Wool & Sheep
Activity Book

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This book includes a variety of ready-to-use activities to integrate agriculture into basic subject areas. The activities are ideal for use in classrooms, community organizations or anywhere young people could benefit from learning more about the food, fiber and natural resource industries.

Why Teach about Agriculture?

In the past, people were very aware of the role agriculture played in their lives. It meant survival. Nearly everyone - men, women and children - worked the land. On average, today's youth are five generations removed from the land. They no longer have a grandfather or aunt on the farm. They no longer have firsthand contact with farms or ranching. They are not aware of the vast range and impact of agriculture on our society and way of life. Because we eat, we are involved with agriculture.

Importance of Agriculture

Agriculture, with its related occupations, is the nation's and the world's largest industry. It generates billions of dollars each year and one out of every five American jobs depends on agriculture in some way. Agriculture has a huge impact on the American economy and on the prices Americans pay for their basic needs of food, clothing and shelter. Agriculture influences the United States balance of trade and directly affects the number, as well as kinds, of jobs throughout the world.

Opportunities in Agriculture

Few students today pursue agricultural careers. Along with a limited knowledge of agriculture itself, there seems to be a widespread and false belief that agricultural careers are mainly production farming and low-income jobs. In reality, there are growing demands and excellent career opportunities for well-educated, qualified people in many of the over 500 occupations associated with agriculture. Agriculture needs good people with technical skills.

Challenges in Agriculture

It is estimated that 20% of our population is employed in agriculturally related occupations. However, only about two percent of U.S. citizens work in production agriculture. This small group meets the food and fiber needs of the entire nation as well as many people abroad. Agriculture faces huge challenges to meet the needs of a growing world population. Tomorrow's citizens must be agriculturally literate in order to make responsible, moral decisions about the giant global lifeline. Building that literacy and awareness is the goal of the Colorado Foundation for Agriculture with its agricultural education and Ag in the Classroom programs.

Content Standards Addressed:

SCIENCE ~ GRADES 3-5
Standard 3: Life Science: Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment. (Focus: Biology-- Anatomy, Physiology, Botany, Zoology, Ecology.)
1. Each plant or animal has different structures and behaviors that serve different functions in growth, survival, and reproduction
2. Green plants need energy from sunlight and various raw materials to live, and animals consume plants and other organisms to live
4. There is interaction and interdependence between and among nonliving and living components of ecosystems (for example: food webs, symbiotic and parasitic relationships, dependence on rainfall, pollination)
5. Life cycles vary from organism to organism (for example: frog, chicken, butterfly, radish, bean plant)
7. There are similarities and differences in appearance among individuals of the same population (for example: size, color, shape)
8. There are similarities and differences between organisms (for example: plants vs. animals, vertebrate vs. invertebrate)

READING AND WRITING ~ GRADES K-4
Standard 1. Students read and understand a variety of materials. In grades K-4, what the students know and are able to do includes using a full range of strategies to comprehend materials such as directions, nonfiction material, rhymes and poems, and stories.
Standard 4. Students apply thinking skills to their reading, writing, speaking, listening, and viewing.
• recognizing an author's point of view;
• predicting and drawing conclusions about stories;
• differentiating between fact and opinion;
• using reading, writing, speaking, and listening to define and solve problems;
• responding to written and oral presentations as a reader, listener, and articulate speaker;
• formulating questions about what they read, write, hear, and view; and
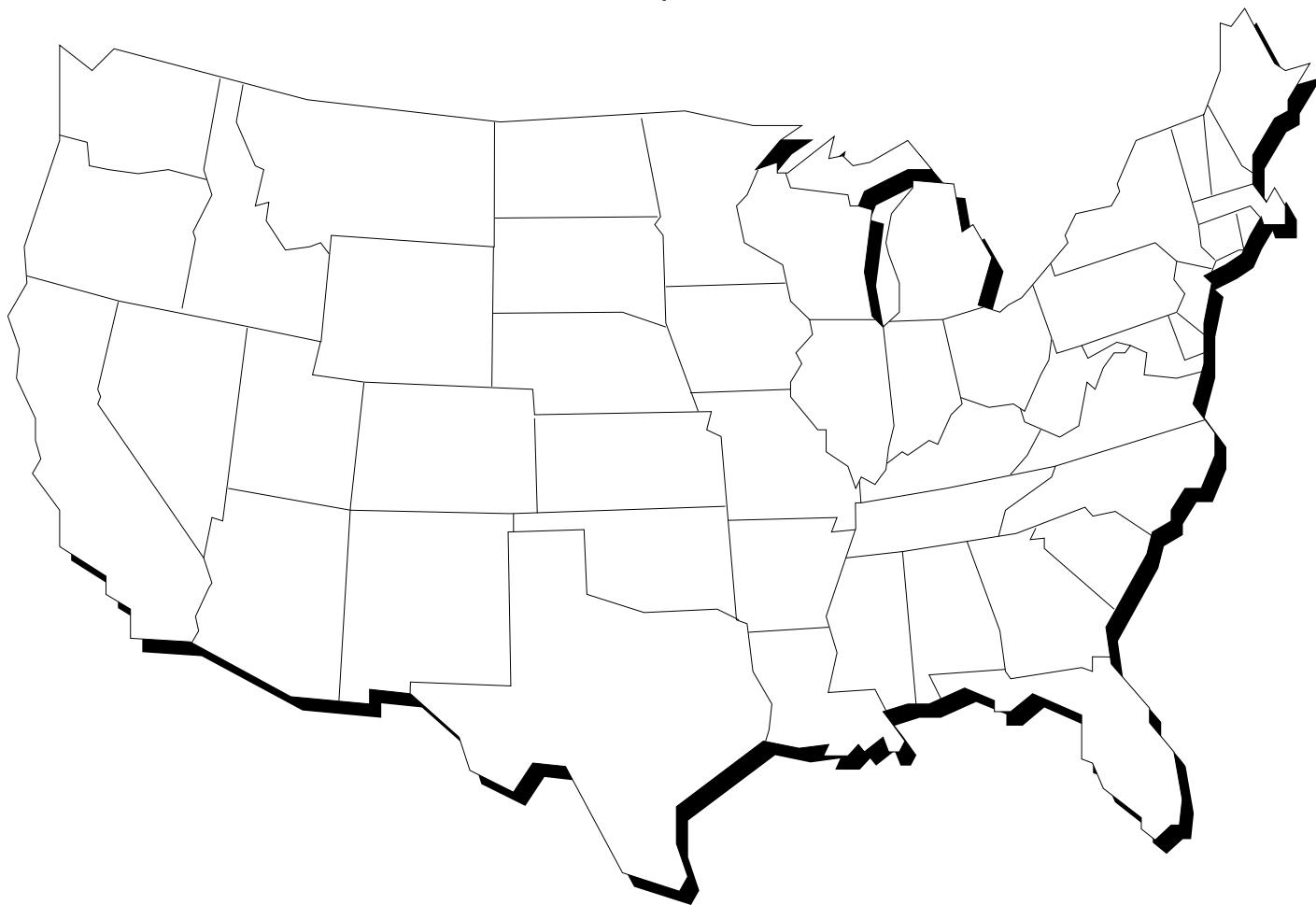• using listening skills to understand directions.

