Lecture 2: Units and Vectors

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Time Diagram

- **Week 1 (last week):**
  - Homework due: none
  - Lecture: Introduction to Phys-218
  - Recitation and Labs: no

- **Week 2:**
  - Homework due (today): *Introduction to Mastering Physics, Math reviews*
  - Lecture: Chapter 1, 2
  - Recitation: Chapter 1
  - Labs: Read Lab 3 manual

- **Week 3:**
  - Homework due (Monday): Chapter 1
  - Lecture: Chapter 3
  - Recitation: Chapter 2 (*may incl. quiz*)
Homework

- Have a notebook where you solve **ALL** home assignments. (Will help when you prepare for exams!)
- **End-Of-Chapter (EOC) problems:**
  - Do them on in your notebook first (symbolically)
  - Go to Mastering Physics; use numbers from there, plug into the solution, and submit the answers.
- **Additional material in MP**
  - Work out in the notebooks!
  - Then submit the answers
Online Info about PHYS-218

- **My web-page:**
  - [http://faculty.physics.tamu.edu/roshchin/218/](http://faculty.physics.tamu.edu/roshchin/218/)
  - Includes syllabus, FAQ, schedules, homework info, these notes and all future announcements

- **PHYS-218 on eLearning.tamu.edu**
  - [http://eLearning.tamu.edu/](http://eLearning.tamu.edu/) - your scores
E-mail communication

• Link to E-mail Business Etiquette tips on my web-page:
• Read the FAQ and my webpage before sending an e-mail. Your question might be already answered there.
• Please, understand that I do my best to answer e-mails as soon as I can, but answering your e-mails is not the only (or even the main) thing I do.
What to do?

- Look for excuses
- Look for solutions
Do you have problems with the new mouse?

while accessing my webpage
http://faculty.physics.tamu.edu/roshchin/218/
Or Mastering Physics
Chapter 1: Math n’ Stuff

• Won’t cover the entire chapter:
  - Unit conversions
  - Problem Solving
    • Tricks
    • Methods
  - Vectors
    • Components (Unit vectors)
    • Addition
    • Multiplication (dot and cross products)
Converting Units

• Problem: express length of a football field in feet:
  - 1 football field = 100 yards
  - 1 yard = 3 feet

• Solution:
  - 1 football field = 1 football field
  - 1 football field = 1 football field \times (1) \times (1)
  - 1 football field \times (100 \text{ yards}/1 \text{ football field}) \times (3 \text{ feet}/\text{yard})
    = 300 \text{ feet}
  - Both are units of length!

• Another problem:
  - Express speed $v = 50 \text{ km/hour}$ in m/s
Problem Solving Overview

• There are good general problem solving TRICKS
  - Units checking
  - Special case checking
  - Etc.

• There are good METHODS of problem solving that prepare you for the exams

We’ll use both to solve problems in lecture
First Things First!

What’s the first thing you should do when you’re given a problem?

• **Draw a diagram!!!**
  - Usually good for some partial credit

• **List givens and wants as variables**
  - Also a good bet for partial credit

Then use reasonable equations and solve with variables
Trick #2: Units

• The speed of your car isn’t measured in seconds, its measured in meters/second (or miles/hour etc.)

• Paying attention to the units will help you catch LOTS of mistakes on exams, quizzes and homework!!
  - If we ask what the mass of your car is, make sure your answer is in kg (or lbs etc.)

Trick #2: Every time you finish a problem **ALWAYS** check the units of your answer!!
Tricks #3 and #4

Check Reasonableness:

- Can you find another way to do the same problem that gives the same answer?
- Simple numbers give expected numerical answers? Example: Zero, or infinity
For Wednesday

• Complete what you were supposed to do by Today:
  - Read FAQ and my webpage for the course.
  - Math quizzes
  - Read Chapter 1
  - Register iclicker2’s
  - Register in Mastering Physics.
For Next Week

• **HW:**
  - MP “Intro and Preliminary Material” due Monday, Sep. 7

• **Before Lecture:**
  - Read Chapter 2 (by Monday 9am!)
  - Hint: Q2.8 and Q2.20 (These are the “Discussion Questions”)

• **In Lecture**
  - Cover Chapter 2
  - **Clickers** Quiz on Chapter 2 at the beginning of the 1st lecture of the week

• **Recitation, Lab and Homework:**
  - Start HW for Ch. 1 before recitation
  - Chapter 1 problems due Monday, Sep. 14:
    - **End of Chap (EOC) probs:** CH1: 32, 35, 50, 55, 59, 76, 78, 93
  - Quiz at the recitation
  - Read your lab materials before lab
Time Diagram

- **Week 1 (now):**
  - Homework due: none
    - Start: (before Wednesday): *Introduction to Mastering Physics*
    - *Math Quizzes*
  - Lecture: Chapter 1
  - Recitation and Labs: no

- **Week 2:**
  - Homework due (Next Monday): *Introduction to Mastering Physics*
  - Lecture: Chapter 2
  - Recitation: Chapter 1 (*may incl. quiz)

- **Week 3:**
  - Homework due (Monday): Chapter 1
  - Lecture: Chapter 3
  - Recitation: Chapter 2 (*may incl. quiz)
Homework

- Many students have completed the HW “Introduction” - Great!
- Some have started working on HW Ch.1. - Wonderful!
Homework

• FAQ - have you read it?
• Is something unclear?
• If you don’t like my policies, - feel free to switch to a different section.
First Things First!

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Trick #2: Units

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**Trick #2: Every time you finish a problem ALWAYS check the units of your answer!!**
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Check Reasonableness:

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How to solve a problem

- Solve problems using the right method
  - Draw a diagram
  - Convert the numbers to variables
  - Solve to get a formula
  - Plug in the numbers at the end
  - Check
Vectors

Vectors:
- Why we care about them
- Addition & Subtraction
- Unit Vectors
- Multiplication
Why do we care about Vectors?

• As you may have noticed, the world is not one-dimensional
• Three dimensions: $X$, $Y$ and $Z$. Example:
  1. Up from us
  2. Straight in front of us
  3. To the side from us
     - All at 90 degrees from each other. Three dimensional axis.
• Need a way of saying how much in each direction

For this we use VECTORS
Vector and Scalar

• Vectors have a magnitude **AND** a direction
  - 10 miles in the south direction

• Scalars are just a number
  - Mass of your car
  - Earth radius
For This and Next Week

• HW:
  - MP “Chapter 1” due Monday, Jan. 30, by 8am

• Before Lecture on Wednesday:
  - Read Chapter 2 (by Wednesday)
  - Hint: Q2.8, 5, 15, 19, 20 (These are the “Discussion Questions”)

• In Lecture
  - Continue Ch.1 and start Chapter 2
  - Clickers Quiz on Chapter 2

• Recitation, Lab and Homework:
  - Start HW for Ch. 1 before recitation (for those sections who can)
  - Chapter 1 problems due Monday, Jan 30
  - Read your lab materials before lab

• Before Lecture on Monday:
  - Read Chapter 3 (by Monday) (I’ll tell you more about it on Wed.)