

THE RUMINATION GAME

GENERAL INTRODUCTION:

Ruminants are animals that have “rumens” as part of their digestive system. The rumen is filled with bacteria that help the animal digest plants. (In fact, the grass is mainly for the bacteria to eat. The ruminant animal gets most of its nutrition by digesting the bacteria!) The most common ruminants are cows, sheep and goats.

INFO: HOW RUMINATION WORKS

Ruminants eat only plants. Why can't we humans survive on a diet of just grass, like cows can? Cows' bodies need protein, sugars, fats, vitamins, and minerals, just like ours. How do they get all that nutrition from just grass? The answer is that ruminants have a digestive tract very different from our own.

When the cow swallows a bite of grass, it goes into the first of its four stomachs, called the “rumen.” The rumen is like a huge storage bag. (It can hold up to 200 pounds of food!) The rumen contains millions of microorganisms-- bacteria, protozoa, and even some fungi. These microorganisms can do something that animals can't do: digest plant cells. The cow by itself cannot digest the plants it eats. Without the microorganisms it would starve. The microorganisms eat the plant cells and turn them into loose protein and fatty acids that the animal's body can absorb. The grass constantly gets churned around in the rumen, and ends up passing into the “reticulum.” Sometimes scientist refer to these two stomachs together, calling them the “reticulo-rumen.” The pH of the reticulum is ideal for growing bacteria, and they multiply at a tremendous rate. The combination of partially digested grass and bacteria in the reticulum is called “cud.”

After a day of grazing, the cow stops eating and starts “chewing its cud.” The cow spends about one third of its day chewing its cud. To do this, the cow brings up some of the cud from the reticulum back into its mouth, and chews it some more. The cow re-swallows the cud, which then passes on into the “omasum.” The primary job of the omasum is to strain the pulp and take a lot of the water out of the cud. (A few ruminants, such as camels and llamas, do not have an omasum.)

From the omasum it goes into the “abomasum,” which is most like the human stomach. The abomasum produces strong acids, making the pH of the abomasum unsuitable for the bacteria, and they die. The cow's enzymes then digest the microorganisms. In essence, a cow does not live on grass-- it lives on bacteria and microorganisms!! The cow eats the grass to keep the bacteria alive.

Then the nutrients pass into the intestines, which function just like human intestines, letting nutrients pass into the bloodstream.

The cecum contains a small population of bacteria that works on any remaining plant particles that passed through undigested.

NOTE: Much of this information is presented (as multiple choice questions) on the quiz cards. You might want to sort through the cards and pick out the information you consider most important and put those cards on the top of the stack. (Yeah, we'll let you stack the deck.)

HOW TO SET UP THE GAME:

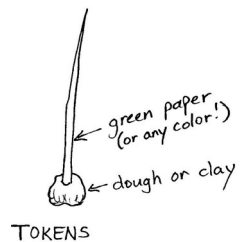
Materials you will need:

- copies of the pattern pages printed onto card stock
- an old cereal box (or other cardboard)
- white glue
- scissors
- a paper fastener
- two washers (you can substitute with washers cut from the cardboard)
- a small amount of play dough or clay
- photocopies of the game pages on heavy card stock paper.
- optional: small blobby chocolates that look enough like cow patties to be used as prizes

Cut apart cards and put into three piles. You might want to put the piles of cards around the outside of the spinner, each pile adjacent to the corresponding section.

Glue the page with the spinner to the cereal box. Let dry, then cut out the spinner and the large square. Assemble it according to the picture on the spinner sheet.

Tape the two game board sheets together in the center to make one 11x17 board. Cut out the playing cards. To make tokens for each player (or team) roll a small blob of dough and stick a piece of paper in it that looks like a blade of grass. You can number the blades, or make them different colors, or whatever is best for you to distinguish them from one another.



