

VET DETECTIVE



ACTIVITY BOOK

Vet Detective Activity Book

This book features five hands-on activities designed for 8- to 12-year-olds. Each activity includes one 30- to 45-minute project and extensions. Activities can be used in any order. Also included are objectives and learning outcomes, assessment questions, ideas for a presentation or exhibit and topics for further investigation. Wonderwise learning outcomes are based on national science education standards identified by McREL (Mid-continent Research for Education and Learning), the Nebraska Educational Standards, and the National Science Education Standards developed under the direction of the National Research Council. This book incorporates concepts of inquiry-based learning and the 4-H Youth Development experiential learning model.

Each youth participant should receive a copy of the activities. Copies of this book can be downloaded from the Vet Detective CD-ROM.

WONDERWISE
Women in Science Learning Series

Wonderwise introduces you to women who have made science their career. Each kit is a comprehensive instructional package that includes a video, CD-ROM, and activity book. With these materials, leaders and youth explore the world of women scientists and discover together the fun of learning about science. For more information about Wonderwise, including free samples, Web activities, resources, science education standards and ordering information, visit our Web site:

wonderwise.unl.edu



Project Directors: Judy Diamond and Gary Heusel **Developer:** Linda Allison **Design/Illustration:** Michael Davis, Linda Allison **Produced by:** University of Nebraska State Museum and the Nebraska Cooperative Extension 4-H Youth Programs. Thanks to Tolani Francisco, Sarah Disbrow, Amy N. Spiegel, Kathy French, Janet Fox, Sandra Frerichs, Michele Rudovsky, Franz J. Camenzind, Rosemarie A. Nold.



Funded by: The Informal Science Education Program of the National Science Foundation

TABLE OF CONTENTS

MEET TOLANI /ACTIVITY ONE 2

Watch a video about veterinarian Tolani Francisco and explore animal flight distances.
Learning Outcomes: Youth develop an understanding of the work of a scientist and of the scientific enterprise.

BISON BEHAVIOR /ACTIVITY TWO 7

Observe bison and learn how to make sense of their behavior.
Learning Outcomes: Youth develop an understanding of animal behavior and learn to collect and interpret data.

VITAL SIGNS /ACTIVITY THREE 16

Learn how to take your own vital signs, and then compare them to the vital signs of other animals.
Learning Outcomes: Youth develop an understanding of animal physiology.

RUMINATION /ACTIVITY FOUR 24

Compare animal digestive systems and then experiment with the process of digesting grass.
Learning Outcomes: Youth develop an understanding of digestion.

DISEASE DETECTIVE/ACTIVITY FIVE 35

Investigate how the disease brucellosis spreads among different herds of elk.
Learning Outcomes: Youth develop an understanding of sampling populations and the causes of disease in animals.

PULLING IT ALL TOGETHER 44

Create a story about a scientist who is a wildlife veterinarian.
Learning Outcomes: Youth draw on what they have learned in the activities to construct their own understanding of what it means to be a scientist.

NEW WONDERS 45

Here are some ideas for projects or exhibits.
Learning Outcomes: Youth develop an understanding of science and technology in society and of science as a human endeavor.

INFORMATION FOR LEADERS

What You Will Need for Each Activity

Listed below are the materials and preparations you will need for each activity. Most of the materials can be purchased locally. The more difficult-to-find items can be purchased from Wonderwise. The symbol © indicates that an item can be ordered from the Wonderwise Web site or GPN, the Wonderwise distributor. To purchase supplies, kits, videos, or CD-ROMs contact:

GPN (Great Plains National)
 P.O. Box 80669 ▪ Lincoln, NE ▪ 68501-0669
 Phone: 1-800-228-4630 ▪ FAX: 1-800-306-2330
 e-mail: gpn@unl.edu ▪ Web site: gpn.unl.edu

| Activity 1 Meet Tolani | Activity 2 Bison Behavior | Activity 3 Vital Signs | Activity 4 Rumination | Activity 5 Disease Detective |
|---|--|---|---|---|
| <p>For the entire group:</p> <ul style="list-style-type: none"> © 16-min. video <i>Tolani Francisco, Vet Detective</i> ▪ video player and television <p>For each person or team of 2:</p> <ul style="list-style-type: none"> ▪ tape measure ▪ pencil ▪ 2 coins or keys | <p>For the entire group:</p> <ul style="list-style-type: none"> © 4-min. video <i>Bison Behavior</i> (also available on the Vet Detective CD-ROM) ▪ video player and television <p>For each team of 2:</p> <ul style="list-style-type: none"> ▪ pencils | <p>For each team of 2:</p> <ul style="list-style-type: none"> © thermometer (instructions are for strip variety) ▪ clock or watch for timing seconds ▪ pencil <p>Optional</p> <ul style="list-style-type: none"> ▪ 2 pinches of modeling clay (marble-size) ▪ 2 toothpicks | <p>For each team of 2:</p> <p>Part one</p> <ul style="list-style-type: none"> ▪ colored pencils or crayons ▪ scissors ▪ tape <p>Part two</p> <ul style="list-style-type: none"> ▪ 1 liter grass clippings packed loosely or shredded lettuce leaves (as a substitute) ▪ 3 zip-lock sandwich bags ▪ 1 large zip-lock plastic bag (4 liter or 1 gal.) ▪ hammer or heavy spoon ▪ cutting board ▪ 50 milliliters (4T) water ▪ measuring spoon ▪ permanent marker <p>For the group</p> <ul style="list-style-type: none"> ▪ heating pad or warm place ▪ towel | <p>For each team of 2:</p> <ul style="list-style-type: none"> ▪ pencil or pen ▪ colored pencils or crayons ▪ scissors ▪ tape |

MEET TOLANI

ACTIVITY
ONE

Watch a 16-minute video about Tolani Francisco, a wildlife veterinarian who works with elk and bison. Then explore how close people can get to animals before the animals become uncomfortable.



Before You Begin

Work alone or in teams of 2

Length:
Part I - 30 minutes
Part II - 30 minutes

What You Need

For the entire group:

© 16-min. video *Tolani Francisco, Vet Detective*

- video player and television

For each person or team:

- tape measure
- pencil
- 2 coins or keys

What We Know. Meet Tolani Francisco, wildlife veterinarian. Tolani is a Native American who grew up in Laguna Pueblo near Albuquerque, New Mexico. Her mission as a veterinarian for the U.S. Department of Agriculture is to protect the health of animals on tribal lands in the United States.

Tolani's job takes her into the field to help prevent disease in wild animals such as elk and bison. She also works with ranchers and farmers in her region to keep their livestock healthy. Sometimes Tolani lends a hand at a clinic where she works with small animals like cats and dogs.

Vets, ranchers, park rangers or anyone who

manages or raises animals make it their business to learn the behaviors of the animals they work with. Tolani knows how to tell when an animal is hungry, sick, or frightened. To treat animals, she has learned to get close to them, but often this is not an easy task.

Many animals become worried when someone intrudes into their personal space. They respond either by flight (moving) or by fight (defending themselves). Before fighting, an animal usually gives some warning signals, like a hiss or growl, baring its teeth or puffing up. Knowing an animal's flight zone (how close a person can get before the animal gets nervous) is important for the safety of both people and animals.

Part One: Meet Tolani

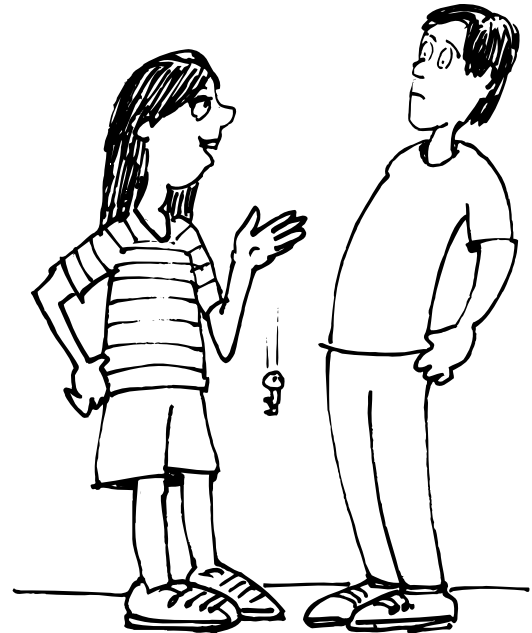
Watch the video about veterinarian Tolani Francisco. Then discuss what it is like to keep large animals healthy.

Think It Over



Part Two: Flight Zones

- 1 Choose a partner for testing. Gather 2 coins or keys, a pencil and a tape measure.
- 2 Explore your partner's flight zone. Begin by starting a conversation. Notice where the person is standing. As you talk, slowly inch closer.
- 3 When your partner moves back or says she is uncomfortable, then stop moving forward. Use the coins (or keys) to mark where you and your partner are standing.
- 4 Measure the distance between the coins. Record the distance on the chart below.
- 5 Now test someone you don't know really well. Ask permission to test their flight zone and explain the experiment. Ask them to tell you when they begin to feel slightly uncomfortable. Record your results on the chart below.
- 6 Try again with a new person, and record your results again.
- 7 Average your distances. (To average, add all the distances together and divide by the number of tests.)



| PERSON | Flight distance (centimeters or meters) |
|-------------------------|--|
| 1. | |
| 2. | |
| 3. | |
| Average flight distance | |

MEET TOLANI

7 Predict which animals on the Flight Distance Chart below have the longest and shortest flight zones. Write your predictions on the chart below.

FLIGHT DISTANCE CHART

| | Predictions | Data (distance in meters) |
|--------|-------------|---------------------------|
| People | | |
| Bison | | |
| Elk | | |
| Cattle | | |

8 Under the Data section of the chart above, write in the average flight distance from your tests with people.

9 Using the information below, fill in the rest of the Data section of the Flight Distance Chart.

| | |
|--------|-----------|
| Bison | 15 meters |
| Elk | 30 meters |
| Cattle | 3 meters |

10 How did the actual data compare to your predictions?



MEET TOLANI

ACTIVITY
ONE

Think It Over



How does understanding flight zones help a wildlife veterinarian?



BISON BEHAVIOR

ACTIVITY
TWO

First think about some of your own behaviors and how you communicate them to others. Then watch a 4-minute video of bison and make some observations.

