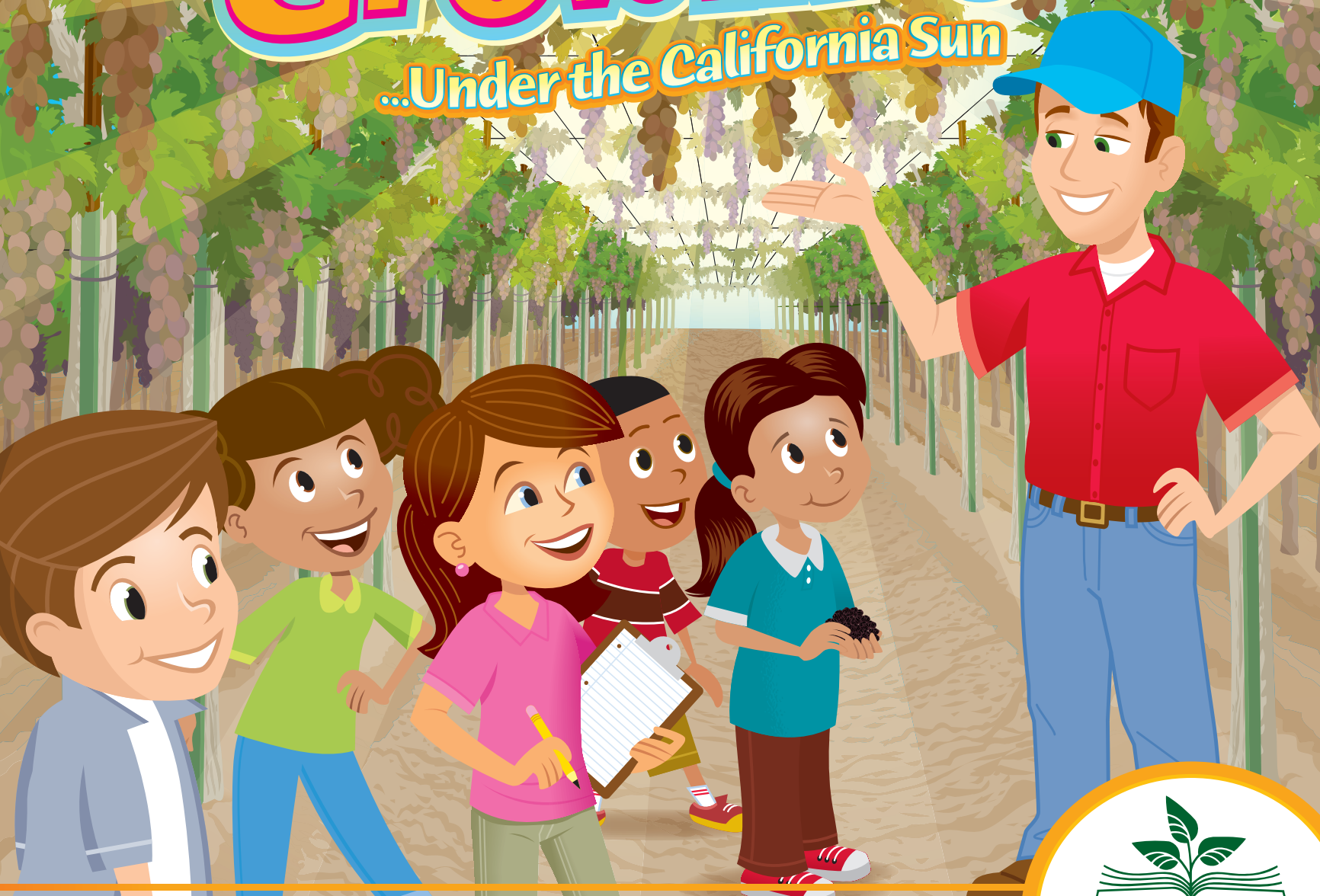


# What's Growin' On?

...Under the California Sun



California Foundation for  
Agriculture in the Classroom

A NEWSPAPERS IN EDUCATION SUPPLEMENT

For Extra! Extra! extension lessons, visit [www.LearnAboutAg.org/wgo](http://www.LearnAboutAg.org/wgo) or call (800) 700-AITC.

# What's Growin' On? ...Under the California Sun

## A message for everyone...

**H**ave you ever wondered what's growing in the fields, orchards, or forests as you drive by in the car? California is a special place for agriculture. The micro-climates and fertile soil found in our state are perfect for growing crops that don't grow well in many other places. More than 400 different crops are grown right here in California and our state leads the nation in agriculture production. Nearly half the fruits, nuts, and vegetables consumed in the United States are produced by California farmers. Mild climate conditions in certain areas of California allow crops to be grown year-round. As a result, Californians are fortunate to always have a variety of fresh produce to choose from at the grocery store.

This year's edition of **What's Growin' On** is inspired by California raisins and the farmers who grow them. Our state grows 100 percent of the raisins consumed in the United States! The Central Valley provides excellent growing conditions for seedless grapes, which are then dried in the sun to produce raisins. Raisins are a nutritious and all-natural food that has been around for centuries. This dried fruit is easy to pack for a snack and has provided energy for explorers on important expeditions to the North Pole and even to outer space!

This newspaper will introduce you to some of the important agricultural products produced in California and will inspire you to explore why California is such a great place for agriculture.

## A message for teachers...

**F**or the past 12 years, California Foundation for Agriculture in the Classroom has produced **What's Growin' On?** to help students discover the many ways agriculture impacts their daily lives.

Use the activities on the following pages to connect your students to the world of agriculture and its important role in California. Encourage students to share **What's Growin' On?** at home to help family members appreciate the process and people involved in producing food, clothing, and other necessities often taken for granted.

Each annual edition of **What's Growin' On?** is developed by educators and reviewed by agriculture experts to provide current and accurate information. The activities on the following pages are aligned to third through eighth grade Content Standards for California Public Schools including Common Core and Next Generation Science Standards.

