

## Student Directions for Lady Bug Revolution Introduction to Rotational Motion

**Learning Goals:** Students will determine

- The factors which affect angular velocity.
- The factors which affect velocity when spinning.
- How linear velocity is related to angular velocity.
- How to graph angular velocity, velocity and angle.

### Student Instructions

1. Under show graphs click on  $\theta$ ,  $\omega$ ,  $v$
2. Experiment with changing to location of the ladybug and beetle on the wheel. Watch the angular velocity. What do you think angular velocity is?
3. How does position relative to the center of the wheel affect the angular velocity?
4. Experiment with changing to location of the ladybug and beetle on the wheel. How does position relative to the center of the wheel affect the velocity?
5. What other factors affect the velocity of the bugs?
6. Determine a mathematical relationship between velocity and all factors that affect it.
7. Using the relationship determined above, write a problem to determine velocity of a bug. Use the ruler feature and other information from the simulation to test and solve your problem. Show all steps.
8. Did your mathematical relationship describing velocity prove correct? Explain how you know.
9. Under show graphs click on  $\theta$ ,  $\omega$ ,  $\alpha$
10. Set the ladybug to undergo angular acceleration. Describe the ladybug's motion. What does angular acceleration mean? Turn on the acceleration vectors. What direction is the angular acceleration? Explain why this direction makes sense.
11. Predict what the graphs of angle vs time, angular velocity vs time and angular acceleration vs time would look like for a ladybug undergoing angular acceleration.
12. Use the simulation to check your predictions.
13. Explain why your predictions made sense or how you fixed them to make sense.
14. Use the simulation to determine what the angular acceleration of the ladybug depends on. Describe the relationships. (directly proportional, inversely proportional, etc.)
15. Describe how to achieve the greatest angular acceleration for the lady bug.