

# Backyard Science Investigation

## A Note to Parents

This project is written during the new coronavirus pandemic for primary school children to do at home with minimum assistance from their parents. As parents you will need to help your children get started and offer support, perhaps reading, interpretation and personal interest as appropriate. All children are different. But you may find some of the things interesting yourselves.



The materials for this project and research area are things with which young children are familiar and can be found without going to a store. However, this project requires access to a 2 x 2 foot square of earth. So it is easy to do in rural areas and at homes with yards, or with permission at community centers with grounds. But it may not be possible to do this project in a completely paved urban neighborhood or apartment house with no open ground.

This project can be of interest to older students, as well. In this case, we would expect more detailed descriptions of specimens, perhaps more sub-categories within the three main categories, and some encouragement to research some of the specimens in books or on line.

Please play the Vegetable, Animal, Mineral (20 questions) game often with your children. The thought process behind this game is a basic strategy used for investigations in science and in many other fields from mathematics to history, psychology to economics, dispute resolution to cooking. The questioning strategy is fundamental to the development of the uses of language. And the concept of class inclusion employed in this game is fundamental to the development of logical thinking in children.

It is useful for children to experiment with this process to experience both whether a question leads to a larger class or to a smaller sub-class, or to a different class altogether. We should expect that for many children this will begin with a random distribution of types of questions that gradually refines itself over time to focus on questions that are the most productive, or perhaps the most interesting. And this process is best left for children to learn at their own pace without prompting or instruction.

There are no shortcuts to the most significant learning. Not all science has to be perfect; just good enough for the purpose at hand.

The following guide and commentary make some digressions into history, math and language when they are relevant or related to the main activity. This is a normal, human way of inquiring, and not a way that most school curricula are designed. But doing this supports the common and social way that children inquire about the world, and it demonstrates how so many topics and things in the world share threads of relationship and interconnection.

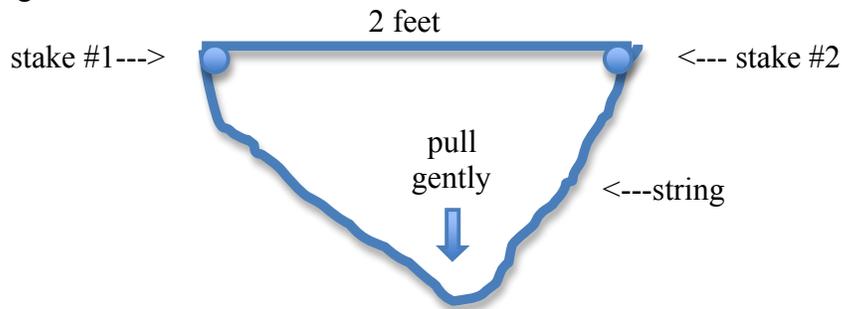
This project can be a fun and interesting experience for the whole family.

# Backyard Science Investigation

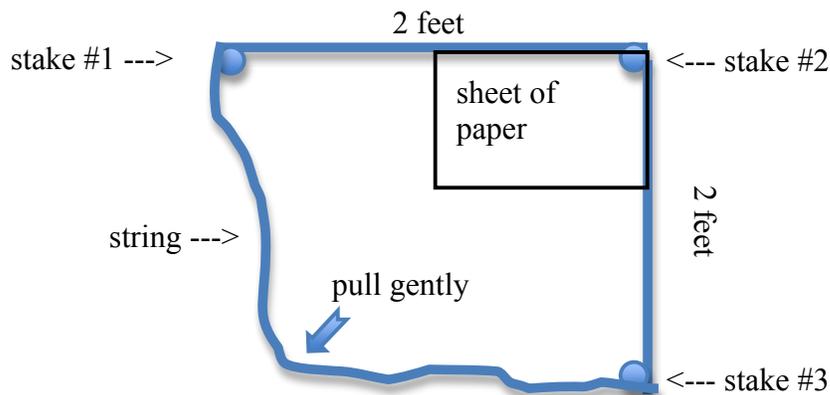
## Setting Up the Study Area

Find an interesting place in your yard that you want to investigate, and that your parents say is OK for this project. Mark off four square feet with stakes and string. This square is 2 feet long on each side. *The string should be at ground level.* For stakes you can use tent stakes, or wood stakes, or pencils, or thick sticks, or anything that works as a stake.