Photo Credits

LET'S LEARN ABOUT SHEEP!

Sheep are raised all over the United States. Texas has the most sheep. Wyoming, California, South Dakota, Colorado, Montana, Utah, Iowa, Oregon and New Mexico also have many sheep.

5,630,000 sheep live in the U.S.

Directions: Circle the state of Colorado. Put a "4th" in our state. Colorado has the 4th largest number of sheep. What state has the most sheep?

_____

_____

SHEEP WORDS

A female sheep is called a ewe.

A male sheep is called a ram.

A neutered male sheep is called a wether.

A baby sheep is called a lamb. Lamb is the name for sheep less than one year old.

Sheep live in groups called flocks or bands.

Directions: Write your answers to the questions below.

What is a female sheep called?

_____

What two names are male sheep called?

_____

What is a baby sheep called?

_____

What is a group of sheep called?

_____

Colorado is one of the top states for lamb feeding in the United States.

SHEEP BREEDS

There are over 35 kinds or breeds of sheep in the United States. There are over 200 different breeds of sheep in the world! All these different breeds of sheep can be divided into two main groups - meat breeds and wool breeds. Most of the time the meat breeds have black faces and the wool breeds have white faces. Meat breeds are primarily raised for food and wool breeds are primarily raised to produce fiber. Both produce food and fiber.

Shown below are four breeds of sheep. Write meat under meat sheep and wool under wool sheep.

Rambouillet

_____

Columbia

_____

Suffolk

_____

Hampshire

_____

WELCOME BABY LAMBS!

Most lambs are born in the spring. Mother ewes can give birth to one, two or three lambs. Some ewes have had as many as five lambs at once! Lambs weigh between seven and fifteen pounds when they are born. Lambs can stand soon after they are born. The mother ewe cleans them off. Lambs drink their mother's milk and grow strong. Soon, lambs will eat grasses and hay like their mother. Lambs stay with their mother until they are ready to go to market. They go to market when they are between four and six months old. Ideal market weight is between 120 and 135 pounds!

Solve these story problems:

In a flock of five ewes, two of the ewes give birth to one lamb each, two of the ewes give birth to two lambs each, and one ewe gives birth to three lambs. How many lambs are there in the flock?

Five ewes were sheared. Each ewe had 8 pounds of wool. How much wool was sheared from the five ewes?

Three lambs are born to a ewe. Each weighs 7 pounds. How much do all three weigh?

Sheep do not have any top front teeth. The roof of their mouth is hard so they can eat grasses and weeds without pulling the plants up by the roots. Sheep are gentle animals and do not bite. You can tell the age of a sheep by looking at its teeth.

Sheep have tails but their tails are trimmed off to about 3 inches when the sheep are very young. This is called docking. Docking feels like getting a shot, it hurts for a little bit, but its necessary to keep the sheep clean and healthy.

Sheep have split hooves which can help them climb rocky hills. Sheep make a <u>bleating</u> sound. A baby lamb can identify its mother by her bleat and her smell.

Some sheep wear ear tags. Sheep producers put ear tags on their sheep to identify them. Putting an ear tag on feels like getting an ear pierced. Next time you see a sheep look for its earring!

Directions: Complete the sentence with a word or words from the story on page 5.

1. Sheep do not have any   _____

2. Sheep eat   _____

3. Sheep's tails are   _____

4. Sheep hooves are   _____

5. The sound sheep make is   _____

6. Sheep earrings are called   _____

Write 6 words from the story that have a long vowel sound.

Colorado's sheep numbers were the highest in 1930 with an inventory of 3,700,000 head.

NATURE'S LAWN MOWERS

Sheep like to <u>graze</u>. Grazing means the sheep eat growing plants. Sheep graze on land where most crops cannot grow. Crops are plants humans grow for food or fiber. Sheep will eat weeds that wildlife and cattle will not eat. Sheep are special because they can eat plants that make other animals sick. Sheep are <u>ruminants</u> (roo′ mi-nents). Ruminant means sheep have four parts to their stomach. Their special stomachs allow them to digest plants and grasses that humans and many other animals cannot.

Ruminant is a big word! Ask your mom or dad if they know what the word ruminant means. *Write the word ruminant and its meaning below.*

_____

- -

_____

- -

_____

- -

_____

- -

_____

SHEEP & THE ENVIRONMENT

Sheep are a natural, low cost way to protect the environment. They can increase the value and beauty of our natural resources by controlling weeds and improving soil conditions. For example, using sheep to eat plants around pine seedlings help the little trees to grow because they get more sunlight, minerals and water. This means fewer chemicals have to be used to control competing plants.

Sheep have pointed hooves which break up the soil so seeds can find a place to grow. When the soil is broken into smaller pieces water can easily get into the ground. This helps plants grow and the plants help prevent soil erosion.

Controlled sheep grazing is used to improve habitat areas for wildlife. Sheep will eat plants that have become dried and low in food value. The plants then grow back more tender and higher in food value. The deer and elk then have better grasses to eat in the winter.

Using sheep grazing to control weeds can reduce or eliminate the use of costly chemical herbicides.

SHEEP HAVE SPECIAL USES

Sheep eat woody and broadleaf plants as well as tall weeds and grasses. Sheep make a good tool to control underbrush in forests and other areas. The U.S. Forest Service uses "firefighting" sheep as a low-tech, low-cost way to control brush. Fires need fuel to burn. If sheep have eaten the brush, there is less fuel to burn in the fire. This makes fires easier to control.

Imagine mowing the grass at a ski slope? Rocks and steep slopes make it nearly impossible to mow. Vermont's Mount Snow Ski Resort has used a quiet, economical and energy-efficent mowing system - sheep.

Junkyards help to recycle car parts. It is difficult to control weeds and grasses in a junkyard. When they grow it makes it hard to find parts. A junkyard owner in Grand Bay, Alabama, has rented sheep to graze around the junk. Weeds are kept down and it is a lot cheaper than mowing with a machine.

One apple grower in southwestern Idaho has used sheep to keep mice from chewing on his trees. Grass grows thick in orchards. This grass makes a great home for mice. Mice like to chew on the bark of apple trees. Rather than using chemicals to control mice populations, apple producers can use sheep to eat the grasses. As the sheep walk, they trample down mice runways and keep the mice away from the trees. They also clean up apples that fall to the ground and they fertilize the ground.

In Colorado, most sheep graze in the high mountain meadows in the summer and are trailed to lower elevations for the winter.

