



NAME: _____

DATE: _____

EVOLUTION 101

You are about to play NOVA's Evolution Lab—a game that will help you to understand the ways scientists piece together the tree of life. But before you begin Mission 1, “Training Trees,” watch the introductory video, “Evolution 101,” and answer questions 1–5 below.

1. According to the video, what are the two key ingredients to natural selection?

- Predation and the environment
- Reproduction and predation
- Reproduction and variation
- The environment and variation

2. What does “the fittest” mean in an evolutionary sense?

- The strongest
- The longest lived
- The most reproductively successful
- The best able to avoid being eaten

3. Evolution is:

- Fixed in one direction
- Completely random
- Neither entirely fixed nor entirely random

4. What is happening in this image? How does it help to illustrate the concept of natural selection?**5. According to the video, what is the goal of the tree of life?**

- To summarize the fossil record
- To describe how natural selection works
- To be a library of all life that has ever lived
- To explain how all species are related to each other





MISSION 1 Training Trees

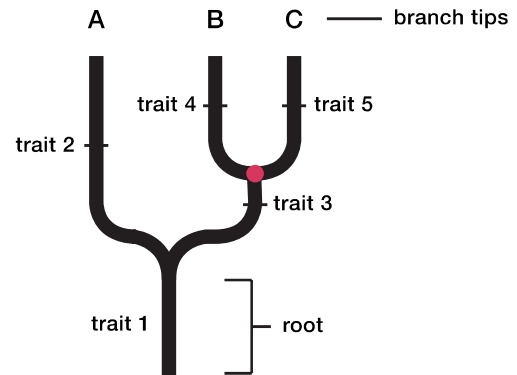
Introductory video: Watch the video to learn some tree basics and to get an overview for how the Build A Tree game works. Each level tasks you with building a phylogenetic tree—a small piece of the overall tree of life. A phylogenetic tree is a model of evolutionary relationships. Before you start the first level, “Red, green, and gecko,” use the tree below and the information in the introductory video to answer questions 1–5.

1. What does the circled node represent?

- The common ancestor species of A and B
- A speciation event
- Both a and b

2. Which way does time run on this tree?

- From root to branch tip
- Across branch tips, from left to right



3. Which lived more recently in time, the common ancestor species of A and B or the common ancestor species of B and C?

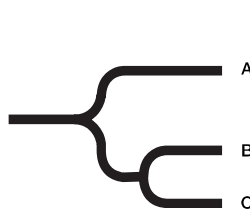
4. Which traits do A and B share? Which traits do B and C share?

A and B:

B and C:

Use your answers to questions 3 and 4 to explain why B and C are more closely related to each other than A and C are.

5. There is more than one correct way to show relationships using a phylogenetic tree. Which of these trees shows the same exact relationships as the tree above? You may circle more than one.





Red, green, and gecko: Your first question is simple: Is a fungus more closely related to an animal or a plant? At first glance, many people might be tempted to say plant—but be careful! First impressions can be misleading. In this level, be sure to read and follow the prompts. The prompts are there to help you get the hang of things. When you're done, answer questions 6–9 below before you move on to the next level, "Familiar faces."

6. **Under a microscope, the cells of mushrooms, plants, and animals all have visible nuclei. This makes them all:**
 - a. Autotrophs
 - b. Heterotrophs
 - c. Eukaryotic
 - d. Prokaryotic

7. **What trait do the mushroom and gecko share that the tree lacks?**

8. **Draw your completed tree and an equivalent tree in the boxes provided. Equivalent trees look different from each other but show the same relationships. See question 5 from the introduction section for examples of equivalent trees.**

Completed Tree

Equivalent Tree

9. **The pop-up question at the end of this level asks whether an animal or a plant is more closely related to a fungus. Why is the correct answer likely surprising to many people?**

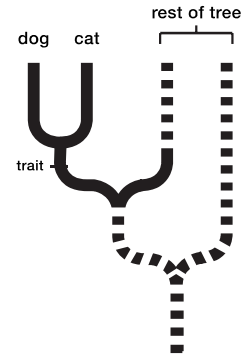




Familiar faces: Let's take a look at some common animals—a dog, goldfish, snake, and stick insect. Think you know which ones share the most traits? Answer questions 10–11 below before you move on to the next level, “Tree of life: Vegetarian edition.”

10. What is an amniote, and which animals on this tree are amniotes?

11. If you were to add a cat onto this tree, it would be placed so that the cat and dog are more closely related to each other than to anything else in the tree, as shown. What biological trait could you use in the spot that is marked?



Tree of life: Vegetarian edition: We often use the terms fruit and vegetable to describe the plants we eat; however, not many people know the real difference between them. If you're a botanist, a fruit isn't something sweet and delicious—it's the part of some plants that contains the seeds. This makes things like tomatoes, nuts, and squash fruits, technically! Any other part of a plant that we eat is called a vegetable. Some vegetables are roots, like carrots, and others are stems or leaves, like celery and lettuces.

Being an animal yourself, it's often easy to overlook plants and their many interesting traits. In this level, you'll gain a new appreciation for some of the plants we eat. Things are getting more challenging now, so be sure to use the species and species compare tabs! Answer questions 12–13 before you move on to Mission 2, “Fossils—Rocking the Earth.”

12. What makes the seaweed different from all the other plants on this tree?

- It has leaves.
- It's a vegetable.
- It uses spores to reproduce.
- It is a photosynthetic autotroph.

13. The pop-up question at the end of this level asks whether a banana is more closely related to a lemon or an onion. Why might the correct answer be surprising to many people?

