Physics = Describing the Universe

(piece by piece)

Physics 1A: Mechanics underlying "everyday" experience

(motion, forces: gravity, friction, solids + fluids)

Describing ...

Measuring Properties:

- Mass (kg): quantity of matter
- Length (m): extent in space
- Time (s): ???

Defining Useful Concepts:

- Position + Motion vectors (velocity, acceleration)
- Force
- Momentum
- Energy

Mathematics – The Language of Physics

Make sure you know:

- Prefixes or units : micro-, milli-, ..., kilo-, Mega-, Giga-
- Scientific Notation : 10^{-6}, 10^{-3}, , 10^{3}, 10^{6}, 10^{9}
- How to convert between units :

  e.g. 1 mile = 1·6 km , 1 hour = 3600 s

  $\Rightarrow$ 1·0 mile/hour = $\frac{1.6 \times 10^3 \text{ m}}{3600 \text{ s}}$ = 0·444 m/s

- Algebra : e.g. if $3x = 8$, then $x = 8/3 = 2.667$
- Functions and graphs : $y = f(x)$
- Calculus : $\frac{dy}{dx}$ (gradient) $\frac{d^2y}{dx^2}$ (curvature)

  $\int y \cdot dx$ (area)

- Basic geometry: areas, circles, triangles
  sine, cosine, tangent, radians
- Vectors : magnitude + direction

- See math worksheet
- Hecht appendices for a math "tune-up."

Unlike Math, Physics approximates the Truth !

e.g. A car travels 430 km in 7 hours. What is its average speed ?

$$\text{Av. speed} = \frac{\text{total distance}}{\text{total time}} = \frac{430\text{ km}}{7\text{ h}} = 61\tfrac{3}{7}\text{ km/h}$$

But is the speed really 61.428571.... km/h ??

- depends on precision of distance + time readings

We can say: "61.4 km/h to 3 significant figures"
or "1 decimal place"
or even "60 km/h to 1 sig. figure"

Precision is often implied, not stated

e.g. if odometer reads 429 km or 431 km : OK
but if I deposit $430 into bank account
what should my statement read : ?

How to do well in Physics 1A:

- Lectures + demos
- Reading assignments (Monday reading quiz)
- HW problems (no "cheating")
- Participate in Problem Section
- Collaborate in labs (but do your own preparation)

Grading:

Quiz (best 6 of 8)	50%	} "closed book"
Final	25%	} "closed book"
Labs	20%	(collaborate away!)
Reading Quizzes	5%	(multiple-choice)

- No "open book" / additional materials in quizzes
- No "curve" - you can all get an "A"
  (so it pays to collaborate in the lab)