SHEEP PRODUCTS

We get food and fiber from sheep. The meat is called lamb or mutton and the fiber is called wool. Wool fiber is used to make clothes and rugs. Sheep give us many other things too. The natural grease from the wool is called lanolin. Lanolin is used in cosmetics, hand lotion, and as a coating on wire.

Look at the pictures of some of the things that come from sheep.
Draw a line between the word and its picture.
Use these words:

soap	buttons	lotions	
tennis balls	paints	film	tape
dice	pet food	ice cream	

Sheep by-products are used to manufacture hundreds of other products. (See page 31.)

MEAT FROM SHEEP

Sheep are raised in almost every country in the world. They are valuable because they provide two products - meat and wool. Meat from sheep is the most widely eaten meat in the world.

Lamb is the meat that comes from sheep less than one year old. Lamb is sold in the meat counter at the grocery store. Mutton is the meat from sheep older than one year of age. Not much mutton is eaten in the United States but it is popular in other countries around the world.

Lamb is nutritious. Lamb contains many important vitamins and minerals. Lamb is a good source of protein. Protein helps build muscles and strong bones. Lamb is a good source of iron and the B-vitamins. Iron and the B-vitamins give people energy. Lamb is also a good source of zinc. Zinc helps make hair healthy and shiny.

Directions: *Write your answers to the following questions.*

What is the most widely eaten meat in the world?

What two products come from sheep?

Why do our bodies need protein?

SHEEP GIVE US WOOL!

Sheep grow fluffy wool over most of their bodies. Wool keeps them warm and dry. Sheep must have a haircut once a year. This is called <u>shearing</u>. Sheep grow a new coat of wool every year. Shearing does not hurt the sheep. Shearing is most often done in the spring. This way a sheep does not have to wear a wool coat all summer! The wool from one sheep is called a fleece.

Directions:
Write your answer to the questions below.

What do sheep grow on their bodies?

What is giving a sheep a haircut called?

Colorado is the 6th highest wool producing state in the nation..

WOOL IS A NATURAL FIBER

Directions: Read the story, then complete the sentences.

Wool is the natural fiber sheared from sheep. Wool is a renewable resource because it grows back every year. Different breeds of sheep grow different kinds of wool. Most wool is white but some sheep have wool that is black, grey or brown. These sheep are called natural colored sheep. There are many different kinds of natural colored sheep.

Sheep can grow fine wool, medium wool, or coarse wool. Fine wool is often used to make suits and clothes. Medium wool is often used to make blankets. Coarse wool is often used to make carpets. Wool from natural colored sheep is usually used to make specialty items and yarns because of its color. Many items like knitted sweaters, caps, gloves and scarves are also made from wool.

Wool comes from _____

The three kinds of wool are _____

_____

_____

Fine wool is used for _____

_____

Medium wool is used for _____

Coarse wool is used for _____

What natural colors can wool be? _____

_____

_____

THE WOOL STORY

Wool has developed because humans raised and bred sheep for wool. The ancestors of our tame sheep had long hair and a soft, downy undercoat. Shepherds chose to keep and raise the young from the sheep that had more of the soft downy undercoat. Slowly the long hair was replaced by wool. Wild sheep do not have wool.

Over 8,000 years ago, people domesticated sheep. Sheep were one of the first animals to be herded by humans. Sheep helped provide people with food, clothing and shelter. As humans moved from place to place, sheep were easy to herd and take with them.

Buying and selling wool cloth was important to many areas. As early as 4,000 B.C. woolen cloth was being used in the city of Babylon. Babylon means "land of wool."

Today, there are over 1 billion sheep in the world and more than 200 different breeds. Last year sheep produced 50 million (50,000,000) pounds of wool in the United States.

Wool is versatile. Wool is comfortable to wear year-around because it is an absorbent fiber that helps regulate body temperature.

HOW DOES WOOL BECOME CLOTHING?

Sheep are sheared in the spring. Their wool or fleeces are put in large sacks and sent to a woolen mill for processing. The fleeces are washed to remove dirt, grass and lanolin. After the wool is clean and dried, it is combed or carded. Carding makes the fibers straight. The next step is spinning the wool into yarn. There are two types of yarn - woolen and worsted. Woolen yarn is used to make carpets or thick sweaters. The worsted yarn is knitted or woven into cloth that is used to make shirts, dresses, suits and other woolen garments. Weaving is the process of forming cloth or fabric by interlacing the strands of yarn.

HOW CAN WOOL HELP THE ENVIRONMENT?

Wool is also being used to benefit the environment. It is being used to soak up oil from oil spills. The nice thing about wool sponges is that oil can be cleaned out of the sponge. The oil is recycled and the wool sponge is used over and over again. Wool can clean up 10 to 30 times its weight in oil.

Wool is also used as mulch around trees and plants. In some places seeds are placed in wool mats and used to grow grass and plants along new highways. Because wool is a natural fiber, it is biodegradable which means it will be decomposed or broken down by nature.

How well did you read?

What does carding do?

_____
_____
_____
_____

How can wool help the environment?

_____
_____
_____

RAISING SHEEP FOR
FUN & PROFIT

People who raise sheep are called sheep producers or sheepmen. In early history people who tended the flocks of sheep were called shepherds. Raising or herding sheep is one of the oldest professions in the world. Sheep people are proud of their heritage and still enjoy working with sheep in much the same way as their forefathers did.

Sheep producers give the sheep a good place to live, plenty of food to eat and clean water to drink. The sheepmen protect the sheep from animals that might hurt or kill them and care for sheep when they are sick. In return, sheep producers get paid by selling wool and meat the sheep produces.

The shepherds of today use computers and scientific technology to help them with their work. This makes their job easier and their business more efficient and profitable. It also helps make the sheep more productive.

Raising sheep is a good family activity. Children enjoy the baby lambs and help care for them. Sheep are an ideal animal for children to learn about raising livestock. Sheep are small in size and easier to work with than larger animals. Many young people start working with sheep when they are in grade school. These children build their flocks and use the income to help pay for a college education.

People who raise sheep like animals. They enjoy working outdoors. They appreciate the land and take care of the soil and water resources.

Sheep producers receive about 30% of their income from wool and 70% from the sale of meat.

SHEEP ON THE FARM

Sheep are raised in groups called flocks or bands. A flock of sheep can be from 5 to 1,000 head. Sometimes flocks are called farm flocks when they are raised on farms or small acreages that are fenced into pastures.

All breeds of sheep can be raised on a farm flock operation. Black faced sheep are more commonly raised as farm flocks because they will spread out in the fenced pastures and evenly graze the grasses.

Sheep are good animals to raise on small acreages because they take less land and equipment to care for them. They also provide two sources of income - money from the wool and from the meat. Sheep can also live in small areas and eat a variety of plants and weeds. Sheep are also easy to handle and work with. Often sheep are combined with other farming enterprises to help the farm owner make more money from the farm.

Each day on the farm, the sheep will eat hay or graze the grasses in pastures. Many farmers will use sheep to eat the left-over crops from harvest in the fall.

