

Lady Bug Revolution Activity

Name _____

Date _____

Period _____

Instructions: Go to http://phet.colorado.edu/simulations/sims.php?sim=Ladybug_Revolution and launch the app found there. (You could also search for “Ladybug Revolution” to find the app.) Be sure to answer all parts of each question, answer questions marked “C.S.” in complete sentences, and show all work for calculations. Box your answers, include units, and write neatly.

1. Use your notes, the book, or the internet to define angular (aka rotational) velocity. (C.S.)
2. Under show graphs click on θ , ω , v . Click the minimize button on the θ graph. Type 180 in for angular velocity and click “go”. This will make the turntable turn at a rate of 180° per second. Look at the vector arrows coming from the ladybug. A) What direction is her centripetal acceleration? B) What direction is her tangential velocity?
3. 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 angular velocity? (C.S.)
4. Click on the ruler box at the bottom left of the screen. A) How long is the ruler? (Always include units!) B) How wide is each band of color on the turntable?
5. Place the ladybug a known distance from the axis (center) of the turntable. A) Record the ladybug’s tangential velocity as V_L . (This is simply referred to as velocity on this simulation, and it is written in green on the velocity graph.) Place the beetle twice as far from the axis. B) Record the beetle’s tangential velocity as V_{B1} . C) Move the beetle three times as far from the axis. C) Record the beetle’s tangential velocity as V_{B2} . D) Explain how the radius (distance from the axis of the turntable) affects the tangential velocity? (C.S.)
6. A) Record both bugs’ tangential velocities. Double the angular velocity to $360^\circ/s$ and record the new tangential velocities. How does doubling the angular velocity affect the velocity of the bugs? (C.S.)
7. Since the angular velocity is currently $360^\circ/s$, the period T is 1 rotation/s. A) Using $v = 2\pi r/T$, calculate the tangential velocity the beetle would have if you moved him to the edge of the turntable (a radius of 4 m from the axis). B) Move the beetle to $r = 4$ m and record his tangential velocity.
8. If the huge beetle has a mass of 8.0 kg, find his centripetal acceleration a_c . D) What is the average centripetal force F_c on the beetle?
9. If the ladybug has a mass of 6.0 kg and is at a distance $r = 1$ m, find her A) velocity, B) centripetal acceleration, and C) centripetal force.