{lobtails} + \text{contacts})$   
 $= 7,200 - (320 + 72 + 171)$   
 $= 6,637 \text{ seconds}$   
 $(\text{or } 110.6 \text{ minutes or } 1.8 \text{ hours})$



At SeaWorld Adventure Camp, a young ethologist studies a bottlenose dolphin.

7. Average dive depth is about 389 meters.  
 Average diving time is about 23 minutes.  
 Average surface time is about 3:08 minutes.



9. Based on this data, a student might predict that a 9-m whale might breach about 17-18 times.

## Splash of Math

### A. WATCH THE WHALES

Gray whales migrate each year from the Arctic to Baja California, Mexico and back: about 10,460 km (6,500 miles) each way. They leave Alaska waters in November and arrive off Baja California in January. The journey takes about 56 days. When traveling, they often breathe at the surface four times in about one minute, and then take a deep dive for four minutes.

Answer the following questions. Round answers to the nearest whole number.

1. What is a gray whale's average speed (in km per hour)?
2. On average, how far does a whale travel in one week?
3. What percentage of time does a whale spend at the surface?

### B. TIME TALLY

You are an ethologist studying bottlenose dolphins. Last Tuesday you watched one dolphin for two hours and recorded these behaviors: 10 breaches, 24 lobtails, 22 bows, and 57 contacts with other dolphins. The dolphin spent the rest of the time swimming by itself.

Answer the following questions:

4. Breaches and bows last about 10 seconds each. During your observation period, how much time did the dolphin spend on these behaviors?
5. Lobtails last about 3 seconds each. What percentage of the total time did the dolphin spend lobtailing?
6. A contact with another dolphin lasted an average of 3 seconds. How much total time did the dolphin spend swimming by itself?

### C. DEEP DIVERS

Research on the diving behavior of elephant seals has revealed amazing data. In 1989 a time-depth recorder attached to a male elephant seal recorded a dive of 1,581 m (almost a mile). Recently, researchers gathered the data at right.

7. First estimate, then calculate, the average dive depth, diving time, and surface time.

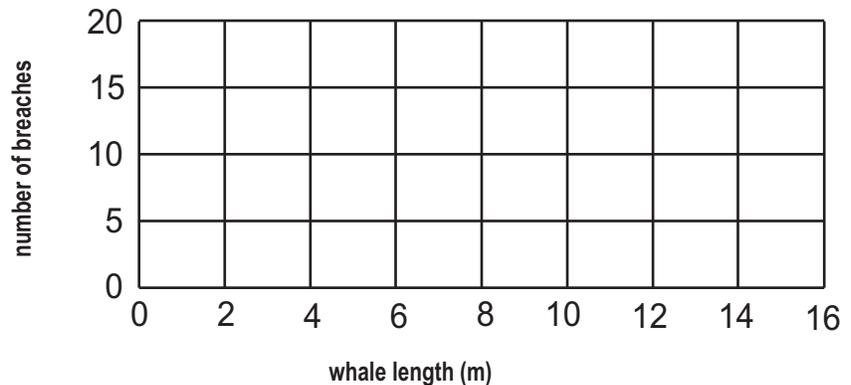
DIVE DEPTHS (m)	DIVING TIME (min)	SURFACE TIME (min)
75	77	1:56
410	8	2:25
118	12	3:30
379	19	3:45
210	24	7:21
105	49	0:30
362	9	5:47
978	28	2:19
402	18	2:31
357	23	3:22
382	10	2:56
713	22	0:41
541	6	3:31
349	20	5:02
451	14	1:18

### D. BREACHES OF THE HUMPBACK

You are an ethologist studying the breaching of humpback whales in the western North Atlantic Ocean. You observed many whales and recorded the data at right for those that breached. You estimated the length of each whale and the total number of breaches in the breaching sequence.

WHALE	LENGTH	NO. BREACHES
1	12 m (39 ft.)	6
2	8.5 m (28 ft.)	20
3	11 m (36 ft.)	11
4	9.8 m (32 ft.)	16
5	13 m (43 ft.)	5

8. Using this data, graph number of breaches vs. length for these five whales.
9. Given a whale 9 m (29.5 ft.) in length, predict how many times it might breach in sequence.



# Naturalist's Notebook

## OBJECTIVES

Students practice observation skills as they document the behavior of an animal and the characteristics of its environment.

## MATERIALS

- pencil and paper
- stopwatches
- optional*: binoculars, magnifying glass, tweezers

## BACKGROUND

*Ethology* is the study of an animal's behavior. The first step in learning about animal behavior is to observe and record the behavior. Observers must be careful not to attribute human characteristics or motivations to the animals they study.



## ACTION

1. Students record the behavior of a wild animal in its natural environment or at a zoo or aquarium. Brainstorm a list of categories of behaviors they may observe. (Include resting or sleeping, grooming, eating, watchful behavior, aggressive activity, and social or individual "play.")
2. Before beginning, students create an animal observation log. They will need space to record the observation location, the animal, and its behavior.
3. Students find a suitable observation post and observe their animals for 30 minutes. One documentation method used by ethologists is to record the animal's behavior at the beginning of each minute. To do this, students set a stopwatch to alert them at the the start of each new minute. (Once the student records the behavior the animal is doing at the start of the minute, he or she does not record further behavior until the start of the next minute.)
4. In the intervals between behavioral documentation, students record their observations of living and nonliving components of the environment, including temperature, time of day, and other animals present.
5. Students summarize their data. They can calculate percentages for various categories of behavior. They summarize their findings and outline questions that could be addressed in further research.
6. Students discuss their findings in the class. Allow the rest of the class to question or comment on each report.

