

SCIENCE

FRICTION

“Hard to live with, can’t live without”



Homework

Direction: On a sheet of size 2 paper, answer the following questions completely. Use GRESA and express your final answers to two decimal places. Justify your answer.

You press the book between your hands. The force that you exert on the front and back covers of the book is perpendicular to the book. The book weighs 31 N . The coefficient of static friction between your hands and the book is 0.40 . To keep the book from falling, what is the magnitude of the minimum pressing force that each hand must exert?

Homework

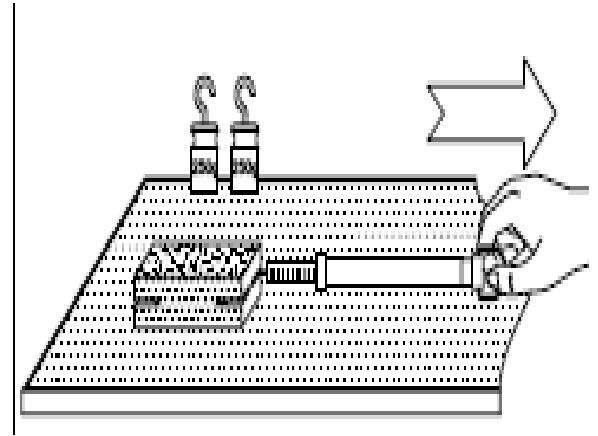
Direction: On a sheet of size 2 paper, answer the following questions completely. Use GRESA and express your final answers to two decimal places. Justify your answer.

Critical Thinking. You push a 13-kg table in the cafeteria with a horizontal force of 20 N, but it does not move. You then push it with a horizontal force of 25 N, and it accelerates at 0.26 m/s^2 . What, if anything can you conclude about the coefficients of static and kinetic friction?

EXPERIMENT A

- Weight and Friction

Analysis: Weight influences friction. The greater is the weight, the higher is the friction force.

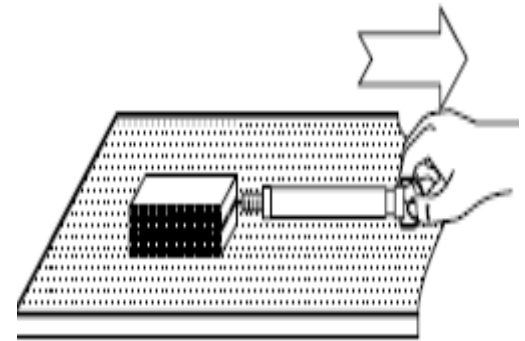


Trial	Weight (N)	Friction (N)
1	2.90	1.00
2	4.00	1.40
3	5.90	2.00

EXPERIMENT B

- Surfaces in contact and Friction

Analysis: Type of material influences friction. Rubber on vinyl has greater friction than wood on vinyl.

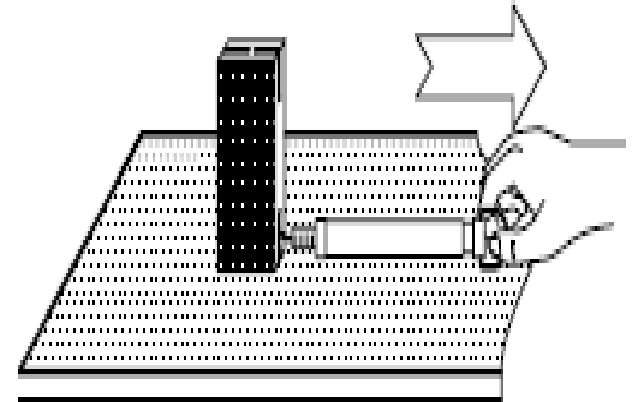


Trial	Surfaces	Friction (N)
1	Vinyl on wood	1.00
2	Vinyl on rubber	3.00

EXPERIMENT C

- Size of Contact Area and Friction

Analysis: Surface area does not influence friction. There is no difference in the magnitude of friction force.

