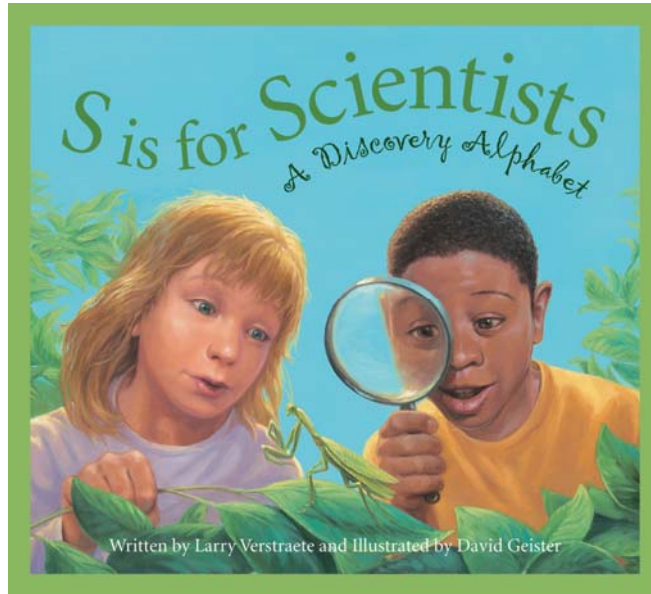


Teacher's Guide



S is for Scientists: A Discovery Alphabet

**Author: Larry Verstraete
Illustrator: David Geister**

Guide written by Jillian Hume

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Explore the Book

S is for Scientists



While looking through the book *S is for Scientists* there are many things to discover. Carefully explore the book to find the answers to the questions below.

1. What does an author of a book do? _____
2. Who is the author of *S is for Scientists*? _____
3. What does the illustrator of a book do? _____
4. Who is the illustrator of *S is for Scientists*? _____
5. An International Standard Book Number is a number given to a book to identify it. It is like a student number, a classroom number, or even an address. For short, it is an ISBN. What is the ISBN of *S is for Scientists*? _____ - _____ - _____ - _____ - _____
6. What did the Wright brothers build? _____
7. On July 24, 1911 Hiram Bingham found Machu Picchu, which means _____ in the Quechua language.
8. Did Jane Goodall give chimpanzees names as she observed them? _____
9. In order to track butterflies, Fred and Norah Urquhart used _____ to track butterflies. They found that the butterflies were migrating to _____ during the winter.
10. What liquid did Archimedes use to find out the volume of the king's crown? _____
11. Archimedes discovered not only a solution, but a simple truth. "Sometimes the best ideas come when we _____, yield to the _____, and simply allow our minds to _____.



Why Do I Need Math?



S is for Scientists

We use math everyday, even when we don't realize it. We use math when we shop, cook, measure, tell time, and even while playing games and sports. Use the book *S is for Scientists* to find at least five people who used math to discover something. After finding those five people, complete the "Math in Real Life" chart below to brainstorm some of the many ways we use math.

Person	Discovery/Invention
1.	
2.	
3.	
4.	
5.	

Helpful Hints

measurement rhythm patterns temperature money fractions time percentage

Activity	How we use math
1. Cooking/Baking	time, measurement, fractions
2. Playing basketball	
3. Playing video games	
4. Shopping	
5. Traveling	
6. Building	
7.	
8.	

Create a Timeline

S is for Scientists

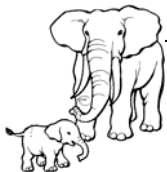
A timeline is a list of events in the order that they happened. Create a vertical timeline below based on at least 10 discoveries from the book *S is for Scientists*. Be sure to label both the discovery and the year that it took place.

265 B.C.

You can use water to measure volume.



Elephants communicate using hundreds of different calls.

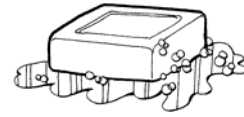


1984



Inquiry Experiment

S is for Scientists



Take the next step! Some discoveries happen by accident, like when Patsy Sherman noticed something odd from an accidental spill. Some people set out to discover something. By following the steps below, you will become the scientist, meaning you must also create your own experiment. With the objects listed below, follow the steps to create your own experiment.

Materials

8 tablespoons of liquid dish soap

1 quart water

1 straw

1 shallow tray

1. Create a question that you want answered

2. Come up with a hypothesis

3. Design the experiment. What will you do? How will you use the materials? Use another piece of paper if needed.

4. Come up with a conclusion. What happened? Was your question answered?

5. Share your conclusion with others.



Collecting and Comparing Data

S is for Scientists



An important part of coming up with new discoveries and inventions is by collecting data and comparing it, like many of the scientists in *S is for Scientists*.

