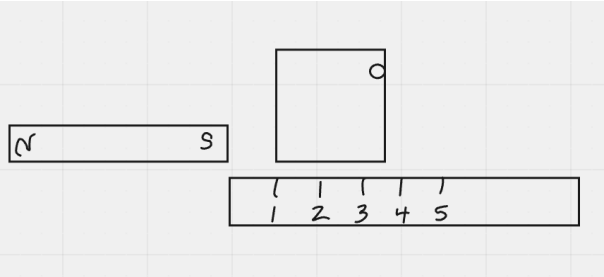
Strength of a Magnetic Field

Have you ever wondered how far away a magnetic field can be felt? Are all magnetic fields the same? In this activity, you will experiment with some different magnetic fields.

Supplies: Assorted magnets
Ruler
Databot
Copper wire
Nails
Batteries with leads attached

Part 1: Measuring the strength of a magnetic field.
[Video of Measuring Strength of a Magnetic Field]
Procedure:

1. Open Vizeey on your phone or computer.
2. Turn on a databot.
3. Choose Magnetometer
4. Select your databot - if there are multiple databots near you, yours will be in blue
5. Place a magnet and ruler near a databot as shown in the picture below:
   Begin with the databot 1 cm from the magnet.



6. Press the play button in the top menu bar.
7. Look at the top graph.
8. The exact value of the magnetic field will be varying quite a bit. That is okay. Pick a number that is near the middle of the numbers that you see. If the value is negative and that bugs you, turn the magnet around.
9. Record the number in the data table.
10. Move the databot so that it is 2 cm away from the magnet and record a value for the strength of the magnetic field at that distance.
11. Repeat until you start getting no change or negative numbers.
12. Repeat the entire experiment with two different magnets.

Distance	Magnetic Field Strength for a Bar Magnet	Magnetic Field strength for _____	Magnetic Field Strength for _____
1 cm			
2 cm			
3 cm			
4 cm			
5 cm			
6 cm			
7 cm			

Create a graph of your data:

1. Put the data from your data table into a Google Sheet
2. Highlight all of the data.
3. Go to the insert menu at the top of the screen and choose chart.
4. Most likely, it created a nice line graph. If no, you can adjust it using the panel at the right.
5. Insert a copy of your graph here.

Analysis Questions:

1. Do all magnets have the same strength? _____
2. Do all magnets have a magnetic field that extends the same distance from the magnet? _____

Part 2: Measuring the strength of an electromagnet

Click here for a video.

Procedure

1. Wrap 12 turns of copper wire around a nail. Try to wind them neatly so it looks like a spring. Keep a tail on the beginning and end of your spring. Sand the varnish off the wire with steel wool or sandpaper.
2. If your databot has timed out, restart the magnetometer and press play.
3. Attach each tail to the ends of a battery or use the provided clips. If you are holding the ends to a battery, you will have to work quickly because the battery will get hot.
4. Place the head of the nail onto one of the small holes on the databot. Stop the databot and record the approximate y-axis value in the data table.
5. Get a new nail (because your nail might be becoming semi-permanently magnetized) and wrap 25 turns of copper wire around the nail.
6. Attach each tail to the ends of a battery, restart the databot and record the y-axis value.
7. Repeat with a new nail with 50 turns.

Number of turns	Approximate magnetic field strength

Analysis Question:

1. What happens when you double the number of turns on the electromagnet? _____