

Foods Made From Milk

You Can Do It!

Math and Nutrition

Objectives

1. Students will understand that food provides humans with nutrients they need for growth, maintenance and energy.
2. Students will be able to identify the nutrients provided from dairy for their daily needs.
3. Students will use math conversions to determine the amount of specific dairy products that can be made from a set amount of milk.

Background Information

Calcium: Helps build stronger bones and teeth. Dairy products are a major source of calcium in our diets.
Potassium: Diets that are enriched with potassium help the body build proteins, muscle and maintain normal growth.
Vitamin D: The purpose of vitamin D in our bodies is to maintain the proper levels of calcium and phosphorous which supports healthy bones.

Consuming dairy products helps to improve bone health and lower the risk of osteoporosis or brittle bones. It is especially important for children and adolescents to consume dairy products because their bones are growing during this stage of development. Along with improved bone health, dairy products are also associated with reducing the risk of cardiovascular disease, Type 2 diabetes and lower blood pressure.

Grade Level: 4th- 5th

Time: 40 minutes for each activity

Standards:

Math

- Measurement and data
- Understanding of volume and mass
- Number and predictions in base ten

Science

- LS1. A Structure and Function
- LS1.C Organization for Matter and Energy

Food, Health and Lifestyle National Ag Literacy Outcomes

- Describe the necessary food components of a healthy diet using the current dietary guidelines.
- Identify food sources of required food nutrients.

For National Ag Literacy Outcomes
 - <http://www.agclassroom.org/get/>

Recommended Daily Consumption of Dairy Products*

Children	2-3 years old	2 cups
	4-8 years old	2 1/2 cups
Girls and Boys	9-13 years old	3 cups
	14-18 years old	3 cups

What to Make with Milk

What to Make with Milk?

Using the conversion factors below, answer the questions and show your work.

Milk Conversion Factors:

One quart of milk weighs 2.15 lbs.

One gallon of milk weighs 8.6 lbs.

To make one pound of.....you need:

Butter	21.8 lbs whole milk
Cheese	9.8 lbs whole milk
1 gallon Ice Cream	12.0 lbs whole milk
Plain Yogurt (not low fat)	1 lb whole milk

Source: USDA

Can any products be produced with just one gallon of milk?

How many pounds of milk are in five gallons?

How many gallons of ice cream can be made with five gallons of milk?

What products, when added together, could be made with two gallons and three quarts of milk?

How many gallons of milk would you need to make 5 gallons of ice cream?



Answer Key

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Can any products be produced with just one gallon of milk?

Only plain yogurt

How many pounds of milk are in five gallons?

8.6 pounds per gallon X 5 gallons = 43 pounds of milk

How many gallons of ice cream can be made with five gallons of milk?

43 pounds / 12 pounds = 3.6 so only three gallons can be made

What products could be made with two gallons and three quarts of milk?

2 gallons X 8.6 pounds = 17.2 pounds of milk

3 quarts X 2.15 pounds = 6.45 pounds of milk

17.2 pounds + 6.45 pounds = 23.65 pounds of milk

One gallon ice cream, one pound cheese, one pound plain yogurt = 22.8 lbs

Or one pound of butter and one pound of plain yogurt = 22.8 pounds

How many gallons of milk would you need to make 5 gallons of ice cream?

5 gallons X 12 lbs milk = 60 pounds of milk

60 pounds of milk / 8.6 lbs in a gallon = 6.98 gallons of milk



Plastic Bag Ice Cream

Background:

Ice cream can be made in the classroom using the principle that adding salt to the ice between the plastic bags

lowers the freezing point of water. Heat energy is transferred easily from the milk through the plastic bag to the salty ice water causing the ice cream mixture to freeze and the ice to melt.

