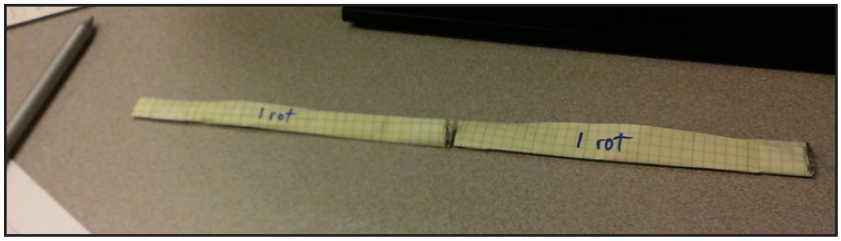
Scaffolding Tool One-Rotation Prop (Straight)

A physical "one rotation" prop can help students think about the relationship between distance traveled and wheel rotations used to get there.



Shown at left: *How far the robot would go in 2 rotations, made by combining two 1-rotation props.*

Another use: To travel the distance shown, you should use 2 rotations.

Use this tool when a student would benefit from:

1. **A concrete manipulative representing the distance-rotations relationship**
2. **Constructing a mechanistic representation of distances**
3. **A prop for use in a "building up" strategy for distances longer than one rotation (make several copies of the prop)**

I. Students make the prop!

1. Have students program the robot to move for one rotation
2. Run the program on top of, or alongside, a piece of paper
3. Mark the starting and ending points of the movement, on the paper, using a pen
4. Fold or cut the paper so it ends at the marks – the sheet should now be the length of "one rotation". Tape it so it holds that shape.
5. **Label the prop:** 1 rotation straight (or, 1 rot)

II. Tips for using the prop

1. Choose a "reference point" on the robot, such as the point where the wheel touches the ground, and always measure to and from that point
2. Having students make the prop themselves may help them understand the relationship between wheel rotations and distance traveled
3. The prop only applies to the robot it was made from – not all robots go the same distance in one rotation; seeing this may help students understand the relationship

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III. Math Reasoning Activity Using the Prop

What is the relationship between the one-rotation prop and a "standard" unit of length such as a millimeter or an inch?

1. Students build the prop as described above
2. How long is the one-rotation prop? Measure it using a ruler!
   - 1 Rotation is _____ long (include units: inches or mm!)
3. Fill in the following table:

When I make the robot go...	*It travels (in inches or millimeters)...*
1 rotation	
2 rotations	
3 rotations	

4. How many inches/mm do you think the robot will go in 4 rotations?
   - Make your prediction! Explain how you calculated that distance.

4 rotations	**Your prediction:**	**in / mm**

   - Test the prediction by measuring the distance the robot goes. Does it match?

4 rotations	**Actual distance:**	**in / mm**

Standards Addressed (Act. III)

CCSS.Math.Content.4.MD.A.2
Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

See Also

Appendix A.2. *One-Rotation Angle Prop*
Lesson R3.1. *iKnowMation Measuring*