Rotational Inertia Worksheet

As you work through the steps in the lab procedures, record your experimental values and the results in this worksheet. Use the exact values you record for your data to make later calculations.

Measurements

What is the mass of the wheel?

$M =$ _____

What is the radius of the wheel?

$R =$ _____

What is the calculated value of the moment of inertia of the wheel?

$I_{\text{calc}} =$ _____

What is the radius of the step pulley?

$r =$ _____

Complete the table below.

Data Table 1

Hanging Mass m (kg)	**Average Acceleration at the Rim of the Wheel a' (m/s^2)**	**Acceleration at the Step Pulley $a = a'(r/R)$ (m/s^2)**

CHECKPOINT 1: Table values

Procedure A: Linearization Method

What are the slope and y-intercept of the plot of acceleration versus hanging mass?

slope = _____

y-intercept = _____

What are the values of the moment of inertia and frictional torque as determined from the slope and intercept?

I_{slope} = _____

τ_f = _____

What is the percent difference between the calculated value of the moment of inertia and that obtained from the slope?

percent difference = _____%

CHECKPOINT 2: Graph and calculations

Procedure B: Exact Method

Using the values from the first and last trials in Data Table 1, determine the moment of inertia of the wheel and the frictional torque.

I_{exact} = _____

τ_f = _____

What is the percent difference between the calculated value of the moment of inertia and that obtained by the exact method?

percent difference = _____%

Which method is the most accurate?

CHECKPOINT 3: Calculations

Procedure C: Determining moment of inertia of the extension

Enter values for the extension of your choice.

Which extension did you add to your wheel?

What is the mass of the extension?

$m_{\text{extension}} =$ _____

Enter r_1 for the inner radius of the hoop, or a for the width of the rectangular plate.

Enter r_2 for the outer radius of the hoop, or b for the length of the rectangular plate.

What is the calculated value of the moment of inertia of the extension?

$I_{\text{ext,calc}} =$ _____

What is the expression for the total moment of inertia of the wheel and extension in terms of r, m, a, and τ_f?

$I_{\text{total}} =$ _____

Fill out the following information for your determination of the moment of inertia of the wheel with extension.

hanging mass	$m =$	_____
tangential acceleration of the wheel	$a' =$	_____
acceleration of the step pulley	$a =$	_____

What is the experimental value of total moment of inertia?

$I_{\text{total}} =$ _____

What is the experimental value of the moment of inertia of the extension? Use the value obtained from the exact method in procedure B for the moment of inertia of the wheel.

$I_{\text{extension}} =$ _____

What is the percent difference between the experimental value and the calculated value of $I_{\text{extension}}$?

percent difference for = _____%

CHECKPOINT 4: Extension calculations