**Review and Problem Solving Day:**
Geometry, movement, and Free-fall.

**Guest Lecture Friday**
- He’d welcome your feedback!
- Write something and put it in my mailbox at 111 White Hall.
- Email me: sarah.spolaor@mail.wvu.edu

*you will still have lecture and clickers as usual

**Test schedule**
- **First mid-term in 3 weeks! 7-10PM; Sep 19; location TBD.**
- Review and practice a little each day!!!
- **EMAIL ME BY SEP 12 if you have class or athletic conflicts. For other conflicts, please note rules on the syllabus!**

*Chem 116 note: You will take Physics 101 exam as scheduled in September. I will organize an alt exam time for you in November.

**SOH CAH TOA!**

For right triangles...

\[
\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}} \quad \text{soh}
\]

\[
\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} \quad \text{cah}
\]

\[
\tan \theta = \frac{\text{opposite}}{\text{adjacent}} \quad \text{toa}
\]

\[
a^2 + b^2 = c^2 \quad \text{Pythagorean Theorem}
\]

\[
c = \text{hypotenuse}
\]
Adjacent
an angular size of ~20 degrees. You want to impress your friends by telling them how far it is, so you remember Physics 101 and whip out your calculator. About how far is the Eiffel Tower?

You’re in Paris, far away from the Eiffel tower. Your friends want to walk to the tower. You know it is 300m tall, and it appears to have an angular size of ~20 degrees. You want to impress your friends by telling them how far it is, so you remember Physics 101 and whip out your calculator. About how far is the Eiffel Tower?

Try this today: estimate the size of something in town or in your room.

You can easily measure the size of anything you know the distance to!

Your hand at arm’s length gives excellent indicator of angular size!
Let’s solve problems!

- Topic and problem-solving practice.
- Diagnosing your issues.
- No chatting please.
  1. Dimensional analysis, unit conversion.
  2. Estimation.
  4. Solving complex problems, and finding “hidden information”

Dimensional analysis

What are the SI units of each piece of this equation?

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

1. A. m m/s m/s
2. B. m m m/s
3. C. All are m/s
4. D. All are meters
5. E. All are miles

Humans to the Moon

The moon is about \(2.4 \times 10^5\) miles from Earth. If you stacked up adult humans, each standing on the next one’s head, estimate how many would you need to stack to reach the Moon.

1 mile = 1604 m

A. 100 people
B. \(10^5\) people
C. \(10^8\) people
D. \(10^{10}\) people
E. \(10^{12}\) people

Graphing

A driver is traveling west. She comes to a stop at a stop sign and then continues traveling in the same direction. If the positive direction is taken to be east, which velocity vs. time graph could describe this motion?

A. B. C. D. E.

You’re 60 miles away from your wedding, and your GPS says that if you maintain your current speed it will take you 1 hour to arrive. A few minutes ago you were stuck in traffic, going 30 mph. Your gas tank is 50% full. You’re getting frantic texts from your future spouse. The wedding starts in 35 minutes. How fast, on average, do you have to travel to get there in time for the start?

Complex problems

- Make a plan.
  - Identify important EVENTS and INFORMATION.
  - What is actually happening? Meditate.
  - What's actually being asked?
  - What variables do you need to deal with?
- Follow problem-solving strategies for each part of the problem!

Kinematics: always \( v, v_0, a, t, x \) (or \( y \))

Follow problem-solving strategies for each part of the problem!
You’re 60 miles away from your wedding, and your GPS says that if you maintain your current speed it will take you 1 hour to arrive. A few minutes ago you were stuck in traffic, going 30 mph. Your gas tank is 50% full. You’re getting frantic texts from your future spouse. The wedding starts in 35 minutes. How fast, on average, do you have to travel to get there in time for the start?

**What is actually happening/being asked?**
Visualize/meditate.

**What variables are relevant?**

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You’re 60 miles away from your wedding, and your GPS says that if you maintain your current speed it will take you 1 hour to arrive. A few minutes ago you were stuck in traffic, going 30 mph. Your gas tank is 50% full. You’re getting frantic texts from your future spouse. The wedding starts in 35 minutes. How fast, on average, do you have to travel to get there in time for the start?

- Make a plan.
- Identify important EVENTS and INFORMATION.
- What is actually happening/being asked? Meditate.
- What variables do you need to deal with?
  - Kinematics: always $v$, $v_0$, $a$, $t$, $x$ (or $y$)
  - Follow problem-solving strategies for each part of the problem!

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You want to throw your friend a sandwich, but she’s on the roof of your building, hands ready to catch 20m above you. Assuming you throw it straight upwards, what’s the minimum velocity you need to throw it so that she can catch it at 20m?

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**Figuring Out Which Formula**
(main formulas given on exam!)

$$ v = \frac{x_f - x_i}{t} $$

$$ \Delta x = v_0 t + \frac{1}{2} at^2 $$

$$ v^2 = v_0^2 + 2a\Delta x $$

$$ v = v_0 + at $$

Kinematics variables:
- $\Delta x$, $v_0$, $v$, $a$, $t$

- If you know three of these variables, you can figure out ALL of them. If you feel don’t have enough information, look for hidden pieces of info.
- Multipart questions: do one part at a time. Sometimes need answer from a to answer b
You want to throw your friend a sandwich, but she’s on the roof of your building, hands ready to catch 20m above you. Assuming you throw it straight upwards, what’s the minimum velocity you need to throw it so that she can catch it at 20m?

If she instead drops it down to you, what will its velocity be just before you catch it?

A. -9.8 m/s²
B. +9.8 m/s²
C. +19.8 m/s
D. -19.8 m/s
E. 

Practice Resources

- Book: odd numbered problems have answers in the back!
- Office hours
- T.A. office hours.

https://sarahspolaor.faculty.wvu.edu/classes/physics-101-fall-2018

Example: Surveying the River
(speak to your neighbor)

A surveyor wants to measure the distance across a river. Starting directly across from a big tree on the opposite bank, he walks 100 m along the riverbank to establish a baseline. Then, he sights across to the tree. The angle from his baseline to the tree is 35 degrees.

How wide is the river?
   Draw a picture.