Farm flock shepherds provide clean, fresh water for their sheep. They also care for the health needs of the sheep. For example, shepherds will protect their sheep from diseases by giving them vaccinations or by treating them with antibiotics if they get sick. They will care for them or take them to a veterinarian (animal doctor) if the sheep get hurt.

How do shepherds protect their sheep from diseases?

_____

_____
If a sheep gets sick, what does a shepherd give them?

_____

SHEEP ON THE RANGE

Range sheep are usually white faced breeds such as Rambouillet, Columbia or Targhee. White faced sheep have more flocking or herding instincts than black faced sheep. This means they will stay together in a group. Sheep that do not stay with the flock are easier prey for wild animals.

Sheep on the range are raised in large groups called bands. A band is 1,000 to 2,000 head of sheep. These bands live on large areas of open land that is usually not fenced. This area is called rangeland. Rangeland is land that is not cultivated or plowed. It often has rocky hills, deep canyons or rugged ground. Rangeland has very little water and the soil is not deep or rich in materials that are needed to grow crops. Most of the rangeland in the United states is found in the Western states. Rangelands are best suited for grazing by livestock and wildlife.

Natural or native grasses and green leafy plants called forbs grow on the range. Shrubs and trees also grow on the range. Sheep and wildlife graze on the grasses and forbs. They also eat the leaves and twigs from the woody plants. This is called browsing.

People called sheep herders or shepherds live with the sheep that graze on the range. Herders are men or women who care for the sheep. They help the sheep find feed and water. If a sheep gets sick, the herder helps it get well. Herders also protect the sheep from predators and other animals that might kill or hurt them.

People who care for sheep on the range are called:

_____

How many sheep might be in a band?

_____

_____

A DAY ON THE RANGE WITH A HERDER

Herders usually live alone in a tent or a sheep wagon which is similar to a travel trailer. Herders have sheep dogs and horses to help them move the sheep. They also have guard dogs to help protect the sheep.

Herders wake up before dawn and take their working dogs to move the sheep off the bedding ground, bedding ground is where the sheep have slept for the night.

The herder and dogs move the sheep to new grazing areas and water. Here the sheep will eat and drink. Sheep get water from the morning dew on the grass, a nearby stream or a water tank.

Now it is time for the herder and the dogs to eat their breakfast. Once a week, the camp tender brings groceries to the herders. The camp tender is the person who checks on the herders to make sure they are safe.

The herder and the dogs spend the day watching the sheep and herding them to new grass. The sheep eat grasses and weeds. They lick salt blocks the herder has set out for them. Salt provides sheep with important minerals they need.

In the evening, the herder and the dogs herd the sheep to water for a drink. The sheep are then moved to the bedding ground for a good night's sleep. During the night the guard dogs watch for wild animals called predators. Predators like to eat sheep. Some predators are coyotes, bobcats, mountain lions and bears. Eagles, ravens and foxes will also kill baby lambs. Pet dogs will also chase sheep and hurt or kill them.

Alliteration

means using many words
that have the same beginning sound.
For example:

Harry, the herder, hurried hastily up the
hill.

*Your turn. Using alliteration, write
sentences describing the life of a herder.*

_____

_____

_____

_____

_____

_____

_____

_____

Read pages 17, 18, and 19 answer the following questions: What does it mean
when we say animals have a herding instinct?

_____

_____

_____

What is the difference between a band and a flock of sheep?

_____

_____

_____

Mountain lions, bobcats, foxes, eagles and domestic dogs also kill sheep and lambs.

SHEEP DOGS

There are two kinds of sheep dogs: working dogs and livestock protection dogs. Working dogs are very smart and work with the herder to move the sheep. They run around the sheep quietly to herd them. Most young working dogs first learn how to herd sheep by watching their mothers. A dog trainer will also help them learn. Herders may have two to three working dogs for every 1,000 sheep. Some working dogs are Border Collies and Australian Shepherds.

Livestock protection dogs are used to protect the sheep from wild animals such as coyotes, bears and mountain lions. Livestock protection dogs are not treated like pets. People do not play with livestock protection dogs. Livestock protection dogs like to be with sheep and are very protective of them. Livestock protection dogs stay with the sheep day and night and scare wild animals away. Some livestock protection dogs are the Komondor, Great Pyrenees and Akbash. Other animals like llamas, mules, donkeys, cattle, ostriches, and goats are also used to protect sheep.

Livestock Protection Dog

OUTLINING

Directions: After reading the story about sheep dogs, fill in the following outline.

I.   two kinds of sheep dogs are

     a.   _____

     b.   _____

2.   working dogs

     a.   _____

     b.   _____

     c.   _____

     d.   breeds of working dogs are

        1)   _____

        2)   _____

3.   livestock protection dogs

     a.   _____

     b.   _____

     c.   _____

     d.   breeds of livestock protection dogs are

        1)   _____

        2)   _____

4.   other animals used to protect sheep are

     a.   _____

     b.   _____

Livestock protection dogs are used in rural areas to protect sheep from attacks from domestic dogs and coyotes.

SOLVE THESE MATH PROBLEMS

1 One ewe eats four pounds of hay a day. How many pounds will she eat in 100 days?

2 The ewe is put out on pasture for 150 days. It costs 10 cents a day. How much will it cost to have her on pasture?

3 The ewe is then put out to eat corn stalks. It costs 10 cents a day to let her eat the corn stalks. She will stay there 60 days. How much will it cost to keep her there?

4 A sheep owner has 5 sheep. One fleece weighs 10 pounds, 2 weigh 8 pounds, and 2 weigh 9 pounds. How many pounds of wool did the owner get from his sheep?

5 Wool sells for $1.00 per pound. If a fleece weighs 10 pounds, how much will it sell for?

6 A lamb will sell for 80 cents a pound. If a lamb weighs 120 pounds, how much will the farmer receive when it sells?

7 If a farmer's lambs are worth $90.00 and a coyote eats 2 lambs, how much did the farmer lose?

LET'S REVIEW

Fill in the blanks to spell out the names of predators of sheep. One has been done for you.


```
              P
        _ _ _ R _
        _ _ _ E _
        D _ _ _
        _ A _ _ _
_ _ _ _ T _ _ _   _ _ _ _ _
        _ O _ _ _ _ _
        R A V E N S
```

Fill in the blanks to spell out names of animals used to protect sheep.


```
              P
        _ _ _ R _     _ _ _ _
              O _ _ _ _ _ _ _ _
        _ _ _ T _
        _ _ _ E _
              C _ _ _ _ _
              O
              R
      _ _ _ _ _ S
```

Predators killed 16,000 head of Colorado sheep and lambs in 2009.

What did you learn about sheep? Fill in the blanks with the best answer. You may want to look back at the page listed.

There are over _____ (p. 3) breeds of sheep in the world. There are two

main groups of sheep, _____ breeds and _____ breeds

(p. 3). Female sheep are called _____, baby sheep are called _____

and male sheep are called _____ or _____ (p. 2).