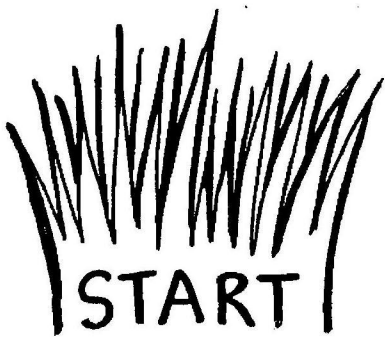
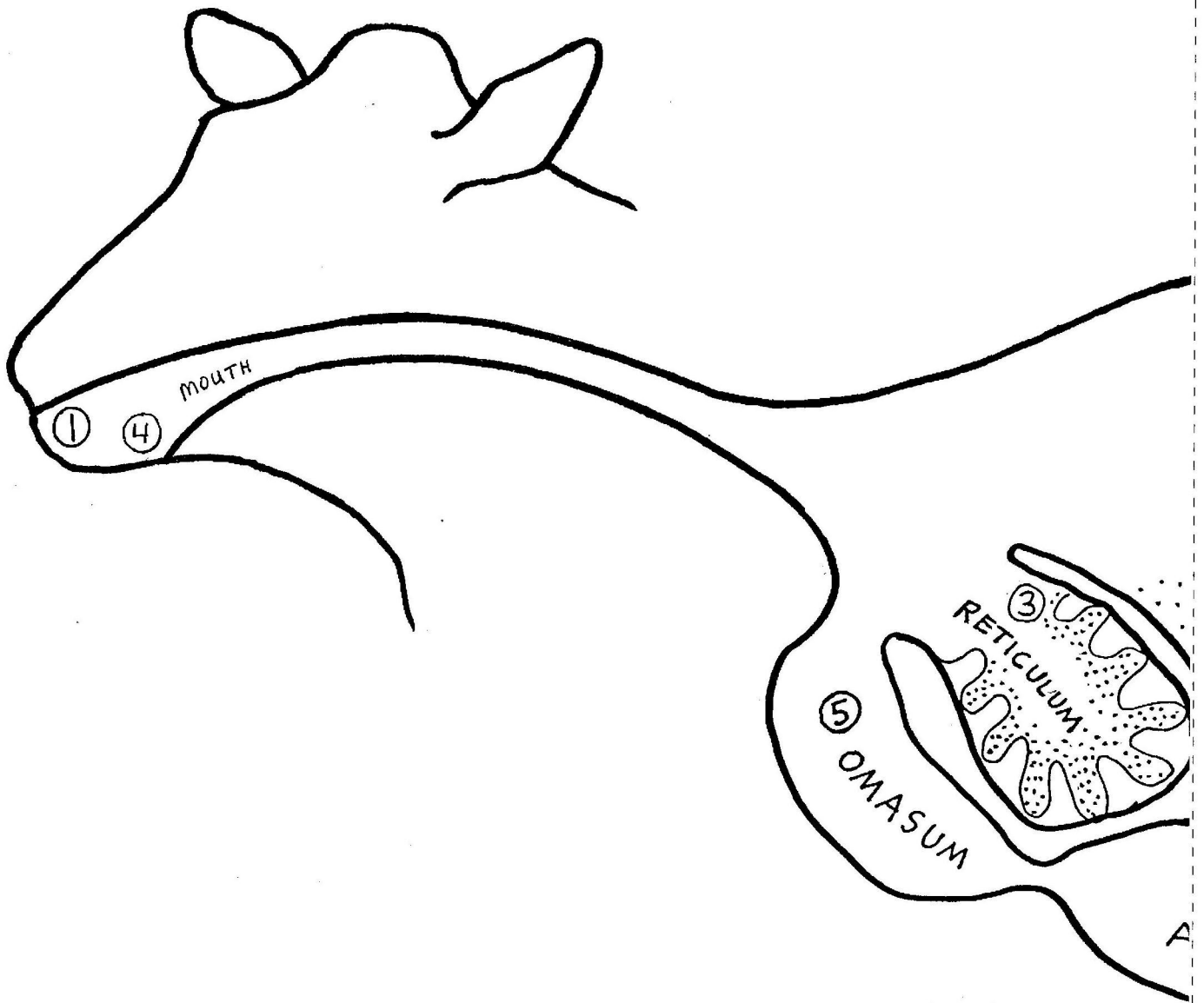
HOW TO PLAY THE GAME:

If you have more than 4 players, divide the players into 2, 3 or 4 teams. Put each team's grass blade token on the START clump of grass. Tokens can be labeled with numbers, or they can be made of different colors of paper.

The object of the game is to get your token through the cow's digestive system. In order to do this, each player or team must answer questions (or accomplish silly tasks in bovine theatre). Tokens proceed through the digestive system according to the numbered dots. This numbered order simulates the pattern in a real bovine digestive system. (Notice that the grass blade must be regurgitated and chewed as cud on dot number 4!) The game is over as soon as one team's grass blade token makes it all the way through the system and is drops into the pile of dung.

