Egg Reader

Ag in the Classroom—Helping Students Understand Their Connection to Agriculture

the INCREDIBLE EGG
AMERICAN EGG BOARD
Grades 3–5

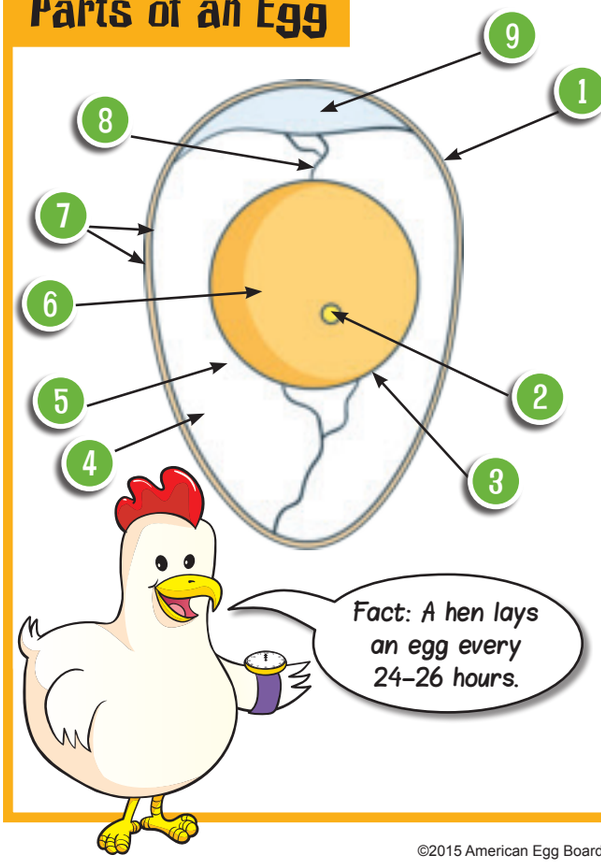
The Hen: "Eggspert" Producer

Most of the eggs we eat come from chickens. Female chickens are *hens*. They are the ones who lay eggs. It's an all-day event for a hen to make an egg and lay it.

1. The hen is born with many tiny yolks in her body. One at a time, these grow to full size.
2. When full size, the yolk is released into a long tube, called an *oviduct*. This release takes about 14 minutes.
3. As the yolk moves, a thick white layer of *albumen*—also known as the egg white—develops around it. This takes about three hours.
4. Water goes into the albumen to form a thin layer of white. This takes about an hour and 15 minutes.
5. The formation of the *eggshell* is the last and longest step. This step can take as long as 20 hours. The shell gets its pigment at the very end of this step, making the eggshell white, cream, or brown, depending on the breed of the hen.
6. The hen lays the egg, and the process starts again.

White hens lay white eggs. Brown hens lay brown eggs.

Parts of an Egg



1. **shell**—the outer covering of an egg, which is composed mainly of calcium carbonate and is the part that takes the longest to form in the egg-laying process
2. **germinal disc**—a slight depression on the yolk surface where an embryo can begin to develop if the egg has been fertilized and kept warm
3. **vitelline membrane**—the membrane that surrounds the yolk
4. **thin albumen**—the egg white nearest the shell
5. **thick albumen**—the egg white nearest the yolk and contains most of the egg's riboflavin and protein
6. **yolk**—the yellow portion of an egg and the major source of an egg's vitamins, minerals, and fat and about half of the protein
7. **shell membrane**—one of two membranes surrounding the albumen inside the shell, which is a barrier against bacteria
8. **chalazae**—twisted, cordlike strands of egg white that anchor the yolk in the center of an egg
9. **air cell**—a pocket of air formed at the large end of the egg between the two membranes

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What Do You Know?

Write the name of the egg part on the line next to the description.

Hint: Look back at page 1 if you need help.

_____ This is the outer covering of the egg. It is made up mainly of calcium carbonate and may be white, cream, or brown, depending on the breed of the hen. The color does not affect an egg's quality, flavor, nutritional value, shell thickness, or how it cooks.

_____ This is the yellow part of the egg. The color varies with the feed eaten by the hen but doesn't affect nutritional content. This egg part is a major source of the egg's vitamins, minerals, and fat and about half the protein.

_____ These are twisted, cordlike strands of egg white that hold the yolk in the center of the egg. Their presence indicates that the egg is fresh.

_____ The membrane that surrounds the yolk.

_____ This pocket of air forms at the large end of the egg because of the contraction of the egg's contents as they cool after laying. It increases in size as the egg ages. (It forms at the large end because this end is more porous.)

