1. A girl with a mass of 25kg rides on a merry go round. The merry go round is a disc with a radius equal to 2.5m and a mass of 100kg. If the girl is riding on the edge, 2.5m from center, the angular speed of the merry go round is 1.25 radians per second. What will the angular speed be if she moves to the center of the merry go round, distance from the center zero.

$m = 25\,kg$ $r = 2.5\,m$ $M = 100\,kg$ $\omega_0 = 1.25\dfrac{rad}{s}$	*Solution.* Angular momentum of the system is conserved. The projection of the angular momentum into the vertical axis in the first case and in the second one: $L_0 = \left(I + mr^2\right)\omega_0$, $L_1 = \left(I + m\cdot 0^2\right)\omega_1$,
$\omega_1 - ?$	where $I = \dfrac{Mr^2}{2}$ is the moment of inertia of a uniform disc with a radius r and a mass m.

From the equality $\left(I + mr^2\right)\omega_0 = I\,\omega_1$ one can express new angular speed:

$$\omega_1 = \left(1 + \frac{mr^2}{I}\right)\omega_0, \quad \boxed{\omega_1 = \left(1 + \frac{2m}{M}\right)\omega_0}.$$

Let check the dimension: $[\omega_1] = \dfrac{rad}{s} = \dfrac{rad}{s}$.

Let evaluate the quantity: $\omega_1 = \left(1 + \dfrac{2\cdot 25}{100}\right)\cdot 1.25 = 1.875\left(\dfrac{rad}{s}\right)$.

Answer: $1.875\dfrac{rad}{s}$.