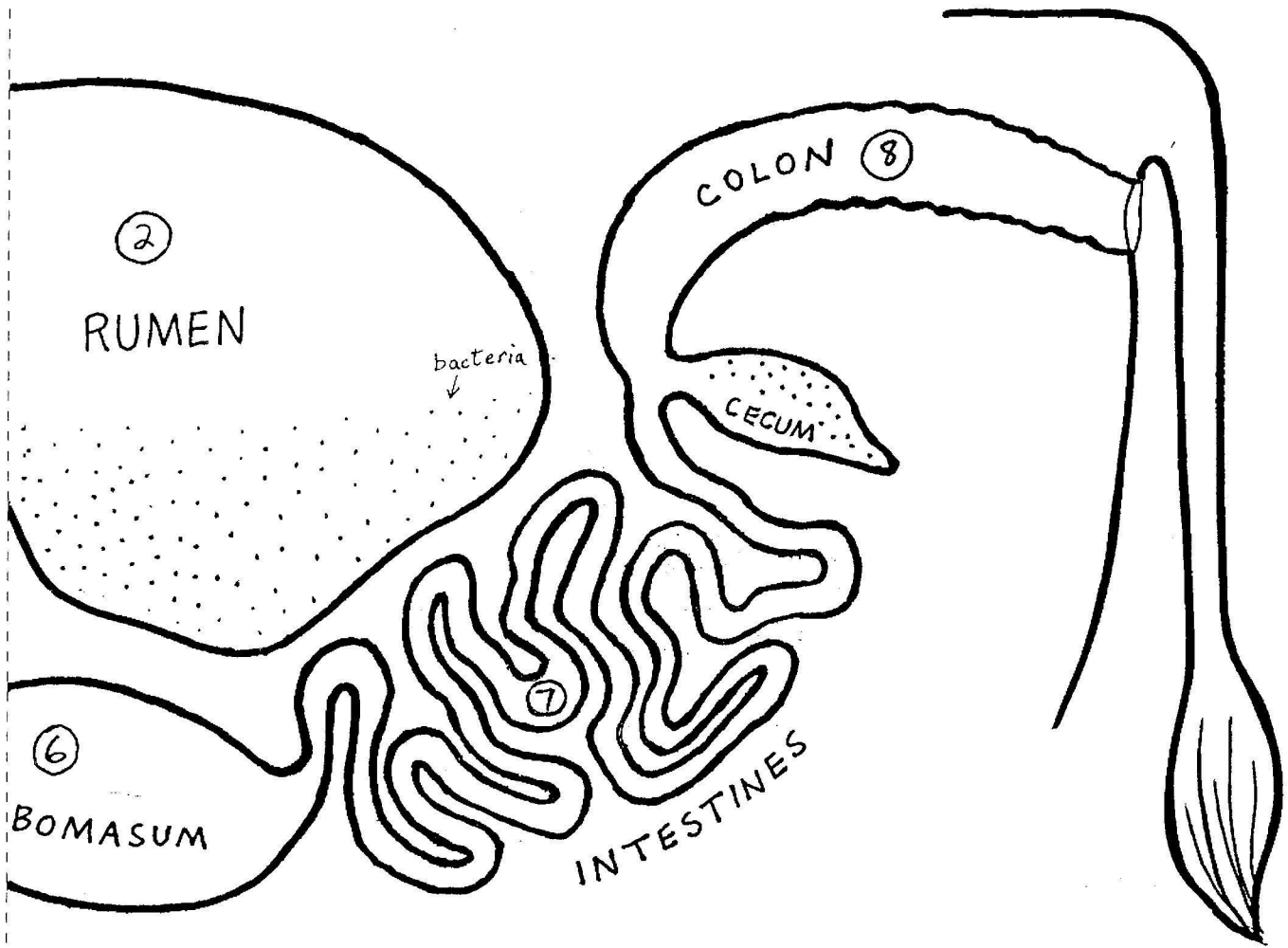
The method of play is that each team (or player) spins the spinner to see which kind of card to draw. If they land on Dairy Corner or Laboratory, they simply answer a multiple choice question. If they answer correctly, the token moves to the next number dot on the board. If they answer incorrectly, nothing happens. If they spin Bovine Theater, they must do whatever the card says. Having accomplished their very silly task, they may then move the token to the next number dot. When finished with the card, put it on the bottom of the stack. You probably won't get through the whole stack, but if you do, and the same cards come up again, it's fine. Just keep playing until someone wins.

