Let’s DO FORCES!
(and chapters 1-3 review)

What are your questions? (ch. 1-3)
Exam Topics.
Math and Conceptual understanding of:
- Estimation
- Units/prefixes
- Horizontal kinematics
- Dimensional analysis
- Free-fall
- Displacement, velocity, acceleration
- Vectors
- Symbolic reasoning
- Graphing
- Projectile Motion
Will not be on test: significant figures.

Calculating final velocity...
- Let’s finally finish this kinematics problem 😊.

Questions on forces?
A car starts from rest on a horizontal roadway and accelerates forward for 6.0 seconds when it reaches a speed of 24 m/s. The net horizontal force forward on the car during that time is 4800 N. What is the mass of the car?

\[
v = v_0 + at
\]
\[
\Delta x = v_0t + \frac{1}{2} at^2
\]
\[
v^2 = v_0^2 + 2a\Delta x
\]

A. 200 kg  
B. 600 kg  
C. 800 kg  
D. 1200 kg  
E. 2400 kg

**Inclined planes**

We'll see these plenty.

What's so great about boxes on inclined planes?!

Many things we do involve inclines. Boxes are an easy way to simplify many complex objects. (It helps us all to not overthink the complexity!)

All equivalent in the keen eye of the physicist.

**Ice on a hill.**

When my driveway is a sheet of ice (ignore friction), how fast do I need to be driving to get to the top of my driveway?

**Ice on a hill.**

Where is the car's normal force pointing?

A. Straight up.  
B. \(-15^\circ\) left from up (perpendicular to driveway).  
C. None of the above.
A cable attached to a car holds the car at rest on the frictionless ramp (angle \( \alpha \)).

The ramp exerts a normal force on the car. How does the magnitude \( n \) of the normal force compare to the weight \( w \) of the car?

A. \( n = w \)
B. \( n > w \)
C. \( n < w \)
D. not enough information given to decide

Regular axes need \( v_x, v_y, \Delta x, \Delta y \)

To find how fast the car moves on the incline.

NOW, there is only movement in the x direction!

\[ \Delta y = 0, \quad v_y = 0 \]

But what's the force component along the x direction?

(Hint: In our new axes, what are the components of the car's weight vector?)

A. \( F_G \)
B. \( F_G \sin(15^\circ) \)
C. \( F_G \cos(15^\circ) \)
D. \( F_G \tan(15^\circ) \)
E. None of the above
Ice on a hill.

When my driveway is a sheet of ice (ignore friction), how fast do I need to be driving to get to the top of my driveway?

\[ v = v_i + at \]

\[ \Delta x = v_it + \frac{1}{2}at^2 \]

\[ v^2 = v_i^2 + 2a\Delta x \]
Ice on a hill.

When my driveway is a sheet of ice (ignore friction), how fast do I need to be driving to get to the top of my driveway?

What if my car can’t get this fast out of the garage? How could I get out of my driveway?

Ice on a hill.

When my driveway is a sheet of ice (ignore friction), how fast do I need to be driving to get to the top of my driveway?

What if my car can’t get this fast out of the garage? How could I get out of my driveway?

Ice on a hill.

How does the magnitude of the car’s normal force compare to the car’s weight?

A. n = w
B. n > w
C. n < w
D. not enough information given to decide