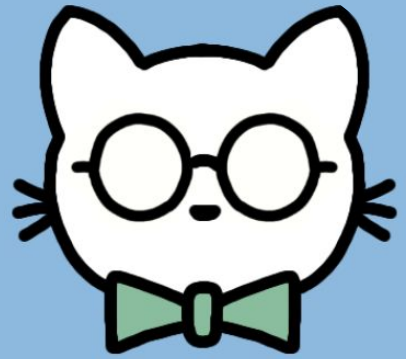
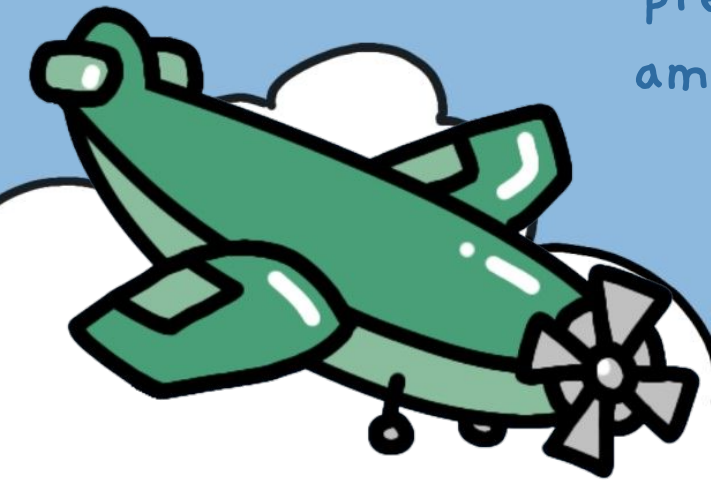
Physics Study Session



presented by: your amazing kitty hawk tutors!



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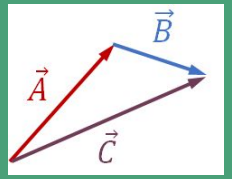
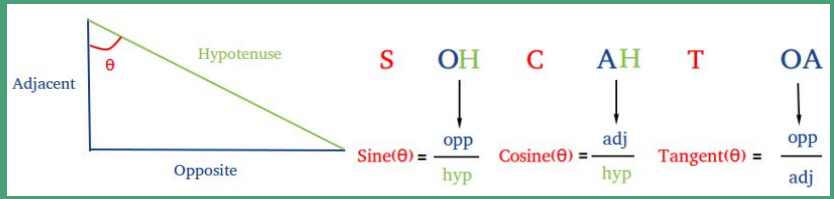
Graphical



- head-to-tail method
- adding vectors: A+B = R
- subtracting vectors: A-B = A+(-B) = R
- when solving graphically:
  - draw arrow from tail of vector A → head of vector B
  - measure magnitude with a ruler
  - measure direction with a protractor

Analytical

- SOH-CAH-TOA



- components of a vector
- resultant vector
  - sum of two or more vectors
  - Pythagorean Theorem
- Find angle of resultant vector
  - $\tan^{-1}$ (opp/adj)

Projectile Motion

Keywords / Main Points

- from the ground
  - $y_i = 0$
- shot horizontally
  - $v_{yi} = 0$
- maximum height
  - $v_{yf} = 0$
- hits the ground
  - $y_i / y_f = 0$
- always:
  - $t_y = t_x$
- horizontal and vertical motion are independent