Complete each of the activities in the chart below for 20 seconds. Make sure to do them in order. Then, record what three of your classmates got for the same activities.

For 20 seconds:	Me	Classmate #1	Classmate #2	Classmate #3
Resting Pulse				
Hoola Hoop				
Jump Rope				
Active Pulse				



Complete the chart below using a tape measure. Then compare your data with three classmates.

Measurement	Me	Classmate #1	Classmate #2	Classmate #3
Height head to toe				
Circumference of a basketball				
Height of a cone				
Length of left arm				
Length of the free throw line				
Circumference of your head				



The Guitar Tells the Pitch



S is for Scientists

Scientists often use tools and equipment to help them make new discoveries. In the book *S is for Scientists*, Clyde Tombaugh used a telescope to find a ninth planet. In this activity you will make a guitar from a shoe box to better understand pitch. You can also decorate your guitar, and learn songs!

Materials:

- Shoe box with lid
- Five rubber bands (each of a different thickness)
- Empty paper towel tube

Procedure:

1. Draw a circle about 4 inches in diameter in the middle of the lid of the shoe box.
2. Cut out the circle.
3. Put the lid back on the box.
4. Put the rubber bands lengthwise around the box from thickest to the thinnest.
5. Tape or glue paper the towel tube to the box to create the neck of the guitar.

Now that you have completed your shoe box guitar, it's time to explore the different sounds of the rubber bands. Pitch is caused by the vibration of the rubber band.

1. Which rubber band will vibrate the fastest? _____
2. Which rubber band will vibrate the slowest? _____
3. Which rubber band do you think has the highest pitch? _____

