# Rotary Encoders & Human-Computer Interaction — Encoder Worksheet

**Class Demonstration: Prediction**

1. Turn on the LEGO MINDSTORMS EV3 device.
2. From within the LEGO MINDSTORMS EV3 brick, turn on the rotaryencoderdisplay.c program.
3. Select a target angle (from 0 to 360 degrees), and record this angle as your "Predicted Angle" in the table below.
4. Turn the encoder wheel to this predicted value, and record the angle on the Intelligent Brick as the "Computer Angle."
5. Collect data for ten target angles.



| Predicted Angle | Computer Angle |
|---|---|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

6. Select an angle from the table above where the predicted angle is close to 96 degrees. Write it in the table below.

| Predicted Angle | Computer Angle |
|---|---|
|  |  |

7. Compute the percent error using the equation.

$$percent\ error = \left| \frac{(predicted\ angle - computer\ angle)}{computer\ angle} \right| \times 100\%$$

8. Write your answer: _____
9. How do you think this percent error affects an actual engineering design?

_____

_____

**Discovery Phase**

1. Dissemble the computer ball mouse and draw what you see in the computer mouse in the box below. Identify and label the rotary encoder.

2. Reassemble the mouse.
3. Connect the mouse to a USB port on the laptop.
4. Turn on a web browser and go to the website http://www.fossiltoys.com/pixel-screen-ruler.html
5. This online ruler measures in units of pixel. Look at the ruler below, which measures in inches. Line up the mouse cord with the 0-inch mark on the ruler.

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |

66 inches
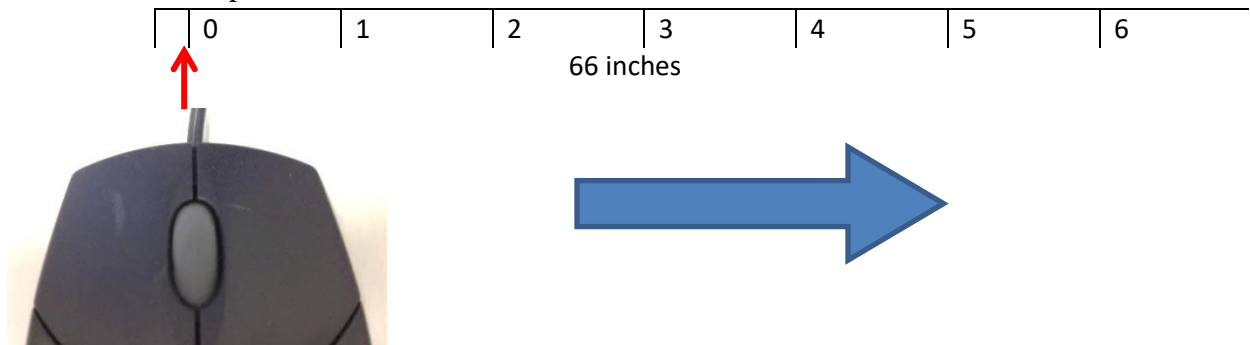
6.  Move the mouse cursor to the 0-pixel location on the laptop screen; if necessary, move the worksheet so that the mouse is still located at the 0-inch on the ruler above. This may require several rearrangements to ensure that the mouse is at the 0 mark on both the worksheet *and* the laptop screen.
7.  Slide your mouse to the right, to the 1-inch position. Record the number of corresponding pixels that the mouse cursor moved on the screen.
8.  Repeat step 7 for the rest of the positions, and record the data in the table below.

| Inches | Pixel |
|:---:|:---:|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

9.  Graph the data in the box below. (Pixels vs. Inches). Be sure to label your x- and y-axes.