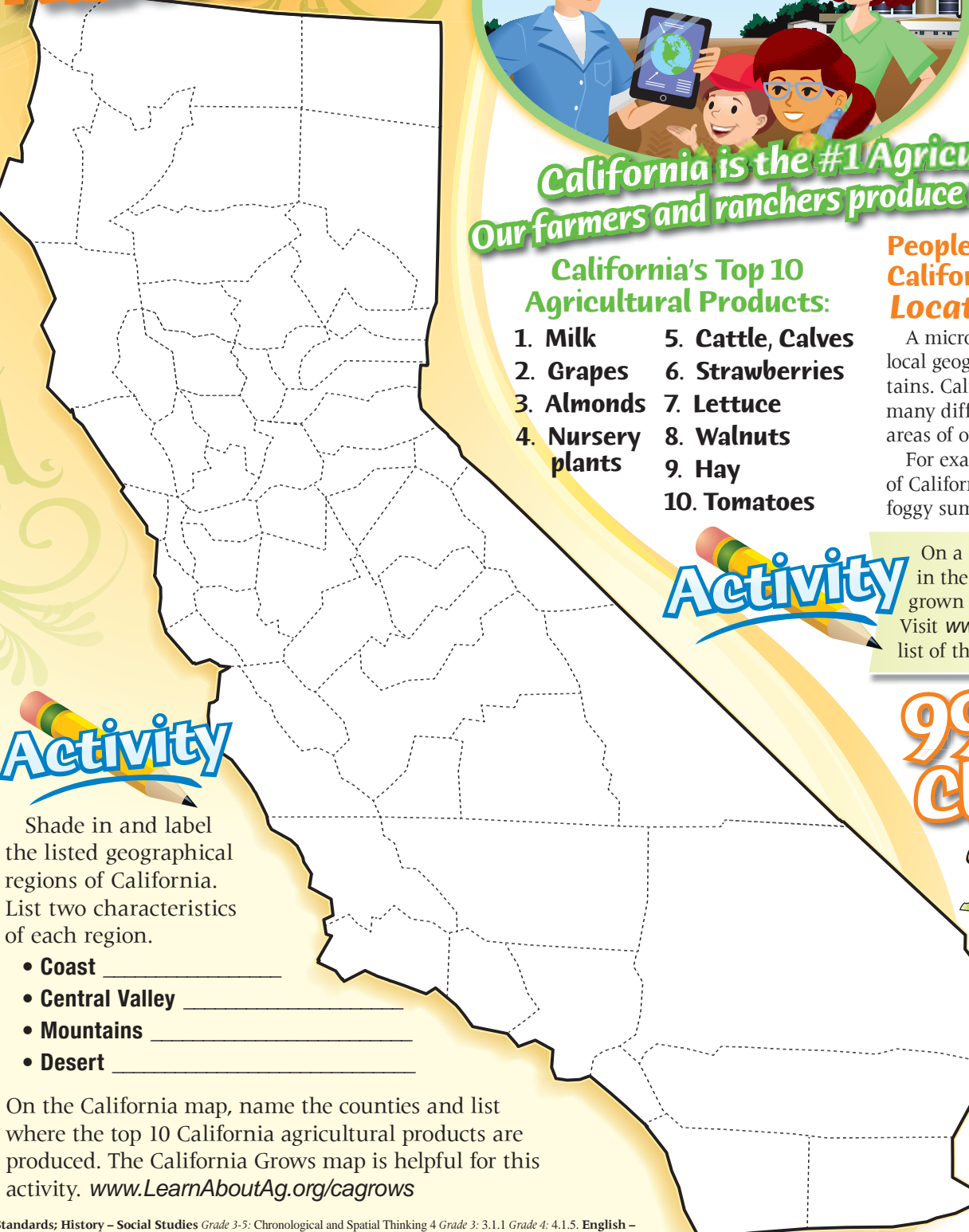
An answer key and additional lesson ideas may be found in the Extra! Extra! extension lessons posted at [www.LearnAboutAg.org/wgo](http://www.LearnAboutAg.org/wgo).

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# We Are Number One!



**Now**



The average farmer produces enough food for 155 people per year using less land and water than in the past.

**Then**



In the 1940s, the average farmer produced enough food for 19 people per year.

**California is the #1 Agriculture State in the Nation.**  
**Our farmers and ranchers produce more than 400 different products.**

**California's Top 10 Agricultural Products:**

- |                   |                   |
|-------------------|-------------------|
| 1. Milk           | 5. Cattle, Calves |
| 2. Grapes         | 6. Strawberries   |
| 3. Almonds        | 7. Lettuce        |
| 4. Nursery plants | 8. Walnuts        |
|                   | 9. Hay            |
|                   | 10. Tomatoes      |

**People, plants, and animals love California for many of the same reasons.**  
**Location! Location! Location!**

A microclimate is the climate in a small area, usually affected by local geographical features such as bodies of water, valleys, and mountains. California's microclimates make our state a good place to grow many different kinds of crops. California has mild seasons in many areas of our state that make it possible to grow crops year-round.

For example, the coastal marine microclimate of the north coast of California experiences heavy rainfall during the winter with cool, foggy summers. This climate is ideal for growing coast redwood trees.

**Activity**

On a separate piece of paper, name and describe a microclimate in the area where you live. Name and describe one crop that is grown there.  
 Visit [www.cfbf.com/counties](http://www.cfbf.com/counties) and click on your county to see a list of the top agricultural products produced there.

**Activity**








Shade in and label the listed geographical regions of California. List two characteristics of each region.

- **Coast** \_\_\_\_\_
- **Central Valley** \_\_\_\_\_
- **Mountains** \_\_\_\_\_
- **Desert** \_\_\_\_\_

On the California map, name the counties and list where the top 10 California agricultural products are produced. The California Grows map is helpful for this activity. [www.LearnAboutAg.org/cagrows](http://www.LearnAboutAg.org/cagrows)

**99% Club**

California produces 99% or more of many crops grown in the United States. Some of them are listed below. Complete the chart.

	Name	How it grows <i>(trees, vines, plants, etc.)</i>
		
		
		
		
		
		
		

# Sprouting the Bounty

## Life Cycle of a Sunflower

### What is a seed?

Seeds are the reproductive part of flowering plants such as sunflowers, apple trees, tomatoes, and almond trees. Once planted, seeds grow into a plant that looks like the parent plant. View this time lapse video of seeds germinating over the course of 10 days.

[www.vimeo.com/7608720](http://www.vimeo.com/7608720)

### Why are seeds important?

We need seeds to grow our future food supply. Some farmers hire seed companies to grow their seeds for them. Farmers want to make sure they get healthy seeds that have been selected for vigor and other traits such as disease- and drought-resistance.

### Farmer Highlight



**Leon Etchepare**, Emerald Farms

**Where is your farm?** Our headquarters are in Maxwell, CA and most of the land we farm is in Colusa and Glenn Counties.

#### What crops do you grow for seed?

We grow hundreds of species of plants. A few examples include arugula, beets, cucumbers, melons, zucchini, pumpkins, and tomatoes.

#### What are important points to know about growing crops for seed?

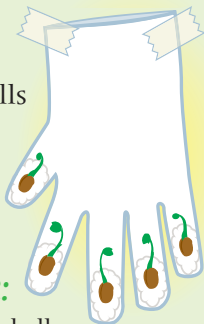
In order to produce a seed crop, we must grow the vegetable crop beyond the actual edible stage. For example, if you plant lettuce you will notice that it sends up flowers and forms seeds near the end of the growing season. When this happens, the lettuce is no longer very good to eat and is usually bitter.

**Who do you sell seeds to?** We grow seeds for many different worldwide seed companies. You have probably seen some of these packages of seeds for sale at your local garden store.

### Activity Handy Garden

#### Materials:

- Latex glove
- 5 cotton balls
- Variety of 5 seeds
- Water
- Tape

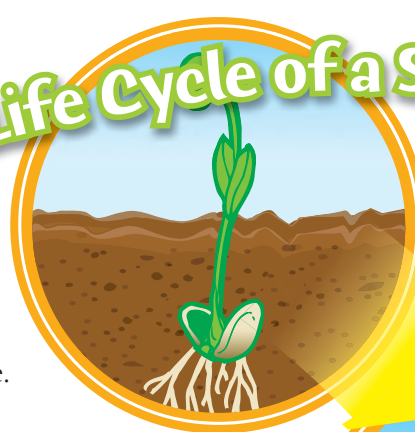


#### Procedure:

1. Moisten cotton balls.
2. Place a different seed inside each cotton ball.
3. Place one cotton ball in each finger tip of the glove.
4. Tape glove to a sunny window.
5. Keep cotton balls moist.
6. After seeds germinate, cut fingers off glove, remove cotton balls and plant seedling in a container or in the ground.
7. Observe seedlings over the next month. Use a notebook to record observations, growth measurements, and sketch seedlings as they grow into mature plants.

#### The seed germinates

When soil is warm enough, the seed cracks open and first roots and leaves emerge.