You can tell the age of a sheep by looking at its _____ (p. 5).

Trimming a sheep's tail is called _____ (p. 5)

Sheep have _____ (p. 7) parts to their stomach. Animals that have a four

part stomach are called _____ (p. 7).

The natural grease from wool is called _____ (p. 10). Meat from

sheep less than one year old is called _____ (p. 11). Lamb is a good

source of p_____ (p. 11). Cutting a sheep's wool is
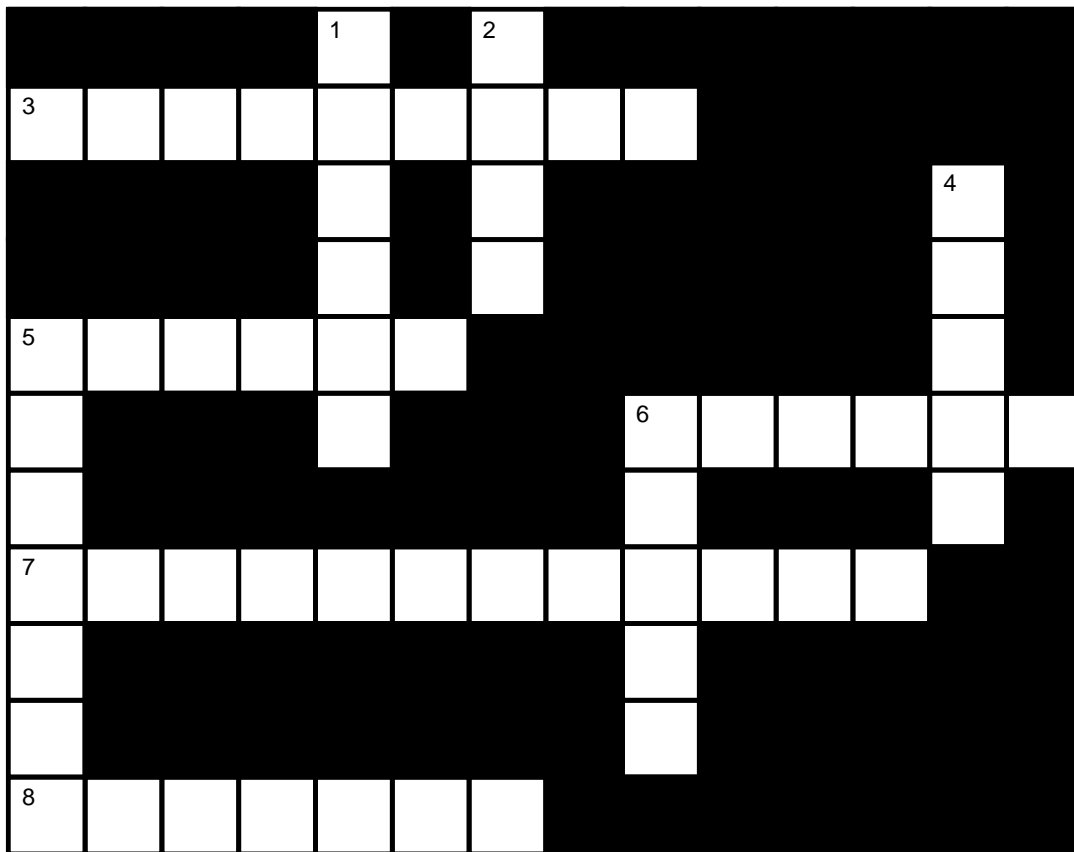
called _____ (p. 12).

There are two kinds of sheep dogs: _____ dogs and _____ dogs

(p. 21). Livestock protection dogs protect sheep from _____ (p. 21).

Wild animals that eat sheep are called _____ (p. 19)

Shepherds protect their sheep from diseases by giving them _____

(p. 17). When sheep get sick, shepherds sometimes give them

_____ (p. 17).

Directions: **Solve the puzzle. You may want to turn back to the page listed for help.**

Across

3. Natural land that is not cultivated or plowed. (p. 18)
5. Neutered male sheep. (p.2)
6. Wool produced from one sheep. (p.12)
7. Animal doctor is called this. (p. 17)
8. Eating grasses and forbs. (p.18)

Down

1. A person that lives with sheep and moves them from place to place. (p. 19)
2. Over 1,000 sheep in a group is called this. (p. 18)
4. Between 5 and 1,000 sheep are called this. (p. 17)
5. Forming cloth or fabric by interlacing the strands of yarn. (p. 15)
6. These are green leafy plants. (p. 18)

The sheep was one of the first animals to be domesticated over 8000 years ago. Sheep were usually seen with humans on the move because they could be herded easily and they provided humans with their basic needs - food, clothing and shelter. For the early Stone Age hunter, the fleece served as a tunic or sleeveless shirt, worn just as it came from the animal's back. The first weavers used reeds, threads or grass to make baskets and nets. By Neolithic times, a simple loom had been invented and the art of weaving was well on its way.

As early as 4000 B.C. wool clothing was worn in Babylon, Babylon means "Land of Wool". Fifteen hundred years later, nations of the East began to trade wool, thus making it one of the early items of international trade.

In Asia, herdsmen used wool for their clothing and for the carpets that helped insulate the walls and floors of their tents. By this time, the art of weaving was growing and spreading throughout the known world. Wool clothing was worn by the richest king and the lowliest peasant.

Sheep were brought to Spain by the Romans because the climate was thought to be ideal. Eventually a breed of sheep called Merino was developed. Merino wool was so fine that it could be made into the best clothing. Anyone caught taking a Merino out of Spain could be put to death. Wool was an important economic tool. In fact, the wool trade helped finance Columbus' explorations of the New World.

It was Columbus who introduced sheep into the Americas. He left sheep in Cuba and Santa Domingo. Cortez took them into Mexico where they were soon seen in large flocks. Sheep from these flocks would eventually find their way to the Southwest and the extreme western United States. The Navajo Indians traded for sheep and began their very important art of weaving wool for clothing, rugs and blankets. Weaving by hand, the Navajo women of the southwest created original designs of incomparable quality. Today the product of their work is treasured as art pieces all over the world.

In Europe during the Middle Ages, England and Spain became rivals in the wool trade. Competition was so fierce the King of England, Edward III, forbade his subjects to wear clothing made from foreign wool. By the mid 1600's, wool made up two-thirds of England's foreign trade.

Since England did not approve of exporting sheep to the new world, some sheep were smuggled into the colonies. The colonists were forced to buy the animals from the Dutch settlers on Manhattan Island. In 1643, there were about 1,000 sheep in Massachusetts. Twenty-one years later, there were over 100,000. In 1664, the General Court of Massachusetts passed a law requiring young people to learn to spin and weave. This requirement was intended to make the colony more self-sufficient.

As the American wool trade grew, the English became very upset. They made sheep raising and wool trading a crime. If caught, the offender's right hand was cut off. The English restrictions on sheep raising and wool trade in America was one of the major factors leading to the American Revolution.

