Stealth Object Design

Answer Key

Name:_____

Date:_____

Vocabulary

Mimesis - A camouflage technique where an animal tries to look like something uninteresting to the observer.

Activity 1

For this activity, you will test how well various materials reflect the waves from Ari's Time-of-flight sensor. You are encouraged to pick materials with different properties, like color (light vs dark), shape (rounded vs sharp edges), shine (matte vs glossy), and material (plastic vs glass vs wood vs metal).

- ☐ Find several objects to test. Remember to look for objects that differ in their properties.
- ☐ Fill in the table for each of your objects, noting their color, shape, shine, and the material they are made of. Leave the **Distance** and **Stability** columns empty for now.

Object	Color	Shape	Shine	Material	Distance	Stability
Textbook	White	Square/flat	Medium	Cardboard	20.2 cm	High
Mirror	White	Flat	High	Glass	20.6 cm	Low
Cell Phone	Black	Flat	High	Glass	20.4 cm	Medium
Soda Can	Green	Round	Medium	Aluminum	19.8 cm	High

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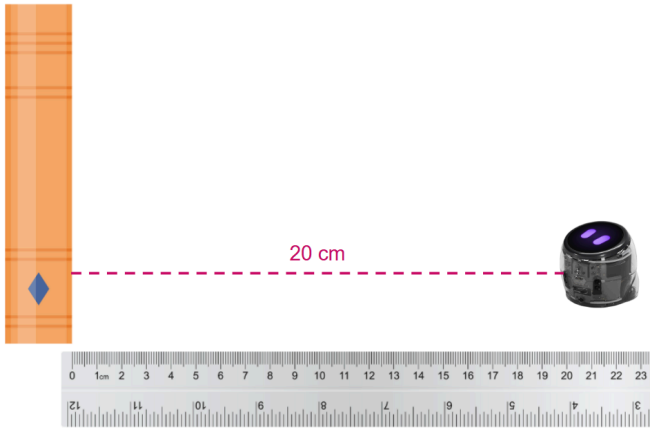
Activity 2

For the second activity, you will use Ari's Time-of-flight sensor to test how well each object can "stealth" from Ari. Objects that are better at "stealth" will tend to have inaccurate distance readings so that is the number we will look at to determine what materials are better at stealth.

- ☐ Calibrate Ari by placing a ruler on a flat surface and placing Ari 20 cm away from 0 cm, as shown in the image.
- ☐ Place an object at the 0 cm line. This object should be something that you aren't testing and should be flat and light in color.
- ☐ Turn on Ari's distance app and verify the distance is 20 cm. Adjust Ari until the distance reading shows 20 cm.



- ☐ While keeping Ari fixed in place, test the first object on your list. Record the **distance** reading.
- ☐ In the **Stability** column, note if the distance reading jumps around. A highly stable reading that doesn't change implies a surface that is better at reflecting, and a reading that fluctuates (ex. → 20.2, 19.7, 20.3, 20.1, etc.) implies a surface that is better at stealth.

  Mark this column as "high" (fluctuates more than 1 cm), "medium" (fluctuates 0.5 - 1 cm), or "low" (fluctuates less than 1 cm).

- ☐ Repeat the previous 2 steps for your other objects.
- ☐ Look through your data. What conclusions can you draw from your results?

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Exit Ticket

Please answer the following prompt.
Remember to include your **name** and **date** on this paper!

1. An aerospace manufacturer is trying to design a new type of stealth aircraft and has hired you as a consultant. Based on the data from your experiment, what properties would you suggest the new aircraft have?

   Answers will vary based on the objects tested. Students should identify materials that have a high **stability** and whose **distance** is close to 20.0 cm.

2. In today's activity, you used Ari's Time-of-flight sensor on flat surfaces. How do you think the activity would be different if we used angled surfaces like those commonly used in military aircraft?

   The readings from Ari's Time-of-flight sensor would be less accurate or might not even produce a reading. This is because light doesn't reflect directly back to the source of the Time-of-flight sensor when the surface the light hits it at an angle.