Why? _____

4. Which rubber band do you think has the lowest pitch? _____

Why? _____

5. Circle which action below would make a sound with a high pitch.

Barking Dog Phone Truck Horn Whistle

6. What is something that creates a low pitch? _____

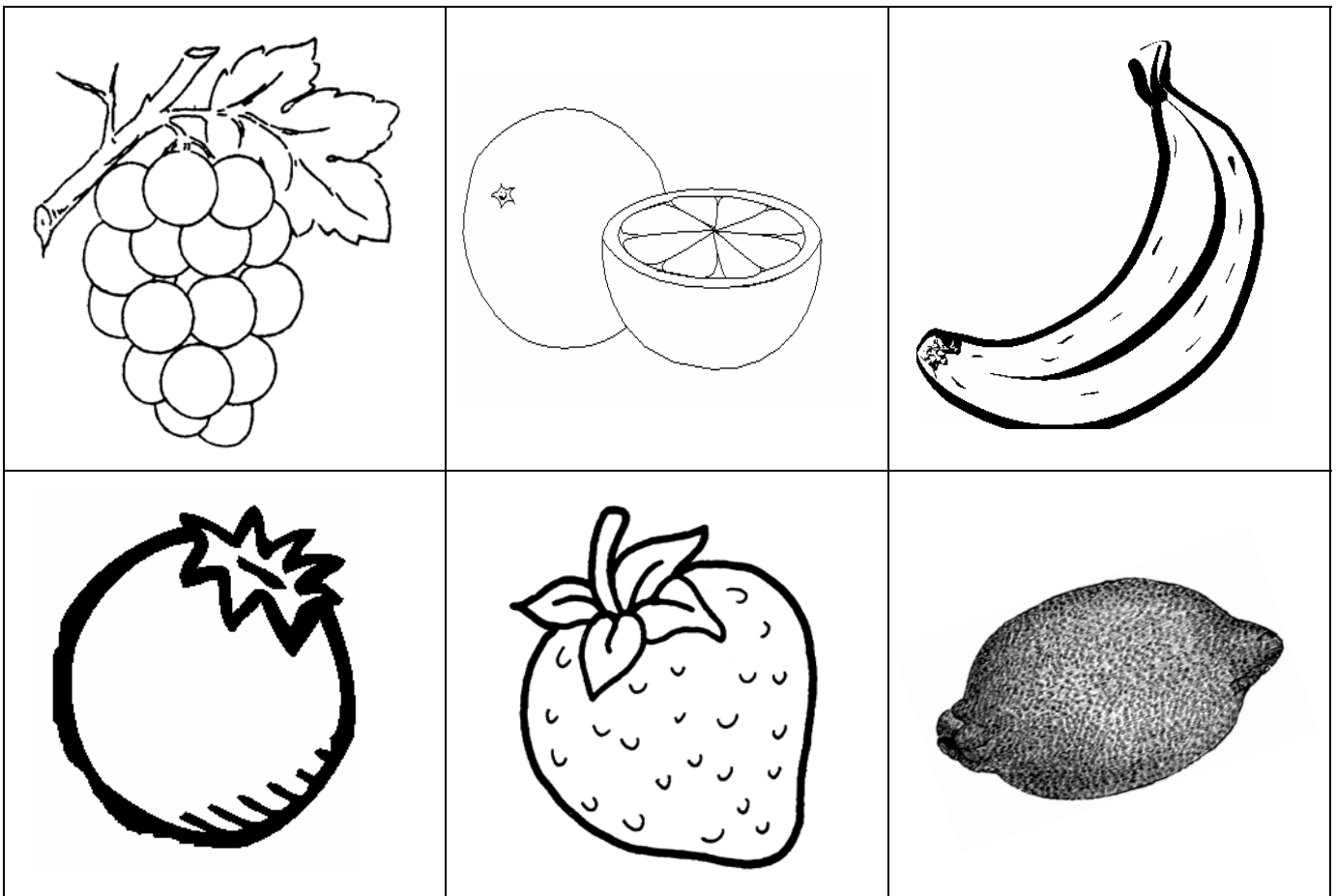
Fruit Color Wheel

S is for Scientists

Even young artists have discoveries to make! This hands-on activity for preschool through second graders promotes inquiry-based learning as well as fine motor skills.

Materials: white paper, blue paint, yellow paint, red paint, scissors, water, paint brushes, cardstock cut in a circle

1. Using only red, blue, and yellow paints have the students paint the banana, strawberry, and blueberries accurately according to color.
2. Using only those three colors, have students experiment with how to make the appropriate colors to paint the lime, grapes, and oranges.
3. Once painted fruits have dried, have students cut them out.
4. As a whole group, have students talk about how each color was created, and glue them on the circle cardstock (plate) according to their place on the color wheel.





Neighborhood Map



S is for Scientists

Sometimes the best place to discover something new is in the places where you are most familiar. Create a map of the neighborhood or where your house or school is. Be sure to include a map title, compass rose, and key. When you have finished, put your map away for a few days. Be very observant next time that you travel to and from the neighborhood. Do you see things that you forgot on your map? After two or three days pass, get your map back out and add things that you forgot. Make a list below your map of the many things that you discovered!

Things that I discovered about the neighborhood:



Estimate and Measure

S is for Scientists



Measurement is a very important part of being a scientist. There are many tools used to measure the world around us. Gather the materials listed and estimate the measurements of the things in the table. Once you have made the estimations, measure them, and record your answers.

Materials:

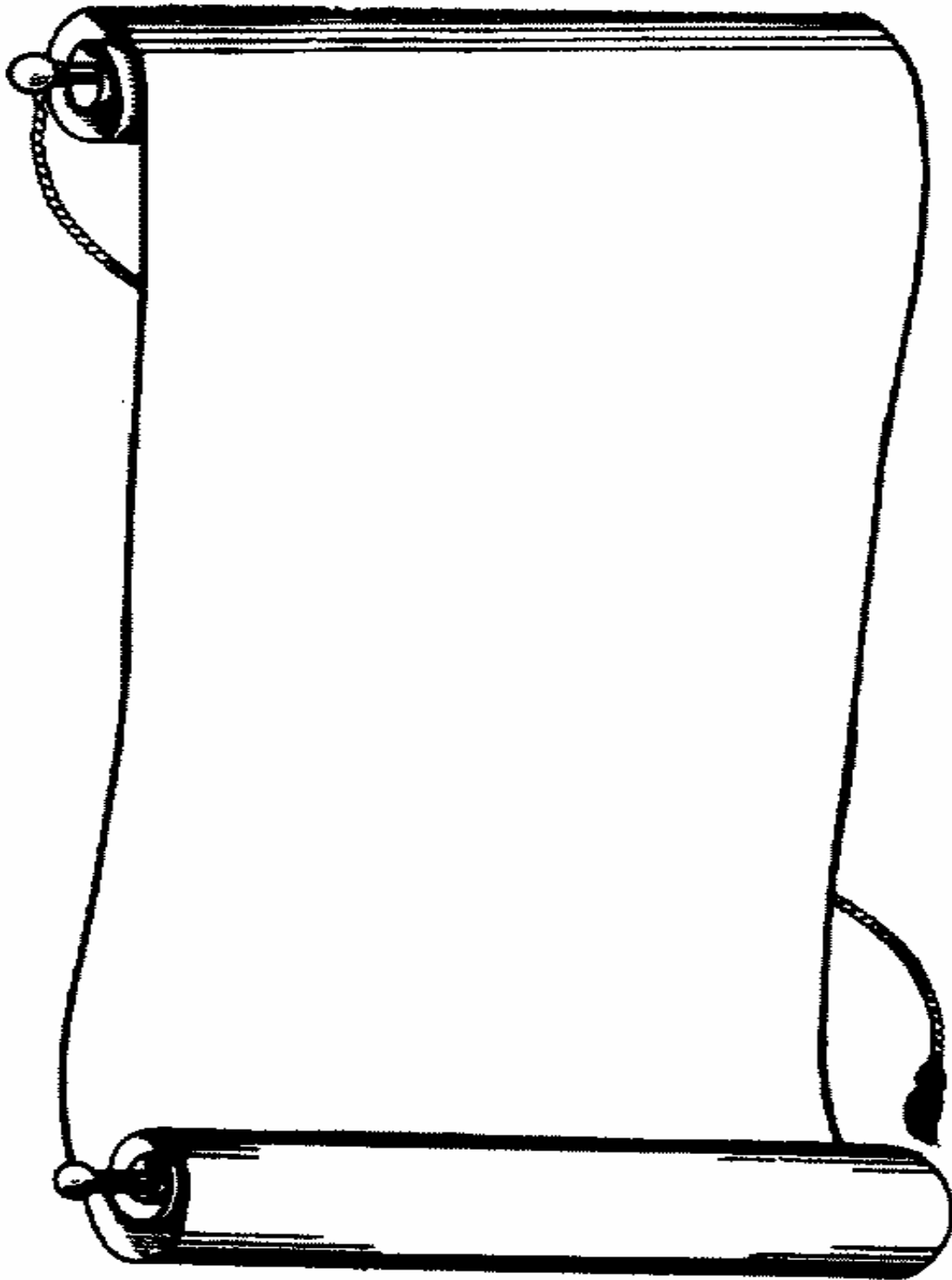
- Ruler
- Beaker with measurements
- Thermometer
- Scale
- Stopwatch

	Estimation	Measurement	Units	Tool used to measure
Width of a notebook	10 inches	8 ½	inches	ruler
Height of your math book				
Temperature of the room				
Time it took to do 10 jumping jacks				
Distance from door-knob to the floor				
Weight of an eraser				
Time it took to cut out five squares				
Height of a crayon				
Temperature of sink water				
Weight of a calculator				

Science Safety

S is for Scientists

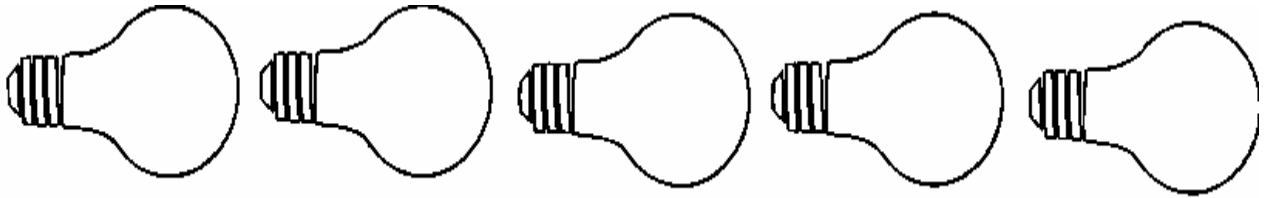
Before starting any science experiment, it is very important to be safe. Brainstorm ways that you can keep yourself and others safe. Create a safety poster by drawing a full-body picture of yourself and add safety items that you would wear to protect yourself during a science experiment.



Invisible Ink

S is for Scientists

Science can be explored with even the most basic ingredients and materials. You don't need to be in a laboratory or canoeing through the rain forest to enjoy science. Use these household ingredients to explore what happens when an organic substance that oxidizes is exposed to heat.



Materials:

- Lamp or lightbulb
- Bowl
- Spoon
- Water
- Half of a lemon
- Cotton swab
- White paper

Procedure:

1. Squeeze the lemon juice into the bowl and add three drops of water.
2. Use the spoon to mix the lemon juice and water.
3. Dip the cotton swab into the lemon juice and water mixture.
4. Write a message on the white paper.
5. Set it aside and let it dry completely. It will be clear when it is dry.
6. When you are ready to reveal the secret message, hold it close to the lightbulb. Be very careful, the lightbulb will be hot. Don't touch the paper to the lightbulb, or touch the lightbulb with your skin.
7. Can you now read the message you wrote?



