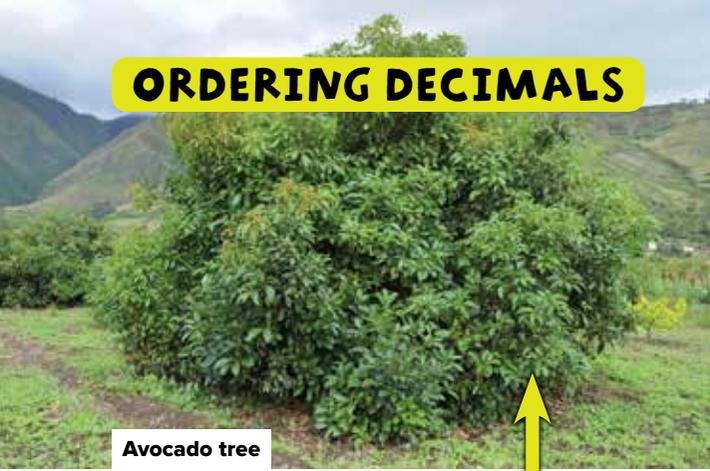
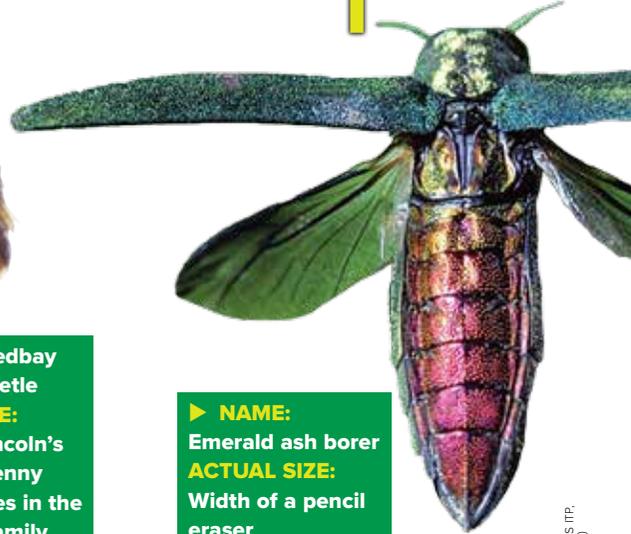


ORDERING DECIMALS



◀ **NAME:** Redbay ambrosia beetle
ACTUAL SIZE: Abraham Lincoln's nose on a penny
VICTIM: Trees in the Lauraceae family, including avocado and sassafras trees



▶ **NAME:** Emerald ash borer
ACTUAL SIZE: Width of a pencil eraser
VICTIM: Ash trees throughout much of the U.S.

Beetle Battle

Meet the people going to war against forest-killing beetles

America's forests are under siege. The culprit? Billions of beetles, many of which are no bigger than a grain of rice. The insects burrow into trees and kill them by cutting off their food and water supply. (But not all beetles do this. For more info, see "All About Beetles" on page 10.)

Some tree-killing beetles are invasive species. This means

they arrived in the United States from somewhere else. With no known predators in their new habitat, they can cause damage.

Other beetles are native to the U.S., but warmer weather patterns in recent years have led to a dangerous growth in their populations.

From developing an insect repellent for trees to importing beetles' natural predators, scientists are

battling tree-killing beetles in creative ways.

Appetite for Avocado Trees

Jason Smith's biggest enemy is very, very tiny. The scientist at the University of Florida studies the redbay ambrosia beetle.

This invasive species has killed more than 500 million trees in the U.S. since 2002. "It's an epidemic," he says.



Jason Smith



Western U.S. pine trees



Southern U.S. pine trees



▶ NAME: Mountain pine beetle
ACTUAL SIZE: Point of a pencil
VICTIM: Pine trees in the western part of North America



▲ NAME: Southern pine beetle
ACTUAL SIZE: Height of 3 stacked credit cards
VICTIM: Pine trees in the southern part of the U.S.

GEORGE WESTERN U.S. PINE TREES; MANANA SKULADZE/REUTERS; IMAGES (SOUTHERN U.S. PINE TREES); STEVEN VALLEY, OREGON DEPARTMENT OF AGRICULTURE; BUSHWOOD, OREGON MOUNTAIN PINE BEETLE; ERIC G. VALLERY, USDA FOREST SERVICE; SRS-4552, BUGWOOD.COM (SOUTHERN PINE BEETLE); COURTESY OF VANESSA LOPEZ; VANESSA LOPEZ

Redbay ambrosia beetles are native to Southeast Asia. There they eat dead trees. But in the U.S., they've been attacking live trees. The beetles reproduce at lightning speed. The offspring from just one beetle can infest and injure a tree in just three weeks.