_____ This is the white part of the egg nearest the shell.

_____ This white part nearest the yolk is the major source of an egg's riboflavin and protein.

_____ Two of these, an inner and an outer one, surround the albumen. They provide a protective barrier against bacterial entry; the air cell forms between them.

Farmers Care About Their Hens

Hens are raised and lay their eggs in different housing systems subject to consumer demand. No matter the system used, America's egg farmers are committed to the health and well-being of their hens and dedicated to providing their customers a fresh, nutritious egg.

Most of America's egg farmers follow guidelines to ensure the hens are provided with adequate space, nutritious feed, clean water, light, and fresh air. Proper light, housing, and diet are critical to the production process to ensure high-quality eggs.

Types of Eggs

Cage-Free Eggs

- Laid by hens that live indoors; sometimes called free-roaming.
- The hens often live in a barn or poultry house.
- Systems vary and include barn-raised and free-range hens.
- The hens are provided with floor space, nest space, and perches.
- May have an automated egg collection system.

Free-Range Eggs

- Produced by hens raised outdoors or that have access to the outdoors; sometimes called pasture-fed hens.
- The hens may forage for wild plants and insects.
- These hens are provided with floor space, nest space, and perches.

Cage-Laid Eggs

- Produced by hens living in communal cage systems.
- Systems vary, depending on the size of the bird and the farm.
- Collected with an automatic collection system.

* Hens who lay all three types of eggs have access to fresh food and water. Shelters protect the hens from predators. The farmers who care for these hens participate in common handling and care practices.

Explanatory writing (W.3.2; W.4.2; W.5.2)

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"Eggsploring" Food Safety

How do you stay safe while working with eggs? Cleanliness is the key!

- Wash your hands in hot, soapy water before handling food. Wash countertops, utensils, and equipment that have been in contact with raw food before using them again.
- Use separate cutting boards and knives for raw and cooked foods. Wash them thoroughly with hot, soapy water after each use.
- Throw away eggs that are dirty, cracked, broken, or leaking. Eggs should not be washed at home; they are washed and sanitized before they are packed.
- Don't use an egg's shell to separate the contents. Use an egg separator to separate whites and yolks. Use a clean utensil to remove any shell from an egg mixture.

Salmonella is a common microbe found around food. In large amounts, it will make people sick. Salmonella will not grow at temperatures below 40°F. This is why refrigeration of eggs and other foods is a very important part of food safety. The danger zone for food is between 40°F and 140°F. These temperatures are ideal for rapid Salmonella growth. Freezing does not kill Salmonella but does stop growth. On average, only one out of 20,000 commercially produced eggs in the US might contain Salmonella bacteria.

Activity

Write a paragraph that explains two ways to protect yourself from Salmonella.

Specialty Eggs: lots of options

Nutritionally enhanced eggs are created by varying the hen's diets. You can find eggs with reduced saturated fats or added omega-3 fatty acids. Farmers provide these types of eggs based on demand.

Pasteurized eggs are eggs that have been exposed to heat in order to destroy potential bacteria. Due to the heating process, pasteurized eggs may have slightly lower amounts of heat-sensitive vitamins, such as riboflavin, thiamine, and folic acid. Pasteurized eggs are suitable for preparing recipes that aren't fully cooked and when serving the very young, the elderly, pregnant women, or anyone whose immune system might be weakened. They can be used in all recipes, just like unpasteurized eggs.

Organic eggs must be produced according to the national USDA organic standards. The hens' feed was grown without most conventional pesticides, fungicides, herbicides, or commercial fertilizers. Due to higher production costs and lower volume per farm, organic eggs are more expensive than eggs from hens fed conventional feed. The nutrient content of eggs is not affected by whether or not the feed is organic; it depends on the nutrients in the feed.

Vegetarian eggs are produced by hens who are fed rations containing only vegetables.

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A Good-for-You Food

Eggs are among the most nutritious foods. An egg contains vitamins and minerals. An egg yolk is one of the few foods that contains vitamin D, the sunshine vitamin. There are 70 calories in a large egg, and eggs are a good source of protein. In fact, egg protein is of such high quality that it is often used as the standard by which other protein is measured. Egg protein contains all the essential amino acids the body needs. This means eggs contain the amino acids our bodies don't produce. This is why eggs are classified with meat in the food groups and why egg protein is called complete protein.

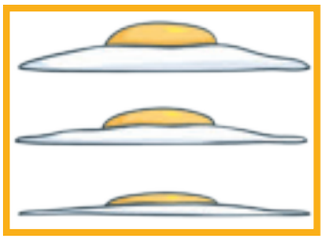
It's in the Yolk

- The *yolk* is the yellow part of the egg and the major source of vitamins, minerals, and fat from the egg. It also contains about half the protein.
- Some egg yolks are more yellow than others because of differences in hens' feed. Hens that eat feed containing yellow corn and alfalfa meal lay eggs with medium-yellow yolks, while those hens eating wheat or barley lay eggs with lighter-colored yolks.
- A diet made up of colorless foods, like white cornmeal, produces almost colorless yolks.

Eggs in the News

Cholesterol is a fatty, waxlike substance produced by all animals naturally. Our food can also contain cholesterol. Recent studies have shown that dietary cholesterol (cholesterol in food) does not have much effect on blood cholesterol, making eggs okay to eat.

Eggs Are Graded Too!



Grade AA: The egg stands up tall, the yolk is firm, and the area covered by the white is small. There is a large proportion of thick white to thin white.

Grade A: The egg covers a relatively small area, and the yolk is round and upstanding. The thick white is large in proportion to the thin white and stands fairly well around the yolk.

Grade B: The egg spreads out more, and the yolk is flattened. There is about as much or more thin white as thick white.

Grade is determined by the inside and outside quality of the egg when the egg is packed. There is no difference in nutrition among the grades. Egg cartons from USDA-graded eggs must display the date the eggs were packed. The cartons may have other markings, including the USDA Grade Shield (signifying that the eggs were graded by the US Department of Agriculture) or a logo identifying that the eggs were produced according to certain animal care guidelines.

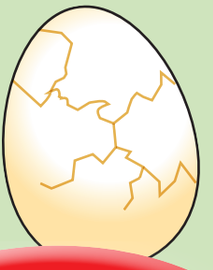
When you eat a large egg, you get...

70 Calories and Vitamins

vitamin A
vitamin D
vitamin E
vitamin B12
biotin
choline
folate
niacin
pantothenic acid (B3)
pyridoxine (B6)
riboflavin (B2)
thiamine (B1)

and Minerals

calcium
copper
iron
magnesium
manganese
phosphorous
potassium
sodium
sulfur
zinc



Ever wonder why some eggs peel easier than others? The fresher the egg, the more difficult it is to remove the shell.

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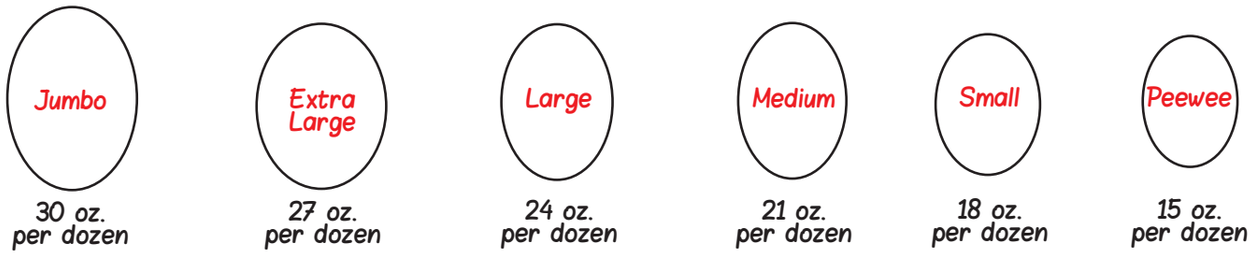
Egg Sizes

These illustrations show the minimum ounces per dozen each egg size must have. (Eggs not to scale.)

