



Snippets of Science from Fermilab

PS 1 A (3-5) Explain

MYSTERY BOXES

Challenge: Can you “see” what is inside the mystery box?

Goal: Use indirect observation and a variety of tools to determine the contents of the mystery box. Can you collect enough evidence to identify the hidden objects?

Fermilab Connection: Fermilab scientists use indirect observation to study objects too small to be seen by the naked eye. Use similar methods to figure out what is inside the mystery box!

Preparation

Prepare a mystery box by using an empty shoe box or gift box. Fill the box with some of the following items: steel wool, pencil, paper clip, wooden block, marble, magnet, penny, ball bearing or others of your choice. Seal the box so it can't be opened by the investigators. If a similar empty box is available, that can help with the investigation.

Procedure

1. You may use any non-violent, non-intrusive way to investigate the mystery box.
2. Read the column descriptions on the data sheet carefully to see what you are going to do. The first row gives you an example.
3. The data sheet is for recording indirect evidence. Do not guess the identity of the items; that will happen later.
4. Here are some ideas to help you discover what is inside the box. You may NOT open the box during your investigation!
5. Use your hands to move the box around and listen to the sounds made by the objects. Pay attention to how the box feels as the items move around inside.
 - a. Use a magnet to move around the outside of the box.
 - b. If you have a compass, move it around the outside of the box.
 - c. Use a scale to mass (weigh) the box and compare it to an empty box.
 - d. Other ideas? List them in the space below:
6. Complete the chart in the data sheet by listing each tool you used in your investigation, how you used it, and what you learned by using it.

GRADE LEVEL
Grades K–8 with
modifications

MATERIALS

- Prepared mystery box
- Scale
- Magnets (Strong ring magnets work well.)
- Rulers
- Empty mystery box (optional)

Fermilab Resources:
Click on the linked
resources!

[How Particle Physics
Discovery Works](#)

Data Sheet:

	What tool did you use?	What did you do with this tool?	What evidence did you collect using this tool?
	Example: <i>Fingers</i>	<i>I shook the box gently with my fingers under the box</i>	<i>I felt a smooth, light, round object roll evenly across my fingertips.</i>
1			
2			
3			
4			
5			

6			
7			
8			
9			
10			

Conclusion: In the spaces below, list the items you believe are in the box and the evidence you have collected to support your conclusion.

1. One item in the box is a/an: _____
 - a. The evidence that supports this conclusion is:

2. One item in the box is a/an: _____
 - a. The evidence that supports this conclusion is:

3. One item in the box is a/an: _____
 - a. The evidence that supports this conclusion is:

4. One item in the box is a/an: _____
 - a. The evidence that supports this conclusion is:

