GOT MILK?

Overview
This lesson will introduce students to the dairy industry in Kansas and the various careers associated with dairy production.

Objectives
1. Student will be able to identify the different career opportunities in the dairy industry.
2. Students will apply math skills to determine different calculations related to milk production.
3. Students will understand the digestive system of ruminants and how it supports survival, growth and behavior of the dairy animal.

Background Information
In Kansas, there are approximately 137,000 milk cows on 310 registered dairy herds and 5 production plants that process dairy products. Kansas ranks 16th in U.S. dairy production, producing nearly 2.9 billion pounds of milk annually. In recent years, the value of milk that Kansas produced reached nearly $592 million and added approximately $131 million and 482 jobs to the economy in Kansas.

In the United States, there are six major dairy breeds; Holstein, Brown Swiss, Jersey, Guernsey, Milking Shorthorn and Aryshire. While the production traits (average cow size, calf birth weight and milk production levels) vary between breeds, they all function the same way. Dairy cattle (bovines) are ruminants. Ruminant animals have compartments in their stomachs. Cattle have four compartments: rumen, reticulum, omasum and abomasum. Other ruminant animals include sheep and goats. Monogastric animals have only one stomach. Pigs, horses and humans would be considered monogastric.

A mature cow will eat 20-25 pounds of grain, 40-60 pounds of ensilage, 30 pounds of hay and drink about 15-25 gallons of water (approximately a bathtub full) each day. After she swallows her partially chewed food, it goes to the rumen (the largest of the four compartments). Later she regurgitates (burps up) the food; this is called the cud. She rechews the food and swallows it again for further digestion. She will spend 8 hours chewing her cud as she breaks down her food.

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Background Information Continued

A cow will be bred so that her first calf is born when she is about 24 months of age. Gestation, or pregnancy, is about 279-290 days (nine months). Cows may be bred with a bull, through artificial insemination or by being a recipient of embryo transfer. A cow will normally have only one calf per year.

Dairy farms will vary in size from a small number of cattle to thousands of cattle. Therefore, barns vary in style, size and design. Milk is taken from the dairy barn to the processing plants in large milk trucks. Milk is kept at around 39 degrees Fahrenheit for a maximum of an 48 hours in the milk transportation truck. Barns and milk plants are inspected for food safety standards by the Dairy Sanitation Inspection and Licensing Program.

According to United States Department of Agriculture's National Resource Conservation Service, a milking dairy cow produces 50 pounds of manure per day. Many dairies recycle the energy from this waste by using methane digesters. Methane digesters produce methane from manure. Methane can be used to produce energy or electricity. Due to the fact that manure is important for soil structure and nutrients, cows are natural recyclers.

Vocabulary

Cow: Adult female that has produced a calf.

Bull: Intact male.

Steer: Male animal that has been castrated and cannot breed.

Heifer: Young female that has not produced a calf.

Calf: Young dairy animal that is either male or female.

Artificial Insemination: Breeding process that uses sperm that has been collected from a bull, processed and stored, and is inserted into the cow's reproductive tract.

Embryo Transfer: Process where embryos are placed into the uterus of a female cow with intent of establishing pregnancy.

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Career Information

Producers rely on many consultants to help them on a daily basis.

Nutritionist: Researching nutrition, reproduction, growth and development of dairy cattle.

Crop Scouts: Assessing crop performance and problems of crops grown for feeding purposes.

Artificial Insemination Technician: A technician that breeds dairy cattle by inserting frozen semen into the reproductive tract of a cow.

Housing Specialists: Deals with the building design and ventilation of dairy production buildings.

Mechanics: Keep machinery in operating order.

Truck Drivers: Haul milk, feed and machinery for the dairy farm.

**Accountants:** Advise the business decisions and deal with how the money is handled on the dairy farm.

Advertisers: Assist in selling the end dairy products.

Food Safety Inspector: Inspects all aspects of dairy production from the farms, processing plants and the products to ensure a safe and healthy product.

Veterinarians: Study, treat and control animal injuries and diseases.

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Ruminant Digestive System
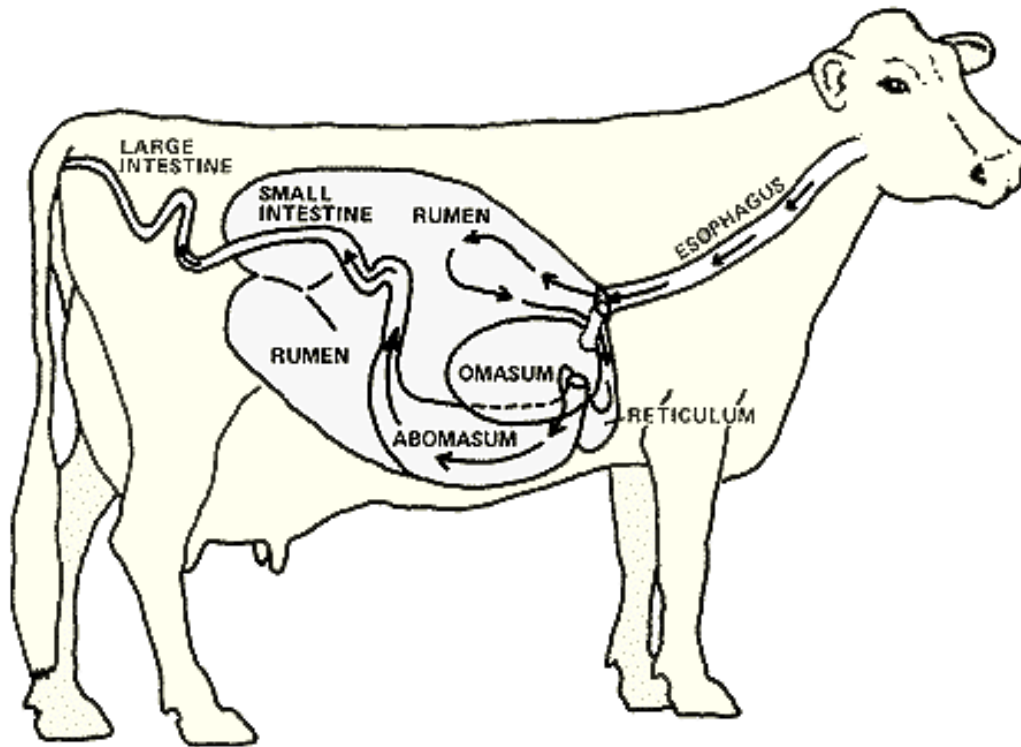
Ruminant Vocabulary

Esophagus: The muscular tube by which food passes from the pharynx to the stomach.

Rumen: The first compartment of a ruminant stomach which collects the food after it is swallowed.

Reticulum: The second compartment of the stomach of ruminants that is lined with a membrane that has honeycombed ridges.

Omasum: The third compartment of a ruminant animal, located between the abomasum and the reticulum.

Abomasum: The fourth compartment of the stomach in ruminants where digestion takes place. This compartment would be the equivalent of the human stomach.

Small Intestine: Upper part of the intestine where digestion is completed and nutrients are absorbed by the blood.

Large Intestine: Last part of digestion in ruminants where water is removed from the digested food before it passes out of the body as solid waste.

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Dairy Math Problems

Name:_____

Date:_____

Instructions: Answer the questions below and show your work.

1. One gallon of milk weighs 8.6 lbs. How many gallons of milk would it take to equal your weight?

2. If a cow produces about 70 pounds of milk per day, how many gallons is that (round your answer to the nearest whole number)?

3. There are 8 pints in a gallon. If one milk carton is ½ pint, how many milk cartons of milk does a cow produce each day (hint: use the answer from Question #2).

4. If each student in your class drank one carton of milk at breakfast and one carton at lunch, how many gallons would that be? Can one cow produce the milk needed to supply the students for one day? If the cow produces eight gallons per day, how much milk will be left over after the students get their share?

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5. If you can milk 80 cows each hour, how long will it take to milk 640 cows?

6. On your farm, cows can be milked in groups of five cows at a time. If you have 13 cows left, and will only bring in 3 groups, what are the ways that the cows can be grouped?

7. On your neighbor's farm, the cows are 58 inches tall and 23 inches wide. She asks you to help her plan her new barn. To make sure the cows are comfortable in their stalls, you multiply their height by two to find the length of the stall and their width by two to find the width of the stall. Using these formulas, what should the dimensions of the stall be? (Use inches and feet)

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(Answer Key) Dairy Math Problems

1. One gallon of milk weighs 8.6 lbs, how many gallons of milk would it take to equal your weight?

Answers will vary depending on the weight of the student!
95 lbs (use the student's weight) /8.6 lbs of milk in one gallon =
11.04 gallons of milk to equal student weight

2. If a cow produces about 70 pounds of milk per day, how many gallons is that (round your answer to the nearest whole number)?

70 lbs / 8.6 lbs per gallon =8.1 or rounded to 8

3. There are 8 pints to a gallon. If one milk carton is ½ pint, how many milk cartons of milk does a cow produce each day (hint: use the answer from Question #2).