A Work of Art



S is for Scientists

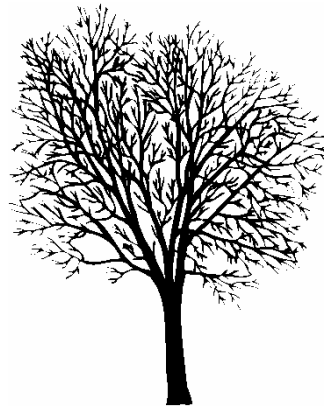
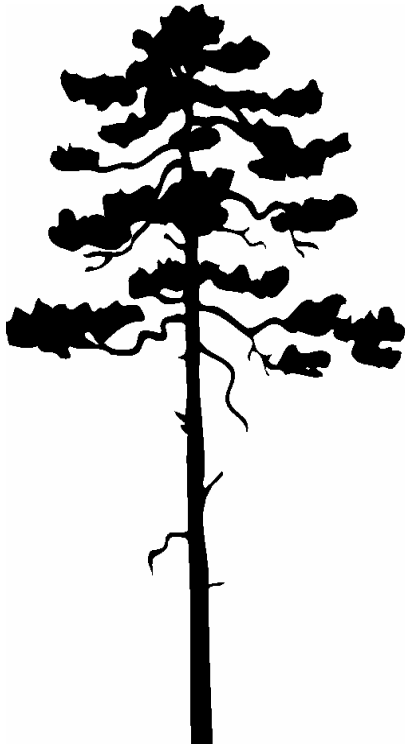
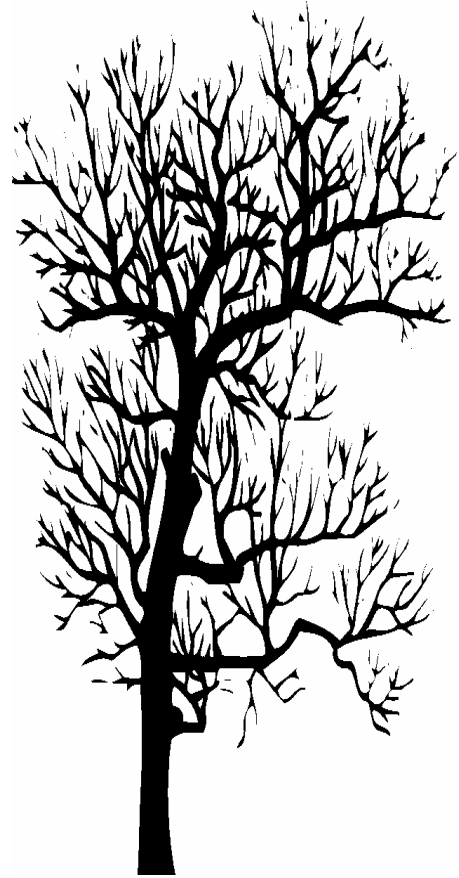
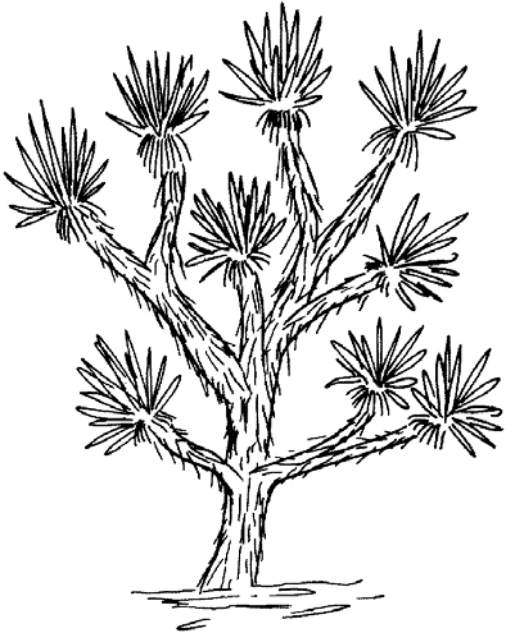
Many discoveries are also inventions. On the page “J is for join,” Stephanie Kwolek turned something she was going to throw away into something that is used for many things we see in the world around us. That discovery, through creativity, turned into an invention. On the page “F is for find,” Hiram Bingham found a lost city that was once home to the Incans. That, however, was not an invention.

Open up the creative part of your mind to write a creative short story about something you wish you could invent. Be sure to include what went wrong during the discovery, what you used, and who the invention would help. Use the box below to include a drawing, but only use your pencil. Your pencil can create many details and shades. Challenge yourself to create a masterpiece!