Recently, redbay ambrosia beetles have begun to attack avocado trees. Smith estimates that the beetles have killed about 30,000 avocado trees in Florida since their arrival in 2002. If the beetle reaches California, the effects could be devastating. California farms produce 90 percent of the

avocados grown in the U.S.

Smith is testing a special bug spray to keep the beetles off healthy trees. Farmers are also training dogs to sniff out infected trees. Then the farmers can dig up and destroy the diseased trees to stop the infection from spreading. So far, success has been limited. "It's a complex problem," Smith says.

Hunting for Predators

Vanessa Lopez loves talking about beetles. "They're my favorite animals!" she says. Lopez is an entomologist, or person who studies

insects. She works for the U.S. Forest Service studying invasive beetle species.

Lopez and other scientists have been studying the emerald ash borer for a number of years. It's been killing ash trees all over the U.S. since it came from Asia in 2002.

Attempts to get rid of the pest have failed so far. So the U.S. government has imported four wasp species from Asia that eat only the emerald ash borer.

Scientists have to be careful when considering whether to introduce a new species.

They must run tests to make *continued on page 10* →



Vanessa Lopez

sure the species won't alter the ecosystem. "Before we can release any natural enemy, we have to make sure it only attacks the insect we're targeting," Lopez says.

Small Successes



Robert Rabaglia

Not all beetle problems are caused by invasive species. Scientist Robert Rabaglia studies native insects with the U.S. Forest Service.

Some, like the mountain pine beetle, have killed more than 20 million acres of trees across the West from 2000 to 2014. "There is only so much you can do when there is an outbreak," he says.

But with dedicated forest management, it's possible to make the outbreaks less severe. That has been the case with the southern pine beetle, which lives in the southeastern United States.

These beetles prey on weak trees. Since 2003, the Forest Service has partnered with landowners to cut down weak trees, so that the remaining trees can grow stronger and healthier. "Keeping trees healthy is the best way to prevent an outbreak," Rabaglia says.

—Alexa Kurzius

MATH TALK:

What are some situations in which insect scientists might work with fractions and decimals?

ALL ABOUT BEETLES

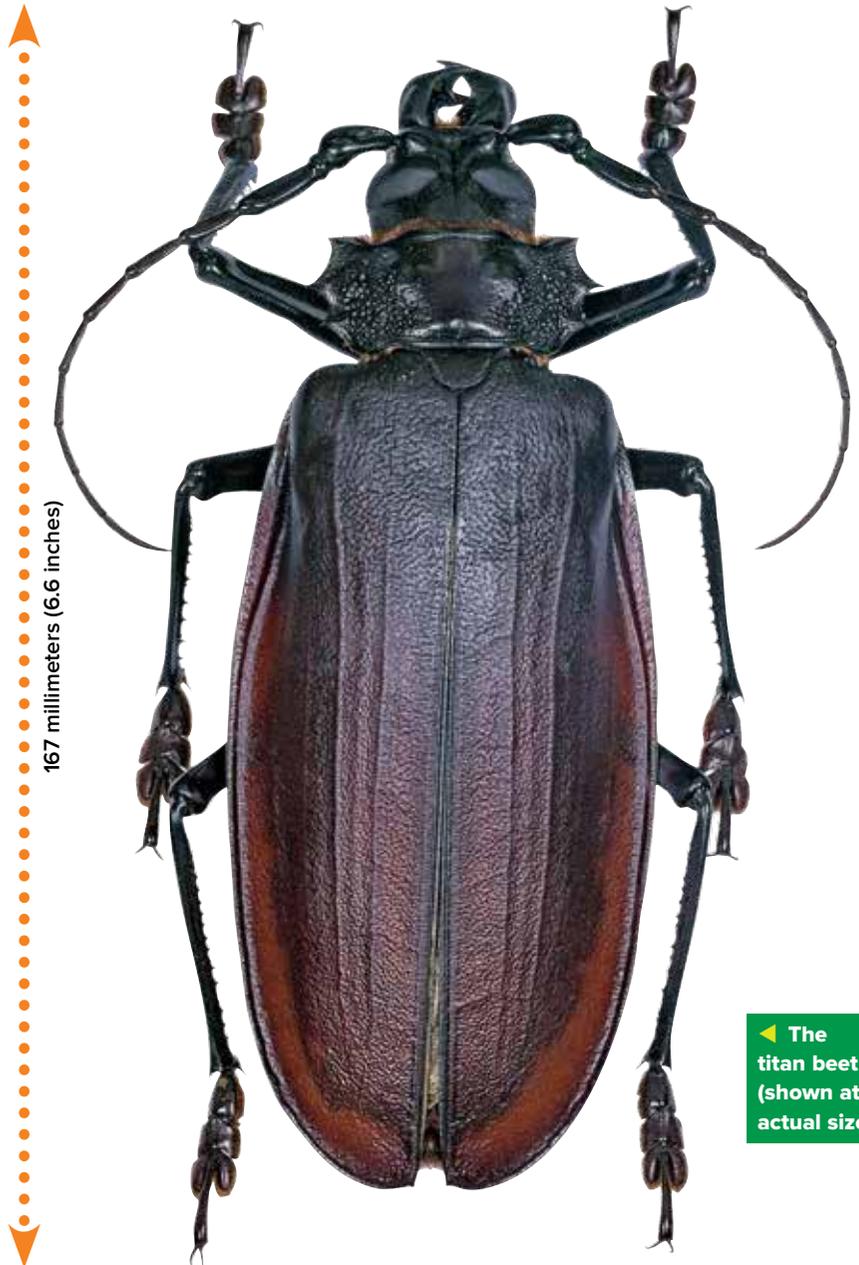
There are more known species of beetles than any other group of organisms on Earth. Scientists estimate that there are more than 1 million beetle species!