Before You Begin

Length:
Part 1 - 15 mins.
Part 2 - 60 mins.

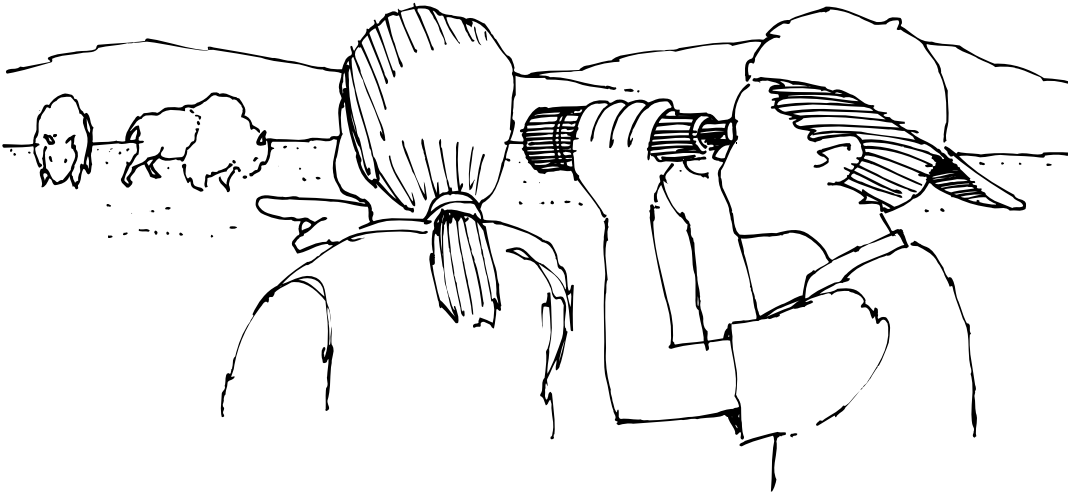
What You Need

For the entire group:

- Ⓞ 4-min. video *Bison Behavior* (also available on the Vet Detective CD-ROM)
- video player and television

For each team of 2:

- pencils



What We Know. Animals behave in ways that help them survive and help their young survive. People who study animal behavior know behaviors aren't always what they seem. A bison that is wallowing in the dirt looks like it's simply scratching its back. Rolling on the ground is actually a grooming behavior that helps remove parasites from a bison's hide. In male bison it is also a marking behavior; the scent he leaves behind warns other males to stay away from his territory. A male that can successfully chase other males away increases his chances of mating with a female bison. A behavior that seems simple at first glance can often be complex.

A behavior in one animal language doesn't necessarily translate to another animal language. For instance, a dog may wag its tail as you approach. This behavior can mean it is happy to see you. A bison with a raised tail may look like it is wagging its tail, but it is not happy to see you. A raised tail is an alarm signal. Mistaking this for a friendly invitation could be a painful disaster.

Tolani Francisco, in her work as a wild animal veterinarian, is skilled at observing animal signals. Learning to read behaviors can help her tell if an animal is healthy or sick, if it is not getting enough food, or if it is stressed. Watch the video and try your hand at observing and identifying bison behavior.

BISON BEHAVIOR

Part One: People Watching

People display all sorts of interesting behaviors. First consider some of your own behavior patterns. What do you do when you are scared? When you are bored? Or hungry?

1 Find a partner. Together consider each of the feelings on the chart below. Think how you might advertise each feeling. Then list the specific movements or actions (not words) that show each of these feelings.

| FEELING | BEHAVIOR: Describe your actions, such as body position, facial expression, movements, and sounds (not words) |
|---------|--|
| Playful | <i>skip</i> <i>smile</i> <i>laugh</i> |
| Hungry | |
| Scared | |
| Itchy | |
| Angry | |
| Tired | |

2 Pick a behavior recorded above. Send a message to your partner (no words are allowed!) See if your partner can guess what you are feeling by watching your behavior.

3 Ask your partner what she thought you were feeling. Take turns sending behavior messages to each other until the time is up.

Excellent Work!

BISON BEHAVIOR

ACTIVITY
TWO



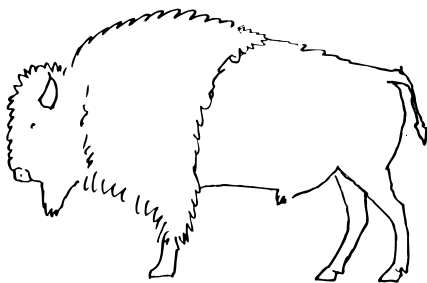
Think It Over

Think of a familiar animal. Describe how your animal behaves when it is hungry, scared, or playful.

Part Two: Observing Bison Behavior

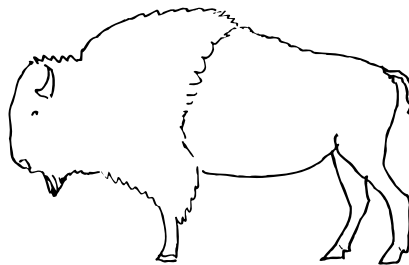
There is a difference between an animal's actions (behaviors) and what the actions mean (function). First watch a video of bison interacting on the range in Wyoming and observe and record their actions. Then view the video again and use the key to sort out what the different behaviors might mean.

1 Meet the bison.



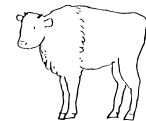
Male Bison

2 Meters tall at the shoulder. Males have thicker horns, fuller beards and genitals in the mid-belly.



Female Bison

About 1/3 smaller than males with lighter bodies and a smooth underbelly.



Calf

Born with reddish fur that darkens after the first year. By the second year they look like adults.

2 Watch the short video, *Bison Behavior*.

3 Look carefully at what the bison are doing. While you watch, record the actions or behaviors you see on the Behavior by Body Part Chart on p. 11. Remember to think about each body part separately.

BISON BEHAVIOR

ACTIVITY
TWO

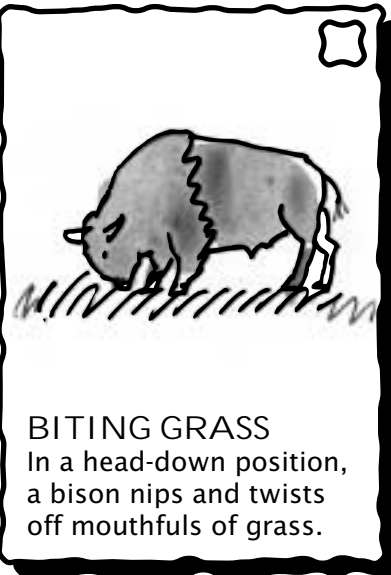
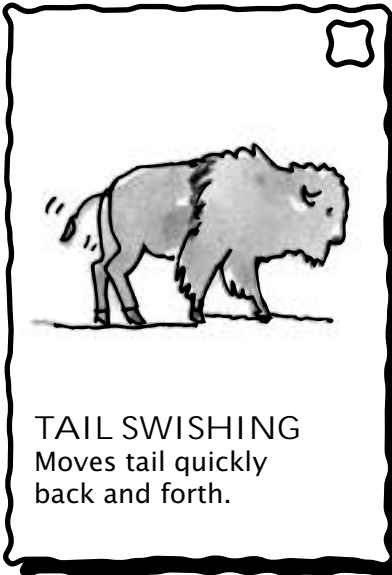
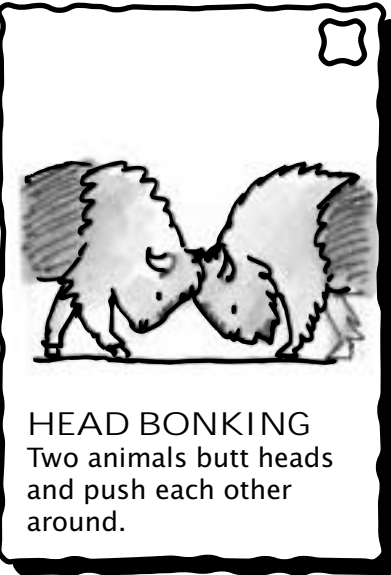
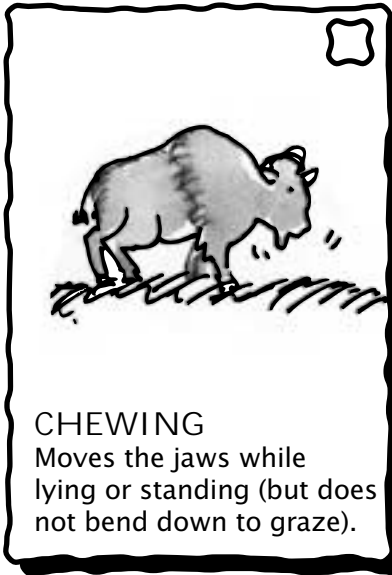
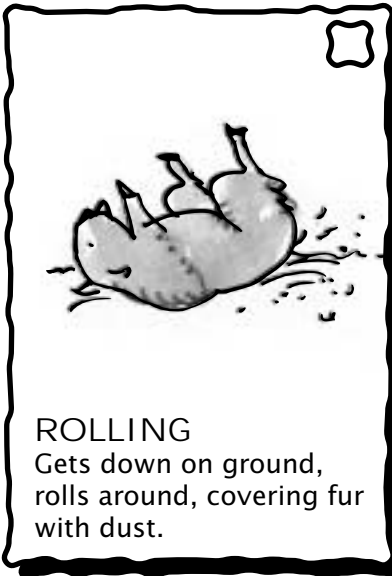
.....

BEHAVIOR BY BODY PART CHART

| Body Part | Observed Behavior (Describe bison actions such as body positions, movements, sounds, interactions with others) |
|------------------|--|
| Mouth | <i>licking a bison calf</i> <i>drooling</i> <i>male making snorting sounds</i> |
| Head | |
| Body | |
| Tail | |
| Feet | |

Part Two: Observing Bison Behavior (cont'd)

- 4 On page 13 is a set of cards with some bison behaviors defined by a bison expert. Use the cards to decode the behaviors in the video. First, read the bison behavior cards.
- 5 Watch the video again. While you watch, put a check in the upper right hand corner of each behavior card if you observe that behavior.
- 6 Sometimes different behaviors have the same functions. Think about the function of each behavior. First cut the behavior cards on p.13 apart. Then sort all of the cards into the function categories on p. 14. (Hint: if you think a card might fit more than one place, write the behavior name on a slip of paper and use it again.)
- 7 With your partner, review the behavior cards in each category. Discuss your similarities and differences. Remember, a behavior can have different meanings depending on who does it.