Thus, weaving homespun wool garments was a sign of patriotism during the revolution. Both George Washington and Thomas Jefferson were inaugurated in suits made of American wool. George Washington even raised sheep at his Mount Vernon home. When Washington and others began to realize the lack of fine apparel wool in America, 80 Merino sheep were brought from Spain. They were mixed with the American herds to upgrade the quality of American wool. Wool cloth was thought to be so important that weavers and other wool crafters were given immediate citizenship in the early days of America.

About the same time, Merino sheep from Spain were exported to France. Louis XVI put them on his estate in Rambouillet and from these the Rambouillet breed developed. The Rambouillet is larger than the Merino and is a major breed found in the range country and high plains of the United States today.

An enterprising British Army officer took 13 Merinos to Australia. From this original flock of 13 sheep, Australia grew to its position as the number one wool producer in the world today.

Meanwhile, the manufacturing machinery for the wool industry was developing in England. As the industry grew, England replaced hand spinning and weaving with large mills using steam powered machinery. In 1769, the first American mill was established.

As frontier farmers and their families moved westward, sheep always went with them, helping to open up the new land.

Sheep have provided humans with many things and yet sheep can be raised in regions where no other animals can be raised because of the sheep's specialized digestive system. Sheep can roam the arid highland or thrive in farm flock areas. Today sheep are raised in all U.S. states. The size of a flock varies from a few head to as many as 10,000 animals.

Of 200 different breeds of sheep in the world, only about a dozen are important in the United States sheep industry. The most popular breeds in the United States are the Suffolk, Hampshire, Rambouillet and Columbia. Of the many breeds present, there are basically two types: black faced and white faced. The Suffolk and the Hampshire are black faced and are meat breeds while the Rambouillet and Columbia are white faced and are bred for their wool.

In the Midwestern, Eastern and Southeastern United States, sheep are raised in farm flocks consisting of 10-100 ewes. In contrast, the West and Southwest sheepmen have 1,000 to 5,000 ewes in their rangeland operations. Of the top five sheep raising states, Texas has the largest number followed by California, Wyoming, South Dakota, and Colorado.

Raising sheep is a family operation and in many cases the land and flocks of sheep have been handed down from generation to generation.

Today's sheep operation is run like any modern business with up-to-date scientific research on the most efficient kinds of feed, how to keep the animals disease-free, and how to improve the quality of the

wool and the sheep's growing ability. If you were to walk onto a sheep ranch or Midwestern farm today, it would not be uncommon to see all members of the family involved in feeding, herding, shearing or in some way caring for the sheep. Sheep are a major source of income to the family and are as important as any agricultural product.

Because sheep are so important for income and as an agricultural product, producers work hard to protect them from predators. Sheep producers will use Great Pyrenees, Komondors, Akbash dogs, donkeys, llamas or a combination with their flocks.

FROM FIBER TO FABRIC
(Underlined words are defined in the glossary)

Once each year the sheep can give us the coats off their backs. The wool is removed with shears similar to those a barber uses. This process of shearing does not hurt the sheep. In about five minutes the wool is shorn from the sheep in a single piece, called the fleece. The fleece is carefully rolled and tied for bagging. Most shearing is done between February and June, just before lambing. Most shearers move from ranch to ranch. A good shearer can shear from 80 to 125 head of sheep a day. A highly trained expert can shear up to 225 head of sheep in one day.

Fleeces are rolled up and tied, then packed into sacks. These sacks hold between 20 and 35 fleeces (of 4-12 lbs each) and weigh an average of 200 to 400 pounds. From this step the processing of the wool begins.

The wool is washed by moving it gently with rakes through a series of tubs containing a soap and water solution heated to about 140º F. It is then rinsed. During the washing process, wool loses 30 to 70 percent of its weight when natural grease (lanolin) and soil are removed. After washing, the wool is passed through a series of squeeze rollers and finally dried. The purified lanolin by-product is used in face creams, soaps and other ointments.

Wool can be dyed at several stages in the processing - after it has been washed, in which case, it is called stock-dyed wool; after spinning, when it is referred to as yarn-dyed wool; or after weaving or knitting when it is called piece-dyed. Because wool is a porous fiber, color tints are absorbed right into its core to give rich and lasting hues.

Carding blends wool fibers, removes vegetable matter, and straightens the fibers so they will lie in the same direction. This is done by passing the wool through a system of rollers covered with wire teeth which form the fibers into a thin web. If the wool fibers are to be made into fabric, the web is divided into strips which are rubbed together gently to form the "roving" or "sliver."

Spinning draws strips of roving through small rollers, applying a twist that gives the resulting yarn strength and size. The difference in size, twist and ply give the woven fabric different texture which is part of the fabric design.

Woven fabrics are made on looms by interlacing at least two sets of yarn at right angles to each other (put another way, weaving involves two pieces of yarn running in different directions, one up and down, and one across). The lengthwise (or up and down) yarn is the warp. Yarn running crosswise in the loom is called weft or filling. As warp yarn passes through the loom, it is raised and lowered by a wire eyelet through which it is threaded. To form the woven fabric, filling yarn is pushed through openings created in the warp.

As the fabric comes from the loom, it has a loose texture. Fulling or milling by the application of moisture, heat and fricton causes the material to shrink and thus tighten the weave. The fabric can then be napped by a metal brushing process, or sheared to give a smooth, uniform appearance. Various chemical finishes can be applied to obtain such advantages as moth-proofing, stain resistance and washablilty.

PROCESSES IN THE WOOL INDUSTRY

BY-PRODUCT - something produced in addition to the main product. In the case of sheep, wool and meat are the major products. Other products that come from the sheep are lanolin for cosmetics; hides and skins for leather goods; gelatin for photographic film; animal fat for soap and special glues and medicines - to name only a few.

CARDING - blending and straightening out the wool fibers.

DYEING - to impart color to something.

FLEECE - coat or wool covering a sheep.

FULLING - applying moisture, heat and friction to wool fabric to cause the weave to tighten.

LANOLIN - the natural grease taken from the wool of sheep. It is used in many cosmetics and other facial preparations.

LOOM - piece of equipment used to weave cloth.

ROVING - a slightly twisted roll of fiber.

SACKING - packing the fleeces into sacks or bales, each containing between 20 and 35 fleeces and weighing 200 - 400 pounds.

SHEARING - cutting off or removing the wool from the sheep.

SPINNING - the act of twisting fiber into yarn or thread. In colonial times males, who did this were known as spinners. The older, unmarried girls in the family who did this were known as spinsters.

SCOURING (WASHING) - the process of removing the natural grease and soil from the wool.

WARP - vertical threads attached to beams on looms.

WEAVING - forming cloth or fabric by interlacing strands of yarn.

WEFT - filling or yarn which interlaces across and through warp.

YARN - thread made by spinning fibers.

