

Soil Logic Puzzle

Grade Level: 4-8

Lesson Overview

A logic puzzle is a problem that can be solved using deductive reasoning. A deduction is a logical conclusion drawn from two or more true statements. One common type of logic puzzle involves a tool known as an elimination grid. In this activity, students will learn about making an edible soil profile and then use an elimination grid to solve a puzzle. Students may also make an edible soil profile.

Student Objectives

1. Practice logical thinking skills utilizing charts to draw conclusions based on information provided while learning about soil.
2. Recognize that soil is made up of different layers and identify the components of a soil profile.

Materials

- ✓ Soil Logic Puzzle Basic worksheet
- ✓ Soil Logic Puzzle Advanced worksheet
- ✓ Edible Soil Profile recipe materials
 - 44 oz. ready-to-eat chocolate or vanilla pudding
 - 2 (16 oz.) packages of chocolate sandwich cookies, crushed
 - 30 gummy worms
 - 12 oz. package chocolate chips or bag/box of crushed chocolate cereal such as Cocoa Krispies
 - ½ cup multi-colored sprinkles
 - ½ cup coconut
 - green food coloring
 - 6 clear bowls
 - quart-sized Ziploc bag
 - paper towels
 - 36 plastic spoons
 - 30 clear plastic cups

Procedure

Logic Puzzle

Allow students time to complete the Soil Logic Puzzle Basic and/or the Soil Logic Puzzle Advanced and then compare answers. Please note the Soil Logic Puzzle

Basic is was designed to be a little easier. The Soil Logic Puzzle Advanced was designed to be more challenging.

If you have not given your students a logic puzzle previously, you may want to help them understand the steps in finding an answer. Please keep in mind that not all of the information is given. Students should use the information available and the process of elimination to find the answers.

Edible Soil Profile

1. Explain to the students that they will be building an edible soil profile from the ground up, but first they have to identify the ingredients they represent.
2. Pour the chocolate chips or crushed chocolate cookies into the first of the six containers, asking students for suggestions on what component they represent (parent material/bedrock). Explain to the class what parent material/bedrock is and its purpose in the soil profile.
3. Pour the pudding into the next container. (Vanilla pudding helps make the layers more distinctive and offers variety to all the chocolate.) Again, ask the class for suggestions (subsoil). Explain what you might find in the subsoil.
4. Place the crushed cookies or crushed chocolate cereal into the third container. Do the students know what this represents? (topsoil) Explain the difference between topsoil and subsoil. This might be a good time to discuss erosion.
5. Next, pour the multi-colored sprinkles (organisms) into a container, asking for student suggestions and offering explanations.
6. Put the coconut into the quart-sized Ziploc bag and add a few drops of green food coloring. Shake the bag until the coconut has turned green. Spread the coconut on paper towels for about 30 minutes to dry. (Note: you many want to do this before class as a time saving device.)
7. Place the green-tinted coconut into a container. Do the students know what this represents? (grass) How can grass, or the lack thereof, affect erosion?
8. Place the gummy worms in the last container. Can the students guess these represent earthworms? What role does an earthworm have in the soil profile?
9. Place a plastic spoon in each of the bowls.
10. Have the students take turns building their edible soil profile in the following order and enjoy!
 - parent material/bedrock
 - subsoil
 - earthworm
 - organisms

- topsoil
- grass

Additional Resources

- Illinois Agriculture in the Classroom Soil Interactive Ag Mag: http://www.agintheclassroom.org/TeacherResources/AgMags/Soil%20Ag%20Mag_2019_Online_Interactive.pdf
- Illinois Agriculture in the Classroom Soil Reader http://www.agintheclassroom.org/TeacherResources/TerraNova/Soilnews_clr.pdf
- A Handful of Dirt by Raymond Bial; ISBN: 978-0802786982
- Soil! Get the Inside Scoop by David L. Lindbo and others; ISBN: 978-0891188483

Standards

Illinois Mathematics Standard

7.SP.8b Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams.

Illinois English Language Arts Standard

RI 1 Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

The **M**ultidisciplinary **A**gricultural Integrated Curriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in April 2021.



These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

Soil mAGic project update writers/reviewers: Rhodora Collins – Dekalb County; Suzi Myers – Kane County; Connie Niemann – Montgomery County; Debbie Ruff – Livingston County; Jennifer Waters – Sangamon County; and Dawn Weinberg – Hancock County.

Name _____

Soil Logic Puzzle Basic

The chart helps you identify what you've learned from each clue. In the square where the vertical and horizontal meet is where you mark your possible answers. Read each clue and record the information on the chart. When you find a true match put a yes in the appropriate box. When you prove a combination false, put an X in the box. Continue until you find all the answers.

The students in Mrs. Myers' science class are going to do the edible soil profile as a review of all their soil studies. Each child has volunteered to bring one of the ingredients. Use the clues and the chart to find what each child was bringing.

	Karen	Mary	Sally	Joe	Max	Sam
Ingredients						
Chocolate Pudding						
Crushed Oreo Cookies						
Gummy Worms						
Chocolate Chips						
Sprinkles						
Coconut						

- ✓ Sam just had to add milk and stir to make his ingredient.
- ✓ Karen's ingredient reminded her of going fishing with her dad.
- ✓ Mary's ingredient comes from the seeds of palm trees.
- ✓ Sally had fun using a rolling pin to prepare her ingredient.
- ✓ Joe and Sam both brought things that have the same flavor.

