**Similarities of Translational and Rotational Kinematics**

**Name and section number:**

**Partner’s name and section number:**

1. Sketch the forces acting on the masses and hanger and cart. Show your coordinate systems.

Cart, mc

φ

Masses and hanger, mh

Experimental set-up

2. Apply Newton’s Second Law to the diagrams above and solve for the translational acceleration as calculated by Newton, aN. Show your work.

3. Type the kinematical equations for x, θ, v, and ω. Also type the equations relating x and θ, v and ω, and a and α, given the “no-slip” condition that the string does not slip on the pulley.

4. Copy and paste your raw data here, with the data and data boxes legible.

a) b)

c) d)

5. Fill in this table. If you are rushed for time, at least fill the yellow boxes with your raw data.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| H [] | L [] | φ [] | mh [] | mc [] | S [] | n | r [] |
|   |   |   |   |   |   |   |   |
| aN [] | av [] | αω [] |  ax [] | αΘ []  |  | **Acceleration results** |
|   |   |   |   |   |  | Average: |  |
|  |  | aω [] |  | aΘ []  |  | Std Dev: |   |
|  |  |   |  |   |  | SD/Ave: |   |

6. *Individually* report your result for average acceleration in standard form. Comment on the equivalence of the different ways of determining acceleration in this experiment.

7. Use two pairs of acceleration results to find two alternative values for r. Find them. Compare them to the value measured by the string. Has the “no-slip” condition been met? Explain.