Students can try their own method for laying out a square. A simple way is to measure a little more than 8 feet of string and tie the ends together; then, put stake # 1 in the ground and measure 2 feet away from it. Put stake # 2 in the ground where you measured 2 feet away from stake # 1. Stretch the loop of string around the two stakes that are 2 feet apart. Pull gently on the string loop so that the part of the string between the stakes is really straight.



Place a whole sheet of paper with the long side along the stretched string with the corner of the paper touching stake number 2. Measure 2 feet from stake #2 following along the short edge of paper and then past it (at a right angle to the string that is between stake #1 and stake #2). Place stake # 3 where you measured 2 feet. Loop the string over that stake. Remember you are making a square. Does the corner you just made with your string at stake # 2 look like the corner of a square? Now your string should be making a loop around three stakes.



To finish the square you can put your finger inside the string loop, and gently pull the string in the direction away from stake # 2 until it is tight. Then measure 2 feet along the string from stake # 3 and put stake #4 inside the string right there. Did you make a square? You can move stake #4 a little to the right or to the left so that the string makes a square. Test your corners with your sheet of paper to see if they are squarish.

## Materials

a ruler, yardstick or tape measure

4 stakes (anything that works; I used a pencil, stick, spoon and tent stake.)

9 feet of string or cord

one digging spoon

10 small containers (about the size of paper cups or baby food jars) for specimens

a few jars or cans for samples

4 sheets of graph paper (copy attached)

10 sheets of plain white paper

a clip board or 9"x12" piece of heavy cardboard to support drawing paper

two pencils

colored pencils or markers

(optional magnifier)



## First Observation and Classification

1. Carefully observe the ground surface inside your square and draw some of the objects you see on the ground.
2. Get three sheets of paper and write **Animal** on one sheet, write **Vegetable/Plant** on the second sheet [Vegetable is another word for plant, although by habit we usually say that just the part of a plant that we eat is a vegetable.], and write **Mineral** on the third sheet. Make more sheets like these if you end up with more things than will fit on one sheet. Lay these sheets on the ground outside of your study square.

An **animal** is something that is alive, or used to be alive, that could move itself from one place to another.

A **vegetable/plant** is something that is alive, or used to be alive, but can't move itself from one place to another.

A **mineral** is usually anything that is not a plant or an animal; things that are not alive. A rock, for example, is made up of one or more minerals. Calcium is a mineral that your body uses to make bones.



This is what calcium looks like. ----->

3. Beginning inside one corner of your square, carefully pick up the things you find on the ground, and put each thing on the paper where it belongs, sorting or classifying it into what you think is an animal thing, a vegetable/plant thing, and a mineral thing. Put animal things on the paper labeled **Animal**. Put vegetable/plant things on the paper labeled **Vegetable/Plant**, and mineral things on the paper labeled **Mineral**.

If you put a living worm or an insect on your Animal paper and it crawled away, that's all right. Just remember what it was so you can write it later on your Animal list. An interesting observation is that **animals eat vegetables** to grow, and **vegetables "eat" minerals**, or take in minerals, to grow. And after a time, after animals and vegetables die on the land, they decompose and separate into minerals and other stuff, so that new vegetables can take in, or eat, the minerals to grow. And new animals can eat the new vegetables to grow. So life goes on.

4. For now, *skip this part for later*, maybe tonight or tomorrow we'll get back to it.

#### **Animal, vegetable or mineral?**

In Alice in Wonderland, when Alice meets the Duchess, the Duchess tells her:

*"Flamingos and mustard both bite."*

Alice responds:

*"Only mustard isn't a bird. [...] It's a mineral, I think."*

In Through the Looking Glass: "The Lion looked at Alice wearily. '**Are you animal—or vegetable—or mineral?**' he said, yawning at every other word."