Be the Botanist

S is for Scientists

The book *S is for Scientists* tells the story about Richard Evans, who went canoeing in the rainforest to study plants. Evans is a botanist, which is someone who studies plants. Cut out the pictures of the plants below and sort them by height. Glue them onto another sheet of paper when you are done.

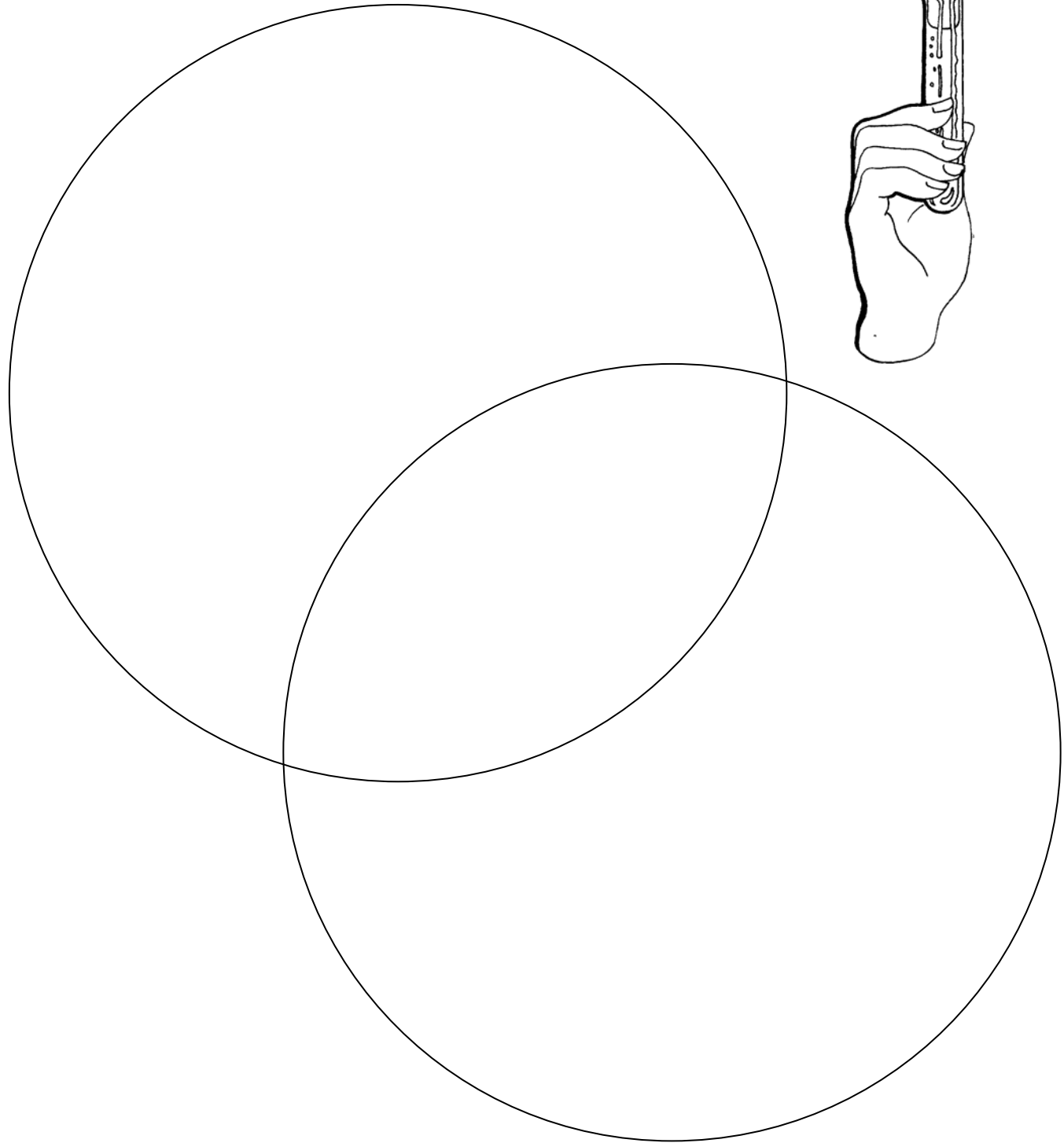




Compare and Contrast

S is for Scientists

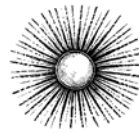
Use the Venn diagram below to compare yourself with someone in the book *S is for Scientists*. Pay close attention to physical traits, personality traits, lifestyles, and time periods. Challenge yourself to come up with as many similarities and differences as possible.