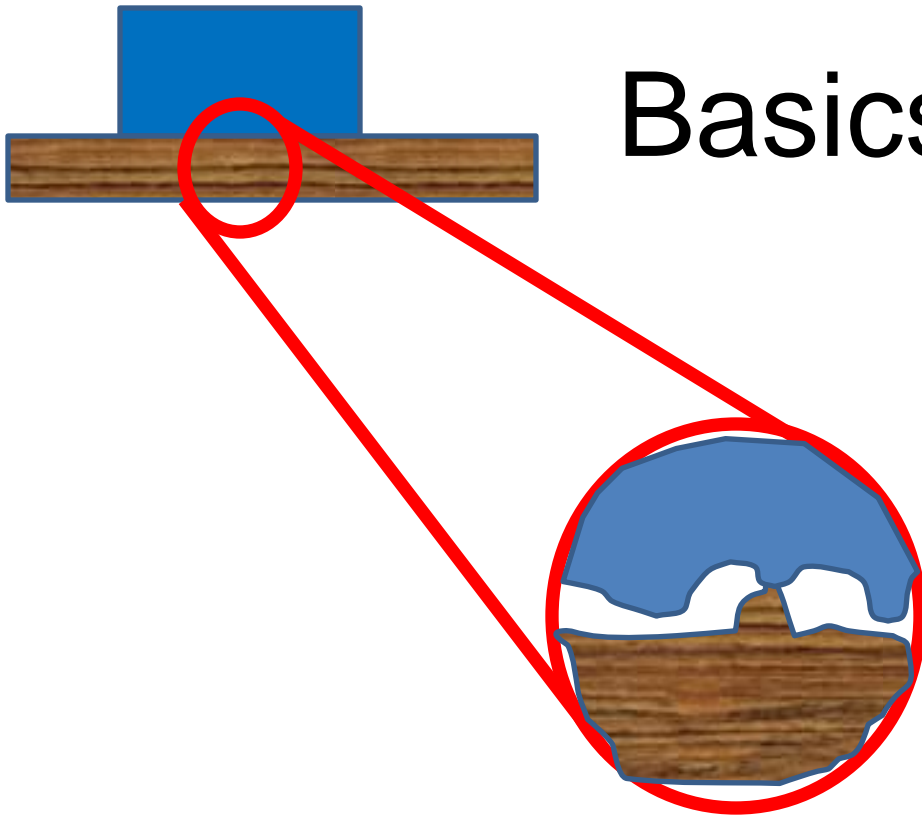


Trial	Surfaces	Friction (N)
1	large	1.00
2	small	1.00

Objectives

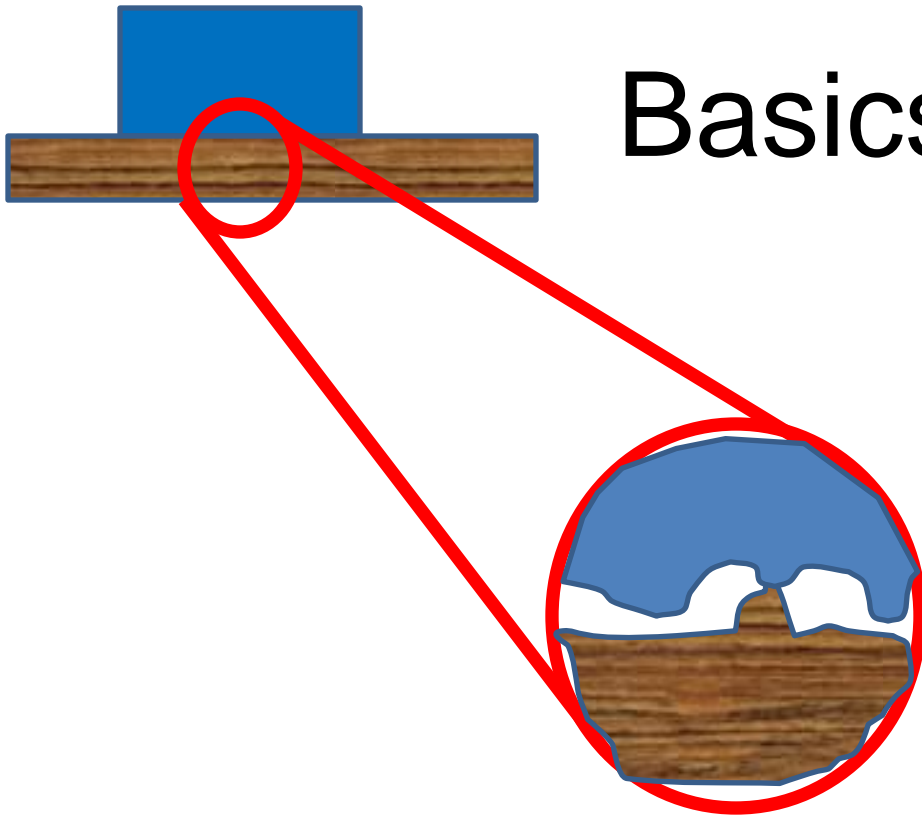
- differentiate static friction force from kinetic friction force;
- compare coefficients of static friction and kinetic friction;
- state the mathematical expression for kinetic friction and static friction; and
- solve problems involving frictional forces.

