PHYS 1511 Discussion Section: Week 2

Connor Feltman

University of Iowa

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Review Lecture

-Solving Symbolically

-Speed vs Velocity & Distance vs Displacement

-$\Delta x = x_f - x_o$ notation & Kinematic Charts

-Gravity & gravitational acceleration

Relevant Equations

$$v = \frac{\Delta x}{\Delta t} \qquad \text{(Average Velocity)} \tag{1}$$

The Kinematic Equations:

$$v_f = v_o + at \tag{2}$$

$$\Delta x = x_f - x_o = v_o t + \frac{1}{2} a t^2 \tag{3}$$

$$v_f^2 = v_o^2 + 2a\Delta x \tag{4}$$

Question #1

Circular Logic

A couple walks around a circular lake of radius 1.5km. They start at the east side of the lake and head north to begin with. They eventually take a break when they are 235° from due east. (assume the origin is at the center of the lake) What is the distance traveled by the couple?

BONUS: What is the magnitude of the couple's displacement measured from due east?

Question #2

Float like a butterfly

According to inews.com the Testa Model S Car has one of the greatest accelerations. It managed 0 to 60mph (95.56 kph) in about 2.28 seconds.
a) Calculate the average acceleration the car must've experienced to achieve this (in m/s^2)
b) Find the distance travelled by the Model S during this time (in meters)

Question #3

Knights of the Round

Sir Gawain and Sir Lancelot are jousting towards one another. Each rider starts from rest a distance 88m apart, then ride directly towards one another. Gawain has an acceleration of $a_G = 0.3\frac{m}{s^2}$ while Lancelot has $a_L = 0.2\frac{m}{s^2}$. Relative to Gawain, where do the knights collide?

Question #4

Astronaut Symbols

An astronaut wants to measure the acceleration due to gravity at the surface of the mystery planet they're on. They toss a rock up into the air and measure the time it takes to fall back into their hand. Solve for the gravity of the planet **symbolically** if you know the following (assume no air resistance):

t_{toss} - The time it takes for the rock to return to the astronaut's hand once thrown

V_o - The initial speed of the rock

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An astronaut wants to measure the acceleration due to gravity at the surface of the mystery planet they're on. They toss a rock up into the air and measure the time it takes to fall back into their hand. Solve for the gravity of the planet **symbolically** if you know the following:

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V_o - The initial speed of the rock

If $t_{toss} = 20.0$ s and $V_o = 15$ m/s what is the gravitational acceleration on the planet?

Question #5: Challenge Problem

Sets of equations

While standing on a bridge that's "h" meters high you push a stone (from rest) off the bridge towards the water below. When the first stone has travelled Δx distance you throw another rock down with some initial velocity V_o. Solve for the initial velocity of the second rock **symbolically** if both rocks are to hit the water at the same instant? (Write your answers in terms of gravitational constant g,h and Δx)