
Worksheet: Angular Momentum

1. Two matching space stations of mass m are tethered by a cable to be a distance $d_1 = 800$ m apart. They rotate about their mutual center of mass with a period of $T_1 = 40.0$ s.
 - a. What is the moment of inertia I_1 of the pair of space stations? Express in terms of m and their radius of rotation r_1 . Treat them as point masses.

 - b. What is their angular speed ω_1 ? Express in terms of T_1 .

 - c. What is their angular momentum L_1 ? Express in terms of I_1 and ω_1 .

 - d. What is their kinetic energy K_1 ? Express in terms of I_1 and ω_1 .

2. The tether connecting the space stations of question 1 is shortened to $4/5$ of its initial length, 640 m.
 - a. What is the new radius of rotation r_2 of the space stations? Express in terms of r_1 .

 - b. What is the new moment of inertia I_2 of the pair? Express in terms of I_1 . Treat them as point masses.

 - c. What is their new angular momentum L_2 ? Express in terms of L_1 .

 - d. What is their new angular speed ω_2 ? Express in terms of ω_1 .

 - e. What is their new kinetic energy K_2 ? Express in terms of K_1 .