Weather Mobile

S is for Scientists



In the book *S is for Scientists*, Tetsuya Theodore Fujita, a meteorologist, created a scale to categorize hurricanes. A meteorologist is a scientist who studies the atmosphere, predicts the weather, and studies climate trends. Create a mobile that displays at least four types of weather. Draw a picture of the weather in each of the boxes below. Be sure to label them and write one complete sentence about the season when that type of weather would occur. When you have finished, cut out the boxes, attach a string to each, and tie it to a hanger.

<hr/> <hr/> <hr/>

<hr/> <hr/> <hr/>

<hr/> <hr/> <hr/>

<hr/> <hr/> <hr/>

Story Problems

S is for Scientists



Solve the story problems below. Use the empty space to show your work. Remember that drawing pictures to represent the story problems will also help you solve them.

1. In the Amazon rainforest, Richard Evans Schultes collected plant specimens. He did this over a 14-year period. How many months is 14 years? _____

2. Galileo used his pulse to time the swing of a chandelier. Each swing was 3 beats of his pulse. If he timed it for 66 beats of his pulse, how many times did the chandelier swing? _____

3. In 1947, six experienced sailors put together a 35-foot raft, called the *Kon-Tiki*, to sail west with the currents to reach Polynesia. Determine the area of the *Kon-Tiki*, assuming the raft was 35 feet long, and 3 feet wide. Draw a picture with your answer. _____

4. Clyde Tombaugh was a young astronomer in Arizona. He was born February 4, 1906. He discovered Pluto in January of 1930, just a month before his _____th birthday. Use a timeline to help you solve this problem.

5. A decade is 10 years. If Jane Goodall was patiently observing chimpanzees for four and a half decades, how many years was she observing them? _____



Create a Boat

S is for Scientists



Explore the concept of buoyancy. Below is a suggested list of objects that could be used to make a boat. With permission, use other objects from indoors or outdoors. Use a large bowl, dishpan, or other large tub filled with water to test objects in, and then create a boat that will float for at least one minute.

Pipe cleaners	Egg carton	Plastic bottles	Crayons	Stones
Flower seeds	Washers	Keys	Straws	Tape
Rubber bands	Paperclips	Popsicle sticks	String	Fabric

Create a plan. List the materials that you think will be helpful when creating a boat that will float for at least one minute. _____

Draw a picture of your boat below:

Did your boat float for at least one minute? _____

If not, what could you do differently next time? If it did float, try adding more objects to your boat without it sinking. Write about what you added to your boat.



True/False



S is for Scientists

In order to prove that something is right, you must also prove that something is wrong. Use the book *S is for Scientist* to determine if the statement is true or false. If it is true, write a T in the blank on the right. If it is false, write an F on the blank to the left. Then, cross out the part of the statement that is false, and write the corrected statement in the blank.

- _____ 1. Clyde Tombaugh discovered the planet Jupiter. _____
- _____ 2. Russian Scientist Ivan Pavlov experimented with food and dogs. _____
- _____ 3. Machu Picchu means “tall mountain” in the Quechua language. _____
- _____ 4. In 1903 the Curies were awarded the Nobel Prize. _____
- _____ 5. Kevlar is used to make other substances weaker by breaking down molecules. _____
- _____ 6. A F1 is the strongest, most dangerous tornado. _____
- _____ 7. The *Kon-Tiki* sailed against the currents to reach Polynesia. _____
- _____ 8. Fred and Norah Urquhart were fascinated with monarch butterflies. _____
- _____ 9. In 1781 Friedrich Kekule dreamed about snakes and that led to the understanding of chemicals. _____
- _____ 10. Sixty-five million years ago, dinosaurs disappeared completely. _____

Write five true/false questions like the ones above. Exchange papers with a classmate and answer their questions!

11. _____

12. _____

13. _____

14. _____

15. _____

Out of the Ordinary

S is for Scientists

Three words in each group have something in common. Find the one that is out of the ordinary. Use your science knowledge and the book *S is for Scientists* to help you figure out which doesn't belong.



