Nov 11, 2015 LB 273, Physics I

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Prof. Leanne Doughty

Today:

Chapter 8 – Circular Motion & Angular Momentum

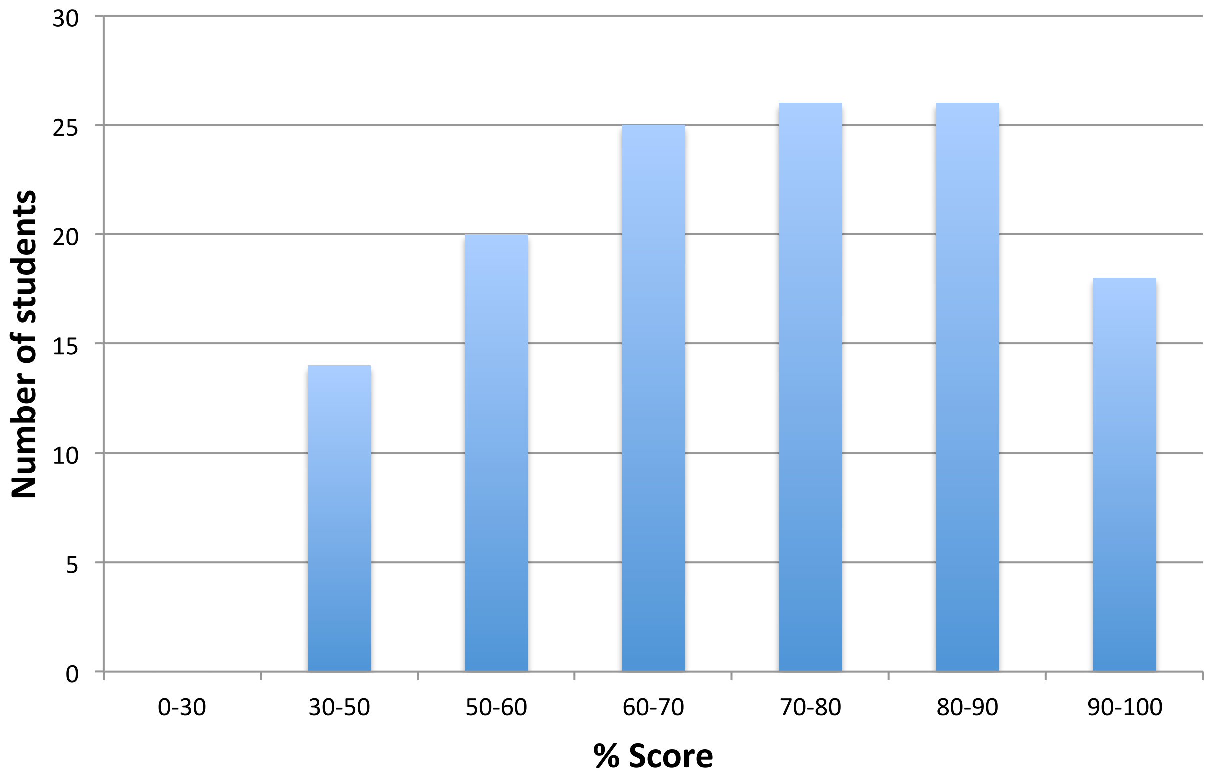
Irish Phrasebook

Odious – *Adjective to mean really good or really bad depending on how it's said*

Exam 2 - Overall

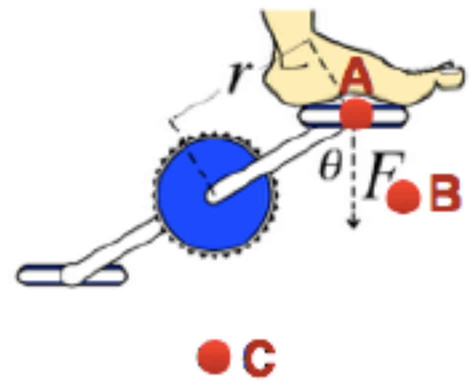
Exam was still a little long – 10 points being added

