In Class Activity Plan

Week 14: Angular Motion & Simple Harmonic Motion

25 min **Whiteboard – Satellite Centripetal Ranking (**[**Word**](centripetal_force_ranking_task.docx)**,** [**Pdf**](centripetal_force_ranking_task.pdf)**)**

 PURPOSE: Practice modeling centripetal acceleration situation.

*Lots of options here probably want to give one as homework:*

20 min **Board Meeting**

PURPOSE: Build consensus around modeling centripetal acceleration situation.

*Goals:*

* Centripetal force is just the net force towards the center
* Need to attend to the radius of the circular path

Additional resources which could be used:

Ferris Wheel Centripetal Force ([Word](ferris_wheel_centripetal_force.docx), [Pdf](ferris_wheel_centripetal_force.pdf))

Centripetal Force Ranking ([Word](roller_coaster_ranking_centripetal_force.docx), [Pdf](roller_coaster_ranking_centripetal_force.pdf))

Circular Motion Problems ([Word](circular_motion_problems.docx), [Pdf](circular_motion_problems.pdf))

20 min **Whiteboard - Ladybug revolution part 1**

PURPOSE: Investigate rotational motion, introduce rotational analogs to translational kinematics

Direct students to PhET simulation – Ladybug Revolution (<http://phet.colorado.edu/en/simulation/rotation>)

 Give students 10 minutes to explore.

 Summarize what you have learned on whiteboard.

10 min **Board Meeting**

 PURPOSE: Share what was learned from investigation of simulation

20 min **Whiteboard - Ladybug Revolution part 2**

PURPOSE: Develop models for constant rotational motion from graphs of rotational motion.

 Directions: Return to the Ladybug Revolution simulation

Use the second tab which shows graphs, use radians.

Answer: What have you learned? What rules can you make? What questions do you have? On whiteboard.

20 min **Board Meeting**

PURPOSE: Reach consensus about equations that describe constant angular acceleration motion.

1. Review the kinematic representations in the basic 1-d constant acceleration model

 a) Equations

 d = Δpos

 v = Δpos/Δt

 a = Δv/Δt

 d = v0 + ½at2

 vf = v0 + at

 b) Velocity-time graph

v

Slope = a

t

Area = d

2. When does this model apply?

*Answer:* when we have straight line motion

3. What is the motion of the wheel?

*Answer:* not moving linearly, but moving by rotating

4. Create a table of angular variables by analogy

|  |  |
| --- | --- |
| d = Δpos | θ = Δangle |
| v = Δpos/Δt | ω = Δangle/Δt |
| a = Δv/Δt | α = Δω/Δt |
| d = v0 + ½at2 | θ = ωt + ½ α t |
| vf = v0 + at | ωf = ω0 + at |

5. How are we able to go between the two versions?

 a) d = r θ

b) v = r ω

c) a = r α

 6. Now we can add on the rest of the relationships:

|  |  |
| --- | --- |
| m | I = ∑miri |
| p = mv | L = Iω |
| Fnet = m a | τ = Iα |
| Eklinear = ½ m v2 | Ekrot = ½ I ω2 |

25 min **Whiteboard- Helicopter Quantitative Problem (**[**Word**](clothes_dryer_quantitative_problem.docx)**,** [**Pdf**](clothes_dryer_quantitative_problem.pdf)**)**

 PURPOSE: Model situation with constant angular acceleration

20 min **Board Meeting**

 PURPOSE: Build consensus about modeling constant angular acceleration

**Homework - Ranking of Theta vs t graph (**[**Word**](ranking_theta_vs_t_graph.docx)**,** [**Pdf**](ranking_theta_vs_t_graph.pdf)**) and Rotational Speed Ranking (**[**Word**](ranking_speed_two_radii.docx)**,** [**Pdf**](ranking_speed_two_radii.pdf)**)**