Welcome to Physics 215!

Honors Physics I

Phys 221 is a different course!

- Questions? Contact the Lab Manager directly: Sam Sampere, smsamper@syr.edu

Course staff:

- Me: Prof. Lisa Manning: mmanning@syr.edu
- Recitation Instructor:
  - Nouman Butt (ntbutt@syr.edu)

About me

- I am also a researcher
  - Physics of development and cancer
  - Physics of how materials bend and break
- Office: 229B Physics Bldg
- Ask a physicist…
  - Send me an email with any physics question, and I will try my best to answer it in the first 5 minutes of class:
  - "What are gravitational waves?", "Why are metals shiny?", etc.
  - Receive a small amount of extra credit for sending questions

About You

- Background questionnaire

About this course

- Learn Mechanics
  - Develop good understanding of a few important concepts
  - Reason qualitatively and quantitatively
  - Learn to apply to unfamiliar situations
- And more
  - Make friends who you can study with throughout your SU career
  - Learn about new discoveries in physics
  - Maybe even have fun?

How is it different from 211?

- For honors students and physics majors
- Slightly accelerated pace and more advanced content
- More time for small group work
- Extras:
  - SPS exam mentoring and pizza night
  - Extra credit for undergraduate colloquia
  - Extra credit for pseudoscience project (more information later)
  - What careers are there for physics majors?

Course website

- Everything is here: https://mmanning.expressions.syr.edu/2019phy215/
- also linked from: blackboard, my website, physics department website
- Links to thing you need to do this week:
  - Reading for Thursday
  - Due Friday:
    - Pre-assessment on blackboard
      - Make sure you have 35 minutes to take the quiz before you begin!
    - Short problem set due Friday in recitation on dimensional analysis
    - SAGE assignment (will get an email after class today, takes less than 5 minutes)

Course Information
https://mmanning.expressions.syr.edu/2019phy215/

- Materials (see website for full details)
  - *OpenStax University Physics (free)*
- Also on the website – check it out regularly!
  - Announcements/reminders of exams and homework assignments, office hours
  - Course outline, objectives
  - Course calendar
  - Lecture slide shells, homework solutions, exam solutions

Participation: lectures

- 7 % of your grade will come from in-class participation
  - Attendance
  - Reading BEFORE you come to lecture
  - **Small group work**
  - Bring your scientific calculator with you to class
  - *graded on a check+, check, check- scale for every class*
- Shells of lecture slides available evening before on class website

Participation: recitation

- 8 % of your grade will come from in-recitation participation
- Bring your textbook with you
- Attendance will be taken (and is required)
  - You must show up by the time the sign in sheet is passed around or it will not count.

Assignments: two types

- HW assignments
  - 18% of total grade
- Self-assessment
  - 2% of total grade
  - Participation only (responses are not graded)

Homework assignment

- When?: Due Friday at beginning of recitation section (first 5 mins)
- Where?: Assigned on the course website one week before due date
- How?: Problems taken from textbook, and occasionally an extra "exam-style" problem each week, turned in on paper during recitation
  - Graded for partial credit and completeness
- Why?: Practice and understand how to do problems – helps you learn and get ready for exams
- Solutions will be posted online after due date
- ***No late homework will be accepted***

Self-assessment quiz (very short)

- When? : due weekly on Fridays at 5 pm https://sage.syr.edu/
- Where?: you will receive an email every week (starting next week) with a link to the quiz – fill it out online
- How?: Answer the same set of questions every week – about the amount of time you spent studying, what you learned, what the instructor did right and wrong. The program will display a history of your answers and help you compare yourself to others in the class
- Why?: to help you figure out what you need to do to be successful in this class, see what others are doing, and give immediate feedback to the instructor

Possible times for recitation section:

- 8:25-9:20A
- 9:30-10:25A
- 10:35-11:30A
- 11:40A-12:35P
- 12:45-1:40P
- 2:15-3:10P
- 3:45-4:40P
- 5:15-6:10P

Notation!

$\equiv$

$\sum_{i=1}^{8} x^i$

$\vec{v}$

$\dot{x}$

$\ddot{x}$

Converting units

Convert 1 km/hr to microns (micrometers) per second:

$\frac{1\,km}{hour} =$

Small group (SG) question 1-1.1

- Convert $\frac{400\ inches^2}{\min}$ to m^2/s. Use the fact that 2.54 cm = 1 in.