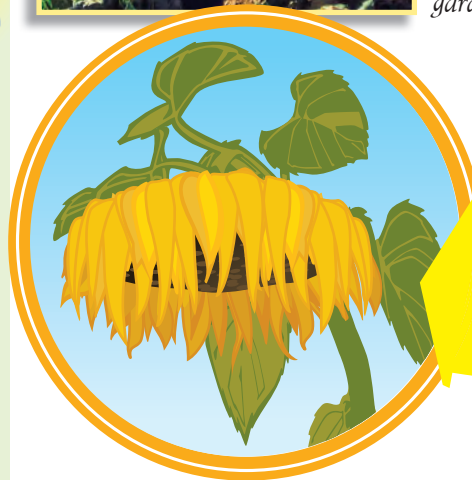
#### The plant grows

Depending on the variety, sunflower plants can reach 3 to 12 feet tall.



#### The plant flowers

Flowers attract pollinators.



#### The plant dies

Seeds that dropped to the ground lie dormant until conditions are right for growth in the spring. The life cycle begins again.



#### The seeds are released

After seeds mature, they drop to the ground or are collected for eating or planting.

#### The seeds form

After the flower is pollinated, petals drop away and seeds form.



# Super Swine!

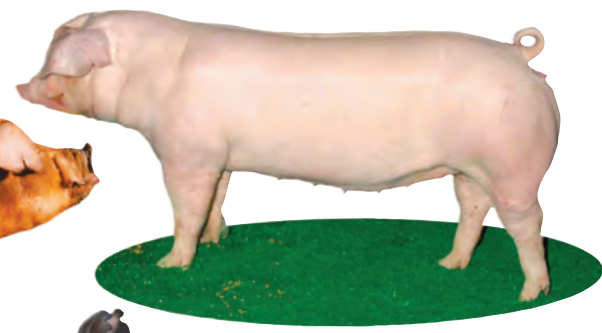
## History of Pork

**P**ork is the meat from swine, also known as pigs or hogs. Pigs were domesticated from wild boars in Europe thousands of years ago. They were not a native species of the Americas and were brought to America by Christopher Columbus in 1493. Pork was very important to colonists for meat, and lard which was used for baking, lamp oil, candle making and even soap. The population of pigs in the colonies grew quickly. Pigs can

have about two litters of piglets a year, with 8-12 piglets per litter, depending upon the breed.

In an attempt to control large herds of roaming pigs, colonists built a long wall on the northern edge of Manhattan Island. This is the same area that is now Wall Street.

Today, more pork is consumed around the world than any other meat. Examples of pork include ham, pork chops, sausage, and bacon.



**Sun Facts**  
Pigs don't have sweat glands so they cool down by rolling in the mud.

## Swine Products

Every part of the hog is used. Besides meat, we also get many other products from hogs.

Insulin for regulation of diabetes, valves for human heart surgery, suede for clothing, and leather for footballs all come from swine. Gelatin, fertilizer, brushes, plastics, antifreeze, floor waxes, crayons, glue, rubber, and chalk all contain swine byproducts.

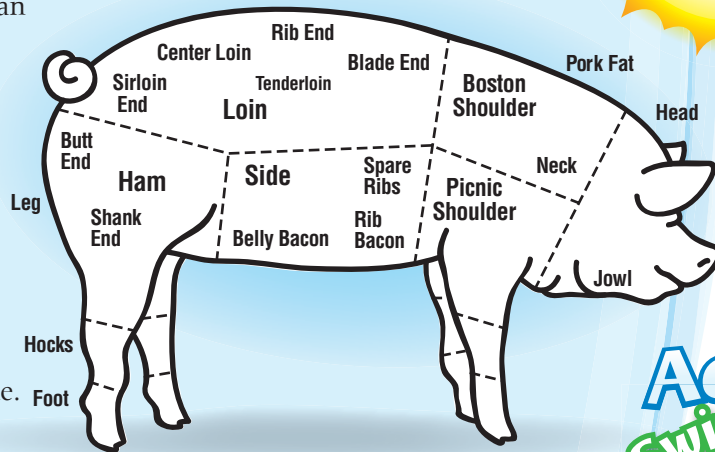


Photo Credits: National Pork Board

## Activity Swine Breeds

Draw an arrow from each description to the correct photo.

1. The **Hampshire** pig is black with a white belt and erect ears. Hampshires were originally bred in Scotland and Northern England and were introduced to the U.S. in 1825.
2. The **Yorkshire** pig is white with erect ears. Yorkshires were introduced to the U.S. in 1830 from England.
3. The **Landrace** is a white colored pig with a long body and droopy ears. Landrace pigs are known for their ability to have large litters. The breed originated in Denmark and came to the U.S in 1930.
4. The **Duroc** is a reddish colored pig with droopy ears. These hogs originated from breeders in New York and New Jersey in 1812.

**Math Activity** Approximately 54% of a market hog is lean meat. Determine the pounds of lean meat from a market hog weighing:

200 lbs = \_\_\_\_\_

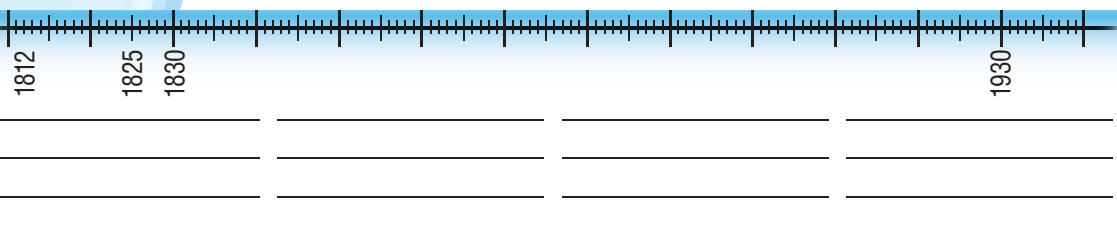
285 lbs = \_\_\_\_\_

302 lbs = \_\_\_\_\_

(Sources: US EPA, National Pork Board, 4-H Swine Curriculum)

## Activity

Make a timeline of when each swine breed came to the U.S. Include one other historical fact about what was happening in the country at that time.



## Activity Pig Idioms

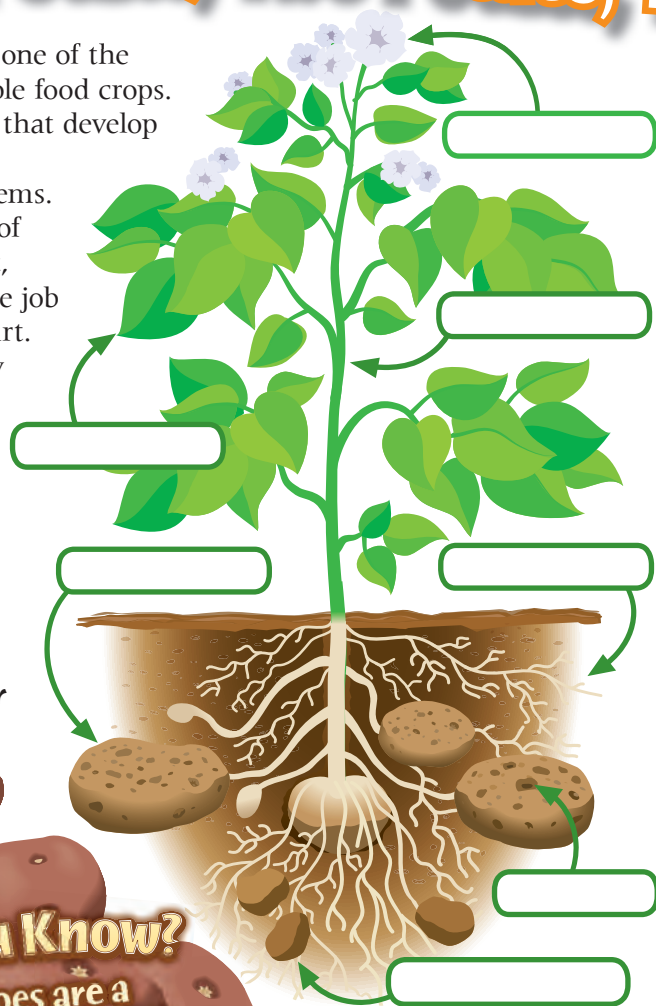
Interpret these common idioms:

- Going hog wild
- Bringing home the bacon
- When pigs fly
- Pig out

# One Potato, Two Potato, Three Potato...

**P**otatoes are one of the world's staple food crops. They are tubers that develop from thickened, underground stems. Label the parts of the potato plant, then, discuss the job of each plant part. Use the glossary for assistance.