GLOSSARY

MODERN SHEEP OPERATION TERMS

ANTIBIOTICS - any of various substances such as penicillin and streptomycin produced by certain organisms that are used for the treatment of disease

BROWSING - eating leaves and twigs from woody plants.

ENTERPRISE - a business operation.

EWE - female sheep.

FARM FLOCK - 10 to 1,000 ewes raised in pastures..

FLEECE - wool produced from one sheep in one year.

FLOCK - group of sheep, can be any size from 5 to 1000 head.

FORBS - green leafy plants.

GRAZING - eating grasses and forbs.

HERDER - a person that lives with the sheep and moves them from place to place for feed and water.

HERDING DOG - dog used in the herding or moving of sheep. They are specially trained to guide the sheep in an intended direction. Common sheep dogs are Border Collie and Australian Shepherd.

LAMB - young sheep under one year of age.

LIVESTOCK PROTECTION DOGS - dogs that are specially bred to protect sheep and other domestic livestock from animals that will hurt them. Common guard dogs are Akbash, Great Pyrenees and Komondor.

PARASITES - insects that live on or in sheep and can affect the health of sheep.

PESTICIDE - chemical used to destroy insects or parasites on animals or plants.

PREDATORS - animals which eat other animals.

RAM - male sheep

RANGE BAND - 1,000 to 2,000 ewes.

RANGELAND - natural land that is not cultivated or plowed.

SHEEP PRODUCER - a person that owns and/or raises sheep.

SHEEP WAGON - a wagon a shepherd lives in when tending a flock away from the ranch.

VETERINARIAN - animal doctor.

WETHER - neutered male sheep.

Geography

1. Show the students a world map or a transparency of the world. Color in or mark the following countries:
   Australia,
   Russia,
   New Zealand,
   Argentina,
   South Africa,
   United States.
Ask them if they know what these nations have in common. (They are the top six wool producing countries of the world respectively.)

2. Look at maps of sheep raising areas either in the U.S. or in the world. Compare the types of land where sheep are found.
What kinds of land are they - arid, wet, fertile?
Why does the land where sheep are found have so many variations?
Is this true of the grazing land of other animals?

Social Studies

3. Make a time line with the following dates:
   Today,
   1800's,
   1786,
   4000 B.C.,
   1493,
   1521,
   1664,
   1765,
   2500 B.C.,

ANSWERS:
   4000 - B.C. - Wool garments worn in Babylon.
   2500 - B.C. - Mesapotamia had developed important sheep industry.
   1493 - Columbus brought sheep to Cuba.
   1521 - Cortez brought sheep to Mexico.
   1664 - Law passed in Massachusetts that required youths to learn to spin and weave.
   1765 - Restrictions on wool by England incurred great protest.
   1800s - As man settled the middle and western United States sheep moved with them.
   Today - Wool is a renewable resource, a primary natural fiber in clothing and   a source of other natural by-products.

History, Sociology

4. Sheep raising has been important to humans for their basic needs of food, shelter and clothing. Explain how sheep were used by humans as they crossed the many frontiers in the new world.

Because sheep can feed nearly anywhere and provide wool as well as meat, humans have taken sheep along on their migrations. The Spanish explorers brought sheep to the new world on their voyages. Colonists and settlers found sheep invaluable as a source of good quality protein (red meat) and wool for clothing.

5. Most human beings like to be around other people. Sheep herders spend many months away from people with their dogs and the sheep as their only companions. Imagine you are a sheep herder. Write

several entries in your daily diary telling about your life and what you see in nature around you.

6. If there were no animals like sheep and cattle to eat grass, millions of acres of land in this country would be economically unproductive. Can you explain why this
is important?

Economics
7. Refer to the timeline. Show how the wool industry has affected the economy of our country from colonial days to the present.

History, Economics, Sociology
8. Imagine you are employed as a spinner or weaver in Colonial Massachusetts. The time is 1769 and the first woolen mill has just started operating. Describe your feelings as you see the big machines working. Also discuss what effect you think this will have on your job. What other jobs might you have to learn?

9. Why do you think many people are returning to old practices of spinning and hand weaving?

10. Try to spin and weave wool. The finished products can be displayed for others to see.

11. Make a large mural showing a pastoral scene of sheep grazing with cattle and wildlife. Use the mural to explain the concepts of a modern sheep ranching operation.

TO SUMMARIZE . . . WOOL FABRICS ARE

RESILIENT . . . because each wool fiber is made up of millions of "coiled springs" (protein molecules) that stretch in use, but coil back to their original positions. This is why wrinkles disappear from wool garments when they are "rested" and why wool rugs retain their springy pile for many years.

WEAR-RESISTANT. . . because these "coiled spring" molecules stretch easily, they can be flexed and twisted thousands of times without breaking. They "give" rather than resist friction and so can stand up under the stresses and strains of normal wear.

LIGHT-WEIGHT . . . because the inherent strength of the wool fiber lends itself to the construction of fabrics that are unequalled in the comfort-to-weight relationship. Even the warmest fabrics are not oppressively heavy.

EXCELLENT INSULATION . . . because in the more dense, lofty fabrics, pockets of air trapped around and among the crimpy fibers, inhibits the transfer of temperature. Cold, snow, rain and wind are slow to penetrate to the body.

STATIC-RESISTANT . . . because the wool protein absorbs moisture so well, the tendency to collect static electricity is reduced. Wool garments are much less likely to "spark" or cling to the body, and of great importance, less likely to attract lint and dirt.

COMFORTABLE . . . because wool is elastic, it fits well and yields easily to body movement. It absorbs moisture, yet never feels damp and clammy. No other fabric serves so well under such a variety of conditions.

RICHLY BEAUTIFUL . . . because the protein core of the wool fiber is strongly reactive, soaking up and combining with a wide variety of dyes, the color spectrum for wool is almost limitless. Wool holds color well because the color becomes part of the fiber.

VERSATILE . . . because wool technologists have developed an endless number of combinations of weaves, knits and textures, the seasonal adaptablility of wool is matched only by it tailorability.

WHEN IS A SHEEP NOT A SHEEP?
ALMOST EVERY DAY . . . IN ALMOST EVERY WAY!

