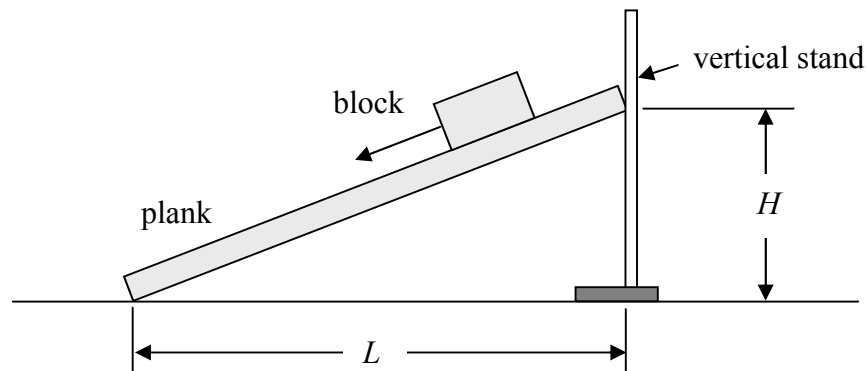# Friction

Have you done the Pre-Lab assignment? If not, you must do so in order to understand the theory behind this experiment.

You need
- hooked wooden block (one side with sandpaper)
- long wooden plank with pulley
- vertical stand with clamp
- string
- electronic balance
- mass hanger
- slotted masses
- meterstick

Part I

Place the wooden block (bare side down) on the plank and raise one end. Tap the block lightly to see if it begins to move. Continue to raise the end of the plank and tap the block until the block slides down the length of the plank at constant speed. Clamp the high end of the plank to the vertical stand and take your measurements.

Height $H =$ _____ meter

Length $L =$ _____ meter

Systematic error in using meterstick = _____ meter

Coefficient of kinetic friction (wood on wood) = _____ (no unit)

Propagated error in coefficient (wood on wood) = _____ (no unit)

Turn the block over (sandpaper side down) and repeat the procedure:
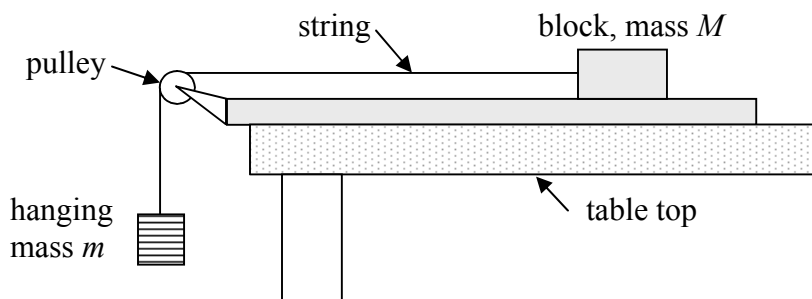
Height $H =$ _____ meter

Length $L =$ _____ meter

Coefficient of kinetic friction (sandpaper on wood) = _____ (no unit)

Propagated error in coefficient (sandpaper on wood) = _____ (no unit)

Part II

Place the wooden block (bare side down) on the plank. Connect a string from the block to the mass hanger over the pulley. Tap the block lightly to see whether it slides at constant speed. If not, add slotted masses to the mass hanger until the block slides along the length of the plank at constant speed. Record the total hanging mass (includes mass of the hanger). Then add 200 grams, 300 grams, 400 grams, 500 grams to the top of the block and repeat this procedure.

Mass of hanger = _____ grams   Mass of block = _____ grams

Extra mass on block   Extra mass on hanger

        0   _____ grams

    200 grams   _____ grams

    300 grams   _____ grams

    400 grams   _____ grams

    500 grams   _____ grams

Note:
Total hanging mass m = (mass of hanger) + (extra mass)
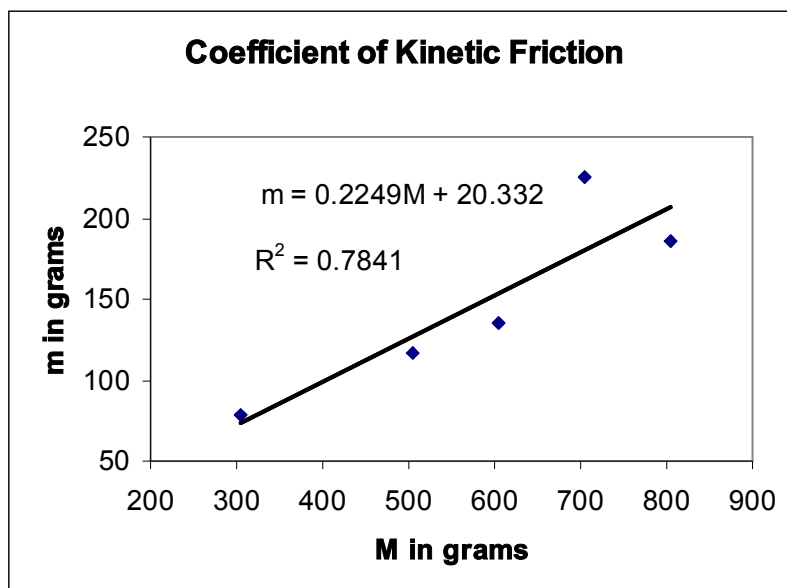Total mass of block M = (mass of block) + (extra mass)

Use Excel to make an XY plot with M as the x coordinate, m as the y coordinate. Add a Trendline (linear fit). Your plot should resemble the one shown on the next page.

From your graph:
Coefficient of kinetic friction (wood on wood) = _____ (no unit)

Error in the coefficient (from R^2 value) = _____ (no unit)

Does your value for the coefficient of kinetic friction obtain in Part I agree with the coefficient obtained in Part II? Answer this question in the Conclusion section of your final report.

Coefficient of Kinetic Friction

$m = 0.2249M + 20.332$

$R^2 = 0.7841$

(y-axis: m in grams, from 50 to 250)

(x-axis: M in grams, from 200 to 900)

Turn the block over (sandpaper side down) and repeat the procedure:

Extra mass on block	Extra mass on hanger
0	_____ grams
200 grams	_____ grams
300 grams	_____ grams
400 grams	_____ grams
500 grams	_____ grams

From your graph:

Coefficient of kinetic friction (sandpaper on wood) = _____ (no unit)

Error in the coefficient (from R^2 value) = _____ (no unit)

Does your value for the coefficient of kinetic friction obtain in Part I agree with the coefficient obtained in Part II? Answer this question in the Conclusion section of your final report.

Describe three different improvements that could be made in the procedure and/or the equipment used in this experiment. Write these up in the Conclusion section of your final report.

IMPORTANT – PLEASE READ:
- **Each group must have their raw data signed by the lab instructor before leaving the lab today.**

- **Each group is required to submit a formal lab report for this experiment. You must follow the format discussed on the Laboratory page of the course website.**