- | | | | |
|-------------------|------------------|----------------|----------------------|
| 1. Ruler | Thermometer | Notebook | Measuring Cup |
| 2. Astronomer | Clyde Tombaugh | Mars | Telescope |
| 3. CD Player | Apron | Safety Goggles | Ear Plugs |
| 4. Radium | Glowing | Cancer | Milk |
| 5. Internet | Computer | Scissors | Mouse |
| 6. Ocean | Chimpanzee | Tanzania | Jane Goodall |
| 7. Rachel Carlson | Pesticides | 1914 | <i>Silent Spring</i> |
| 8. Astronomer | Friedrich Kekule | Dream | Chemistry |
| 9. Geologist | Chemist | Astronomer | Surgeon |
| 10. Pulsar | Jocelyn Bell | Soil | Little Green Men |

Alphabetical Order

S is for Scientists

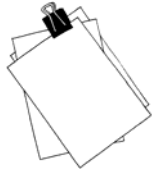


ABCDEFGHIJKLMNOPQRSTUVWXYZ

Like many people in the book *S is for Scientists*, sorting and categorizing is a part of everyday life. Put the following words in alphabetical order.

glider	chemist	explanation	demonstration
discovery	experiment	identify	medical
repeated	exposure	solution	beautiful
documents	gauge	unpredictable	possibilities
journey	radar	curiosity	passageway
study	fossilized	visualize	environment

1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.
13.	14.	15.	16.
17.	18.	19.	20.
21.	22.	23.	24.



Make a Discovery

S is for Scientists



Using household products can lead to amazing discoveries! Read the ingredients and the procedure carefully. Come up with a prediction as to what you think the outcome will be. Record your answer. Then, follow the recipe carefully to make your own discovery!

Prediction:

Materials Needed:

measuring cups and spoons
2 small paper drinking cups
mixing spoon
cheesecloth to use as a filter

Ingredients Needed:

1/4 cup milk
1 tablespoon white vinegar
pinch baking soda

Procedure:

1. Pour the milk into one of the cups. Add the vinegar and stir for 1 minute. The mixture will form clumps (curds) and clear liquid (whey).
2. Place the cheesecloth over the second cup and push the middle down a bit.
3. Holding the cheesecloth in place, slowly pour the curds and whey into the cloth. Most of the whey will flow through the cloth into the cup. Gently squeeze the rest of the whey into the cup, then throw the liquid whey away.
4. Scrape the curds into the empty cup. Add the baking soda and stir well.

By following the directions carefully, I made _____.

What might you use this discovery for in everyday life?

Answer Key

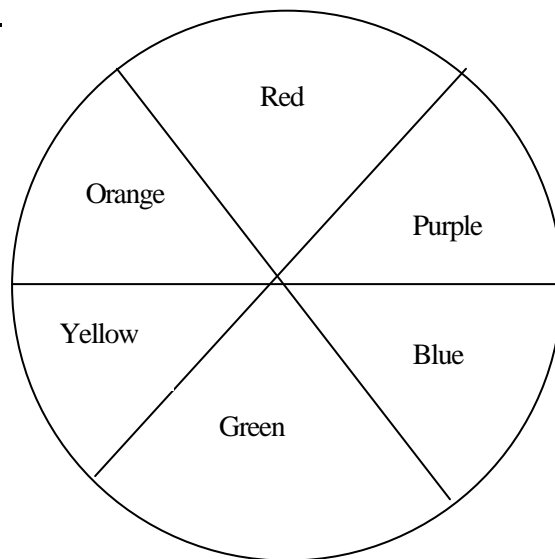
Explore the Book: 1. Creates the pictures 2. David Geister 3. Writes the story 4. Larry Verstraete 5. 978-1-58536-470-1 6. Airplane 7. Old Peak 8. Yes 9. Tags; Mexico City 10. Water 11. Relax; situation; wander

Why Do I Need Math? Answers will vary

Create a Timeline: Answers will vary

The Guitar Tells the Pitch: 1. Thin 2. Thick 3. Thin, it vibrates the fastest 4. Thick, it vibrates the slowest 5. Whistle 6. Examples: a man's voice, tuba, thunder

Fruit Color Wheel:



Science Safety: Goggles, apron, earplugs, gloves

Story Problems: 1. 168 2. 22 3. 105 4. 24th 5. 45 years

True/False: 1. Pluto or Planet X 2. True 3. Old Peak 4. True 5. Stronger 6. F5 7. With the currents 8. True 9. 1861 10. True

Out of the Ordinary: 1. Notebook 2. Mars 3. CD Player 4. Milk 5. Scissors 6. Ocean 7. 1914 8. Astronomer 9. Surgeon 10. Soil

Alphabetical Order: Beautiful, chemist, curiosity, demonstration, discovery, documents, environment, experiment, explanation, exposure, fossilized, gauge, glider, identify, journey, medical, passageway, possibilities, radar, repeated, solution, study, unpredictable, visualize

Make a Discovery: The recipe makes glue. By adding tempera paint or food coloring it can be used as 3-D paint. Allow time to dry.