The first team or player to land in the dung heap wins the game.
Optional: award chocolates "cow patties" as prizes



RUMIN



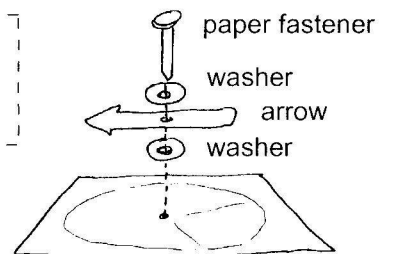
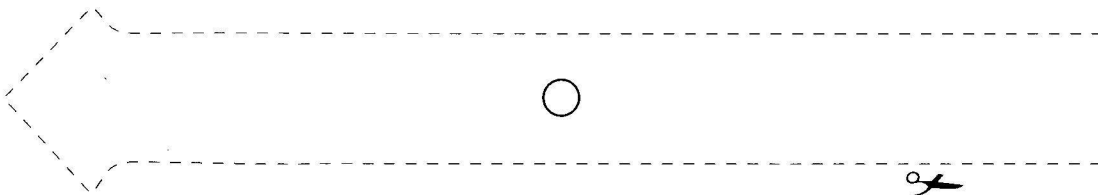


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Glue this sheet onto the side of a cereal box (one you're finished with!), let dry, then cut out the spinner arrow, and the square.



Assembly of spinner

<p>BOVINE THEATER</p> <p>Borrow someone's hand and demonstrate how to milk a cow.</p>	<p>BOVINE THEATER</p> <p>Moo like a cow!</p>	<p>BOVINE THEATER</p> <p>Another cow has just stepped on your hoof. What kind of sound do you make?</p>
<p>BOVINE THEATER</p> <p>You are a calf that has just been taken away from its mother. Show us how you feel.</p>	<p>BOVINE THEATER</p> <p>You are out grazing in the field when you are suddenly hit by a lightning bolt. Show us what happened.</p> <p>(Sadly, this really does happen in real life. Cows do get hit by lightning.)</p>	<p>BOVINE THEATER</p> <p>Show us how you chew your cud. (HINT: A cow's bottom jaw makes a circle motion as it chews.)</p>
<p>BOVINE THEATER</p> <p>Sing "Happy Birthday to You" in cow language.</p>	<p>BOVINE THEATER</p> <p>A fly keeps landing on your face. Try to get it off using your tail.</p>	<p>BOVINE THEATER</p> <p>You stepped in mud out in the field and now it is all over your hooves. What do you do?</p>
<p>DAIRY CORNER</p> <p>Have you eaten any kind of dairy product in the last two days? If you have, advance to the next area of the digestive tract.</p> <p>(If you are allergic to milk, advance if you have eaten spinach, oatmeal, tofu, soy milk, or orange juice plus calcium.)</p>	<p>DAIRY CORNER</p> <p>Name five flavors of yogurt. (Answers will vary.)</p>	<p>DAIRY CORNER</p> <p>What is it called when milk goes bad?</p> <p>a) rotten *b) sour c) moldy d) rancid</p>
<p>DAIRY CORNER</p> <p>Which one of these is NOT a real kind of milk?</p> <p>a) skim b) 1% c) 2% *d) 100%</p>	<p>DAIRY CORNER</p> <p>What turns milk into cheese?</p> <p>a) high heat b) constant stirring *c) microorganisms d) food coloring</p>	<p>DAIRY CORNER</p> <p>Name five things that are made out of milk. (Answers will vary.)</p>