BISON BEHAVIOR

ACTIVITY
TWO

Part Two: Observing Bison Behavior (cont'd)

Sorting Out Bison Behavior

PLAYING

FIGHTING

COMFORTING


EATING

COMMUNICATING

BISON BEHAVIOR

ACTIVITY
TWO

Think It Over

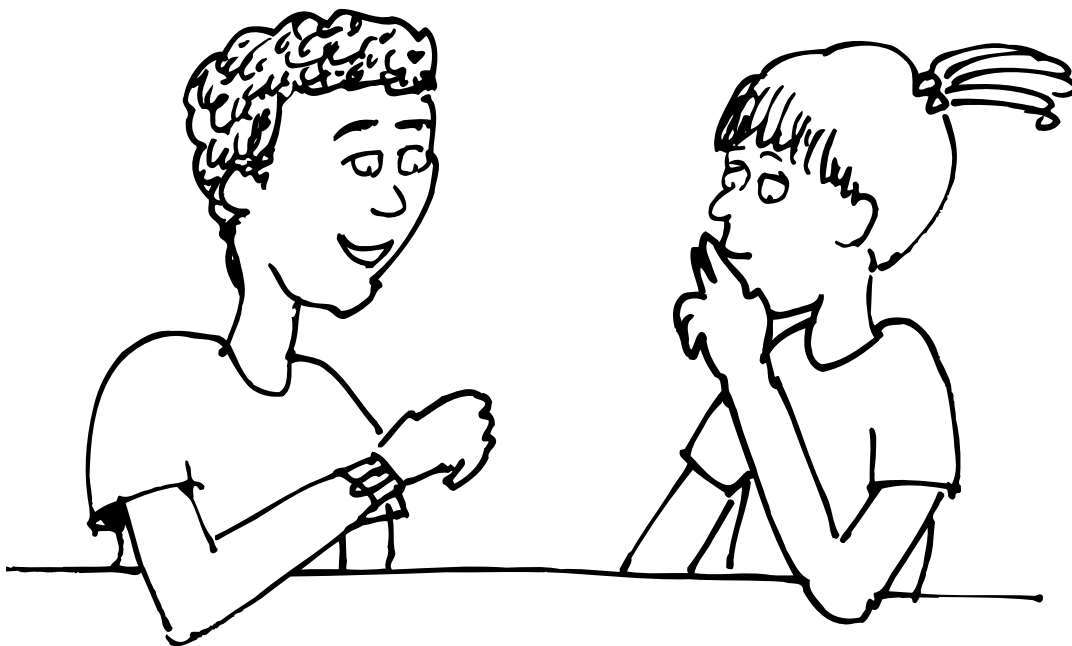


When you are observing behavior, how can you tell the difference between playing and fighting?

VITAL SIGNS

ACTIVITY
THREE

Learn how to take your own vital signs and then compare them to the vital signs of some other animals large and small.



Before You Begin

Teams of 2

Length:
Part 1- 45 minutes

What You Need

For each team of 2:

- ⊙ thermometer (instructions are for strip variety)
 - clock or watch for timing seconds
 - pencil
- Optional**
- 2 pinches of modeling clay (marble-size)
 - 2 toothpicks

What We Know. Sirens, emergency room, a patient is rushed into the hospital. Doctors swarm. Uh oh! The situation looks critical. "Check his vitals," somebody yells. So why in the middle of an emergency do doctors take time out to take vital signs? Because these signs help doctors understand what's going on inside the body.

Temperature, respiration rate and heart rate measure different activities inside a living body. When doctors compare normal vital signs to their patient's vital signs, it helps them identify

problems. Doctors and vets know that normal is not the same for every body. Vital signs vary from species to species. Generally, small animals like rabbits have much faster heart rates than large animals like elk or cattle.

Even among the same species of animals there is a range of normal. For instance, an adult human might have a normal resting heart rate of 70 beats per minute, while an infant might have a normal resting rate of 130. You can see why knowing what is normal for you is important . . . even vital.

Part One: Test Your Own Vital Signs

Temperature is a measure of heat. Your body is constantly taking in food (chemical fuel) and burning it to produce energy. This process also produces a lot of heat. How much heat your body gives off is a measure of how hard your body is working. You know when you run around the block your body feels really hot afterwards. The cells in your body have been working hard, and extra heat is the proof.

The cells inside your body are very sensitive to heat. They must be kept within a few degrees to do their work. Sometimes extra heat (fever) is a sign that your body is working hard to fight off an infection.

Take your Temperature

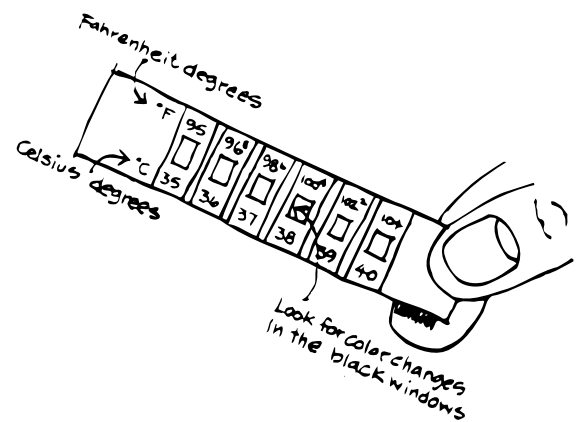
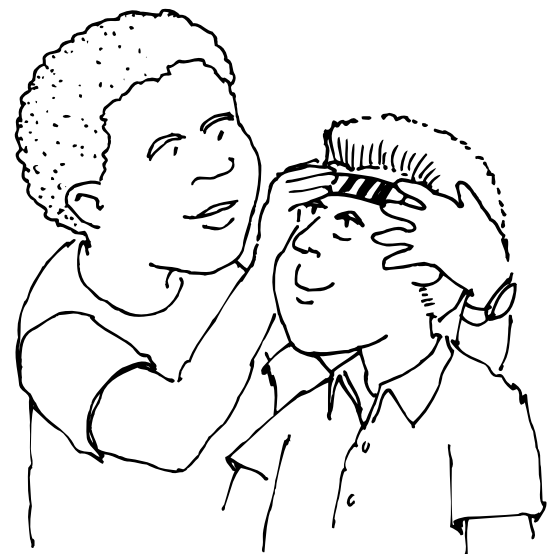
1 You will need a partner and a strip thermometer. Decide if you are using Fahrenheit (F°) or Celsius (C°) degrees. Make sure your forehead is dry.

2 Hold the strip across your partner's forehead for about a minute. **Make sure you hold it only on the ends.**

3 While the strip is in place, your partner will observe that the windows turn from black to a color across the strip. The partner watches where the colors stop. Look for the green square. (Hint: If no green square lights up, look at the number that is halfway between the tan and blue squares.)

- For a temperature in Fahrenheit (F°), read the number above the green square.
- For a temperature in Celsius (C°) read the number below the green square.

4 Write the temperature here _____.



VITAL SIGNS

Part One: Test Your Own Vital Signs (cont'd)

5 Record the temperature from the previous page under Trial 1 on the chart below.

RECORD YOUR TEMPERATURE HERE

| TRIAL 1 | TRIAL 2 |
|---------|---------|
| Name | Name |
| Number | Number |

(Mark your temperature with F for Fahrenheit, or C for Celsius.)

6 Now switch places so you can take your partner's temperature. Record it on the chart above under Trial 2.

Part One: Test Your Own Vital Signs (cont'd)

Take your Respiration Rate

Your body needs oxygen to keep working . . . lots of oxygen. Another important measure of how hard the body is working is how fast you are taking oxygen in, or how fast you are breathing. This is called respiration rate. It is easy to take.

- 1 You will need a partner and a watch that shows seconds.
- 2 Put your fingertips under your nose so you can feel the breath leaving the body.
- 3 Your partner will time you for one minute. When he or she says go, breathe naturally and count your breaths until the minute is up. (Hint: sometimes trying to breathe naturally is very difficult. If you don't think you are getting an accurate count, try and spell your name backwards while your partner counts your breaths.)
- 4 Record your respiration rate on the chart below under Trial 1.

RECORD YOUR RESPIRATION HERE

| TRIAL 1 | TRIAL 2 |
|------------------|------------------|
| Name | Name |
| Respiration Rate | Respiration Rate |

- 5 Now switch places so you can time your partner's respiration rate. Record it on the chart above under Trial 2.

Part One: Test Your Own Vital Signs (cont'd)

Take your Pulse

Day and night your heart pumps blood through the body. How fast it pumps is a sign of how hard the body is working. Sprint to the corner and your heart rate rises, get in a scary situation and your heart rate goes into high gear ready for action. When the body is sick, the heart rate or pulse climbs. Take your pulse to find out your resting normal heart rate.

Finger pulse: feel for a pulse

Your neck and wrist are good places to find a pulse. Blood vessels are close to the surface in these places, and you can feel the blood pushing through them.

1 Put two fingers lightly on your wrist. Move them around until you can feel a steady beat. **Don't press too hard or you won't feel anything.**

2 If that doesn't work, try feeling for your pulse on your neck just under the jaw. Try slightly to the left or right of your Adam's apple.

3 When you find a steady beat, count while your partner times you for 15 seconds.

Record your count here _____.

4 Trade places. Then record your partner's count here _____.

Multiply the counts by 4 to find your 1-minute pulse rates.
(there are 4 x 15 seconds in 1 minute).

You: _____ x 4 = _____

Your partner: _____ x 4 = _____

5 Record your 1-minute pulse rates on the Heart Rate Chart below.



RECORD YOUR HEART RATE HERE

TRIAL 1

TRIAL 2

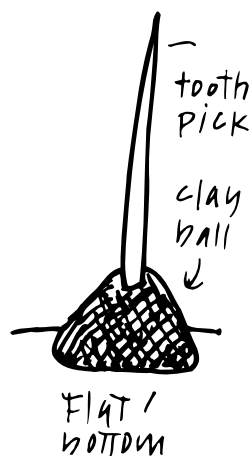
| | |
|---------------|---------------|
| Name | Name |
| 1-Minute Rate | 1-Minute Rate |

Part One: Test Your Own Vital Signs (cont'd)

6 If you are having trouble feeling your pulse, try the Alternative Pulse Method below.

Alternative Pulse Method

(Use this method ONLY if you are unable to find your partner's pulse with your fingertips.)



