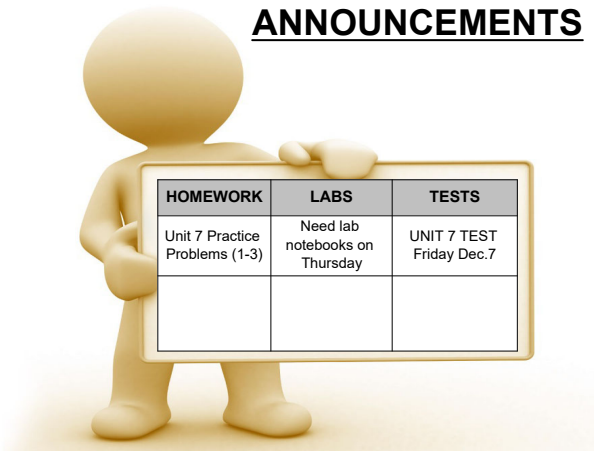
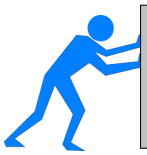
ANNOUNCEMENTS



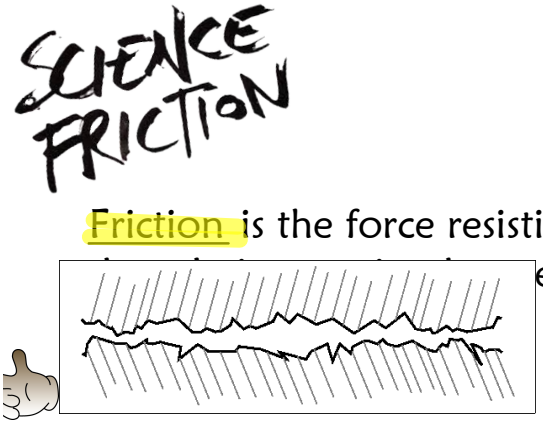
HOMEWORK	LABS	TESTS
Unit 7 Practice Problems (1-3)	Need lab notebooks on Thursday	UNIT 7 TEST Friday Dec.7

7.2 FRICTIONAL FORCES

LEARNING TARGETS



7.2	I can define, analyze, and solve dynamic problems involving friction forces.



Friction is the force resisting

een

Friction Example

You need to move a 105-kg sofa to a different location in the room. When you first push on the sofa, it does not move because of friction.

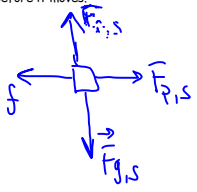
Friction Example

You need to move a 105-kg sofa to a different location in the room. When you first push on the sofa, it does not move because of friction.

1. What characteristics about the sofa affect the amount of friction?

Shape of legs
Surface Area
Mass
Floor Material
Leg Material
Shape of couch
Weight

2. When you push with 102 N of force the sofa begins to move. Draw a free-body diagram for the sofa right before it moves.



$F_{f,s} = F_{g,s}$ $f = F_{p,s}$

2 Important Friction Ideas

The friction force always acts in a direction opposite to the motion.

The magnitude of the friction force depends on the magnitude of the normal force between the two surfaces.

2 Types Friction

f_k

Kinetic Friction(f_k) is the force exerted on one surface by another when the two surfaces rub against each other because one or both of them are moving.

Coefficient Of Friction

mu μ

μ

The **coefficient of friction**, μ, is the ratio of the frictional force to the normal force.

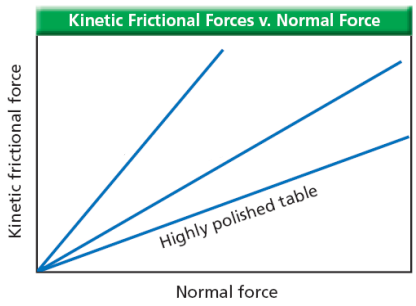
Friction: General Formula

Kinetic Friction Force $f_k = \mu_k N$

$$f = \mu N$$

Static Friction Force $f_s \leq \mu_s N$

Coefficient of Friction



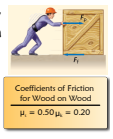
Typical Coefficients of Friction

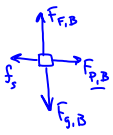
TABLE 6–1 Typical Coefficients of Friction

Materials	Kinetic, μ_k	Static, μ_s
Rubber on concrete (dry)	**0.65**	**0.80**
Steel on steel	0.57	0.74
Glass on glass	0.40	0.94
Wood on leather	0.40	0.50
Copper on steel	0.36	0.53
Rubber on concrete (wet)	0.25	0.30
Steel on ice	0.06	0.10
Waxed ski on snow	0.05	0.10
Teflon on Teflon	0.04	0.04
Synovial joints in humans	0.003	0.01

Friction Example

How much force do you have to apply to get a 25.0-kg wood box moving on a wood floor.





$f = \mu N$

$F_{P,B} = f_s$ $F_{f,B} = F_{g,B}$

$F_{P,B} = \mu_s N$ $F_{f,B} = mg$

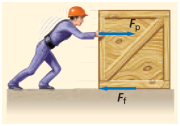
$N = mg$

$F_{P,B} = \mu_s mg$

$F_{P,B} \geq 122.5\ N$

Friction Example

Now you push the box across the floor at a constant speed of 1.0 m/s. How much force do you exert on the box now?



Same F.B.D.

Coefficients of Friction for Wood on Wood
$\mu_s = 0.50$ $\mu_k = 0.20$

$F_{p,B} = \mu_k mg = 49N$

Stopping Force

3. A Mini and a Hummer have the exact same initial velocity, the exact same braking system, and the exact same kind of tires. Both vehicles slam on the brakes on the same road. Which will stop first?

H m S
1 3 9

PRACTICE

UNIT 7 PROBLEMS (4-6)