56. This is a completely inelastic collision which we analyze using angular momentum conservation. Let m and v_0 be the mass and initial speed of the ball and R the radius of the merry-go-round. The initial angular momentum is

$$\vec{\ell}_0 = \vec{r}_0 \times \vec{p}_0 \quad \Longrightarrow \quad \ell_0 = R\,(mv_0)\sin 53^\circ$$

where 53° is the angle between the radius vector pointing to the child and the direction of $\vec{v}_0$. Thus, $\ell_0 = 19\,\mathrm{kg}\cdot\mathrm{m}^2/\mathrm{s}$. Now, with SI units understood,

$$\begin{aligned} \ell_0 &= L_f \\ 19 &= I\omega \\ &= \left(150 + (30)R^2 + (1.0)R^2\right)\omega \end{aligned}$$

so that $\omega = 0.070$ rad/s.