Pulse meter: look for a pulse

You will need a toothpick and a small amount of clay.

Roll a ball of clay about the size of a big marble.

Form the ball into a cone. Smash one side so it lies flat on a table. Stick a toothpick in the middle of the cone.

Relax your hand and arm on a flat surface. Place the cone on your wrist. Move it around until you find the pulse point. The toothpick will jiggle with your heartbeat.

Count the jiggles while your partner times 15 seconds.

Multiply the number by 4 and record your answer _____ x 4 = _____.

VITAL SIGNS

Part One: Test Your Own Vital Signs (cont'd)

Summing Up Your Vital Signs

- 1 Record your data from each of the sections of Part One on the Vital Signs Chart below.

VITAL SIGNS CHART

| | You | Partner | Children Average |
|------------------|-----|---------|------------------------|
| Temperature | | | 97°–100° F (36°–38° C) |
| Respiration Rate | | | 15–25 |
| Heart Rate | | | 85–95 |

- 2 Look at the children averages. Does your data fall in the average range?

- 3 How do your vital signs compare to the vital signs of other animals? First add your vital signs to the chart below.

VITAL SIGNS COMPARISON CHART

| | Cow | You | Rabbit |
|------------------|--------------------|-----|--------------------|
| Temperature | 101.5° F (38.6° C) | | 102.5° F (39.3° C) |
| Respiration Rate | 30 | | 40 |
| Heart Rate | 65 | | 200 |

- 4 How do your vital signs compare to those of a cow?

- 5 How do your vital signs compare to those of a rabbit?

Think It Over



What can vital signs tell you about a person's or other animal's health?

RUMINATION

Compare the digestive system of a human and a cow. Then experiment with the process of digesting grass.



Before You Begin

Teams of 2

Length:

Part I - 30 minutes

Part II - 30 minutes on one day and 15 on the next .

What You Need

For each team of 2:

Part one

- colored pencils or crayons
- scissors
- tape

Part two

- 1 liter grass clippings packed loosely or shredded lettuce leaves (as a substitute)
- 3 zip-lock sandwich bags
- 1 large zip-lock plastic bag (4 l. or 1 gal.)
- hammer or heavy spoon
- cutting board
- 50 milliliters (4T) water
- measuring spoon
- permanent marker

For the group

- heating pad or warm place
- towel

What We Know. Did you know that cows have a four-part stomach? They need all four parts to do the tough job of digesting grass and other plants. Plants have no bones, but they have cellulose. Cellulose is the stuff that makes plants stiff and strong. We use hunks of cellulose (lumber) to build houses. Few animals have the stomach for turning cellulose into digestible food. Grazing animals are the exception to this rule. They can survive on a diet of tough plants.

Grazing animals are called ruminants because of the many parts of their stomachs (the word ruminant comes from rumina, which means bellies or stomachs.) You may have noticed that cows,

bison, and elk "chew their cud." Cows spend up to 8 hours a day chewing cud. These ruminants have a special trick of eating and running, and chewing their food later.

What makes ruminants different from other animals is the first part of digestion. After a ruminant swallows some grass, it goes into the first part of their stomach. Then they regurgitate (spit up) the grass, and chew it into a pulp. It is then swallowed again and sent to the rumen, the largest part of the stomach, which contains billions of microbes. The microbes help break down (ferment) plants so the body can use them as food. Disgusting? No it's digesting . . . ruminant style.

Part One: The Inside Tract, Humans vs. Cows

Discover the amazing four-part stomach of ruminants and their habit of cud chewing. Explore how it compares to your one-part stomach.

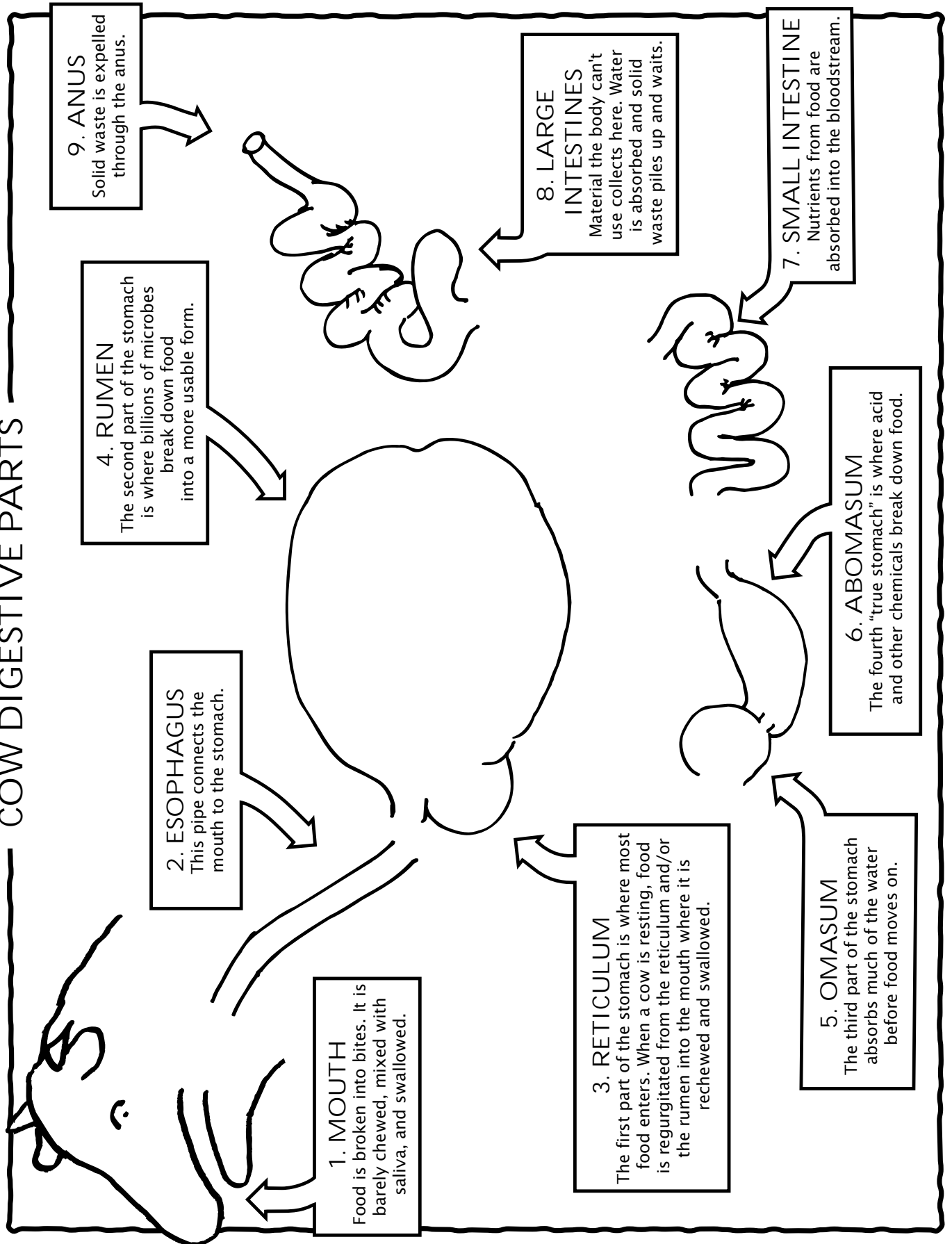
Work in teams of two. Half the teams will assemble a cow digestive system, the other half a human digestive system. Then you will swap expertise. Assemble your team and the materials. You will need a “Parts” page and a “Digestive System” page for either cow or human, and scissors, tape, and colored pencils or crayons.

Compare Digestive Tracts.

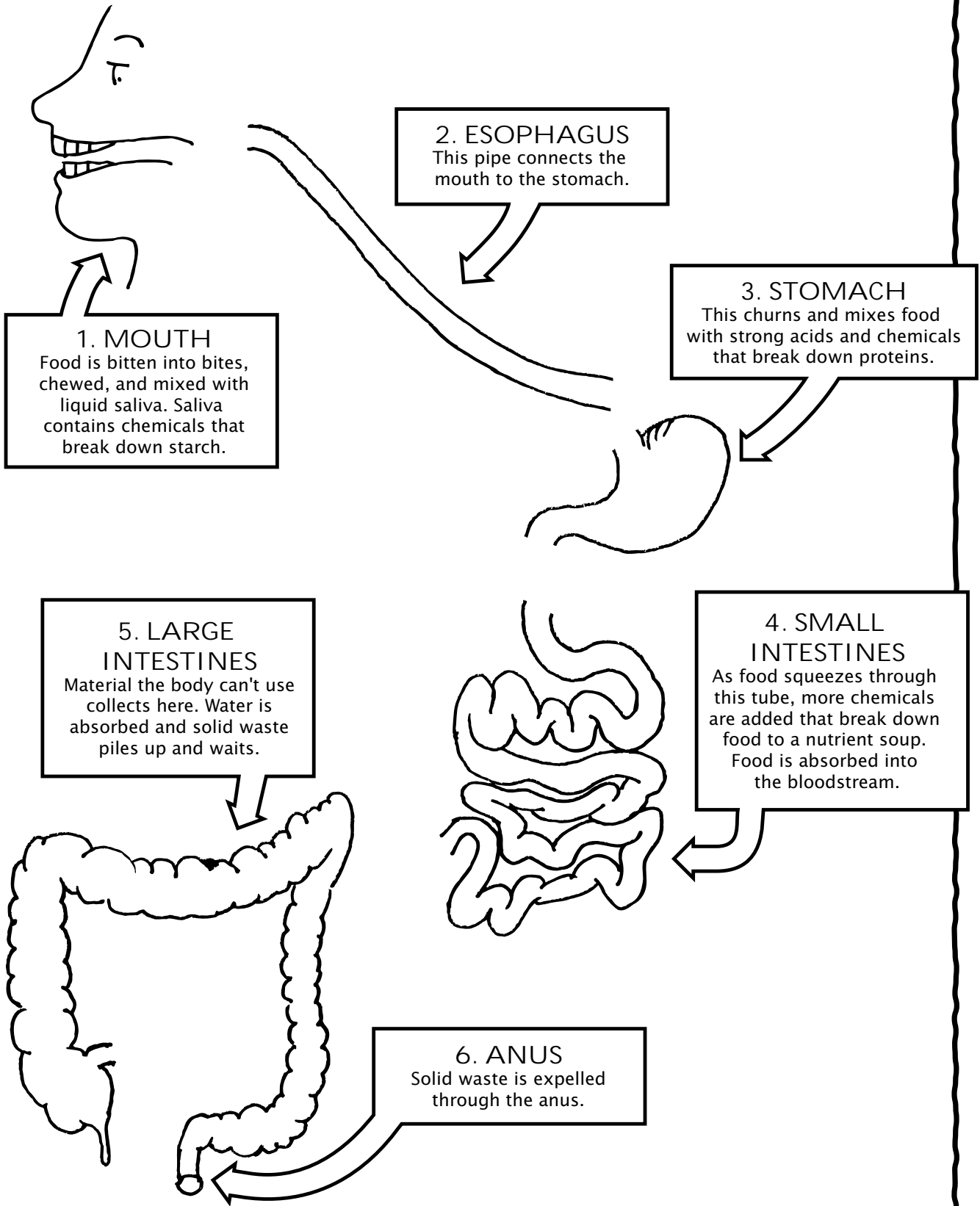
- 1 Choose to work on either cows or humans. Locate your Parts page on either p. 26 (cow) or p. 27 (human).
- 2 Look closely at your Parts page. Read the captions. Lightly color each part of the digestive system and its caption with the same colored pencil. Using different colors, do the same for **each part** and **caption**. Some parts have more than one caption.
- 3 Cut out the parts of the digestive tract and the captions. Set the captions aside.
- 4 Move all the cut-out cow parts to the Complete Cow Digestive System on p. 28. Move all the human parts to the Human Digestive System on p. 29. Assemble the parts within the body outline to make a complete digestive system. Use the small diagram as a guide. Tape the parts in place.
- 5 Add the captions to the parts on your Digestive System page. Tape them in place.
- 6 On your Digestive System, use a pencil to draw the travels of a bite of food through the system.
- 7 Find a team who is expert in the other animal’s digestive tract. Explain your digestive system charts to each other.