- Flower
- Leaf
- Stem
- Roots
- Potato
- Eye
- Young tuber or potato



**Did You Know?**  
Potatoes are a good source of potassium. Potassium regulates water and mineral balance in our bodies and is important in muscle control and nerve function.

## Nutrition Facts

Serving Size 1 potato (148g/5.3 oz)	
Amount Per Serving	
Calories 110	Calories from Fat 0
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	0%
Cholesterol 0mg	0%
Sodium 0mg	0%
Potassium 620mg	18%
Total Carbohydrate 26g	9%
Dietary Fiber 2g	8%
Sugars 1g	0%
Protein 2g	0%
Vitamin A 0%, Vitamin C 45%, Calcium 2%, Iron 6%	

Source: Idaho Potato [www.idahopotato.com](http://www.idahopotato.com)

## Potato Timeline

- 200 B.C.**  
Inca Indians in Peru began cultivating potatoes
- 1536**  
Potatoes introduced to Europe when Spanish conquistadores brought them back from Peru
- 1609**  
European sailors take potatoes to China
- 1621**  
Potatoes brought to Colonies in North America
- 1801**  
French fries served at the White House to Thomas Jefferson
- 1872**  
Russet Burbank potato variety developed. Variety widely used for baked potatoes and French fries.
- 1845**  
Irish Potato Famine
- 1853**  
Potato chips invented in New York
- 1952**  
Mr. Potato Head toy is sold in stores
- 1995**  
Potato is first vegetable grown in space

## Activity

Research and write a paragraph about the impact of the Irish Potato Famine on world history.

**Standards:** NGSS – Grade 3: LS1.A Grade 5: 6, 7, 8: ETS1.A, ETS1.B. **Science** – Grade 3: 3a, 5d, e Grade 4: 6c, f Grade 5: 6b, h Grade 6: 7a Grade 8: 9a. **History** – Grade 3, 4, 5: Chronological and Spatial Thinking 1, Historical Interpretation 1, 3 Grade 6, 7, 8: Chronological and Spatial Thinking 2, Research, Evidence 1, Historical Interpretation 2. **Math** – Grade 3, 4: MP1, OA 1 Grade 5, 6, 7, 8 MP1. **English** – Grade 3, 4, 5: RI 1, 3 W 2, 4, 7 Grade 6, 7, 8: RI 1, 2 W 2, 5. **Health** – Grade 4: 3.2.N Grade 5: 3.2.N

## Spud-tastic Science Activities

### Super Soaker

- Fill two small bowls about ½ full with water.
- Add 3 tablespoons of salt to one bowl and label it saltwater.
- Get help from an adult to slice one medium sized potato in half lengthwise. Examine the two potato halves and write down your observations on a separate piece of paper.
- Soak one half of the potato in the bowl of water and the other half of the potato in the bowl with saltwater overnight.
- How do you think the potato slices might change overnight? Write your predictions down.
- Remove the potato halves and examine the difference between the half that was soaked in water and the half that was soaked in salt water. Write down your observations.
- Explain the scientific process that you think is responsible for the change that happened to the potato halves that were soaked in water and in salt water.

## Trash Can Potatoes

### You don't need a big garden to grow potatoes!

1. Drill holes in the bottom of a 30-35 gallon trash can and add a thin layer of gravel to the bottom to ensure proper drainage after watering.
2. Add a layer of potting soil that is about 18 inches deep.
3. Purchase three seed potatoes from a garden center and cut into chunks that each have at least two eyes (dimples). Allow cut edges to air dry overnight.
4. Plant potato pieces about 4 inches deep and evenly spaced in the potting mix.
5. Place the garbage can outdoors in an area that gets 4-6 hours of sunlight each day. Keep soil moist by watering as needed.
6. As potato plants grow, add a little more potting soil mix to cover stems, but make sure leaves remain exposed. Continue to "hill" or add soil around the stem throughout the growing season to allow potatoes more room to grow under the soil.
7. At the end of the growing season, dump your trash can onto a tarp and harvest your potatoes.

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# A Career With Critters

## Did you know?

Farm animals, like cattle, sheep, horses, and pigs, often require care from a veterinarian. Many farms have veterinarians perform regular checkups to make sure their animals are healthy. Most large animal vets make visits to their patients rather than have their patients come to an office. Their trucks are equipped with all the medical equipment they need to perform exams and even some surgeries at farms. Watch a video form America's Heartland, "U.S. Veterinarian Shortage" to see a large animal veterinarian in action. [goo.gl/CrnaTh](http://goo.gl/CrnaTh)



**Dr. Ford**  
performing knee  
surgery on a horse

## Daily Schedule of a Large Animal Veterinarian

Vet work changes from day to day. Here's one example of a large animal vet's day:

- 6:30 a.m. – drive to a dairy to do pregnancy check on cows.
- 10:00 a.m. – drive to a horse ranch to do regular vaccinations, suture a large cut, and perform lameness exams.
- 12:30 p.m. – lunch on the go
- 1:00 p.m. – drive to a client's home to perform a dental exam on one horse and to castrate a young colt
- 6:00 p.m. – head home

## Compare a Vet's Schedule to Yours

My Daily Schedule:

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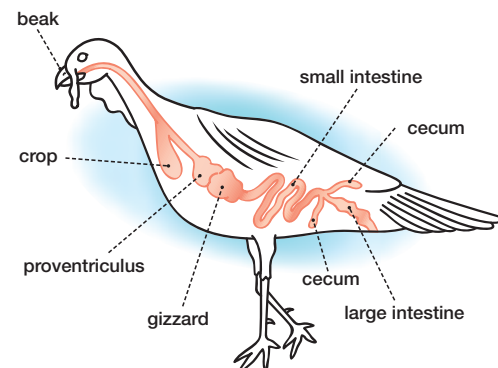
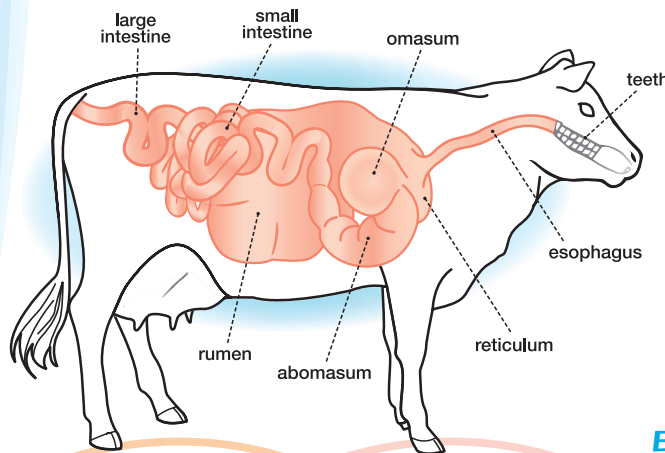
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## Activity

Compare the digestive systems of a cow and a turkey using the Venn diagram. A cow is an herbivore, meaning they are plant eaters. Turkeys and chickens are omnivores, which means that they eat both plants and animals.