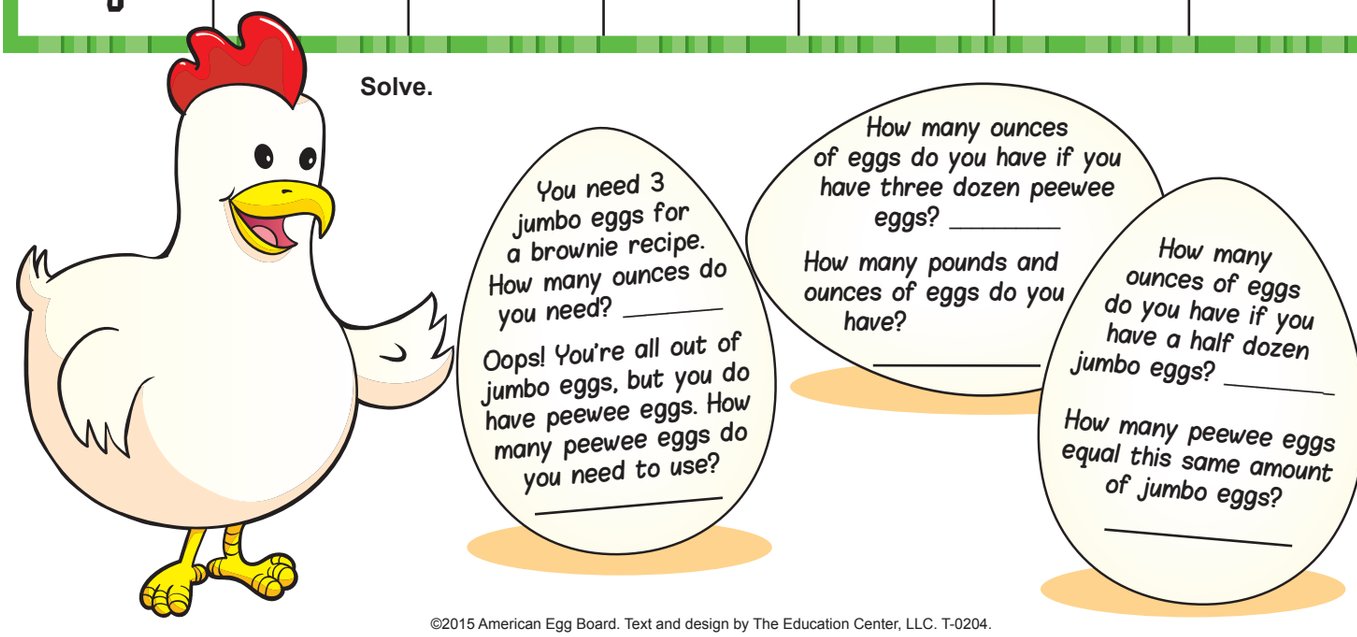


Size is determined by the average weight per dozen. There are 12 eggs in a dozen and 16 ounces in a pound.

Solve for the number of ounces in the following number of eggs. Hint: Dividing by 12 will give you the weight of one egg.

Number of Eggs	Jumbo	Extra Large	Large	Medium	Small	Peewee
1						
2						
3						
4						
5						
6						

Solve.



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Which Came First: the Chicken or the Egg?

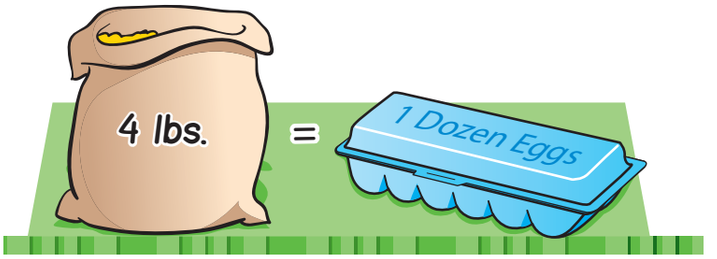
Egg farmers who provide eggs for people in cities and suburbs know that their job is to take good care of their chickens. Their goal is to create a healthy hen and at the same time produce safe and affordable eggs.

During the 1940s, many people kept small flocks of hens in their backyards for eggs and meat. Then hens were exposed to cold and freezing temperatures, diseases spread by contact with other birds, and contamination of their feed. These problems caused as many as 40 out of 100 chickens to die. The strongest hens laid only 112 eggs per year. These eggs were unwashed and kept at warm temperatures. These hens needed eight pounds of feed to produce one dozen eggs.

As more and more people moved to the cities, fewer people raised their own chickens. There were not enough eggs to meet the demand. Egg farmers looked for ways to provide more eggs.

By the early 1960s, improved technology and use of mechanical equipment resulted in a shift from small farm flocks to larger commercial operations. Flocks of 100,000 laying hens are not uncommon, and some flocks number more than one million!

The egg industry and farmers pioneered many improvements for hens. Today, many egg farmers keep their hens in clean, dry laying houses. Temperatures, humidity, and light are controlled, and the air is kept circulating. Birds are either given the run of the floor area or are housed in cages. Automatic feeders move food through troughs for the hens to eat. Along with food, clean water is always available to the hens.



Chickens are fed a balanced diet of corn, wheat, or milo grains and soybean meal. Vitamins and minerals are added to their food. Today's hens eat a better balanced diet than many people eat!

How much a hen eats depends on the hen's size, rate of egg production, temperature, and the energy level of the feed. Today, it takes about four pounds of feed to produce one dozen eggs.

High-quality egg production begins with using the right breed of chickens. Chicken breeds that are well-known and popular for their egg-laying production include *Leghorns* and *Rhode Island Reds*. In fact, when you buy eggs from the grocery store, the odds are good that those eggs came from one of these two breeds.

- A rooster (male chicken) does not need to be present for a hen to produce an egg.
- A pullet is a young hen less than one year old.
- Hormones are never used in U.S. egg production.

