Scenario
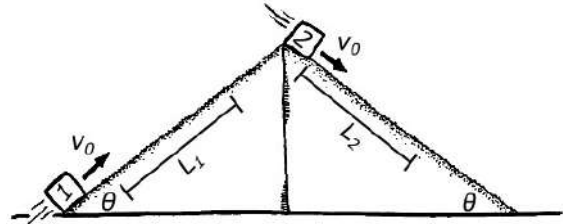
Two identical tracks having significant friction are shown in the diagram. Identical Blocks 1 and 2 are each set on the leftmost part of one of the tracks and given an initial speed v_0. Block 1 goes up its track and Block 2 goes down its track, as shown. Block 1 comes to a stop after traveling a length L_1 and Block 2 travels a distance L_2 before coming to rest.

Data Analysis

PART A: i. Predict: If students performed this experiment, which block would travel farther on its track before coming to rest?

_____ L_1 _____ L_2

Explain your prediction, reasoning in terms of energy transformations.

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ii. Through experimentation, students measure values for L_1 and L_2, shown in the table.

Do the results of the experiment agree with the predictions made in Part A?

_____ Yes   _____ No

Explain your reasoning.

L_1 (m)	L_2 (m)
0.77	2.87
0.79	2.95
11.84	3.25
0.79	2.91
0.81	3.02
AVERAGE 3.0	**AVERAGE 3.0**

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Quantitative Reasoning

PART B: Suppose that the coefficient of kinetic friction in both cases is μ, each block has a mass m, and both incline angles are θ. Derive equations for the following in terms of v_0, m, μ, θ, and g. Identify whether you are using force and motion principles or conservation of energy principles in your derivation.

i. The length L_1

ii. The length L_2

PART C: Explain how your answers for Part B support the results obtained by experiment.

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