A torque of 500 Nm is applied to a fly wheel rotating at 200 rad/s. After 40 s its speed has doubled. What is the flywheel moment of inertia?

Newton's second law of motion adapted to describe the relation between torque and angular acceleration:

$$\tau = I\alpha$$

where τ – torque, I – moment of inertia, α – angular acceleration.

$$\alpha = \frac{\tau}{I}$$

The angular acceleration can be defined as:

$$\alpha = \frac{\Delta\omega}{\Delta t}$$

Therefore:

$$\frac{\Delta\omega}{\Delta t} = \frac{\tau}{I}$$

$$I = \frac{\tau}{\frac{\Delta\omega}{\Delta t}} = \frac{\tau\Delta t}{\Delta\omega} = \frac{500N * m * 40s}{200\frac{rad}{s}} = 100\ kg * m^2$$

Answer: $100\ kg * m^2$