2 cartons in a pint X 8 pints in a gallon = 16 cartons in a gallon
8 gallons produced each day X 16 cartons per gallon = 128 cartons of milk
produced in one day

4. If each student in your class drank one carton of milk at breakfast and one carton at lunch, how many gallons would that be? Can one cow produce the milk needed to supply the students for one day? If the cow produces eight gallons per day, how much milk will be left over after the students get their share?

Answers will vary depending on the number of students in the class!
24 students in the class X 2 cartons each day = 48 cartons
48 cartons / 16 cartons in a gallon = 3 gallons
YES
8 gallons - 3 gallons = 5 gallons left
8 gallons per cow per day / 3 gallons needed by the class = 2.6 (one cow could produce two and a half days worth of milk for the class)

5. If you can milk 80 cows each hour, how long will it take to milk 640 cows?

640 cows / 80 cows per hour = 8 hours to milk 640 cows

6. On your farm, cows can be milked in groups of five at a time. If you have 13 cows left, and will only bring in 3 groups, what are the ways that the cows can be grouped?

Group One: five cows, Group Two: five cows, Group Three: three cows
Group One: five cows, Group Two: four cows, Group Three: four cows

7. On your neighbor's farm, the cows are 58 inches tall and 23 inches wide. She asks you to help her plan her new barn. To make sure the cows are comfortable in their stalls, you multiply their height by two to find the length of the stall and their width by two to find the width of the stall. Using these formulas, what should the dimensions of the stall be? (Use inches and feet)

58 inches long X 2 =116 inches for the stall length or 9.6 feet; 9 ft. 8 inches
23 inches wide X 2 = 46 inches for the stall width or 3.83 feet; 3 ft.10 inches

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Dairy Economics

Student Objectives

1. Students will use problem solving skills to determine the parts of a dollar that go into production of food.
2. Students will determine the Dairy's economic impact in the state.
3. Students will identify the businesses in the state that are impacted by the dairy industry.

Vocabulary

Packaging: Putting the product into containers and labeling it for consumers.

Transportation: Moving the raw product or processed product from one place to another.

Energy: Cost of resources such as fuels or electricity needed to produce or process products.

Profit: Gross income minus Gross expenses.

Advertising: Promotion using media sources such as television, radio, website and print media.

Depreciation: Decrease or loss in value of equipment because of age, wear, or market conditions.

Rent: Amount paid to use something.

Interest: A percentage per year of the amount of money borrowed.

Repairs: The cost to fix something.

Business Taxes: The taxes that a business must pay on products sold, employee and personnel related expenses and on property owned.

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Food Dollar

Students will use problems solving skills to match the money spent on each area with the places their food dollar goes off the farm.

1. Students should use problem solving skills to match the money spent on each area with the places that money goes.
2. Discuss where those businesses can be found and the importance of each of the places the money goes. What are some ways to reduce or eliminate the amount of money spent so the farmer sees a bigger profit?

2012 Food Dollar: Industry Group (Nominal)

https://www.cookstr.com/recipes/oven-roasted-plum-tomatoes

Agribusiness: 3 cents
Farm Production: 10 cents
Food Processing: 16 cents
Packaging: 3 cents
Transportation: 3 cents
Wholesale Trade: 9 cents
Retail Trade: 13 cents
Food Services: 31 cents
Finance & Insurance: 3 cents
Energy: 6 cents
Other: 3 cents

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Food Dollar

Match the amount in the first column to the item it is spent on in the second column using the clues provided.

38.5¢	Packaging
8¢	Business Taxes
4.5¢	Energy
4.5¢	Other Costs
4¢	Rent
4¢	Off-Farm Labor
3.5¢	Repairs
3.5¢	Profits
3.5¢	Transportation
3¢	Interest
2.5¢	Depreciation
1.5¢	Advertising

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Clues

Repairs are the lowest expense

Transportation and advertising cost the same

Transportation and advertising are more than depreciation and less than rent

Packaging costs two times the value of advertising

Off-farm labor is the greatest expense

Energy, depreciation and business taxes are equal

Other costs are two times repairs

Profits and rent are equal

Interest is more than repairs and less than other costs

Profits and rent are more than transportation and less than packaging expenses

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Food Dollar

Match the amount in the first column to the item it is spent on in the second column using the clues provided.

38.5¢	Packaging
8¢	Business Taxes
4.5¢	Energy
4.5¢	Other Costs
4¢	Rent
4¢	Off-Farm Labor
3.5¢	Repairs
3.5¢	Profits
3.5¢	Transportation
3¢	Interest
2.5¢	Depreciation
1.5¢	Advertising