Basics of Friction



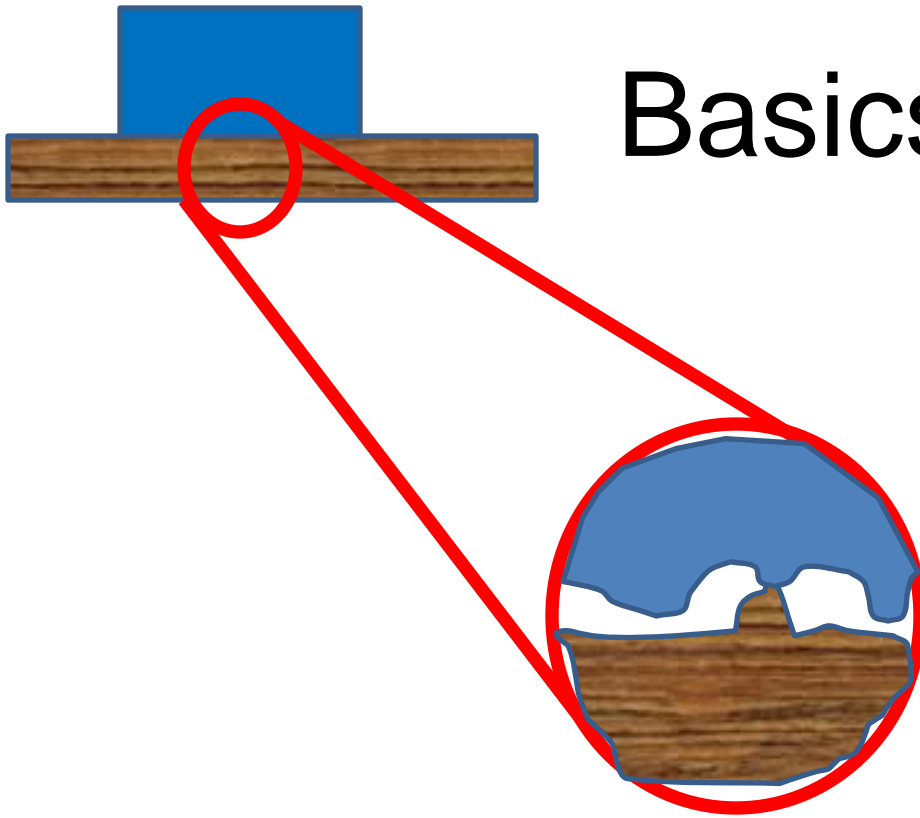
Friction is the force acting between the surface atoms of two bodies in contact.