"Animal, Vegetable, Mineral" was a popular after-dinner game 150 years ago, when Lewis Carroll wrote Alice in Wonderland. Players tried to guess what someone was thinking of. The first questions asked were traditionally: "Is it animal? Is it vegetable? Is it mineral?"

You can play this game with your family after dinner one day this week. Rules later!

5. As the sorting happens, examine interesting items (Use a magnifier if you have one.).

6. When you have lots of things on your three sheets of paper, go to Recording Your Data.



### Recording Your Data

1. On a sheet of white paper, draw one animal that you found. Also draw one vegetable/plant, and one mineral.
2. Print out a copy of the *Graph of Your 2 Foot Square* that is near the end of this document. On the *Graph of Your 2 Foot Square* paper, draw with a pencil little pictures in the boxes of the square where you found some of the Animal specimens. Then draw where you found some of the Vegetable/Plant specimens, and finally draw where you found some of the Mineral specimens.
3. Make a list of everything that is on your **Animal** sheet of paper. You don't need to know the name of the animals. You can just describe them like, for example: a brown bug with six legs, or a butterfly wing, or the shell of a snail, or even just draw a picture of it.
4. If you found any living animals, like a bug or a worm, ***now is the time to put them back in your yard.***
5. Now make a list of everything that is on your **Vegetable/Plant** sheet of paper.
6. Make a list of everything that is on your **Mineral** sheet of paper.
7. Put some of the non-living specimens you found into your small containers to save them for later examination.

## Animal, vegetable or mineral?

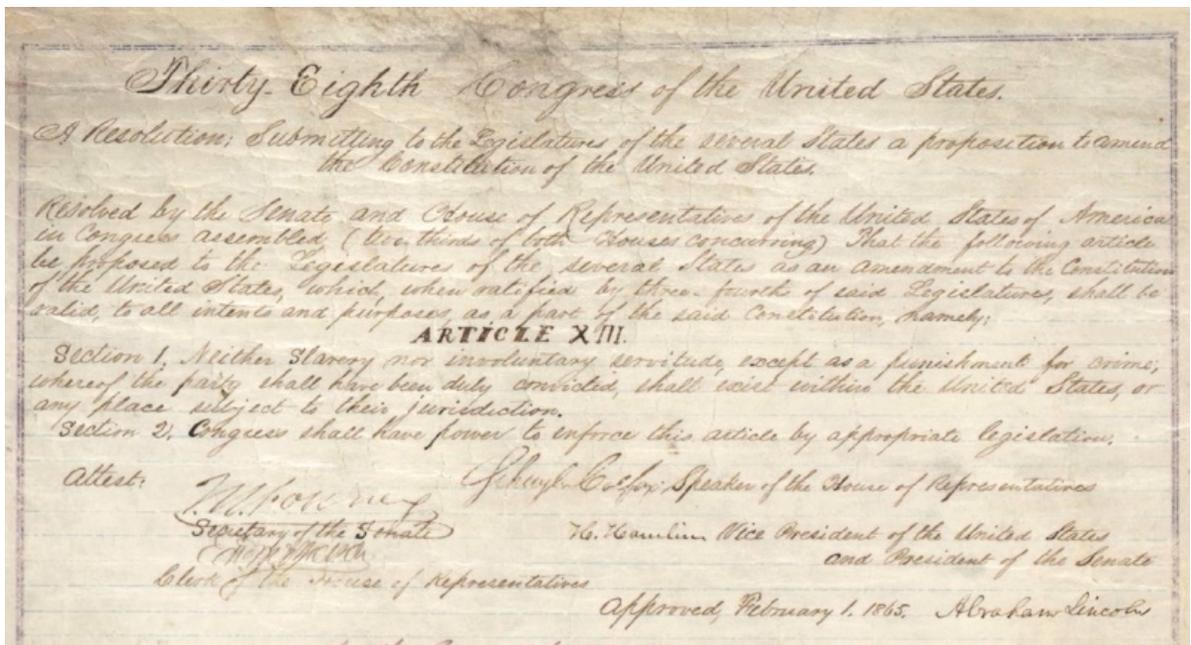
Play this game with your family after lunch or dinner one day this week.