Materials (each student):

- 1 quart resealable freezer bag
- 1 pint resealable freezer bag
- 1 Tablespoon sugar
- 1/4 teaspoon vanilla extract
- 1/4 cup rock salt
- 1/4 cup milk (whole or 2%)
- 1/4 whipping cream or half & half
- plastic spoon
- 8 ounce sundae cup

Teacher's Materials:

- measuring cup
- duct tape
- large serving spoons
- ice cream flavorings (optional)
- ice
- cloth towels or mitts
- water

Procedure:

1. Set up the milk, whipping cream, vanilla, and sugar in an assembly line process for students (to help reduce congestion).
2. Students add 1/4 cup milk, 1/4 cup whipping cream, 1 Tablespoon sugar, and 1/4 teaspoon vanilla to a 1 pint freezer bag. Squeeze out any remaining air, seal tightly and use a strip of duct tape to double-seal the end of the bag.
3. Students will place the pint bag with the ice cream ingredients inside a 1 quart resealable bag. Pack ice around the small bag and add the rock salt and 1/4 cup water. Squeeze out any remaining air in the 1 quart bag, seal the bag, and then double-seal the end using the duct tape.
4. Students should carefully shake the bags between their hands while protecting their hands with cloth towels or mitts. This should be done until you can see that the ice cream is frozen.
5. Each group can open the outer bag and discard the ice and salt. Rinse the outside of the bag containing the ice cream ingredients and cut the corner of the zip lock bag and squeeze the ice cream out of the bag into small cups and serve.
6. Eat the ice cream plain or with your favorite toppings and enjoy. Caution: Students who are allergic to milk or milk products should not eat the ice cream.
7. Clean up all laboratory equipment and discard paper sundae cups and plastic spoons.



Plastic Bag Ice Cream

Ice Cream Trivia

- Nearly 9% of the milk produced by U.S. dairy farmers is used to make ice cream.
- It takes 12 pounds of milk to make one gallon of ice cream.
- One gallon of ice cream weighs at least 4 1/2 pounds, with minimum of 10% milk fat.
- In 1984, President Ronald Reagan declared July as National Ice Cream Month, and National Ice Cream Day as the third Sunday in July.
- America's top 5 favorite flavors are, in order: vanilla, chocolate, Neapolitan, butter pecan, and chocolate chip.
- The U.S. Ice Cream Industry generates about \$20 billion in annual sales.



Homemade Butter

Background Information

Butter is made from cream, a component of milk. Cream is lighter than the rest of the milk and floats to the top, where it can be skimmed off and packaged separately. One pound of butter is made from the cream found in ten quarts of milk.

The more butterfat milk contains, the more butter it will make. The Jersey breed of cattle produces milk with the highest percentage of butterfat. The holstein breed gives the greatest quantity of milk, but the lowest percentage of butterfat.

Today, most people purchase commercially-made butter at the supermarket. Years ago, however, most people made butter at home using a butter churn. A typical butter churn consisted of a container to hold cream, which was then stirred briskly using a stick or paddle. The cream thickened as it was stirred, resulting in butter and buttermilk (the remaining liquid).

Materials

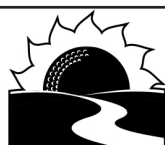
- Pint-size jar (can be glass or plastic or 2-ounce cups with lids also work well)
- Heavy whipping cream, preferably at room temperature
- Salt
- Crackers

Procedure

1. Fill jar or cup 2/3 full with whipping cream. Firmly secure lid. Be sure to leave some space in the container.
2. Shake container briskly for 5-10 minutes (the more cream in the container, the longer it will take). Continue shaking until the butter is a solid lump in the jar. Once the butter has formed, open the jar and pour off the buttermilk.
3. To make salted butter, add salt after the butter is formed.
4. Spread butter on crackers and enjoy!

Variations

- For an experiment, try salting before shaking.
- Experiment by having students record the temperature of cream when beginning, length of time, and number of shakes it takes to form butter to form.
- Instead of using heavy whipping cream (44% cream), try using light cream (18% cream), regular milk (3.5% cream), and 2% milk (2% cream). Have students compare the results.



Want More? Extensions

- <http://www.midwestdairy.com/Op17i313/the-science-of-milk-video/>

