Physics: Coefficient of Friction

Paper citation: Hu A, Peachey B (2016). Redesigning an Experiment to Determine the Coefficient of Friction. J Emerging Investigators *76*: 1-5

Paper questions

In reading through the assigned papers, please answer the following questions:

1. What did you learn from reading the introduction?

   The introduction provides all of the relevant background information needed to understand the paper. In doing so, it also provides a range of references one can look up to learn more about a particular topic. Finally, the introduction states what question is being answered by the paper.

   In this paper, the introduction talks about the "old method" of calculating coefficients of kinetic friction. It also describes the flaws of that method, paving the road for the new method.

2. Starting with Newton's second law, derive the equation for the coefficient of kinetic friction as it is applicable to the "old method".

   $F_{pull} = F_\mu$

   $F_\mu = F_N\mu$

   $\mu = F_\mu/F_N$

3. What was the hypothesis being investigated by the researchers?

   The authors predicted that the standard of deviation for μ calculated using the new method would be lower than the standard deviation from the old method.

4. Do the results match the hypothesis which was first presented by the authors?

    Yes, the authors report much lower standards of deviation when using the new method.

5. Propose two follow-up experiments that could be performed given the data presented in this paper.

    Since μ is independent of mass, this experiment could be repeated with different masses. To avoid the issue of having to give the block a push to start going, a larger θ could be used so that the block starts sliding on its own.

6. In this experimental set-up, what would happen if you changed the angle θ? Would you expect get a different coefficient of friction? Why or why not?

    The calculated μ should not change as the angle changes. This would be another good follow-up to make sure μ remains consistent for a range of angles.

7. What are some shortcomings of this paper?

    It might be hard to achieve consistent sanded-ness for the sanded surface.

8. Could this method be used to experimentally determine a coefficient of static friction? Why or why not?

    No, the way the system and equations are set up, it only works for kinetic friction. For static friction, one could change the angle of the ramp until the block starts moving from rest.