Remember that in Through the Looking Glass: "The Lion looked at Alice wearily. '**Are you animal—or vegetable—or mineral?**' he said, yawning at every other word."

"Animal, Vegetable, Mineral" was a popular after-dinner game 150 years ago, when Lewis Carroll wrote Alice in Wonderland in the year **1865**.

**1865** was the same year that President Abraham Lincoln and the Congress made slavery illegal in the United States by passing the 13th Amendment to the U.S. Constitution. It also was the end of the U.S. Civil War. "It is my greatest and most enduring contribution to the history of the war," Abraham Lincoln said, in February 1865, about ending slavery. "It is, in fact, the central act of my administration, and the great event of the 19th century."

This is a copy of the 13th Amendment to the U.S. Constitution, signed by Abraham Lincoln. Can you see Abraham Lincoln's signature in the lower right hand corner?



## Back to Alice in Through the Looking Glass

'Why the Lion and the Unicorn, of course,' said the King.

'Fighting for the crown?'

'Yes, to be sure,' said the King: 'and the best of the joke is, that it's **my** crown all the while!'

Let's run and see them.' And they trotted off, Alice repeating to herself, as she ran, the words of the old song:

*'The Lion and the Unicorn were fighting for the crown:  
The Lion beat the Unicorn all round the town.  
Some gave them white bread, some gave them brown:  
Some gave them plum-cake and drummed them out of town.'*

'Does — the one — that wins — get the crown?' she asked, as well as she could, for the run was putting her quite out of breath.

'Dear me, no!' said the King. 'What an idea!'



[The royal coat of arms of the United Kingdom has had a lion and a unicorn since 1603. The Lion represents England and the Unicorn represents Scotland. With these two nations arguing for centuries, it should be no surprise that the Lion and the Unicorn would be fighting for the King's Crown in this story.]



The Lion had joined them while this was going on: he looked very tired and sleepy, and his eyes were half shut. 'What's this!' he said, blinking lazily at Alice, and speaking in a deep hollow tone that sounded like the tolling of a great bell.

'Ah, what **is** it, now?' the Unicorn cried eagerly. 'You'll never guess! **I** couldn't.'

The Lion looked at Alice wearily. 'Are you **animal — or vegetable — or mineral?**' he said, yawning at every other word.

'It's a fabulous monster!' the Unicorn cried out, before Alice could reply.

### **Now back to the game.**

The Unicorn guessed wrong (or maybe not) because it did not play the game by the rules.

*Animal Vegetable Mineral* is a game in which players have to guess a mystery object by asking questions to which the answer is only either 'Yes' or 'No'.

The game starts with one 'it' person thinking of something without telling the others what it is.

The other players take turns trying to guess what that person is thinking of by asking questions that can be answered only by 'Yes' or 'No'.

The person who is 'it' can only answer the questions by saying, "Yes," or "No."  
If the 'it' person doesn't know how to answer the question, it's OK to answer, "I don't know."

The first three questions people used to ask were: "Is it animal? Is it vegetable? Is it mineral?" This is how the game got its name. But you don't have to ask those questions.

After the 'it' person answers a question, the person that asked the question can make one guess at what it is. Try not to cry out "It's a fabulous monster!"

If the guess is wrong it is the next person's turn to ask a question.

If nobody has guessed correctly after 20 questions, play one last round of guesses.

[The 'it' person has to keep track on a sheet of paper of how many questions have been asked so you know when to stop after 20 questions.]

Afterwards, even if all the guesses are wrong or one is right, the next person in the circle or in line restarts the game by thinking of a new animal, vegetable, or mineral.

The game ends after everyone has had a turn being 'it'. Or if it's time for bed, whichever comes last.

### **'Something you can see' version of the game**

One person chooses an item they can see, and the rest of the family can ask up to 20 'Yes' or 'No' questions to try and figure out what the object is.