Average: 72% +/- 16%

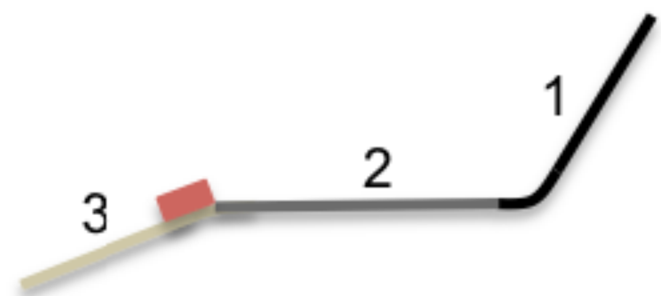


Exam 2 - Observations

- Q1, Torque
  - Incorrect ranking of B and C
  - RHR



- Q2, Friction
  - Motion and momentum forces do not exist
  - Coefficient of friction is not equal to tanθ



Exam 2 - Observations

- Q3, Velocity Graph
  - Flat line is 0 acceleration
  - Be careful of concavity
- Q5, Ranking max heights
  - Mass is not a factor
  - Rank based on initial velocities

Announcements

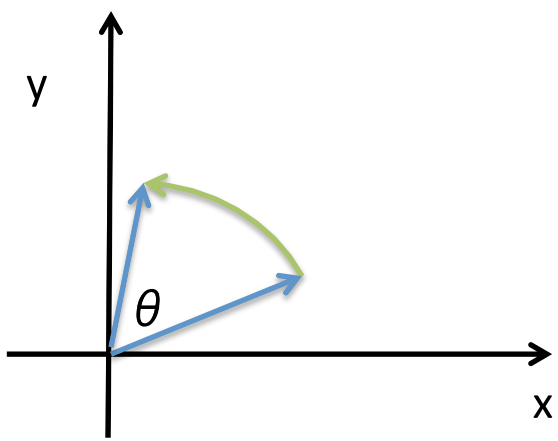
- Grade updates:
  - Ch 6&7 On-paper back Friday
  - Overall grade update by Friday

- Alanna has office hours in the help room after class today until 2:30pm

- Reading Q's for Ch 10 due Thursday 12th

- LON-CAPA HW for Ch8 due Fri. 13th

Angular velocity (ω)



We usually talk about the object's motion relative to the x-axis

- So counterclockwise is positive
- Clockwise is negative

We talk about the motion as an object has moved through a distance s (arc length) through an angle (θ)

A pocket watch and Big Ben are both keeping perfect time. Which minute hand has the larger magnitude linear velocity v?

A. Pocket watch's
B. Big Ben's
C. Same v on both

A pocket watch and Big Ben are both keeping perfect time. Which minute hand has the larger magnitude angular velocity ω?

A. Pocket watch's
B. Big Ben's
C. Same ω on both

Angular Acceleration

- What happens if the angular velocity changes?
  - $\alpha = \Delta\omega/\Delta t$

$$\alpha = \lim_{\Delta t \to 0} \frac{\Delta\omega}{\Delta t} = \frac{d\omega}{dt}$$

- Rate of change of the angular velocity

A student sees the following question on an exam:

A flywheel with mass M=120kg, and a radius r=0.6m, starting at rest, has an angular acceleration of α=.1 rad/s^2. How many revolutions has the wheel undergone after 10 s?

Which formula should the student use to answer the question?

A. $\omega = \omega_0 + \alpha t$

B. $\theta = \theta_0 + \omega_0 t + ½ \alpha t^2$

C. $\omega^2 = \omega_0^2 + 2\alpha \Delta\theta$

What we have so far

Linear Motion

- $v_f = v_0 + at$
- $\Delta x = v_0 t + \frac{1}{2} a t^2$
- $v_f^2 = v_0^2 + 2a \Delta x$

Angular Motion

- $\omega_f = \omega_0 + \alpha t$
- $\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2$
- $\omega_f^2 = \omega_0^2 + 2\alpha\Delta\theta$

What we have so far

Linear Motion

- $v_f = v_0 + at$
- $\Delta x = v_0 t + \frac{1}{2} at^2$
- $v_f^2 = v_0^2 + 2a \Delta x$

- $\vec{F}_{net} = m\vec{a}$
- $\vec{p} = m\vec{v}$

Angular Motion

- $\omega_f = \omega_0 + \alpha t$
- $\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2$
- $\omega_f^2 = \omega_0^2 + 2\alpha\Delta\theta$

- $\vec{\tau}_{net} = \vec{r} \times \vec{F} = I\alpha$
- $\vec{L} = \vec{r} \times \vec{p} = I\omega$