Beetles are insects, so each has a head, a thorax, an abdomen, and six legs. Beetles have two set of wings. Their hardened front wings protect their delicate hind wings.

Beetle species can range in size from 0.3 millimeters to 167 millimeters in length, like the titan beetle below.

Beetles play an important role in the ecosystem. Most of them feed on plants and plant waste, including tree wood.

Many beetles eat other insects too. Ladybugs are one example. They eat insects that damage plants.



◀ The titan beetle (shown at actual size)

ORDERING DECIMALS

What to Do

DECIMALS are numbers that include a fraction of a number.

EXAMPLE:

Which number has the lowest value: **3.211**, **3.2**, or **3.21**?

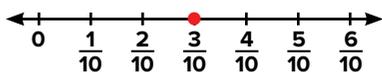
You can use a **place value chart** to compare decimal numbers. Make sure to add zeros so the numbers are all the same length.

| ONES | . | TENTHS | HUNDREDTHS | THOUSANDTHS |
|------|---|--------|------------|-------------|
| 3 | . | 2 | 1 | 1 |
| 3 | . | 2 | 1 | 0 |
| 3 | . | 2 | 0 | 0 |

Moving from left to right, we can see that 3.200 is the smallest number. We know this because the hundredths place is greater for the other numbers.

Now You Try It

1A. A student draws the following number line with fractional values to show the length in centimeters of a mountain pine beetle. Express the number on the number line as a decimal.



B. Southern pine beetles are 0.40 centimeters long. Plot this value on the number line. Is it longer or shorter than the mountain pine beetle?

C. Use decimal fractions to write a number sentence with an inequality symbol comparing the lengths of both beetles.

2A. A scientist collects 3 redbay ambrosia beetles that measure the following lengths in centimeters: 19 hundredths, 201 thousandths, 2 tenths. On a separate sheet of paper, draw a place value chart with these numbers in decimal form.

B. Which beetle is the largest?

3A. Ladybugs are a common type of beetle. They can range in length from 0.70 cm to 1 cm. On your separate sheet of paper, create a number line for the range 0.50 to 1.

B. A scientist collects 4 beetles that measure 0.85 cm, 0.75 cm, 0.60 cm, and 0.51 cm. Plot these numbers on the number line. Which of these fall into the size range of ladybugs?

4 The largest titan beetle ever measured was 16.7 cm long. Four other titan beetles have the following measurements: Beetle A is 16.46 cm long, beetle B is 15.79 cm long, beetle C is 16.07 cm long, and beetle D is 16.305 cm long.

A. Order the four other beetles from shortest to longest.

B. Which beetle is closest in length to the longest titan beetle ever measured?

5 Adult *Goliathus goliatus* beetles measure a maximum of 11 cm. Their larvae can measure a maximum of 11.5 cm. Which goliath beetle specimens in the chart could not be adult beetles? Explain your reasoning.

| GOLIATH BEETLE SPECIMEN LENGTH |
|--------------------------------|
| SPECIMEN A: 11.45 CM |
| SPECIMEN B: 10.208 CM |
| SPECIMEN C: 10.9 CM |
| SPECIMEN D: 11.230 CM |
| SPECIMEN E: 9.07 CM |