## Graphing your data

Count all the types of things, the different specimens, on your list of **Animals** and write that number at the top of the list. If you have two or more of the same thing, count it only once.

Do the same for your list of **Vegetables/Plants**, and your list of **Minerals**.

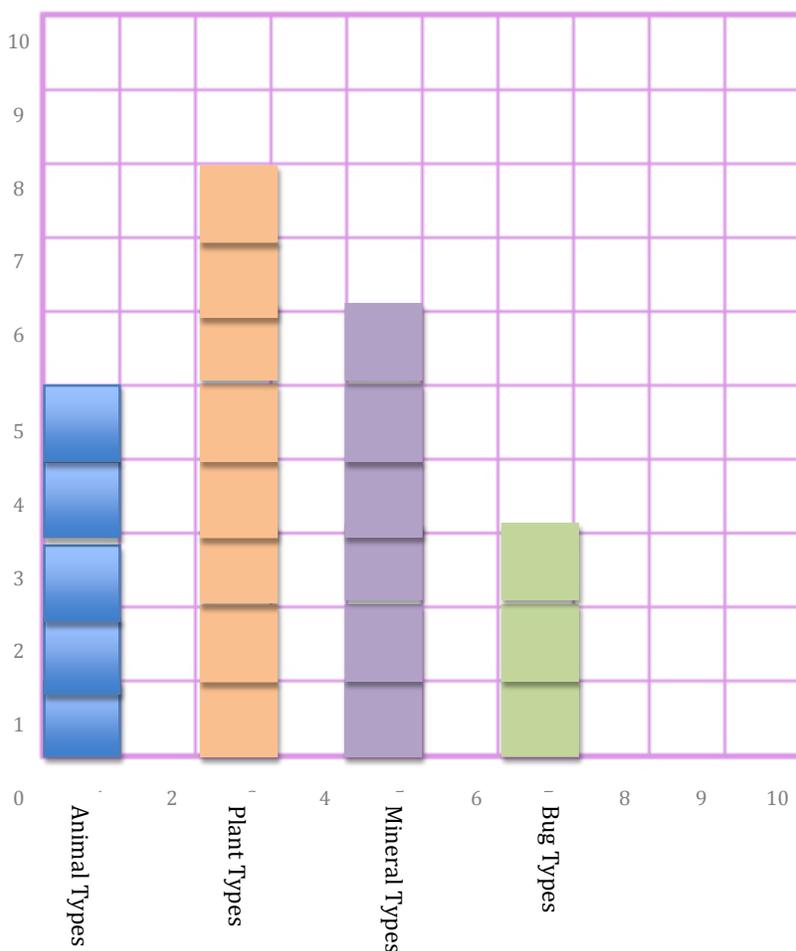
Then count the number of different kinds or types of bugs that you listed and write that number and the word 'Bugs' at the bottom of your Animals list. Remember, if you have two or more of the same kind of bug, count it only once.

Using the four numbers that you wrote on your lists and a copy of the Specimen Graph that is at the end of this document, make a graph like the example below.

### Example of A Specimen Graph

Title: Different Types of Animal, Plant and Mineral Specimens Found in My 2 Foot Square in the Yard

This example shows a graph of the different types of animals, plants, minerals and bugs I found in my 2 foot square. Each square on the graph represents one specimen. The graph shows that I found 8 plant types and 6 mineral types. The minerals were rocks. You can see that 3 of the animals were bugs, but there were 5 animals altogether, so two of the animals were not bugs.