Good work! You now have the whole picture of cow and human digestion.

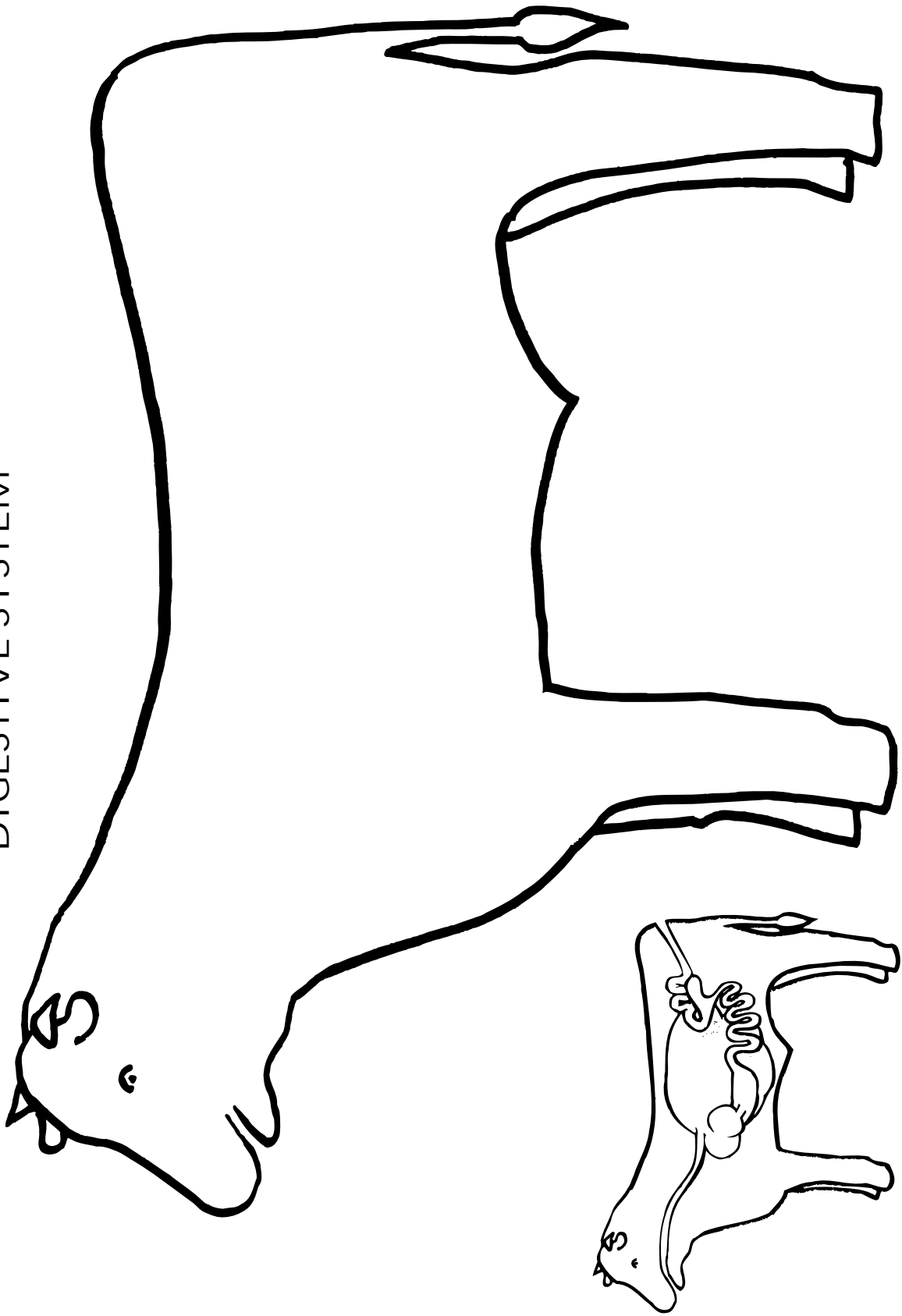
COW DIGESTIVE PARTS



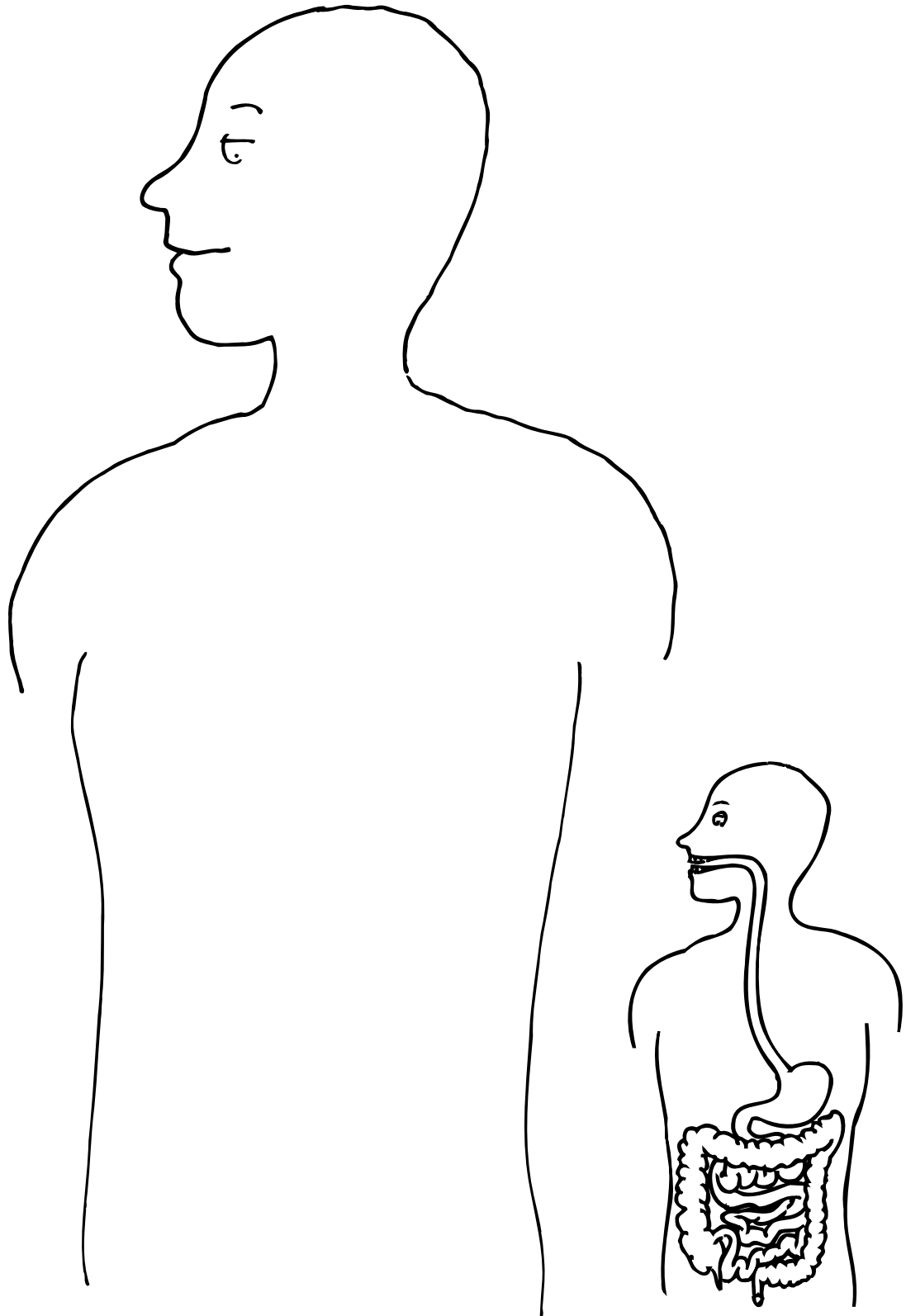
HUMAN DIGESTIVE PARTS



THE COMPLETE COW
DIGESTIVE SYSTEM

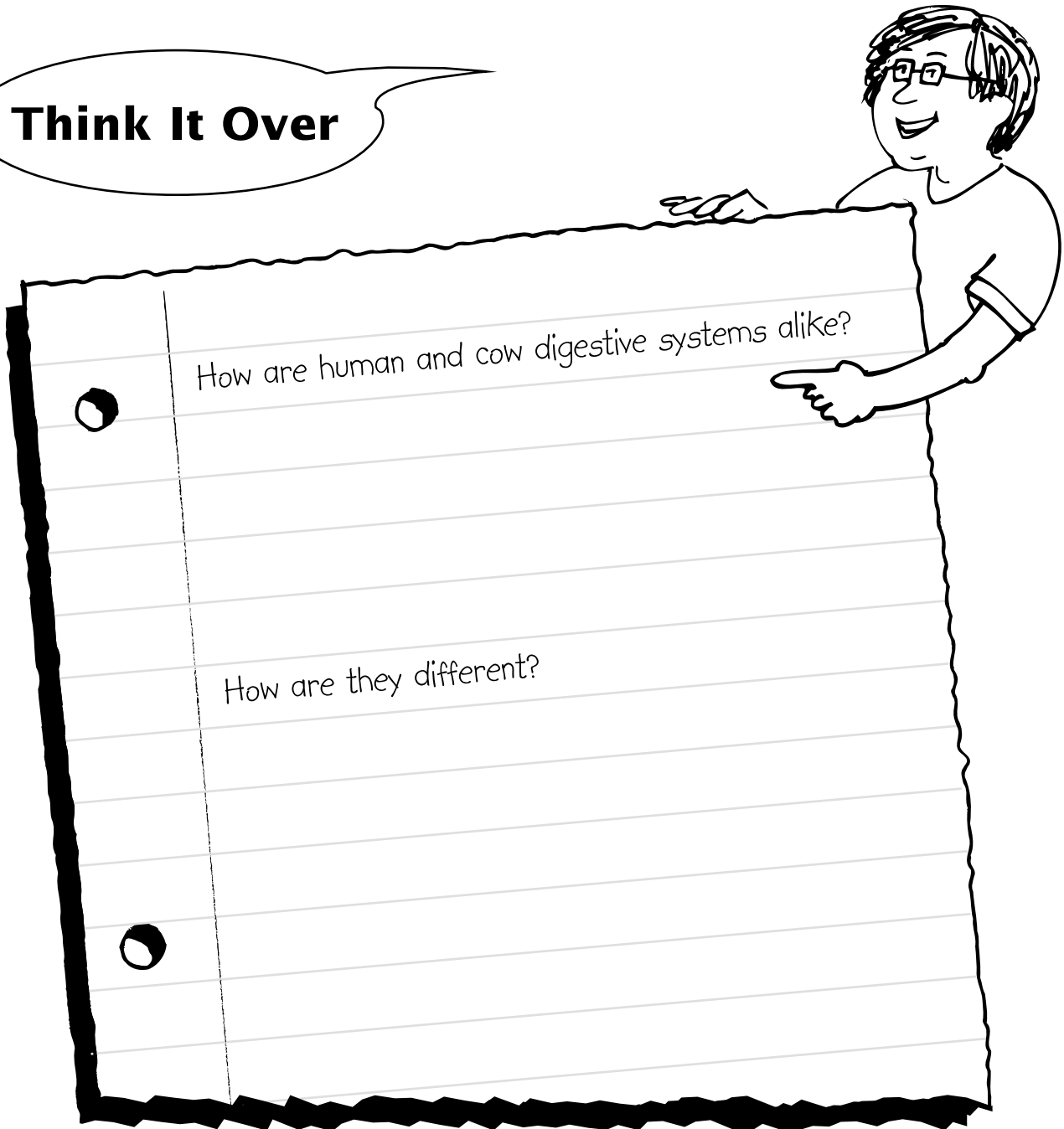


THE COMPLETE HUMAN DIGESTIVE SYSTEM



RUMINATION

Think It Over



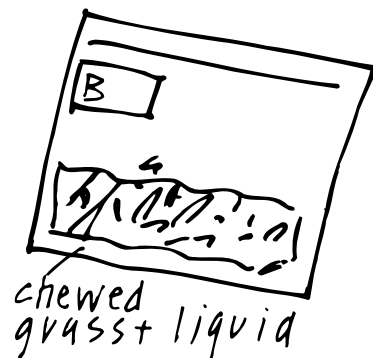
Part Two: Green Food Breakdown

Work with a partner to explore the first stages of digesting grass. Consider the effects of chewing, mixing with liquid, and warming on the process of breaking down grass. Rumination includes these 3 steps and much more.

- 1 Gather about 1 liter of loosely packed grass or shredded lettuce leaves.
- 2 A grazer first tears grass into bite-size pieces. Cut your grass into short, 2-centimeter pieces. Divide the grass into 3 equal piles.
- 3 Put one pile in a zip-lock sandwich bag to make the control sample. A control is a sample that gets nothing done to it (no chewing). Label it **Stomach A**.



- 4 Next you will “chew” the grass. Do this by putting the rest of the grass in a large zip-lock plastic bag. Put the bag on a cutting board. Tap it with a large spoon or hammer until the grass is bruised and chewed looking.



- 5 Make the chewed sample. Put half the grass in a zip-lock sandwich bag. Add about 50 milliliters (4 tablespoons) water. Zip it shut and squish the contents around a bit. Label it **Stomach B**.

- 6 Make the chewed and ruminated sample. Put the remaining grass in a zip-lock sandwich bag. Add about 50 milliliters (4 tablespoons) water. Zip it shut and squish the contents around a bit. Label it **Stomach C**, and set it aside to warm later.



Part Two: Green Food Breakdown (cont'd)

5 Check out each “stomach” and write down how the contents smell and look on the left side of the Stomach Chart below.

STOMACH CHART

| | |
|----------------------------------|---------------------------------|
| STOMACH A Smells Looks | NEXT DAY Smells Looks |
| STOMACH B Smells Looks | NEXT DAY Smells Looks |
| STOMACH C Smells Looks | NEXT DAY Smells Looks |

6 Set the bags aside overnight at room temperature. Put **Stomach C** on a heating pad set to low and cover it with a towel.

Part Two: Green Food Breakdown (cont'd)

AFTER 24 HOURS

Closed Eye Smell Test

- 1 Gather your stomach bags. Choose one person to be the smeller and the other to be the tester.
- 2 The smeller closes her eyes. The tester mixes the order of the stomach bags and then opens the zip locks.