Explain why you think these two animals have different digestive systems?

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# Solar Powered Fruit

## History

People have used the sun to dry and preserve food for centuries. Raisins were enjoyed by ancient Egyptians and were important for journeys where food had to be stored for long periods without spoiling. Raisins were among the food brought on famous expeditions to discover the new world, the North Pole and outer space.

Today, approximately 95 percent of the raisins in California are made from Thompson seedless grapes. Thompson grapes are grown for both raisins and as table grapes that you have probably seen in the grocery store. Thompson grapes make excellent raisins due to their thin skin, lack of seeds, and sweet flavor.

## Nutrition

**California raisins have one ingredient, dried California seedless grapes.**

California raisins are all natural and are dried by the sun with no added sugar.

$\frac{1}{4}$  cup of raisins = one serving of fresh fruit.

Raisins are:

- Fat and cholesterol free
- Low in sodium
- High in antioxidants
- A source of dietary fiber and potassium
- A good source of all-natural energy

## Raisin Research

California raisins contain naturally occurring sugars that are easily absorbed by the body and converted to energy. A pre-exercise snack of raisins and nuts provides a sustained source of energy.

(Spiller, Sphera Foundation & Health Research & Studies Center)

## Raisin Drying Methods

**There are two main ways that raisins are dried.**

**1. Paper Trays.** Grape clusters are cut from the vine and laid on paper trays in rows between grape vines. Many workers are needed to pick the grapes and place them on the drying trays. The grapes dry in the sun for 3–4 weeks. After drying, the paper trays are rolled up and the raisins are put into bins that are shipped to the processing plant.

### Paper Trays



### Dried on the Vine

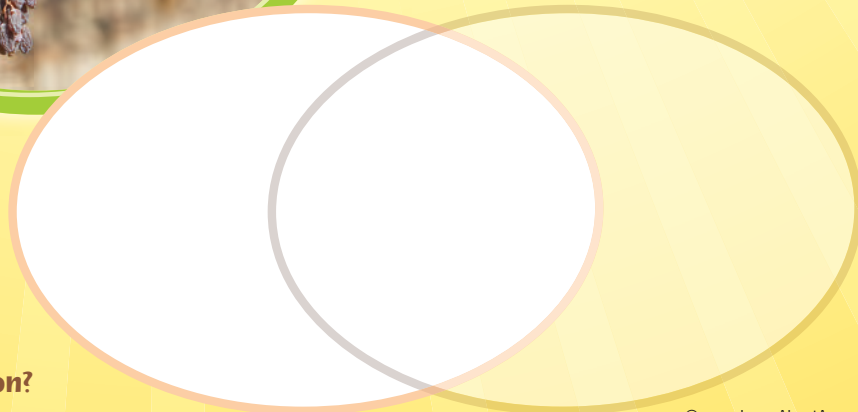


**2. Dried on the Vine.** This method allows grapes to remain on the vine while they dry in the sun. Machines then harvest the dried grapes, cutting down on the amount of hand labor needed for harvest. These grapes must be grown on an overhead trellis in order to make room for the harvesting machine to get underneath the raisins. Drying on the vine takes longer than using paper trays, therefore, some farmers are growing different varieties of grapes that dry faster than Thompson seedless.

## Activity

**Compare and contrast these two different drying methods in the Venn diagram.**

**What do both methods have in common?**





# Sun Facts

California raisins are dried using solar energy

## Activity Do-It-Yourself Raisins

You will need:

- Sunshine and warm weather
- Seedless grapes
- Baking tray

### Directions:

Pick at least 20 grapes off the stem, then wash and dry them. Evenly spread grapes on baking tray and place outside in full sun. Observe grapes each day until they are ready to eat. This will take a week or so depending upon the weather.

What do you predict will happen to your grapes in the sun?

Taste one of the grapes each day and describe how the taste changed as the grape transformed into a raisin.

What do you think made the taste change during the drying process?

## Activity

You need to follow a recipe to make a sweet spread for your breakfast toast. The recipe is in grams, but you only have a measuring device for ounces. Convert the recipe for ounces.

$$1 \text{ Gram} = 0.035 \text{ Ounces}$$



Ingredient	Grams	Ounces
Raisin juice concentrate	5000	
Cinnamon	15	
Raisin paste	1200	
Cream cheese	400	
Vanilla extract	70	

## Activity Raisin Bread Science?

Science helps us learn how food works. Let's use raisin bread as an example. Here are the common ingredients found in homemade raisin bread. Fill in the rest of the chart.

Ingredient	What is it?	What does it do?
Active Dry Yeast	Single-celled fungi	
Warm Water	H <sub>2</sub> O	Activates the yeast
Flour		
Sugar		Provides food for the yeast
Salt		
Vegetable Oil		Makes the bread soft
Raisins	Fruit	

## Did You Know?

During WWII the demand for high energy foods and sugar substitutes resulted in the War Production Board ordering that California's entire winegrape crop be made into raisins.

## Activity From Shriveled Up to Plumped Up!

The process of osmosis happens when water molecules move across a semipermeable membrane from an area where water molecules are highly concentrated to an area where water molecules are less concentrated. This movement of water molecules continues until the concentration of water molecules on both sides of the membrane is equal.

What do you predict will happen if you place several raisins in a glass of water and let it stand overnight?

Carry out the experiment and write down your observations.

What is the semipermeable membrane in this experiment?

What happened to the raisins after soaking overnight in water?

Explain why this happened.

## Activity

It takes 4.5 pounds of fresh grapes to make 1 pound of raisins. How many pounds of grapes would you need to make 50 pounds of raisins? Write your equation below.



# Movin' in the Garden

Mix that compost, Rake those leaves... Movin' in the garden ...Burns calories!

Do these physical activities in an outside space using a little imagination.



Begin by touching your toma - toes!



Move to the carrot patch and hop in place on one foot, alternating feet.

Now it's time to work your core. Reach out to hoe those weeds from the lettuce patch.



Skip on down to the pepper plant and extend those arms. Do bicep curls as you pick big peppers.



Do lunges down to the cucumber vines. Use proper form and don't let your knees pass your toes. Squat down to pick cucumbers then stand up to put them in your basket.



Walk to the watering hose and do jumping twists from side to side as you water all of your garden plants.



## Math Activity

Imagine that you wake up in the morning and your car is covered with a foot and a half of snow! You have to get to school and your mom has to get to work so you start shoveling. You finish after  $\frac{1}{2}$  hour of hard work. At school, your teacher starts the day with P.E. and you play basketball for an hour. Whew, that was a great workout! How many calories did you burn doing these activities? Show your work on a separate piece of paper.

Physical Activities	Approximate Calories Burned Per Hour
Running	600
Shoveling snow	500
Raking leaves	400
Pulling weeds	300
Mowing the lawn	300
Walking	300
Basketball	400

Calories burned per hour varies depending upon intensity of activity, age, and body weight.

## Sun Facts

Vitamin D is needed for strong bones. The body makes vitamin D when skin is exposed to sunlight. Just remember to wear sunscreen.

The number of calories you need each day is based on your age, gender, and how much you exercise.

- *Very Active* means you play sports or do an aerobic activity like running for more than 40 minutes a day.
- *Somewhat Active* means you do a little bit of physical activity like fast walking for 30-40 minutes a day.
- *Not Active* means you do very little physical activity and spend most of your time sitting or standing in place.

## Activity

Find the number of daily calories you need each day in the chart below.