Basics of Friction



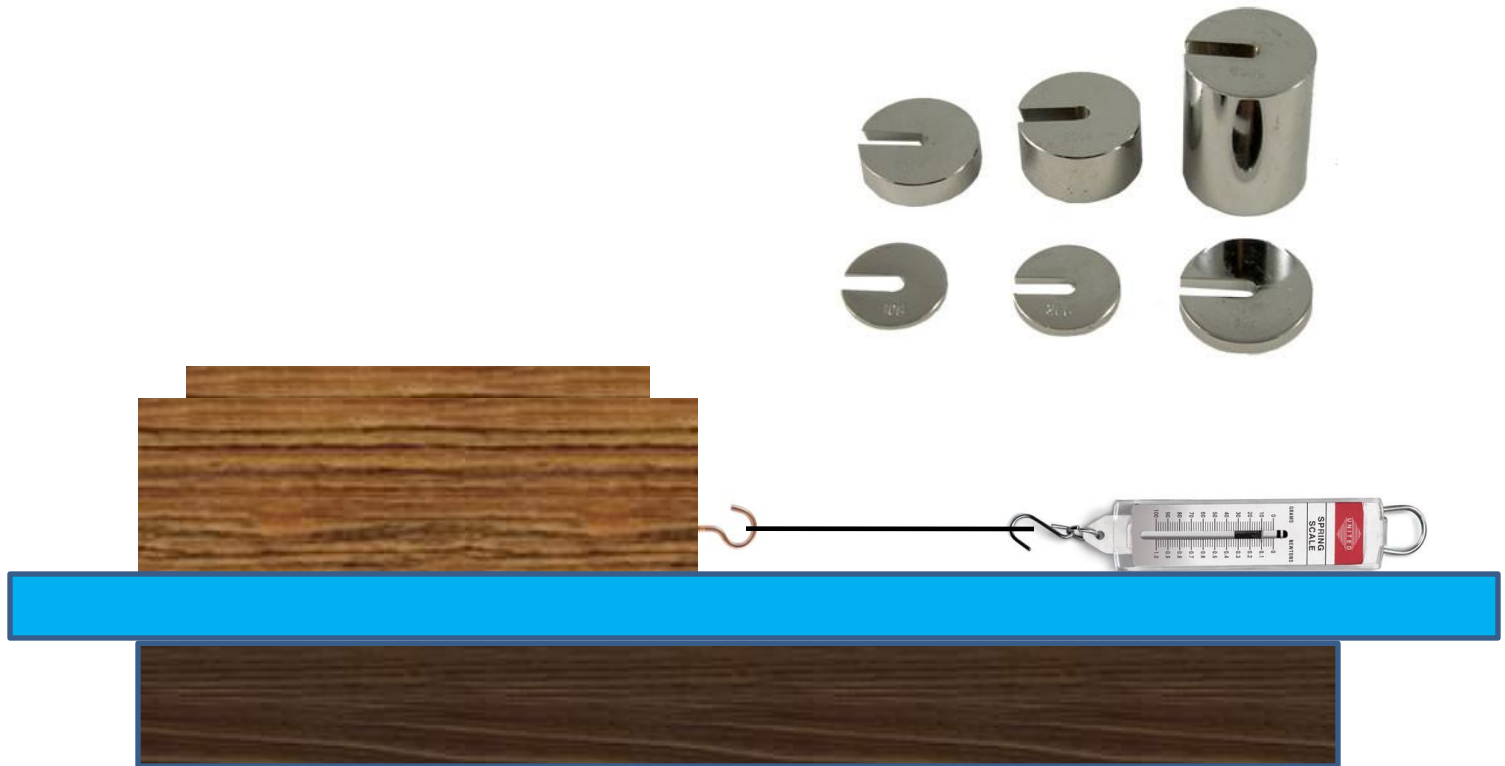
When two surfaces are placed together, only the high points touch each other (cold welding)

Basics of Friction



When pulled across each other, tearing of welds (breakaway) occurs and eventually, jerky motion (stick-slip) is produced.