- 3 The tester places each open bag under the smeller's nose and asks her to describe it. The tester records the smells on the Stomach Chart on p. 32 under "Next Day." Then together, look at the stomach sample. Record your observations under "Looks" on the chart.
- 4 Repeat the smell and look tests on each sample stomach. Record your observations on the Stomach Chart under "Next Day."
- 5 Which sample looks or smells the most digested (dark liquid, mushy grass, sour smell)? Which sample looks or smells the least digested? (Hint: The sour scent is the smell of fermentation or the chemical breakdown of the grass).

Write your answers below.

Most digested _____

Least digested _____

RUMINATION

Think It Over

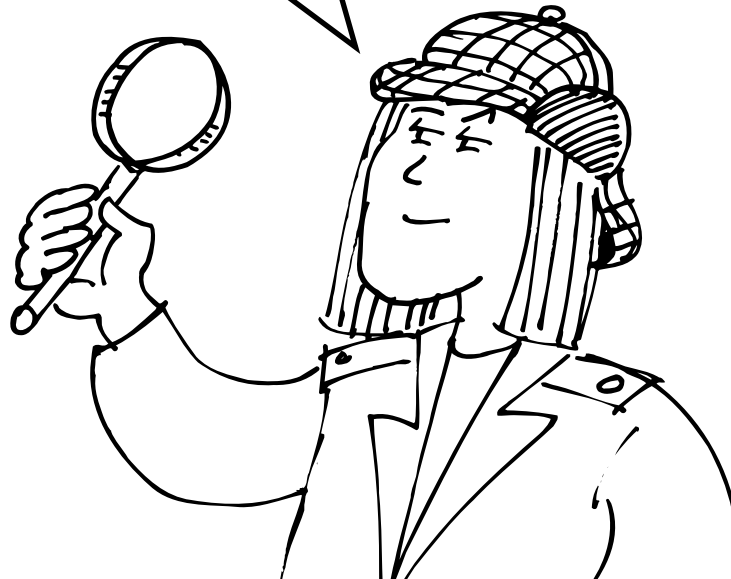


How does rumination help cows digest grass?

DISEASE DETECTIVE

ACTIVITY
FIVE

Today, try thinking like a vet detective while studying a disease called brucellosis. Compare two different herds of elk to find out how many have brucellosis.



Before You Begin

Teams of 2

Length:

Part I - 30-45 minutes

Part II - 15 minutes

What You Need

For each team of 2:

- pencil or pen
- colored pencils or crayons
- scissors
- tape

What We Know. Many things spread by contact. Your friend comes over with the latest game, and you want to get one too. Disease also spreads by contact, but you wouldn't want to get it. Neither do elk. But elk can catch a serious disease when they get together. The disease is called brucellosis. It is caused by a germ (bacteria) that spreads invisibly.

Elk, bison, and cattle can carry the brucellosis bacteria and pass it to each other. Early in the 20th century, brucellosis was common in cattle. About half the cattle herds that were tested in the United States had the brucellosis bacteria. The disease causes weakness, weight loss, and the death of young animals. As you can imagine, this disease can be a big problem for farmers and ranchers.

Is anyone trying to stop brucellosis from

spreading? Yes. Since the 1930s this country has spent billions of dollars testing animals and controlling the spread of the disease. The effort has been very successful. Today, most states in the U.S. call themselves "brucellosis free."

Yellowstone National Park is one place that still has a brucellosis problem. Many of the elk and bison that live in Yellowstone test positive for the disease. The wild herds of elk and bison originally caught brucellosis from cattle.