Age	Not Active		Somewhat Active		Very Active	
	Girls	Boys	Girls	Boys	Girls	Boys
4-8	1,200 – 1,400	1,200 – 1,400	1,400 – 1,600	1,400 – 1,600	1,400 – 1,800	1,600 – 2,000
9-13	1,400 – 1,600	1,600 – 2,000	1,600 – 2,000	1,800 – 2,200	1,800 – 2,200	2,000 – 2,600
14-18	1,800	2,000 – 2,400	2,000	2,400 – 2,800	2,400	2,800 – 3,200

Source HHS/USDA Dietary Guidelines for Americans, 2010

I should eat about \_\_\_\_\_ calories per day.

Exercising for 60 minutes per day is part of a healthy lifestyle. In a complete sentence, describe one thing you can do every day to get enough exercise.



# Delicious Dairy Delights

## What is a Dairy Product?

**D**airy products are foods or beverages produced from the milk of a mammal. A female must give birth in order to produce milk. Examples of dairy products include milk, cheese, yogurt, ice cream, cottage cheese, butter, sour cream, and whipping cream.

California is the *top* producing dairy state in the nation and dairy is California's #1 agricultural product.



## What Animals Produce Dairy?

Cow's milk is the most common milk used for dairy product production. However, goats and sheep also produce milk for dairy products.

After giving birth to a calf, a dairy cow will give milk for approximately 10 months. This is called the lactation period.

## Did You Know?

*The average dairy cow produces 10 gallons of milk per day, which is about 90 glasses. Dairy cows need to be milked 2-3 times per day.*



**The top five milk producing states are:**

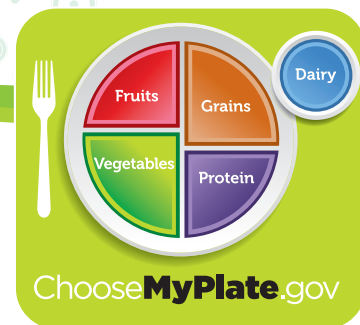
1. California
2. Wisconsin
3. New York
4. Idaho
5. Pennsylvania

## Activity

**On the map of the U.S. Color the top five producing milk states blue and indicate their ranking.**

## Nutrition

Dairy is one of the five food groups. MyPlate recommends that girls and boys ages 9-18 eat 3 servings of dairy per day.



## What is one serving of dairy =

- 1 cup of low fat or fat-free milk
- 1 cup of low fat or fat-free yogurt
- 1 1/2 oz of hard cheese or 1 string cheese
- 1 cup of pudding made with milk

## Nutritional Benefits of Dairy

Milk provides nine essential nutrients: calcium, potassium, protein, vitamin D, vitamin A, phosphorus, riboflavin, vitamin B12, and niacin. These nutrients are important for strong bones and teeth, building muscle, and healthy skin.

## Activity

Breakfast is an important meal that provides the energy and nutrients we need to start the day.

Build a healthy breakfast that includes at least three of the five food groups, including dairy.

## My Breakfast

Food Item	Amount	Food Group

Explain the health benefits of dairy to your family. Write them down.

## Food Safety

Pasteurization is the process of heating milk to a specified temperature for a set amount of time before cooling it back down, packaging, and selling it to consumers. What role do you think this heating process plays in food safety?

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# The Invaders!

## Here's the dirt...

Invasive species are insects, plants, animals, and diseases that are moved by nature or people into an ecosystem where they have not been previously found. They often have no natural predators to control their numbers and as a result, they outcompete or kill native plants and animals.

## Why do we care?

Invasive species can destroy agriculture crops, eliminate jobs, threaten food supplies, and damage our backyard gardens and wilderness areas. On average, a new pest is introduced into California every 60 days. Invasive species cost California's agriculture industry about \$3 billion per year in control methods and crop losses.

## Activity

Farmer Fiona and her family grow oranges on their 100 acre farm. For this example, we will say the annual cost to grow oranges is \$6,000 per acre. This includes watering, pruning, weed, pest, and nutrient management, along with equipment maintenance, and hired farm workers.



Each year, Fiona's farm usually produces 550 cartons of oranges per acre that may sell for around \$15 per carton. However, an insect called the Asian citrus psyllid invaded the orchard and infected 50% of the trees with the huanglongbing disease. In order to prevent the spread of the disease, the infected trees must be removed. On a separate piece of paper, explain the economic impact of this invasive species on Fiona's farm. Do the math to find out how much the farm would have made selling oranges if the orchard had not been infested by the Asian citrus psyllid.

## WHO ARE THEY?

### Asian Citrus Psyllid



Spreads huanglongbing disease that causes bitter fruit and kills citrus trees.

Photo credit: David Hall, USDA Agricultural Research Service, Bugwood.org

### Japanese Beetle



Feeds on leaves, fruit, and roots, damaging plants and destroying lawns.

Photo credit: Alex Wild  
www.alexanderwild.com

### Red Imported Fire Ant



Painful stings threaten people, livestock, pets, and wildlife.

Photo credit: Alex Wild  
www.alexanderwild.com

### Asian Longhorned Beetle



Tunnels through hardwood trees killing timber, nursery stock, and shade trees.

Photo credit: Karen Snover-Clift, Cornell University, Bugwood.org

### Mediterranean Fruit Fly



Maggots feed inside fruit and cause it to rot.

Photo credit: Scott Bauer, USDA Agricultural Research Service, Bugwood.org

### Yellow Starthistle



Invasive plant that crowds out native grasses and reduces forage for livestock and wildlife.

Photo credit: www.nrcs.usda.gov

### Quagga and Zebra Mussels



Clogs water systems and crowds out native species. One female can release up to 1 million eggs.

Photo: slocounty.ca.gov

### European Grape Vine Moth



Caterpillars feed on grapes and grape flowers, destroying the harvest.

Photo credit: Todd Gilligan, CSU, Bugwood.org

## How Can You Help?

- If you travel out of the area, don't bring home food, plants, animals, firewood, or other material that might carry an invasive species.
- Do not release pets such as hamsters, gold fish, and reptiles into the wild.
- Plant only native plants in your yard.

## Detective Dogs!

Photo: Josh Norem www.thefurrtographer.com



Dogs, trained to detect agricultural products in shipments play an important role in preventing the spread of invasive species. These dogs work with their handlers in airports, shipping centers, ports, and state and country borders. When the dogs smell an agriculture product like fruit, vegetables, plants, soil,

wood, or certain insects, they scratch at the container. The container is then opened and inspected by a biologist to check for invasive species. If any are found they are properly disposed of or shipped back to the person who sent the package. After the dogs work for a few hours, they have mandatory play or nap time!

Meet the detective dogs working in California by visiting [www.cdffa.ca.gov/plant/dogteams](http://www.cdffa.ca.gov/plant/dogteams)

## Activity

Research one of the invasive species above and find its country of origin. Write a creative story that tells how the invasive species made its way to California and what agricultural or environmental damage it created once it got here. Include information on methods used to prevent the spread of the invasive species.



# Where Would We Be Without Honey Bees?

**H**oney bees are very important to people. They pollinate many of the food crops we eat. About  $\frac{1}{3}$  of our crops require pollination to produce fruits and seeds. Honey bees also make delicious honey.

In California, honey bees live in colonies of around 50,000 bees. There are three types of bees in a colony:

**Drones** – males who mate with a young queen in flight.

**Workers** – females who gather nectar to make honey, guard the hive, build honeycomb, and care for eggs and larvae. Most bees in the colony are workers.

