

PH 221 Week 1

Benjamin Bauml



Summer 2024



This material is borrowed/adapted from PH 201 Tutorial 1 for Fall 2020.



R1-1: Visual Vector Addition



Add or subtract the following vectors.



a)  + 

b)  + 

c)  - 

d)  - 

e)  + 

f)  - 

R1-2: Semi-Truck Unit Conversions

A semi-truck travels 11 km in 7.5 minutes.

- What does the ratio $(11 \text{ km})/(7.5 \text{ min})$ tell you about the truck's motion?
- What does the ratio $(7.5 \text{ min})/(11 \text{ km})$ tell you about the truck's motion?
- Find the truck's average speed in miles per hour, then in meters per second. Can you tell what type of road (school zone, residential area, freeway, German Autobahn, etc.) the truck should be traveling on?
- Find the time in seconds it takes the truck to travel one meter.

R1-3: Frictionless Pool Lag

You are about to play a game of pool, so you and your opponent are lagging for the first shot. To lag, you must bounce the cue ball off of the far end of the table, and get it as close to the near end as possible without touching it. While preparing to strike, you accidentally give the cue ball a light tap, setting it in motion.

Uh-oh! Through some bizarre accident, the pool table has become entirely frictionless! The cue ball slides toward the opposite end without rolling or slowing down.

A spectator across the table from you decides that the midpoint is $x = 0$ cm. Relative to her, the edge near you is at $x = 127$ cm, and the far edge is at $x = -127$ cm.

It takes the cue ball 4 s to slide at constant velocity from $x = 89$ cm to $x = 17$ cm.

- What is its velocity?
- How long does it take the cue ball to slide from $x = 17$ cm to $x = -127$ cm?
- The cue rebounds from the far edge without losing speed. What is its position 10 s after it is at $x = -127$ cm?

R1-4: Two Vector Hike

Maria hikes 15.0 km at an angle of 30.0° north of east and then hikes 15.0 km southeast (an angle of 45.0° south of east). Let Maria's starting point be the origin of your coordinate system, the east-west axis be horizontal, and the north-south axis be vertical with east and north the positive directions.

- Draw a sketch, approximately to scale, showing the coordinate axes, Maria's two displacements, and her total displacement.
- Find the east (x) and north (y) components of Maria's two displacements.
- Find the east (x) and north (y) components of Maria's total displacement.
- Find the magnitude and direction of Maria's total displacement.
- Check your answer to (d) against your sketch. Do they agree?

R1-5: Motion Diagram Jogging

Mary runs east at 6.0 km/h for 0.50 hr. She then turns around and runs west at 4.0 km/h for 1.0 h. Let east be the positive direction.

- Draw a motion diagram for Mary. Assume turning around takes negligible time.
- How far does Mary run?
- What is Mary's displacement?