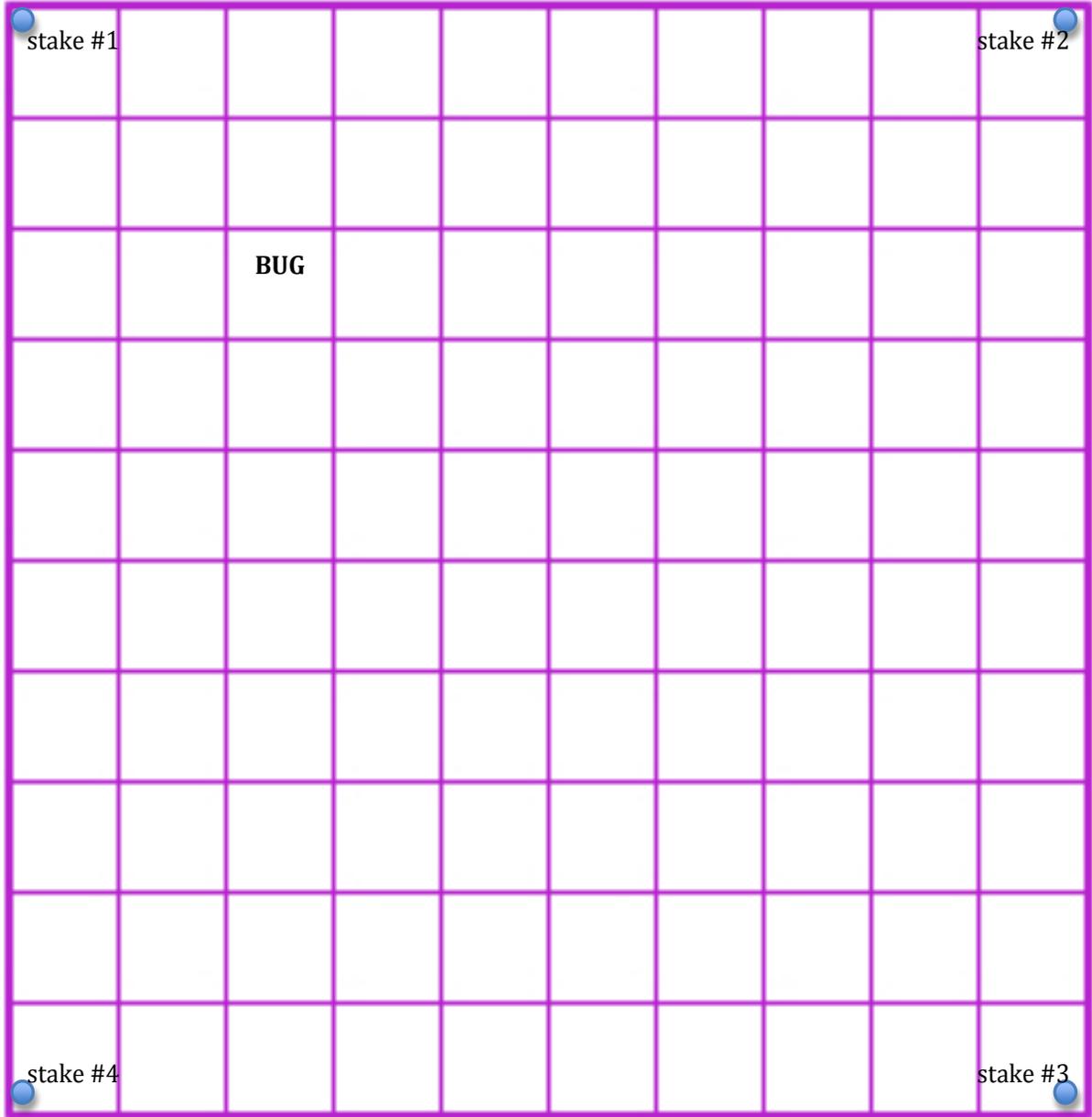


# Graph of Your 2 Foot Square in Your Yard

This graph paper pretends that your square is divided up into little boxes, each one about 2 and 1/2 inches wide. You can draw things that you find in the imaginary box that is closest to where you found it on the ground. For example, if you found a bug about 8 inches from stake #1, you would draw it in the little box on which we wrote 'BUG'.

<-----2 feet----->

<-----1 foot-----> <-----1 foot----->



# Specimen Graph

Title: \_\_\_\_\_

Following the example of a Specimen Graph, **can you make a graph** of the types of animals, plants, minerals and bugs you found in your 2 foot square in your yard?