1. $3.3 * 10^{-3}\ m^2/s$
2. $4.3*10^{-3}\ m^2/s$
3. $1.69*10^{-1}\ m^2/s$
4. $1.69*10^{-3}\ m^2/s$
5. None of the above

Dimensional analysis is powerful

- In the real world, and when solving physics problems, it is often useful to estimate things to see if your equation/answer makes sense
- Dimensional analysis is a way of checking the units of things
  - Some numbers have units
  - Some numbers do not
- Hmm, is the equation F = mv or F = ma?
  - Units of m:
  - Units of v:
  - Units of F:
  - Units of a:

Dimensional analysis is powerful

- You can sometimes use it to do a lot more:
- Example: escape velocity
  - Velocity v
  - Newton's gravitational constant G
  - Mass of the planet m
  - Radius of the planet R

Reading assignment for Thursday

- Open Stax
  - Ch 1.1-1.7 (Review of Units)
  - Ch 3.1-3.4
- I will assume you have read this and you will be graded on in-class participation

Assignments due this week

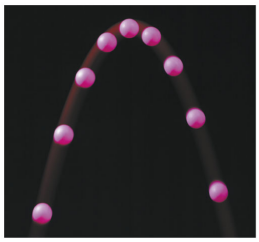
- Due this Friday
  - Pre-assessment (on blackboard)
  - Problem set 1
  - SAGE assignment (should take <5 mins)

Kinematics-- describing motion

1D

Linear motion

Circular motion



Projectile motion

Rotational motion

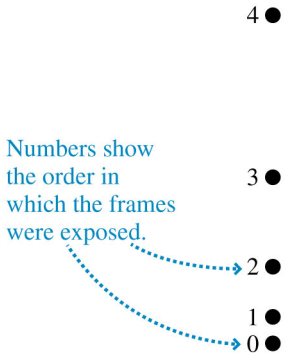
Four basic types of motion

The Particle Model

- Often motion of the object *as a whole* is not influenced by details of the object's size and shape.
- We only need to keep track of a single point on the object.
- So we can treat the object *as if* all its mass were concentrated into a single point.
- A mass at a single point in space is called a **particle**.
- Particles have no size, no shape and no top, bottom, front or back.
- Below is a motion diagram of a car stopping, using the **particle model**.

The Particle Model

Motion Diagram in which the object is represented as a particle

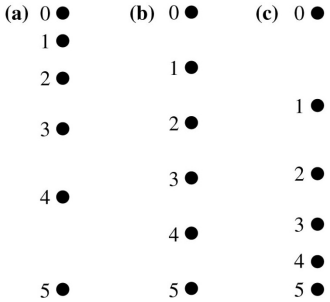


Motion diagram of a rocket launch

SG 1-1.2

Three motion diagrams are shown. Which is a dust particle settling to the floor at constant speed, which is a ball dropped from the roof of a building, and which is a descending rocket slowing to make a soft landing on Mars?

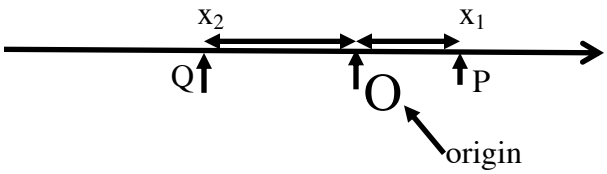
A. (a) is dust, (b) is ball, (c) is rocket.
B. (a) is ball, (b) is dust, (c) is rocket.
C. (a) is rocket, (b) is dust, (c) is ball.
D. (a) is rocket, (b) is ball, (c) is dust.
E. (a) is ball, (b) is rocket, (c) is dust.



Position and Displacement

- Neglect shape of object and represent by point moving in space (1D)
- Position may be specified by giving distance to origin – x coordinate
- Choice of origin arbitrary! – many choices to describe same physical situation.
- Hence x-coordinate not unique

Displacement = change in position



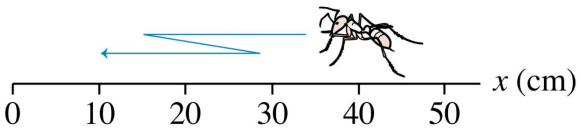
- Displacement (P→Q) = $x_2 - x_1 = \Delta x$
- Displacement does NOT depend on origin!

Displacement

- Displacement is 'distance plus direction'
- Displacement Δx is a vector quantity – change in position (vector) of object
- In one dimension, this amounts to a sign
  - Displacement towards increasing x – *positive*
  - Displacement towards decreasing x – *negative*

SG 1-1.3

An ant zig-zags back and forth on a picnic table as shown.



The ant's **distance traveled** and **displacement** are

A. 50 cm and 50 cm.
B. 30 cm and 50 cm.
C. 50 cm and 30 cm.
D. 50 cm and –50 cm.
E. 50 cm and –30 cm.