### DEEPER DEPTHS

Students use reference materials to look for interpretations and explanations of the behavior they observed.

Students return to the same location and observe their subject for several days. Do students observe different kinds of behavior during different times of the day?

# Money, Money, Money

## OBJECTIVES

Students will explore the reasons for money's importance and state its significance as a reinforcer.

## BACKGROUND

Ask students to research the history of money. Have them search the Internet. Also recommend an encyclopedia and the following sources:

*Money*, by Harry Edward Neal

*Monies in Societies*, by Walter C. Neale

*The Story of Paper Money*, by Fred Reinfeld

## ACTION

1. Discuss the importance of money to people and the reasons behind its importance. Use the following questions to begin the discussion:
  - Of what value is paper money on its own?
  - What does money represent to us?
  - Why do we use money?
  - Why don't we trade or barter for most goods?
  - Where does money come from?
  - Are there any people in the world who don't use money?
  - How would people who don't use money react if you gave them a large sum of money?
  - How would you react if someone gave you a lot of money?
2. Discuss the significance of money as a reinforcer:
  - Do you get money for doing certain behaviors? What are the behaviors? (For example: mowing the lawn, washing the car, baby-sitting, etc.)
  - How does receiving money

increase the frequency of you performing these behaviors?

- Is money always an appropriate reinforcer? What else is a reinforcer for you? (For example: hearing "good job!" from parent, seeing a clean car, playing with kids while babysitting.)

## DEEPER DEPTHS

Have students create and write a story about a society in which money does not exist. Have them go into detail about how government and business would operate without money. Or, have students investigate how the promise of riches and fortune has influenced people's behavior throughout history (for example, the California gold rush in 1848). Students describe human action, response, and reinforcement. Similarly, is the discovery of buried treasure reinforcing because of its monetary value only? Or is the historic value reinforcing as well?

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**\*These books and videos available through SeaWorld.  
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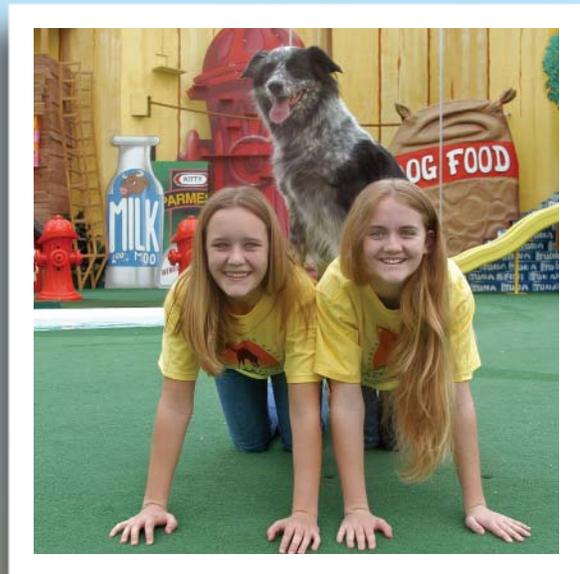
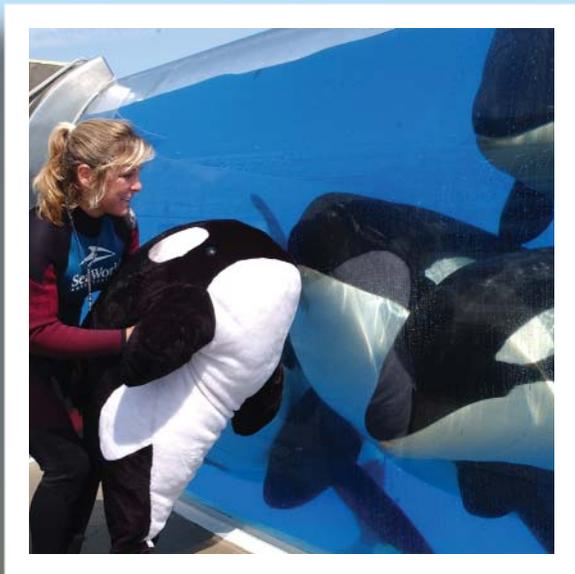
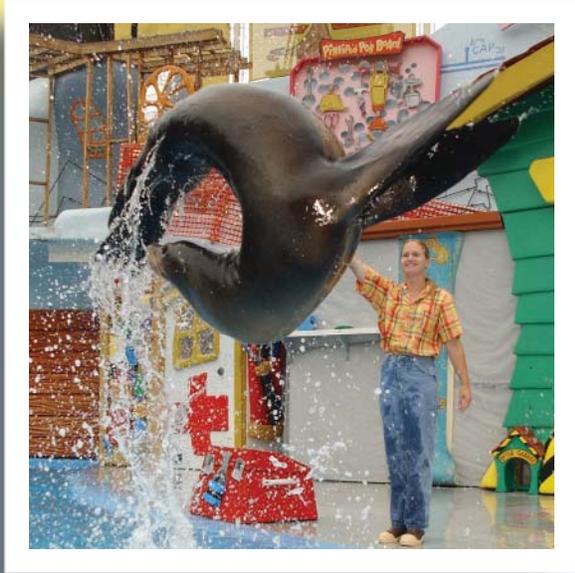
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