Karen brought _____.

Mary brought _____.

Sally brought _____.

Joe brought _____.

Max brought _____.

Sam brought _____.

Soil Logic Puzzle Basic ANSWER KEY

The chart helps you identify what you've learned from each clue. In the square where the vertical and horizontal meet is where you mark your possible answers. Read each clue and record the information on the chart. When you find a true match put a yes in the appropriate box. When you prove a combination false, put an X in the box. Continue until you find all the answers.

The students in Mrs. Myers' science class are going to do the edible soil profile as a review of all their soil studies. Each child has volunteered to bring one of the ingredients. Use the clues and the chart to find what each child was bringing.

	Karen	Mary	Sally	Joe	Max	Sam
Ingredients						
Chocolate Pudding	x	x	x	x	x	YES
Crushed Oreo Cookies	x	x	YES	x	x	x
Gummy Worms	YES	x	x	x	x	x
Chocolate Chips	x	x	x	YES	x	x
Sprinkles	x	x	x	x	YES	x
Coconut	x	YES	x	x	x	x

- ✓ Sam just had to add milk and stir to make his ingredient.
- ✓ Karen's ingredient reminded her of going fishing with her dad.
- ✓ Mary's ingredient comes from the seeds of palm trees.
- ✓ Sally had fun using a rolling pin to prepare her ingredient.
- ✓ Joe and Sam both brought things that have the same flavor.

Karen brought gummy worms.

Mary brought coconut.

Sally brought crushed Oreo cookies.

Joe brought chocolate chips.

Max brought sprinkles.

Sam brought chocolate pudding.

Name _____

Soil Logic Puzzle Challenging

The chart helps you identify what you've learned from each clue. The square where the vertical and horizontal meet is where you mark your possible answers. Read each clue and record the information on the chart. When you find a true match put a yes in the appropriate box. When you prove a combination false, put X in the box. Continue until you find all the answers.

The students in Mrs. Myers' science class are going to make an edible soil profile as a review of all their soil studies. Each child has volunteered to bring one of the ingredients and one of the materials needed to complete the activity. Use the clues and the chart to find what each child was bringing.

Puzzle and clues are on the next page. Record answers below when finished.

Karen brought _____.

Mary brought _____.

Sally brought _____.

Joe brought _____.

Max brought _____.

Sam brought _____.

	Karen	Mary	Sally	Joe	Max	Sam
Ingredients						
Chocolate Pudding						
Crushed Oreo Cookies						
Gummy Worms						
Chocolate Chips						
Sprinkles						
Coconut						
Materials						
Green Food Coloring						
Bowl						
Ziploc Bags						
Paper Towels						
Spoons						
Plastic Cups						

- ✓ Karen brought creepy crawly things to eat and something to hold all ingredients.
- ✓ Joe brought a material used to keep things fresh.
- ✓ Mary brought a food found in the seeds of palm trees and what was used to clean up.
- ✓ Sally had fun using a rolling pin to prepare her ingredient and her material was something usually used for drinking liquids.
- ✓ Joe and Sam both brought things that had the same flavor.
- ✓ One person brought an ingredient and material that both began with the same letter of the alphabet.
- ✓ The person who brought chocolate pudding also brought something that is used a lot around St. Patrick's Day.

Soil Logic Puzzle Challenging ANSWER KEY

The chart helps you identify what you've learned from each clue. The square where the vertical and horizontal meet is where you mark your possible answers. Read each clue and record the information on the chart. When you find a true match put a yes in the appropriate box. When you prove a combination false, put X in the box. Continue until you find all the answers.

The students in Mrs. Myers' science class are going to make an edible soil profile as a review of all their soil studies. Each child has volunteered to bring one of the ingredients and one of the materials needed to complete the activity. Use the clues and the chart to find what each child was bringing.

Puzzle and clues are on the next page. Record answers below when finished.

Karen brought **worms and bowl** .

Mary brought **coconut and towels** .

Sally brought **oreos and cups** .

Joe brought **chocolate chips and bags** .

Max brought **sprinkles and spoons** .

Sam brought **chocolate pudding and food coloring.**

	Karen	Mary	Sally	Joe	Max	Sam
Ingredients						
Chocolate Pudding	x	x	x	x	x	YES
Crushed Oreo Cookies	x	x	YES	x	x	x
Gummy Worms	YES	x	x	x	x	x
Chocolate Chips	x	x	x	YES	x	x
Sprinkles	x	x	x	x	YES	x
Coconut	x	YES	x	x	x	x
Materials						
Green Food Coloring	x	x	x	x	x	YES
Bowl	YES	x	x	x	x	x
Ziploc Bags	x	x	x	YES	x	x
Paper Towels	x	YES	x	x	x	x
Spoons	x	x	x	x	YES	x
Plastic Cups	x	x	YES	x	x	x

- ✓ Karen brought creepy crawly things to eat and something to hold all ingredients.
- ✓ Joe brought a material used to keep things fresh.
- ✓ Mary brought a food found in the seeds of palm trees and what was used to clean up.
- ✓ Sally had fun using a rolling pin to prepare her ingredient and her material was something usually used for drinking liquids.
- ✓ Joe and Sam both brought things that had the same flavor.
- ✓ One person brought an ingredient and material that both began with the same letter of the alphabet.
- ✓ The person who brought chocolate pudding also brought something that is used a lot around St. Patrick's Day.

PRIMARY LAYERS OF A SOIL PROFILE