STATIC FRICTION



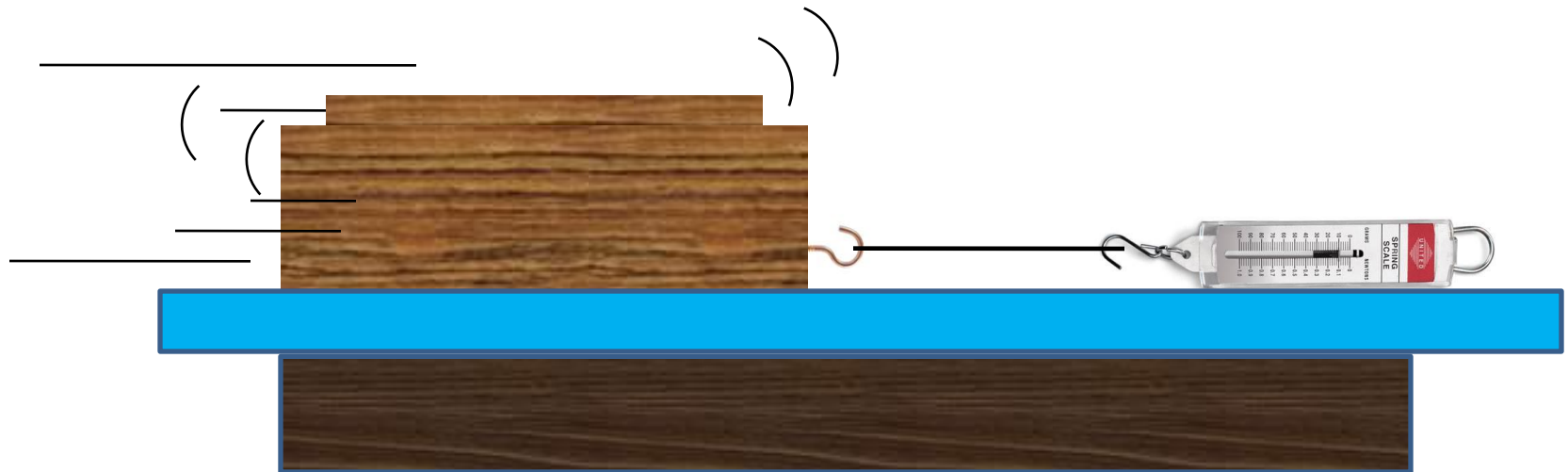
COEFFICIENT OF FRICTION

The ratio of friction to the normal force is equal to coefficient of friction, “*mu*” (μ)

$$\mu = F_f / F_N$$

Materials	μ_s
rubber on dry concrete	0.80
rubber on wet concrete	0.60
wood on wood	0.50
steel on steel (dry)	0.78
steel on steel (wet)	0.15