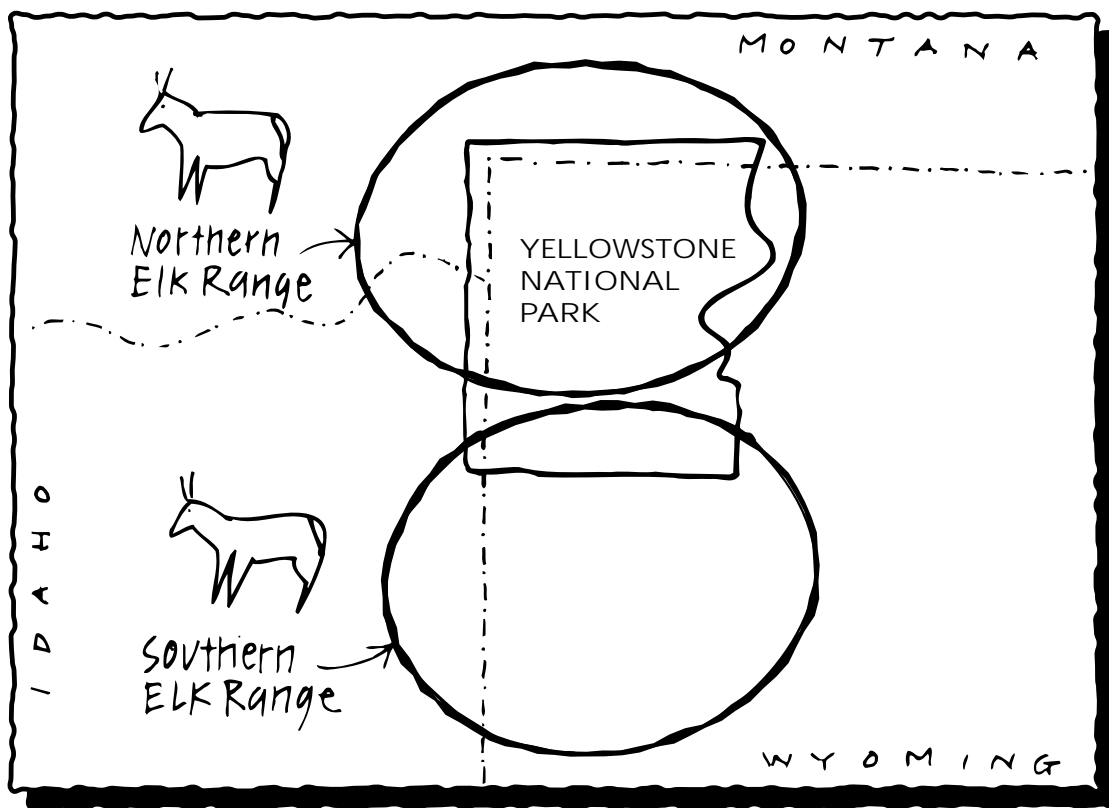
A big effort is underway to find out how the disease works in these wild animals, and how it passes from one member of the herd to another. This will allow people to make a plan to prevent the disease from spreading in wild animal populations . . . and perhaps someday, to wipe it out completely.

Part One: Test the Herds

Map the Herds

- 1 Team up with a partner and get colored pencils.
- 2 On the map below, show where two herds of elk are located in Yellowstone National Park.
- 3 First, add the southern herd of elk to your map. Color their symbol and the whole lower circle with one color. These elk live in the southern part of Yellowstone and south of the park.

MAP OF ELK RANGE IN THE YELLOWSTONE REGION



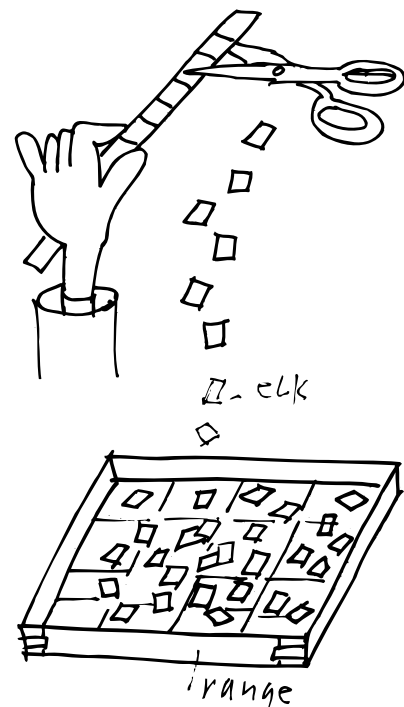
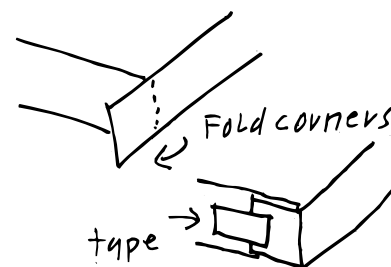
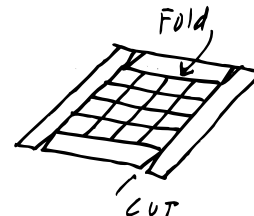
- 4 Now add the northern herd of elk to your map. Color their symbol and the whole upper circle with another color. These elk live in the park and to the north. Review your map.

Part One: Test the Herds (cont'd)

You will now test the two different elk herds to know how many are infected with the brucellosis bacteria. You will not be able to catch and test every animal. Instead, you will take a sample to give you an estimate of the infected animals in each herd. First build a paper model of the elk range. Then sample the two different herds.

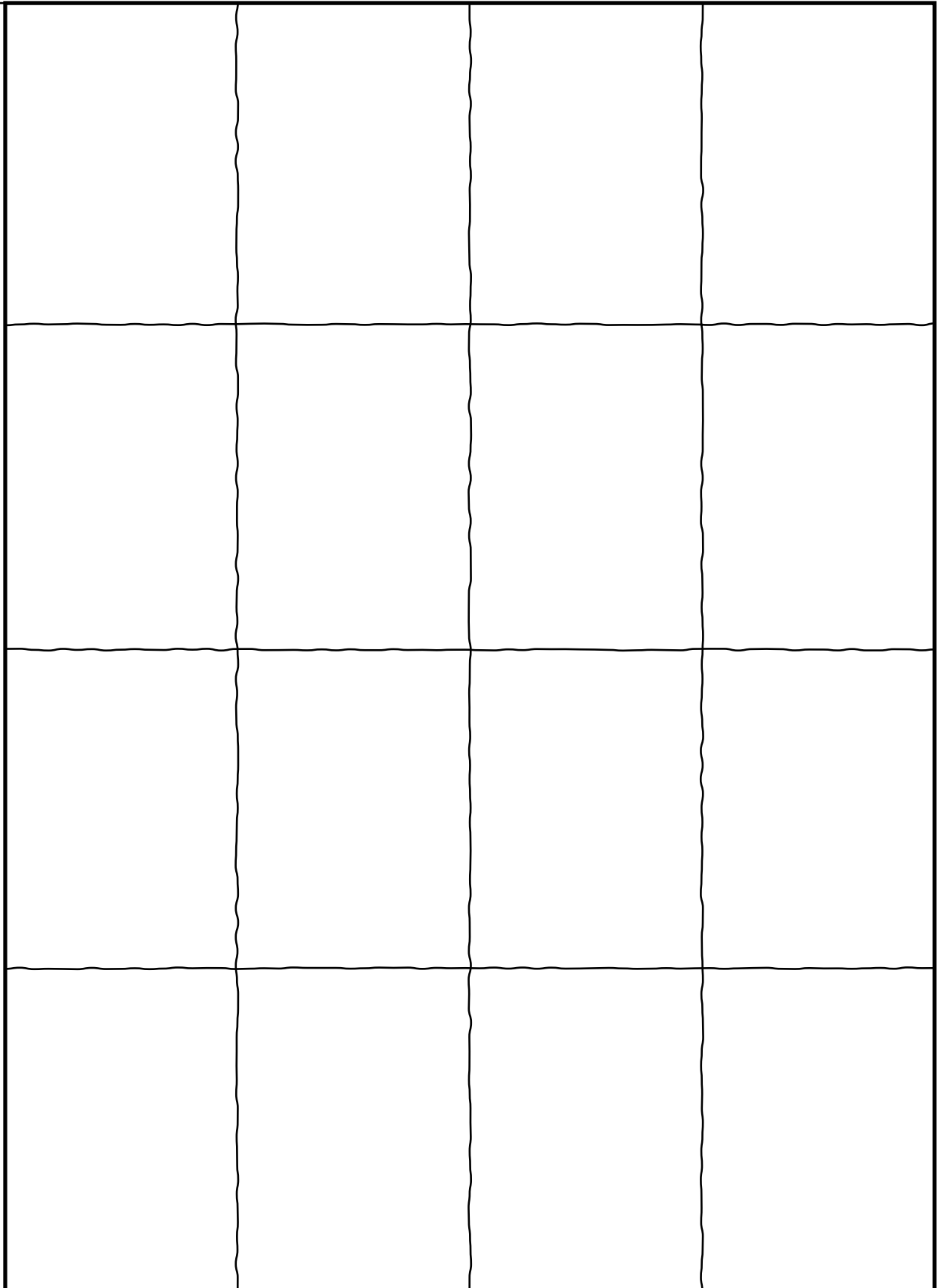
Sample the Southern Herd

- 1 Make the range area from p. 38. Cut the dotted lines. Fold up the edges along the heavy solid lines. Fold the corners and tape into place.
- 2 Create the southern herd of 100 elk by cutting out all the squares labeled "Southern Herd" on p. 39. The southern herd are free-ranging elk that live in southern Yellowstone. They travel to Wyoming in winter where they are fed hay to help them survive cold conditions.
- 3 Turn the southern herd loose on the range. Jiggle the range until the elk are distributed around the range. Take a sample by picking a section of the range at random. Round up ten elk. (If you need more, move to the next-door section.)
- 4 Analyze each elk to see if it tests positive for the brucellosis bacteria. (A vet would use a blood test, but you will look for a tiny + in the center of the elk.) Write the number of elk that are positive (have the bacteria) here _____.
- 5 Multiply this number by 10. Record it as sample #1 on the Disease Chart on p. 40.



