# Example Problem

In an amusement park ride, passengers stand inside a 5.0-m diameter hollow steel cylinder with their backs against the wall. The cylinder begins to rotate about a vertical axis. Then the floor on which the passengers are standing suddenly drops away. If all goes well, the passengers will "stick" to the wall and not slide down. Clothing has a static coefficient of friction between 0.60 and 1.0 and a kinetic coefficient between 0.40 and 0.70. A sign at the entrance says "No children under 30 kg allowed." What is the minimum speed for which the ride is safe to ride?
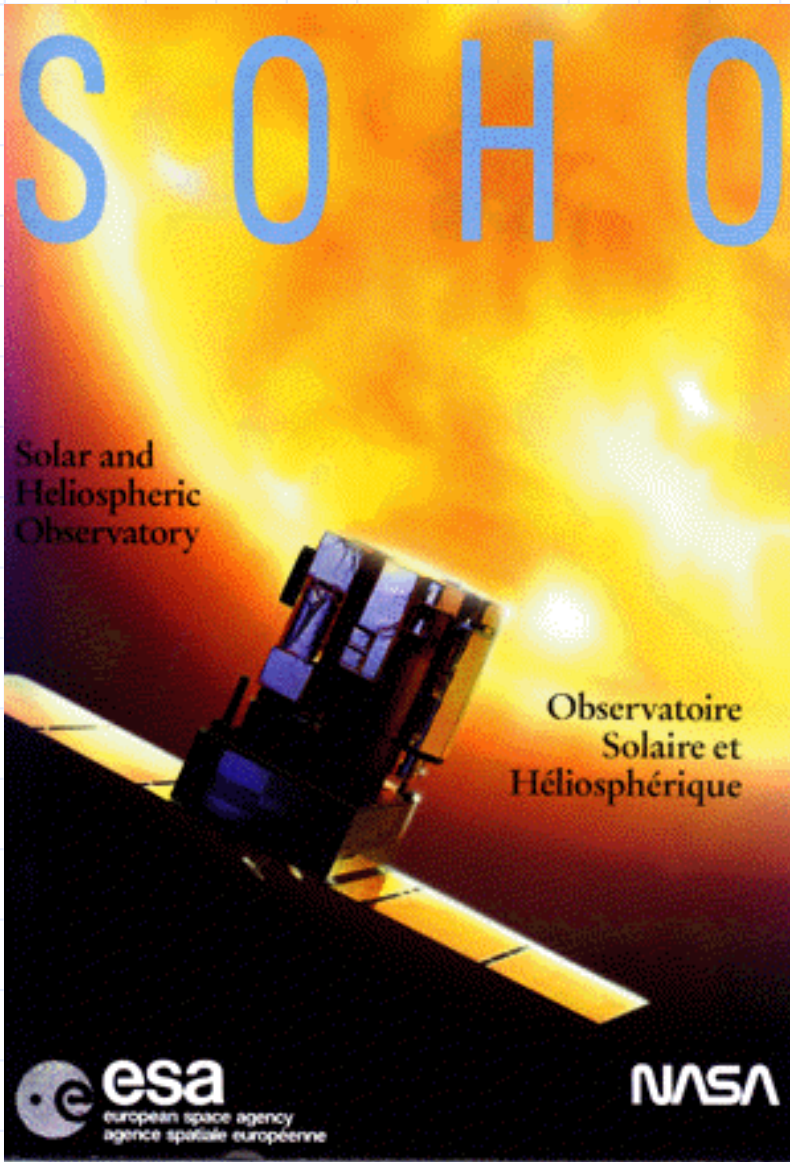
# Example Problem

- A student has 65-cm-long arms. What is the minimum angular velocity (in rpm) for swinging a bucket of water in a vertical circle without spilling any water? The distance from the handle to the bottom of the bucket is 35 cm.

# Kepler's Laws of Orbital Motion

- ◆ 1st Law - planets follow elliptical orbits with the Sun at one focus of the ellipse
- ◆ 2nd Law - the radius vector from the Sun to the planet sweeps out equal areas in equal time
- ◆ 3rd Law - the orbital period of a planet is proportional to the radius to the 3/2 power (derived for circular orbit – just replace r by a)

# Example Problem

The Solar and Heliospheric Observatory (SOHO) spacecraft has a special orbit such that it always has a view of the Sun, but is close to the Earth. It moves in a nearly-circular orbit around the Sun that is smaller than the Earth's orbit. Its period is equal to 1 year! It is always located between the Sun and the Earth along a line joining them. Show that SOHO's distance from the Earth is between $1.47 \times 10^9$ m and $1.48 \times 10^9$ m. $M_S = 1.991 \times 10^{30}$ kg, $M_E = 5.983 \times 10^{24}$ kg, and $r_E = 1.496 \times 10^{11}$ m.

SOHO/CELIAS/CTOF          raw counts - PHA, DAY 96 150-199

SOHO was launched Feb. 14, 1996.

See: http://sohowww.nascom.nasa.gov/