KINETIC FRICTION



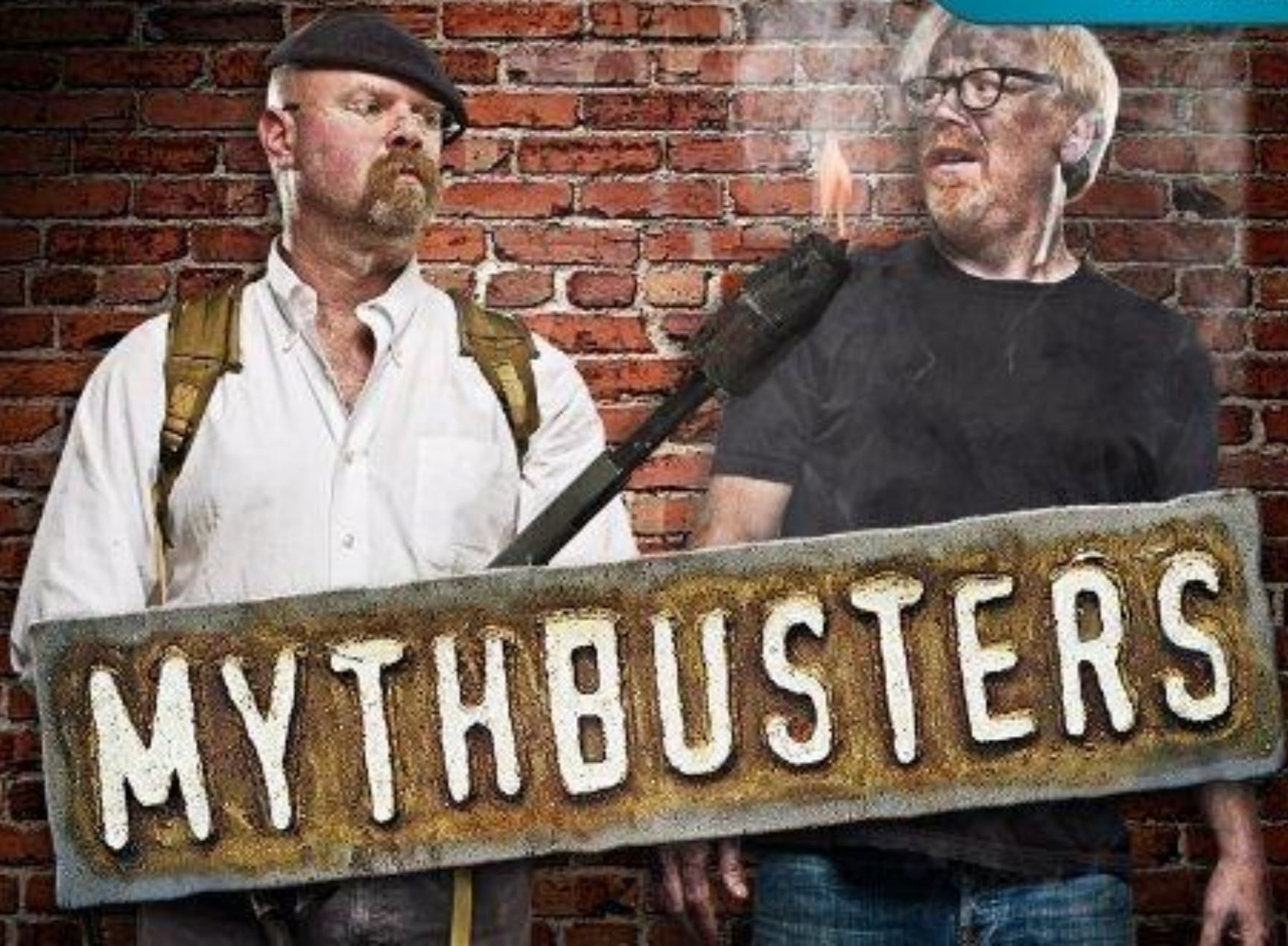
COEFFICIENT OF FRICTION

The ratio of friction to the normal force is equal to coefficient of friction, “ μ ” (μ)

$$\mu = F_f / F_N$$

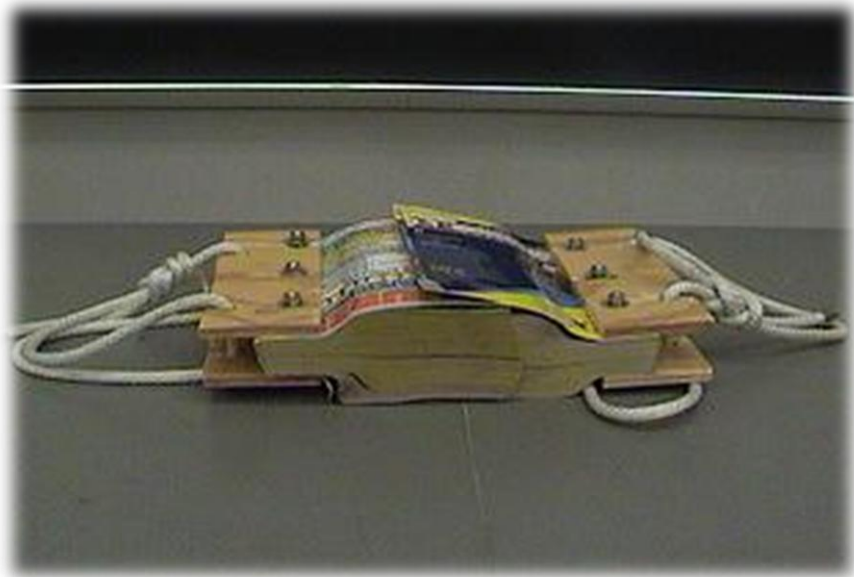
Materials	μ_s	μ_k
rubber on dry concrete	0.80	0.65
rubber on wet concrete	0.60	0.40
wood on wood	0.50	0.20
steel on steel (dry)	0.78	0.58
steel on steel (wet)	0.15	0.06

Discovery
CHANNEL



Phonebook Friction

- Why is it difficult to pull the interlocked phonebooks apart?
- How much friction is offered by the two phonebooks?



Applying the Concept of Friction

- What is the purpose of using starting blocks in a race? What pushes you forward on this case?