Single Comb White Leghorn Chicken

From the Farm to Your Store

From the moment the egg is laid, physical and chemical changes begin. Newly laid eggs must be gathered frequently and refrigerated quickly. Warm temperatures lower the eggs' freshness and quality.

Some eggs are still gathered by hand. Most large laying houses use automated gathering machines to do the job. Eggs that are gathered are moved into refrigerated holding rooms. Humidity is kept high to keep moisture from being lost from the eggs. Eggs are washed, sanitized, graded, and packaged. They are stored in large refrigerated coolers and then transported in refrigerated trucks to stores.

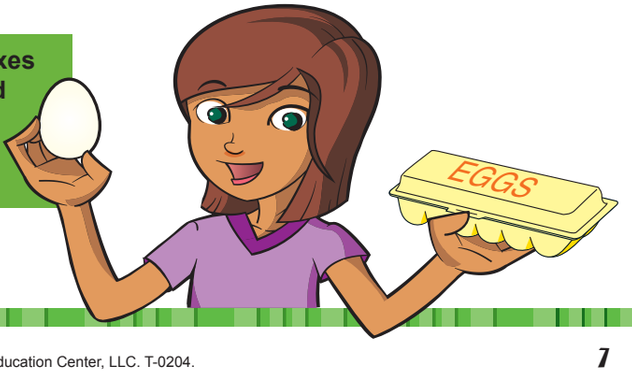
Eggs are brought from the laying houses on conveyor belts for cleaning, grading, and packaging.

Eggs are washed and sanitized. Sometimes a thin coat of mineral oil is applied to help maintain egg quality.

Eggs are inspected for quality control with special lights. This is called candling, where the quality of the inside of the egg and the shell are determined.

The eggs are weighed by electronic scales and packaged by size based on weight.

Packaged eggs are put in boxes and moved into a refrigerated room (cooler) for storage until they are transported by refrigerated trucks to stores.



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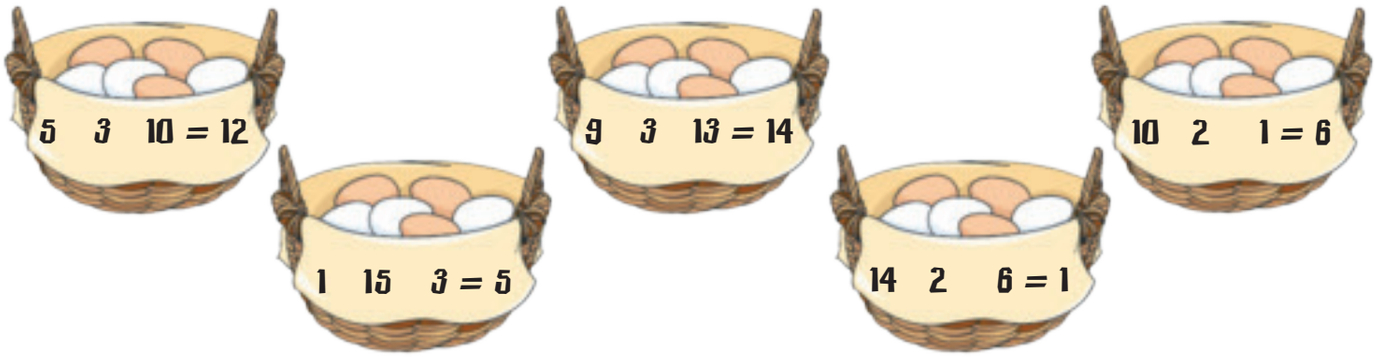
Math, vocabulary (RI.4.4; RI.4.7; RI.5.4; RI.5.7)

"Eggstra" Math and Language Arts Challenges

Look at the numbers on each basket. Use +, –, x, or ÷ between each number to make a correct equation.



Crossword

Use the Egg Reader to complete the puzzle.

Across

1. to change from doing a job by hand to using a machine to do a job (page 7)
4. part of an egg that holds the yolk in place (page 1)
5. microbe that can make you sick (page 3)
10. largest chicken egg sold in stores (page 5)
11. hard outer layer of an egg (page 1)
12. process used to cool foods and keep them out of the danger zone so microbes cannot grow (page 3)

Down

2. type of oil put on eggs (page 7)
3. quality rating of eggs (page 4)
4. fatty, waxlike substance produced by all animals (page 4)
5. to clean thoroughly so that bacteria are destroyed (page 7)
6. where chickens live: _____ houses (page 7)
7. a young hen under 12 months old (page 6)
8. yellow part of the egg (pages 1 and 4)
9. size of the smallest chicken egg sold (page 5)