1) An old record player rotates clockwise at 33 1/3 rpm (revolutions per minute).
   a) What is its angular velocity in rad/s?
   b) Find the period of a record that is rotating at 45 rpm.

2) To throw a curve ball, a pitcher gives the ball an initial angular speed of 36 rad/s. When the catcher
gloves the ball 0.6s later, its angular speed has decreased (due to air resistance) to 34 rad/s.
   (a) What was the ball’s angular acceleration, assuming it to be constant.
   (b) How many revolutions did the ball make before being caught?

3) Two identical twins ride on a merry-go-round, with twin A at a greater distance from the axis of rotation
   than twin B. Which is the most accurate statement?
   a) The angular speed of twin A is greater than the angular speed of twin B.
   b) The angular speed of twin A is less than the angular speed of twin B.
   c) The angular speed of twin A is equal to the angular speed of twin B.
   d) Not enough information is given.

4) Two identical twins ride on a merry-go-round, with twin A at a greater distance from the axis of rotation
   than twin B. Which is the most accurate statement?
   a) The kinetic energy of twin A is greater than the kinetic energy of twin B.
   b) The kinetic energy of twin A is less than the kinetic energy of twin B.
   c) The kinetic energy of twin A is equal to the kinetic energy of twin B.
   d) Not enough information is given.

5) Yo-yo man releases a yo-yo from rest and allows it to drop, as he keeps the top end of the string
   stationary. The mass of the yo-yo is 0.056 kg, its moment of inertia is 2.9 x 10^{-5} kg m^2, and the radius, r,
of the axle the string wraps around is 0.0064 m. Neglect the mass of the string.
   What is the linear speed of the yo-yo after it has dropped through a height of 0.50m?

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6) Two helms-women, in disagreement about which way to turn a ship, exert the forces shown below on a ship’s wheel. The wheel has a radius of 0.74 m, and the two forces have the magnitudes $F_1 = 72$ N and $F_2 = 58$ N. Find (a) the torque caused by $F_1$ and (b) the torque caused by $F_2$. (c) In which direction does the wheel turn as a result of these two forces?

7) A person holds his outstretched arm at rest in a horizontal position. The mass of the arm is $m$ and its length is 0.740 m. When the person releases his arm, allowing it to drop freely, it begins to rotate about the shoulder joint. Find (a) the initial angular acceleration of the arm and (b) the initial linear acceleration of the man’s hand. Assume the arm is a uniform rod, with the axis at one end.

8) A child of mass $m$ is supported on a light plank by his parents, who exert forces $F_1$ and $F_2$ as indicated. Find the forces required to keep the plank in static equilibrium. Use the right end of the plank as the axis of rotation.

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9) A hiker who has broken her forearm rigs a temporary sling using a cord stretching from her shoulder to her hand. The cord holds the forearm level and makes an angle of 40.0 degrees with the horizontal where it attaches to the hand. Considering the forearm and hand to be uniform, with a total mass of 1.31 kg and a length of 0.300 m, find (a) the tension in the cord and (b) the horizontal and vertical components of the force, \( f \), exerted by the humerus (the bone of the upper arm) on the radius and ulna (the bones of the forearm.)

10) An ice skater pulls in her arms, decreasing her moment of inertia by a factor of two. Is her final kinetic energy (a) equal to, (b) greater than, or (c) less than her initial kinetic energy?

11) For a classroom demonstration, a student sits on a piano stool holding a sizable mass in each hand. Initially, the student holds his arms outstretched and spins about the axis of the stool at a rate of 25 rpm. The moment of inertia in this case is 6.4 kg\(\cdot\)m\(^2\). While still spinning, the student pulls his arms in to his chest, reducing the moment of inertia to 1.6 kg\(\cdot\)m\(^2\). What is the student’s angular speed now?