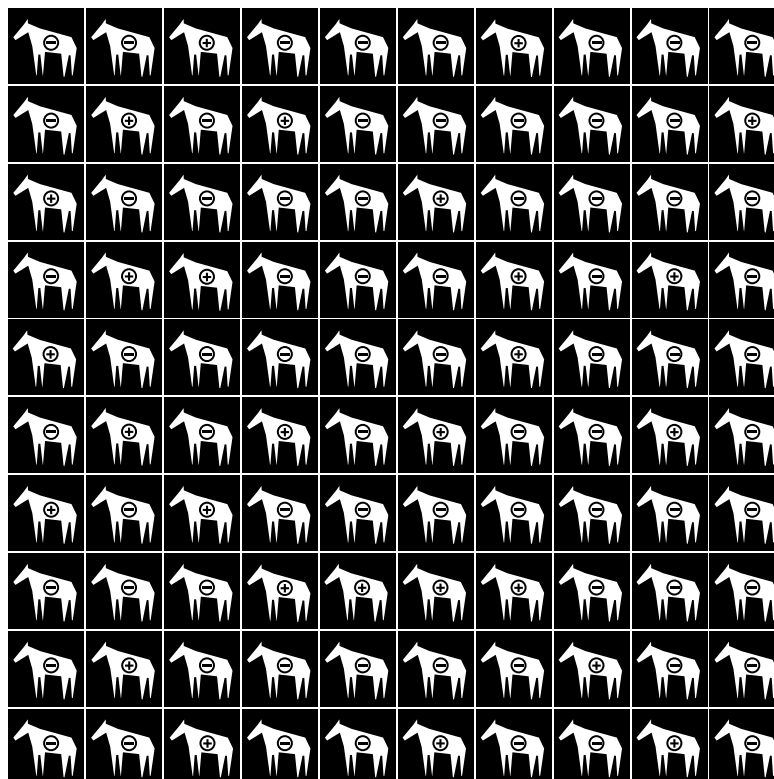
▼ Fold along heavy lines

▲ cut dotted lines



Part One: Test the Herds (cont'd)

SOUTHERN HERD





DISEASE DETECTIVE

Part One: Test the Herds (cont'd)

5 Return your “elk” and redistribute the entire 100 elk on the range. Round up ten more elk, analyze them, multiply by 10 and record the percent on the Disease Chart below.

6 Take one more sample of this herd, analyze, multiply by 10, and record the percent.

DISEASE CHART

| Southern Herd (Winter-fed elk)  | | Northern Herd (Non-winter-fed elk)  | |
|--|--|--|--|
| Sample # | Percent of elk testing positive for brucellosis bacteria | Sample # | Percent of elk testing positive for brucellosis bacteria |
| 1 | % | 1 | % |
| 2 | % | 2 | % |
| 3 | % | 3 | % |
| Average | % | Average | % |

7 Remove the southern herd from the range. Now you are ready to sample the northern herd.

Part One: Test the Herds (cont'd)

Sample the Northern Herd

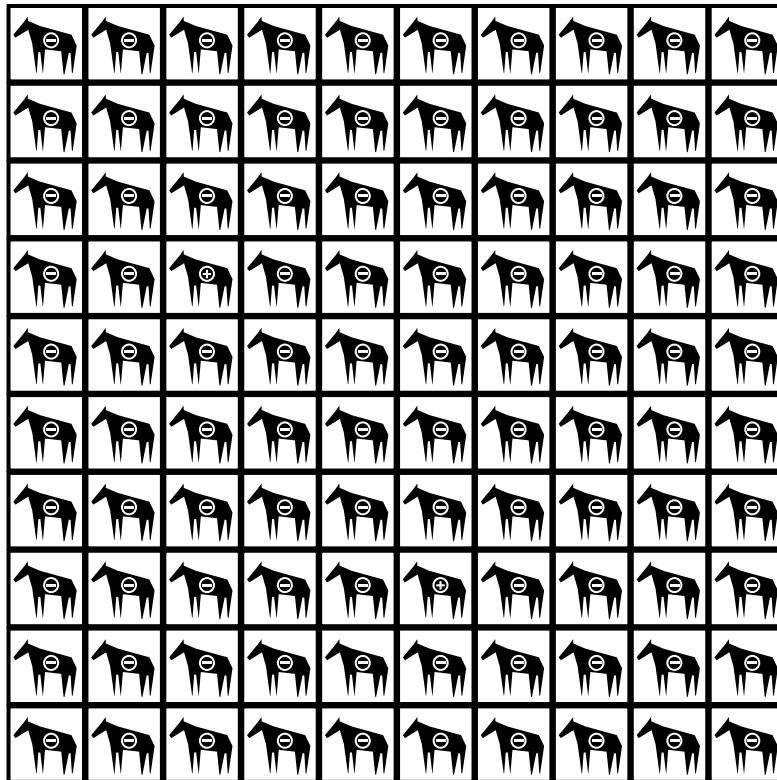
- 1 Create the northern herd of 100 elk by cutting out all the squares labeled "Northern Herd" on p. 42. The northern herd lives in the northern part of Yellowstone Park. They travel to Montana in winter. They find their own food sources, because the state of Montana does not feed these elk.
- 2 Turn the northern herd loose on the range. Jiggle the range until the elk are distributed around the range. Repeat the sampling process for the northern herd: Take a sample by picking a section at random. Round up ten elk. (If you need more, move to the next-door section.)
- 3 Analyze each elk to see if it tests positive for brucellosis. (A vet would use a blood test, but you will look for a tiny + in the center of the elk.)
- 4 Record the number of elk that are positive (have the bacteria) here: _____
- 5 Multiply by 10 and record the number as a percent on the Disease Chart on p. 40.
- 6 Return your "elk" and redistribute them on the range. Round up ten more elk, analyze them, multiply by 10, and record the percent on the Disease Chart.
- 7 Take a third sample of this herd. Record the percent on the Disease Chart.

Compare the Herds


- 1 Average the results for each herd, and write the number on the Disease Chart on p. 40. (To average, total the percent of the positive animals in the herd. Then divide by the number of samples.)
- 2 Compare your results to those of wildlife biologists. Their results show 28 percent of the elk in the southern herd test positive for brucellosis bacteria. Only 2 percent of the northern herd test positive. How close did your sample come?
- 3 Share your results with another group. Discuss why the southern and northern herds have different results.

Part One: Test the Herds (cont'd)

NORTHERN HERD



Think It Over



A disease like brucellosis spreads when animals come together. How is the spread of disease affected by feeding elk in the winter months?

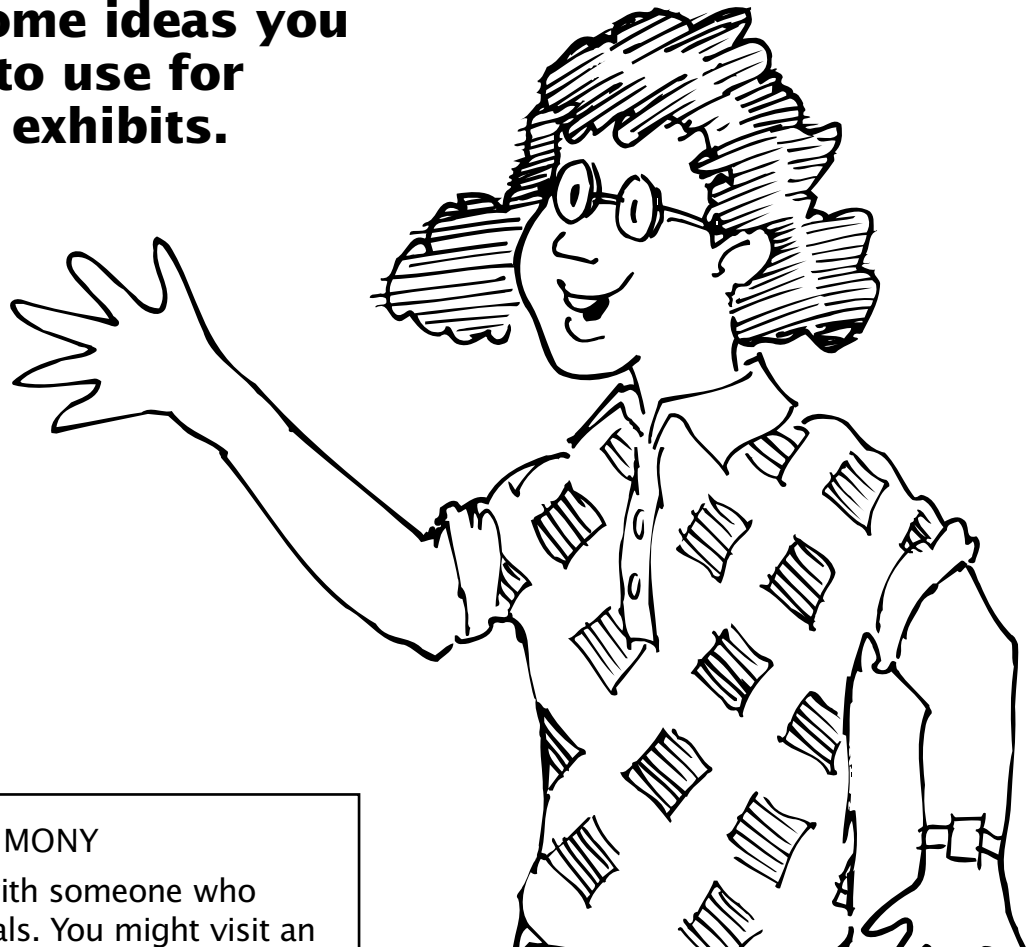
PULLING IT ALL TOGETHER

**Create a story
about a scientist who
works as a wildlife
veterinarian.**



NEW WONDERS

Here are some ideas you might like to use for projects or exhibits.



1. EXPERT TESTIMONY

Arrange to talk with someone who works with animals. You might visit an animal hospital, a zookeeper, an animal trainer, a large animal vet, or someone who shoes horses. Arrange for them to come to your group and talk about what they do and the tricks they use for getting close to animals.

2. GIMME FEVER

Track your vital signs over the course of a day to observe how they change. Take your pulse, respiration rate, and temperature in the morning and in the evening. Try before getting out of bed in the morning to find out how rest affects your vital signs. Try again after hard exercise or during a scary movie.

3. ANIMAL DISEASES

Prepare a poster about the different kinds of animal diseases that are found in your area. In each case, try to identify the disease organism. For information, go to the Web, interview a veterinarian, a rancher, or go to the library.

4. VANISHING HERDS

Once 30 million bison roamed the North American plains. By 1880 these magnificent herds were almost extinct. Go to the library and find out why these animals were hunted to death and how they barely survived.