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Physics: Analysis of Scientific Data

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As part of scientific publication, scientists must analyze the data they collect. Often, there are multiple ways to analyze a dataset, and scientists must choose the most appropriate means to conduct an analysis given their experimental design and circumstances of data collection.

In the paper **"Redesigning an Experiment to Determine the Coefficient of Friction",** the authors calculate coefficients of kinetic friction from a new experimental setup. By looking at their set-up and using their raw, collected numbers, we can independently verify their results.

1. Start by first deriving a formula which relates μ (the coefficient of kinetic friction) to any variable which can be measured (D, H_1, H_2, and L).

2. Using your new equation, calculate μ for all cases below. You may use a computer or calculator to make these calculations faster.

Trial	Distance Smooth (cm)	μ Smooth	Distance Rough (cm)	μ Rough	Distance Sanded (cm)	μ Sanded
1	50.5		34.3		26.7	
2	47.6		32.4		18.1	
3	46.7		34.5		24.5	
4	51		32.7		33.7	
5	47		34.6		17.78	
6	45.6		36.8		28.4	
7	48.9		32.9		35.6	
8	45.7		35.9		36.8	
9	46.5		35.7		20.5	
10	46.8		31.4		31.1	
11	46.2		33.7		33	
12	47.3		34.3		37	
13	45.6		34.6		40	
14	49.8		30.5		36.6	
15	49.5		34.9		34.6	
16	46.7		37.8		28.9	
17	52.5		24.1		34.9	
18	51.9		27.3		29.5	
19	47.3		34.3		29.5	
20	48.9		29.8		29.8	

3. Calculate three averages and standards of deviation for the μ values you found above. If the numbers don't match those reported by the authors, think of some reasons why this might be.