

Name _____

Favorite type of dog/cat _____

Show your work, and circle your answers and use sig figs to receive full credit.

I (about centers): cylinder = $\frac{1}{2}mr^2$, ring/point = mr^2 , sphere = $\frac{2}{5}mr^2$, rod = $\frac{1}{12}mL^2$ (= $\frac{1}{3}mL^2$ about end)

1-3: A 13.0 g, 0.0150 m radius unique circular solid with a moment of inertia given by $\frac{3}{11}mr^2$, rolls down an incline that is 1.20 m long, and loses 0.0840 m of elevation.

1a. Set up the appropriate dynamics equation, substitute for α , and for I , and solve for a . Show your steps below. Give an exact answer.

1b. Substitute values into your expression and calculate the acceleration of the marble as it rolls down the incline.

1c. Use suvat to calculate the final velocity at the end of the incline.

2a. Set up the appropriate conservation of energy equation, substitute for ω , and for I , and solve for v . Show your steps below. Give an exact answer.

2b. Substitute values into your expression and calculate the final velocity of the marble at the bottom of the incline.

2c. Calculate the acceleration of the marble as it rolls down the incline using suvat.

3. An ice skater spinning at 2.80 rad/s reduces their moment of inertia from 22.5 kg m^2 to 9.10 kg m^2 . What is their final angular velocity?
4. A merry go round is spinning at 1.40 rot/s when its moment of inertia is 782 kg m^2 . If the people on it move to the outside changing the moment of inertia to 1790 kg m^2 , what is the new rotational velocity in rot/s?
5. A mass on the end of a 78.0 cm string (ring/point = mr^2) is going in a circle at 85 RPM. The mass is pulled inwards so the string is only 25.0 cm long. What is the new RPM of the mass? (hint - you can keep ω in RPM and the mass will cancel, so you don't need it)
6. A torque of 12.0 mN is exerted for 45.0 s on a flywheel with a moment of inertia of 452 kgm^2 . What is the resulting change in angular velocity? (Use $\Gamma \Delta t = I \Delta\omega$)
7. A 60.0 kg child is 2.40 m from the center of a 2.50 m radius merry go round that is a 170. kg cylinder. If the merry go round is spinning at 52.0 RPM and the child moves from 2.40 m from the center to 0.600 m from the center, what is the new angular velocity of the merry go round in RPMs?