<p>LABORATORY</p> <p>When you eat a hamburger, what part of the cow are you eating?</p> <p>*a) muscles b) bones c) intestines</p>	<p>LABORATORY</p> <p>Which of these is NOT the name of a cow stomach?</p> <p>a) rumen b) reticulum *c) curriculum d) abomasum</p>	<p>LABORATORY</p> <p>It takes quite a while for the microorganisms to digest the plant cells that the cow eats. How long does the grass stay in the rumen?</p> <p>a) about 2 minutes b) about 2 hours *c) about 2 days</p>
<p>LABORATORY</p> <p>Which one of these is NOT found in the rumen?</p> <p>a) bacteria b) protozoa c) grass *d) strong acids</p>	<p>LABORATORY</p> <p>How much of the day does a cow spend chewing its cud?</p> <p>a) almost all of it *b) about one third of the day c) a few minutes</p>	<p>LABORATORY</p> <p>A cow can make this much saliva every day:</p> <p>a) about half a gallon b) over 7 gallons *c) over 70 gallons</p>
<p>LABORATORY</p> <p>Which cow stomach produces digestive enzymes, much like the human stomach does?</p> <p>*a) abomasum b) reticulum c) rumen</p>	<p>LABORATORY</p> <p>Which one of these animals is NOT a ruminant?</p> <p>a) sheep b) goat *c) pig</p>	<p>LABORATORY</p> <p>The process by which nutrients pass from the digestive system into the bloodstream is called:</p> <p>a) digestion *b) absorption c) rumination</p>
<p>LABORATORY</p> <p>The process of tearing apart chemical bonds in food in order to make the molecules available for absorption is:</p> <p>*a) digestion b) rumination c) destruction</p>	<p>LABORATORY</p> <p>Which one of the following does a cow NOT need to eat or drink:</p> <p>*a) meat b) water c) plants</p>	<p>LABORATORY</p> <p>Which one of the following organisms can digest plant cells:</p> <p>a) cows *b) bacteria c) humans d) goats</p>
<p>LABORATORY</p> <p>Which organ contains milk?</p> <p>a) rumen b) omasum *c) udder</p>	<p>LABORATORY</p> <p>A cow can make a lot of milk in one day. How much?</p> <p>a) a cup b) a gallon *c) 8 gallons d) 80 gallons</p>	<p>LABORATORY</p> <p>What does a cow chew its cud with?</p> <p>a) rumen and reticulum *b) teeth and tongue c) knife and fork</p>

<p>LABORATORY</p> <p>Does a cow need to drink milk in order to make milk? yes or no</p> <p>(no)</p>	<p>LABORATORY</p> <p>What does a cow need to have in order to start making milk?</p> <p>a) a license from the government b) instructions *c) a baby calf</p>	<p>LABORATORY</p> <p>A farm that keeps milk cows is called a:</p> <p>a) beef farm b) a milk farm *c) a dairy farm</p>
<p>LABORATORY</p> <p>What flavor is a "cow pie"?</p> <p>a) chocolate b) beef c) milk *d) total yuck (A cow pie is a pile of dung!)</p>	<p>LABORATORY</p> <p>Gas builds up in the rumen as the microorganisms digest the plant cells. To get rid of this extra gas, the cow must:</p> <p>*a) burp b) swallow a lot c) take an anti-acid tablet</p>	<p>LABORATORY</p> <p>Animals that ruminate not only have rumens, but they also have this feature in common:</p> <p>*a) an even number of toes b) a long skinny tail c) ears that stick up</p>
<p>LABORATORY</p> <p>Guess which one of these animals is NOT a ruminant:</p> <p>a) llama b) antelope c) bison *d) wild boar</p>	<p>LABORATORY</p> <p>When milk is homogenized, the result is that:</p> <p>*a) cream will no longer float to the top b) it has double the calcium c) it will not need to be refrigerated</p>	<p>LABORATORY</p> <p>The process of pasteurization is named after what famous scientist?</p> <p>a) Albert Einstein b) Galileo *c) Louis Pasteur</p>
<p>DAIRY CORNER</p> <p>What do dairy farmers call milk straight from the cow, before it is pasteurized?</p> <p>*a) raw b) untreated c) natural</p>	<p>DAIRY CORNER</p> <p>Which one of these is NOT a real breed of dairy cows?</p> <p>a) Brown Swiss b) Holstein c) Jersey *d) Delaware</p>	<p>DAIRY CORNER</p> <p>What do you call a young cow who has not yet had a calf?</p> <p>a) steer *b) heifer c) yearling</p>
<p>DAIRY CORNER</p> <p>What is it called when milk is heated in order to kill microorganisms?</p> <p>*a) pasteurization b) sterilization c) elimination</p>	<p>DAIRY CORNER</p> <p>Which one of these elements is very abundant in milk?</p> <p>a) sodium b) iron *c) calcium d) potassium</p>	<p>DAIRY CORNER</p> <p>Which of these animals is not milked as a dairy animal?</p> <p>a) goat *b) rabbit c) sheep d) camel</p>