Sheep produces more than nutritious meat and warm wool. Sheep help us make the following:

From Hide & Wool
baseballs
tennis balls
drum heads
luggage
footwear
clothing
yarns
artist brushes
fabrics

From Meat
barbecue ribs
roasts
steaks
leg of lamb
lamb chops
ground lamb
rack of lamb

From Hide & Wool
pelt products
rouge base
rug pads
asphalt binder
ointment base
lanolin
felt carpet
upholstery
hide glue
paint & plaster binder

From Bones, Horns & Hooves
marshmallows
pet foods
bandage strips
ice cream
combs & toothbrushes
dog biscuits
phonograph records
dice
tape
steel ball bearings
syringes
gelatin
rose food
piano keys
pencils
abrasives
bone jewelry
bone meal
horn & bone handles
collagen & bone for
   plastic surgery
bone china
wallpaper & paste

From Bones, Horns and Hooves
fertilizer
neatsfoot oil
plywood & paneling
photographic film
cellophane wrap
emery boards & cloth
collagen cold cream

From Intestines
instrument strings
surgical supplies
tennis racquet strings
sausage casings

From Manure
nitrogen fertilizer
potash
phosphorus
minor minerals

From Fats & Lanolin
medicines
chewing gum
crayons
cosmetics
dog food
oleo margarine
ceramics
hand soap
dish soap
biodegradable detergent
tires
candles
shaving cream
shampoo
conditioner
explosives
paints
rennet for cheese
industrial oils
stearic acid
mink oil
shoe cream
creams & lotions

From Fats & Lanolin
chicken feed
antifreeze
floor wax
tallow
chemicals
rubber products
insecticides & herbicides

32

ANSWER KEY
Page 1: Texas
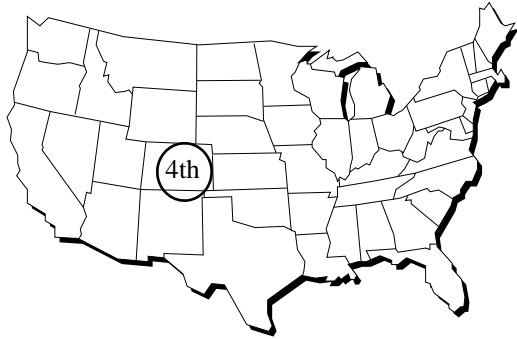
Page 2:   ewe, ram, lamb, flock

Page 3:   Rambouillet - wool
                Columbia - wool
                Suffolk - meat
                Hampshire - meat

Page 4:   9 lambs
                40 pounds of wool
                21 pounds

Page 6:
                1. top front teeth
                2. grasses & weeds
                3. docked
                4. split
                5. bleating
                6. ear tags
sheep, teeth, feels, weeds, clean, so, eat, do bite, you, age
tails, green, babies, keep, clean a, make, bleating,
producers, see

Page 7: ruminant - having a four part stomach

Page 10: from left to right
                pet food
                film
                tape
                buttons
                soap
                ice cream
                dice
                paints
                tennis ball
                otiions

Page 11:   lamb
                wool & meat (lamb)
                Proteins helps build muscle
                and strong bones.

Page 12:   wool, shearing

Page 13:

                sheep
                fine, medium, coarse
                uits, clothes,
                blankets
                carpets
                white, black, grey & red

Page 15:
                carding - straightening the wool fibers
                environment - reusable oil spill cleanup sponges;
                mulch; stabilize landscape plants

Page 17:   give sheep vaccinations
                treat sheep with antibiotics if
                they are sick

Page 18:   herders   1000 to 2000 sheep

Page 20:   herding instinct means animals stick
                together in groups.

The difference between a band and a flock is size. It is
called a flock if there is l,000 or less animals and it is called
a band if there are more than 1,000 sheep.

Page 22:
1. a. working
   b. livestock protection
2. a. smart
   b. work with shepherd
   c. herd the sheep
   d.   1. Border Collie
        2. Australian Shepherd
3. a. protect the sheep
   b. are not treated like pets
   c. like to be with sheep
   d.   1. Komondor
        2. Great Pyrenees or Akbash
4. a & b: ostriches, mules, donkeys,
   cattle, llamas, or goats

Page 23:
1. 4 x 100 = 400
2. 150 x .10 = $15.00
3. 60 x .10 = $6.00
4. 10+8+8+9+9 = 44 lbs
5. $1.00 x 10 = $10.00
6. 120 x .80 = $96.00
7. $90.00 x 2 = $180.00

Page 24:
PREDATORS
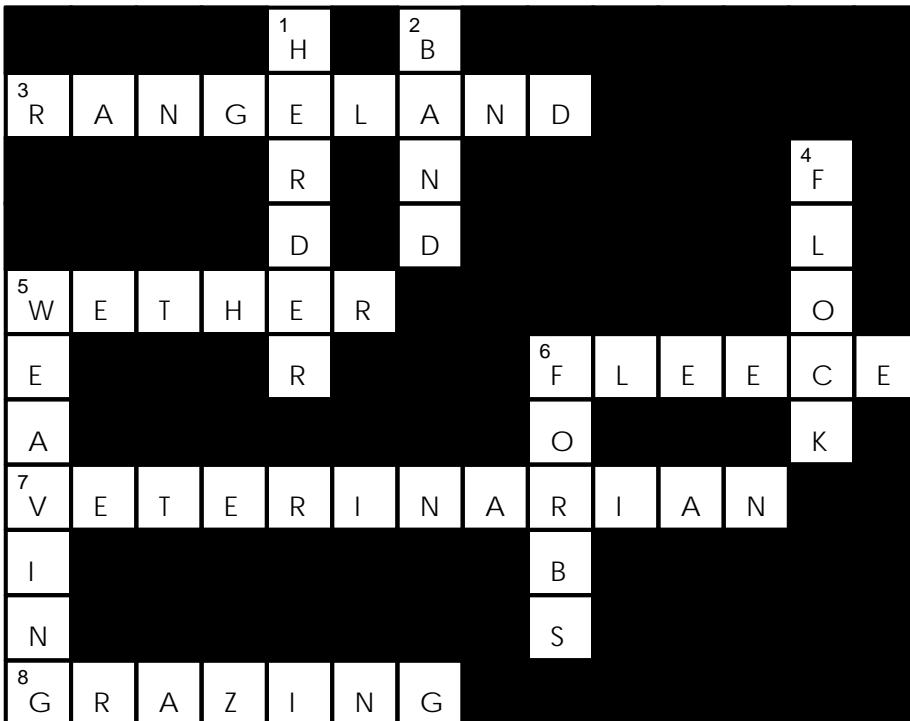   bears
        foxes
        dogs
        eagles
        mountain lions
        coyotes
PROTECTING SHEEP:
        livestock protection dogs
        ostriches
        goats
        mules
        cattle
        llamas

Page 25:
        200
        meat and wool breeds
        ewes
        lambs
        rams or wethers
        teeth
        docking
        four
        ruminants
        lanolin
        lamb
        protein
        shearing
        Livestock protection dogs &
                working dogs
        wild animals (predators)
        predators
        vaccinations
        antibiotics

Page 26

Across:
3. RANGELAND
5. WETHER
6. FLEECE
7. VETERINARIAN
8. GRAZING

Down:
1. HERDRER
2. BANDDR
4. FLOCK
5. WEA VIN
6. FOBS
7. VIN

(crossword grid)

Row: 1. H, 2. B
3. R A N G E L A N D
   E   N
   D   D
5. W E T H E R   4. F
E   R   L
A   6. F L E E C E
7. V E T E R I N A R I A N   K
I   O
N   B
8. G R A Z I N G   S

The End