Vertical Motion

- $a_y = 9.80\ m/s^2$
  - from gravity
- vertical motion is quadratic in time

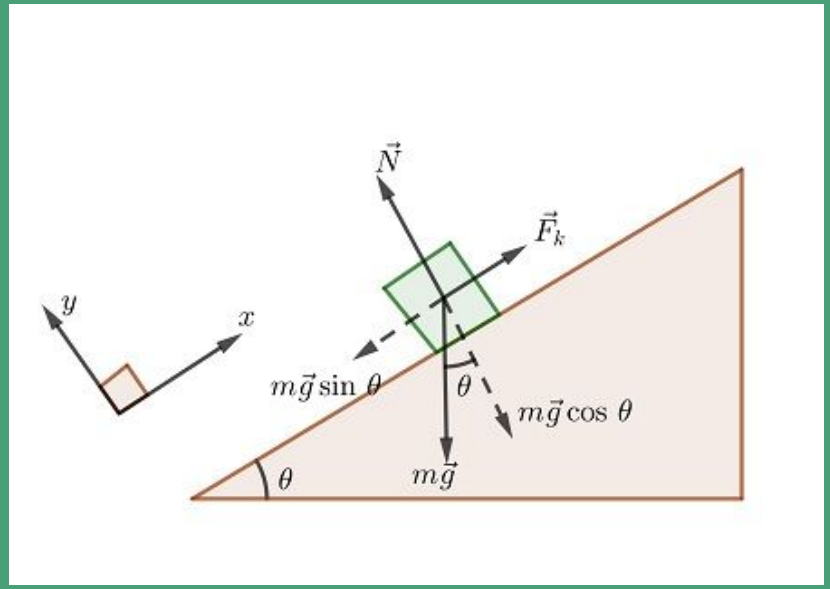
Horizontal Motion

- $a_x = 0\ m/s^2$
- horizontal velocity is constant
- horizontal motion is linear in time

Inclined Planes

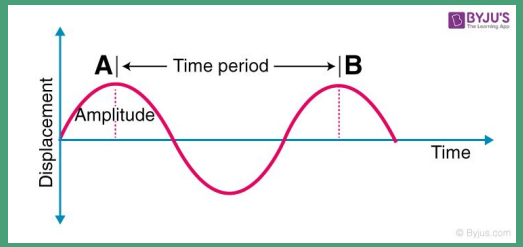
Inclined Planes

- normal force is perpendicular to the surface
- angle of plane is the same as the angle between the F_N and F_g
  - split F_g into its components
- static/kinetic friction
  - horizontal component of gravity is equal to static friction



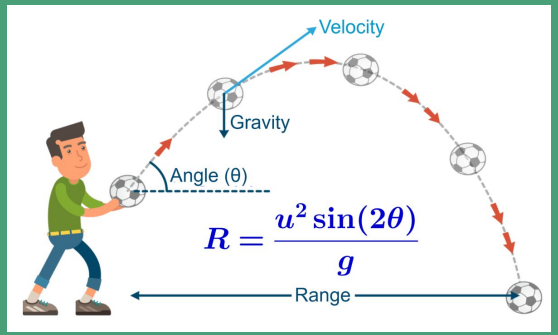
Harmonic Motion

- oscillation: moves back and forth between same positions
- periodic motion: each oscillation takes same time
- simple harmonic motion: restorative force proportional to displacement
  - Hooke's Law: $F=-k\Delta x$
- period: time for one oscillation
- frequency: oscillations per second
- period of mass on a string: $T=2\pi\sqrt{m/k}$
- pendulum is a pendulum bob on a string
  - simple harmonic motion if $\theta<15°$
  - period of simple pendulum: $T=2\pi\sqrt{L/g}$



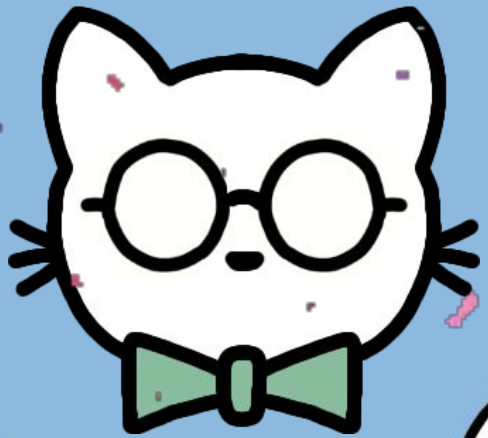
Tips and Tricks

- always think of horizontal and vertical motion separately
- some projectile problems must be separated into 2 parts
  - v_{fy} is 0 at the max height first, and when it hits the ground
- Range Formula
  - only use for level 3 problems (if you use for level 4s, you'll have to derive it)
  - u = v initial



Questions?

Worksheet Time!!

BYEEEE!!

Have a super slay day!!