**Queen** – lays eggs which hatch into larva then pupate into adult bees. There's only one queen in a colony.



## Technology

Did you know that honey bees have to visit two million flowers to make one pound of honey? Help them out by planting “bee friendly” flowering plants in your yard.

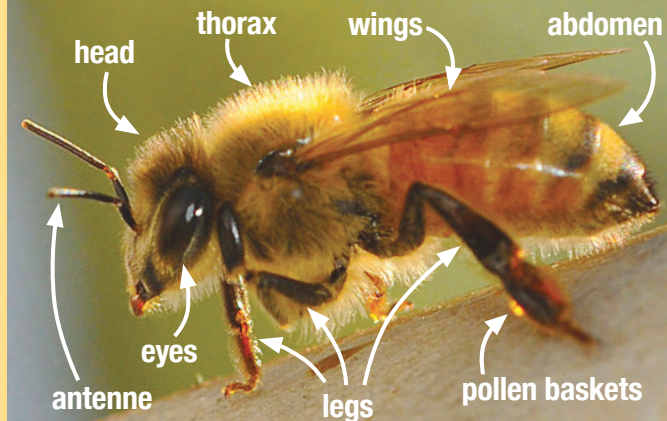
Download the BeeSmart Pollinator Gardener app for your smart phone to help you choose plants that will attract pollinators.

BeeSmart™  
Pollinator Gardener



## Activity

Build a honey bee model using materials such as empty toilet paper rolls, glue, yellow paint, electrical tape, pipe cleaners, construction paper, and other creative materials. Use the photo to identify and label the parts on your model. You may also add a stinger and a proboscis to your model. Only female worker bees have stingers. The proboscis is a long, straw-like tongue that the bee uses to collect nectar from flowers. Take your model home and explain what you have learned about honey bees to your family or friends.



## Activity

On a separate piece of paper, draw the following steps to show how honey bees help pollinate a cherry tree.

1. Honey bee lands on cherry blossom to gather nectar.
2. Pollen from the blossom's anthers rubs off and sticks to the honey bee's fuzzy body.
3. Honey bee flies to another cherry blossom to collect more nectar.
4. As honey bee is gathering nectar, it accidentally brushes against the sticky stamen from a different variety of cherry blossom and leaves some pollen behind. This is called cross pollination.
5. The pollinated blossom develops into a cherry.

## Activity

Each person in the U.S. consumes an average of 1.1 pounds of honey each year. In order to produce one pound of honey, honey bees have to fly approximately 55,000 miles to gather nectar from flowers. How many miles do honey bees fly in order to make enough honey for all the people who live in your house?

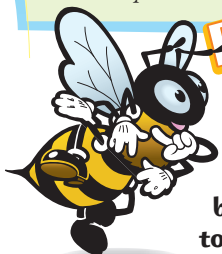


Beekeepers raise bees to produce honey, beeswax, pollen, royal jelly, and to provide pollination services for farmers. Some beekeepers also raise queen and bulk bees to refill empty hives.

In California 1.6 million colonies of honey bees are needed each spring to pollinate just one crop – California almonds. This takes nearly 67% of the honey bee colonies in the United States! Colonies of honey bees are trucked thousands of miles to pollinate crops so we can enjoy many foods including cherries, almonds, berries, melons, apricots, kiwifruit, pears, sunflowers, and cucumbers. Beekeepers use wooden rectangular boxes for hives, each containing around 15,000 to 20,000 bees.

## Did You Know?

When worker bees find nectar, they fly back to the hive and do a type of bee dance to let the other bees know which direction to fly to find food.



## Activity

On a separate piece of paper, write a paragraph that explains how honey bees are involved in making a delicious treat of strawberry ice cream.



Photos courtesy of Kathy Keatley Garvey, UC Davis Dept. of Entomology and Nematology

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# The Vegetable With a Heart

## All Choked Up

In 2013, Lt. Governor Gavin Newsom declared the artichoke as California's official state vegetable. Artichokes are a member of the thistle family. The artichoke is actually a flower bud and the fleshy bottom portion of petals are edible. Inside the artichoke is a fuzzy center or "choke" that can be scraped away to find the "heart" of the artichoke which is considered to be a tasty treat by many artichoke lovers.

California farmers produce nearly 100% of the nation's supply of artichokes. 75% of California's artichoke crop is grown in Monterey County's mild, coastal climate.



**Label the Parts of the artichoke using the word bank.**

- Flower bud
- Bud leaf petals
- Stem
- Plant leaves
- Roots
- Choke
- Heart

## Is an artichoke heart really a heart?

Discuss the function of the labeled artichoke parts with a partner. See the glossary for help.

How tall in inches is the artichoke in the picture? \_\_\_\_\_ inches tall.

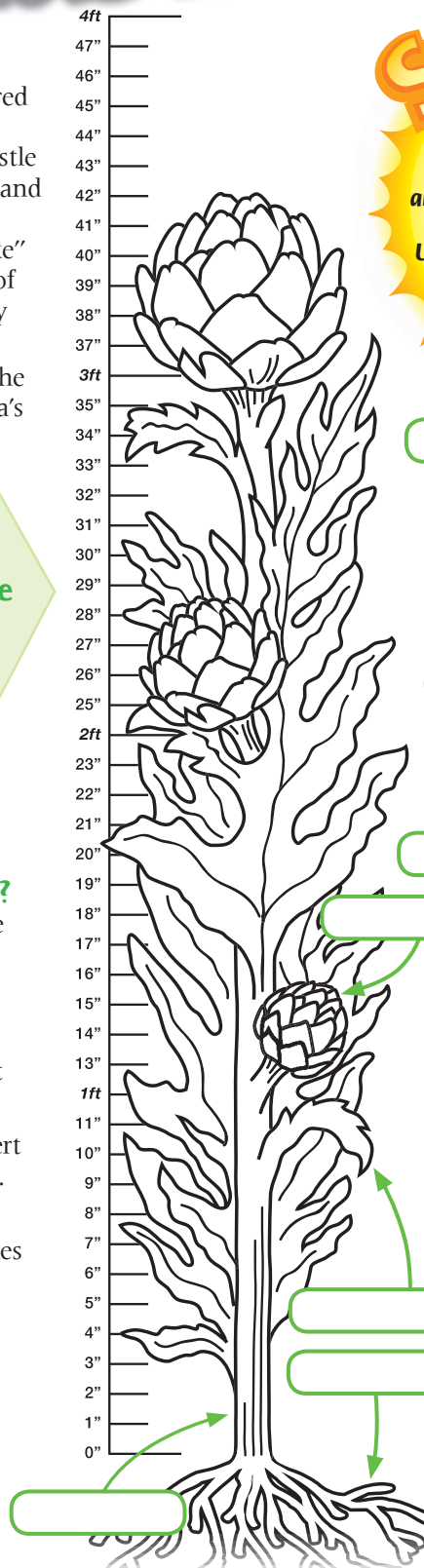
How tall is the artichoke in feet? \_\_\_\_\_ feet tall.

One inch is equal to 2.54 centimeters. Convert the artichoke's height in inches to centimeters. The artichoke is \_\_\_\_\_ centimeters tall.

How tall are you in inches? \_\_\_\_\_ inches tall.

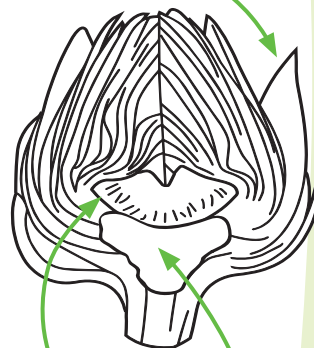
**Compare your height to the artichoke's height and write as a fraction in the space below.**

Express the fraction as a percent.



