

Percent Error Student Guide

Scenario:



You and your partner are part of a team of engineers who will be using Sphero for an exploratory mission.

Often, on teams like this, engineers break into smaller teams to solve a particular problem.

Your team's job is to determine the most accurate settings for the Sphero robot to:

1. Travel a measured distance.
2. Travel in a straight line state.

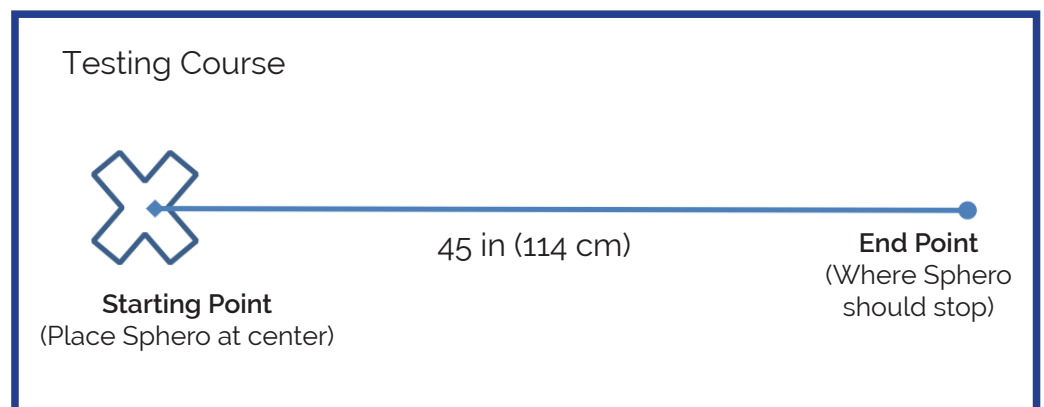
You must track and document your progress as you reduce your robot's percent of error when completing its task and improve its accuracy.

You will need to:

- Create a testing course.
- Create the sample Macro.
- Make adjustments to the delay and speed variables of your program.
- Conduct tests.
- Track your results.
- Calculate the percentage of error for each attempt.
- Create a graph that shows your progress.

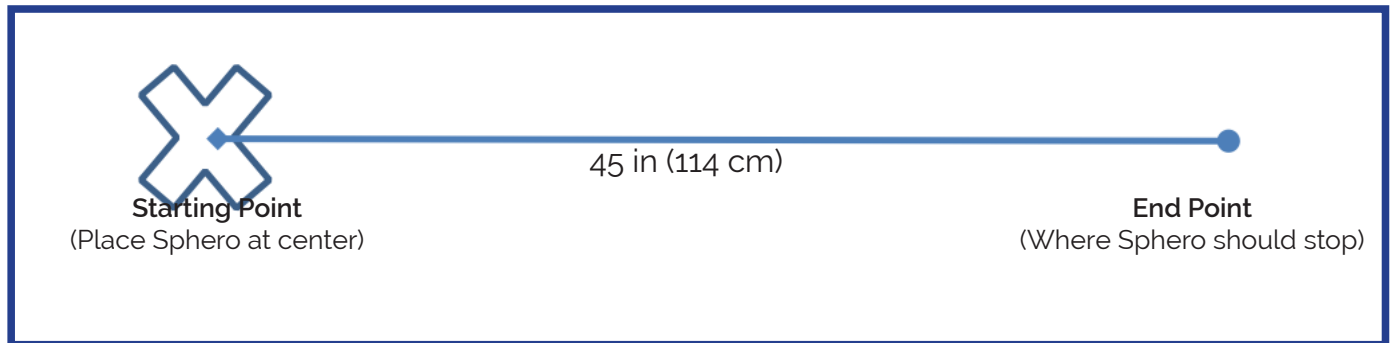
Materials needed:

- 1 Sphero
- Measuring tape
- Electrical or masking tape
- Sample Program

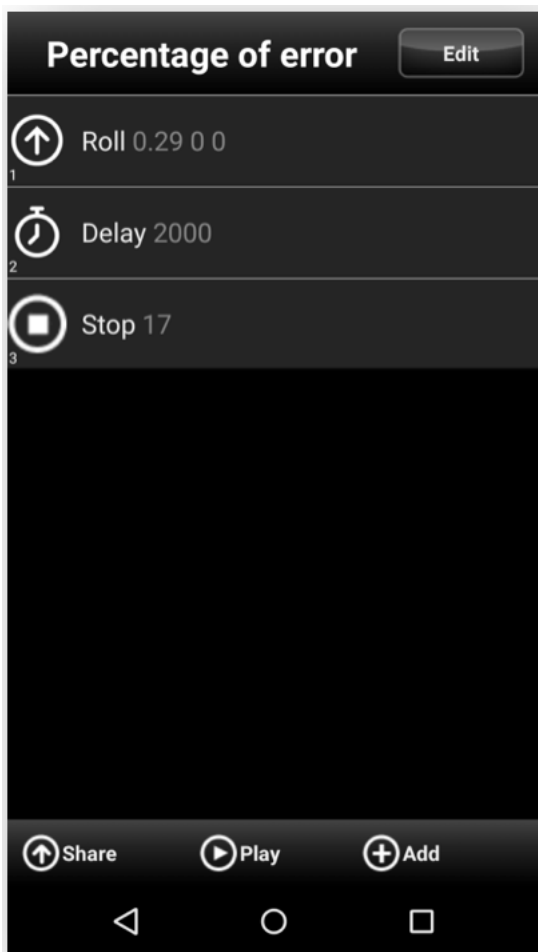


STEP 1: Set up your testing course and determine the initial Percent Error.

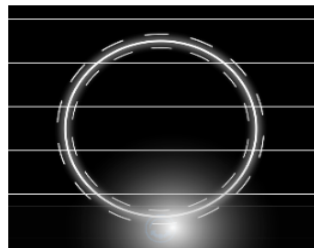
1. Use your electrical tape (or masking tape) to mark an "X" on a flat surface.
Tap Sphero to wake it up and set it at the center of the "X".



2. Create and open the Macro shown below.



NOTE: Remember that Sphero's heading is relative to the user. Each time Sphero is turned on, the heading light needs to be "aimed" to set the direction that will be used for a heading of 0 degrees.



3. Run the Macro on your Sphero and document what happens in the table on the **Trial Tracking Table**.

Trial	Variable Settings	Desired Distance Traveled	Actual Distance Traveled	Percent Error
1	Delay Speed:	45 in (114 cm)		

4. Calculate the percent error for the Sample Macro using the following steps. This process will be completed again each time you make an adjustment to the Macro.

It is a good idea to perform at least three trials for each adjustment made.

Process:

- Set Sphero on the intersection of the starting point you marked with masking or electrical tape.
- Run the Macro.
- Use a ruler or measuring tape to measure the distance Sphero travelled, from the intersection of the starting point, to the point where Sphero stops rolling.
- Subtract that distance from the distance you wanted the Sphero to travel (45 in or 114 cm).
- Use the formula (shown below) to calculate the percent error.

What is percent error?

In engineering, it is important to test a solution many times to see if it solves the problem, shows the solution has the potential to solve the problem, makes no difference, or in some situations, makes the problem worse.

Percent error can be used to make this determination by comparing what you hope the solution will achieve (estimated value) with what the solution actually achieves (actual value).

Percent error is the difference between an estimated value and an actual value. It is represented as a percentage of the actual value.

$$\text{Percent error} = \frac{(\text{Actual}-\text{Estimate})}{\text{Actual}} \times 100$$