## Sun Facts

Artichokes grow well in Mediterranean coastal climates, found between 30 and 45 degrees latitude on the Western side of continents. Use a map to find the degrees latitude of Monterey County, CA. What do you notice?



How many petals are on an artichoke? Ask your teacher to bring an artichoke to class for everyone to inspect. After carefully observing the artichoke, you and your classmates can each write down your guess of how many petals it has. Your teacher can then pull the petals off an artichoke while the class counts.  
My guess = \_\_\_\_\_  
Actual number of petals = \_\_\_\_\_  
What was the difference between your guess and the actual number of petals on the artichoke? \_\_\_\_\_  
Try the activity at home to find out if another artichoke has the same number of petals.



## Farmer Highlight

### Dale Huss

Vice President of Artichoke Production, Ocean Mist Farms

**What growing conditions do artichokes require?** Artichokes don't like weather that is too hot or too cold, which is why they grow so well along the central coast of California.

**What is the hardest thing about growing artichokes?** Since artichokes are healthy for you, they are also healthy for other creatures like insects, voles, slugs, and snails. Protecting our crop from these artichoke pests is one of the hardest challenges we face.

**Where are your harvested artichokes sold?** All over the United States and Canada. However, our best markets are in California and on the West Coast.



## Artichoke Stamp Art

Cut raw artichokes into vertical and horizontal halves and quarters.

Paint cut sides of artichokes and stamp them onto paper to use as note cards.

Label the artichoke parts that are stamped on the paper.



# Growing Strong Glossary

**Agriculture:** The science, art, and business of growing crops and raising livestock.

**Antioxidant:** Vitamins and other nutrients that help protect cells in the body.

**Bee hive box:** used for housing a colony of bees.

**By-product:** Something that is produced as a result of the production of something else.

**Calorie:** Term used to describe the energy content of food.

**Climate:** The usual weather conditions in a region.

**Colonist:** Person who lived in the colonies that later became the first states in the U.S.

**Commodity:** Raw agricultural product that can be bought and sold.

**Crop:** Plant that is grown and harvested by farmers.

**Drone:** Male honeybee. They do not gather food, protect the hive, or sting.

**Embryo:** Early stage in development of plant or animal life.

**Endosperm:** Tissue found inside a seed that provides food for the embryo.

**Eye of the potato:** Bud on a potato that can grow into a new potato plant.

**Flower:** Reproductive structure of a plant.

**Geographical:** Natural features such as mountains and valleys in a particular region.

**Honey:** Sweet material produced by honey bees from the nectar of flowers.

**Germination:** Process when seeds begin to grow or sprout.

**Idiom:** Expression of speech that is not meant to be taken literally. For example, "sick as a dog" means a person is very ill.

**Lactation:** Secretion of milk from a female mammal to feed her young.

**Lameness:** Disabled, in that walking or running is difficult.

**Leaf:** Part of the plant that gathers sunlight and performs photosynthesis.

**Litter:** Offspring of animals that have multiple young at one birth. Examples: litter of puppies, piglets, or kittens.

**Nutrition:** Food necessary for health and well being.

**Osmosis:** Movement of water molecules across a membrane until the concentration of water molecules on both sides of the membrane is equal.

**Pasteurization:** Process of destroying most of the bacteria in a liquid substance by applying heat.

**Pest:** Organism that causes damage to people and/or the environment.

**Pollen:** Dust-like male reproductive

cells of flowers. Also an important protein source for bees.

**Pollinate:** To deposit pollen on the female part of a flower to allow fertilization.

**Proboscis:** Mouthpart of a bee used to collect nectar from flowers.

**Roots:** Plant part that absorbs water and nutrients from the soil and anchors the plant in the soil.

**Seed coat:** Protective covering of a seed.

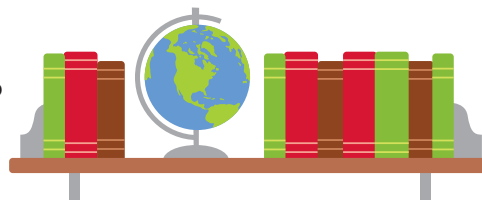
**Semipermeable membrane:** Membrane that allows some types of molecules to pass through but not others.

**Stem:** Main trunk of a plant that develops shoots, branches, and leaves.

**Queen bee:** Fully developed female responsible for laying eggs. There is only one queen per honeybee colony.

**Udder:** Mammary gland of female cattle, sheep, goats, and horses.

**Worker bee:** Female bee other than the queen that gathers nectar, pollen, and water to take care of other bees in the colony. Worker bees have a stinger to protect their colony.



## Resources:

California Artichoke  
Advisory Board  
[Artichokes.org](http://Artichokes.org)

California Department of  
Food and Agriculture  
[www.cdffa.ca.gov](http://www.cdffa.ca.gov)

California Milk  
Advisory Board  
[www.realcaliforniamilk.com](http://www.realcaliforniamilk.com)

California Raisin  
Marketing Board  
[calraisins.org](http://calraisins.org)

Harry H. Laidlaw Jr. Honey  
Bee Research Facility  
[beebiology.ucdavis.edu](http://beebiology.ucdavis.edu)

Hungry Pests  
[hungrypests.com](http://hungrypests.com)

National Pork Board  
[www.pork.org](http://www.pork.org)

UC Davis Veterinary Medicine  
[www.vetmed.ucdavis.edu](http://www.vetmed.ucdavis.edu)

United States Potato Board  
[www.potatogoodness.com](http://www.potatogoodness.com)

USDA MyPlate  
[www.choosemyplate.gov](http://www.choosemyplate.gov)

To request a free copy of  
Extra! Extra! lesson extensions  
or for an answer key, visit  
[www.LearnAboutAg.org/wgo](http://www.LearnAboutAg.org/wgo)  
or call (800) 700-AITC (2482).

## Activity

Choose two glossary  
words and use both in  
a complete sentence in  
the space provided.

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# Imagine This...

## Story Writing Contest

Attention third through eighth grade students:

**You could be a published author!**

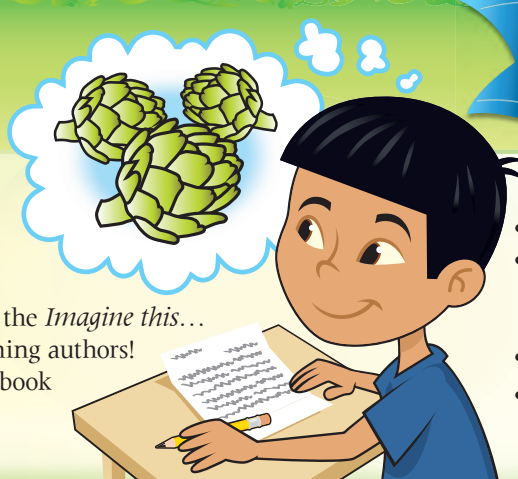
Write a creative story about your favorite agriculture topic and submit it to the *Imagine this...*

Story Writing Contest for the chance to be selected as one of six state-winning authors!

Stories will be illustrated by high school art students and published into a book

that is used throughout the state to teach students about agriculture.

Visit [www.LearnAboutAg.org/imaginethis](http://www.LearnAboutAg.org/imaginethis) for more information.



**2014 Agriculture in the Classroom Conference:**  
**October 16-18, Santa Cruz**  
[www.LearnAboutAg.org/conference](http://www.LearnAboutAg.org/conference)

### Prizes include:

- E-reader
- Expense paid trip to Sacramento for you, your parents, and your teacher to attend awards ceremony

- Engraved plaque

- Agriculture-related book

### Contest Deadline:

**November 1, annually**

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