Introduction

"Things should be made as simple as possible, but not any simpler."

-- Einstein

Think you're smart? ... No?

That's ok.. Prove why anyone at U of T is the best and brightest on a National Level!

Regardless of what part of the bell curve you reside, come try out to represent U of T at the...

2007 Canadian University Science Games

Try out Information:
- October 16, 4-6pm in MS3153
- October 18, 6-8pm in MS3154
- October 25, 1-3pm in MS3153

For more information:

hbsu.sa@utoronto.ca

http://hbsu.sa.utoronto.ca/cusg

www.cusg.ca

Funded by Faculty of Arts and Science

Announcments

- My office hour this Friday, October 13, is cancelled
- Reminder: written homework due by 5 PM Friday October 13 in the Drop Box for your tutorial
- Pre-Class Quiz #5 available
  - Due by 10 AM Monday October 16
  - Chapters 10 – 11
- Lab Questions: direct to Dr. Deyirmenjian
  - I have forwarded all emails about the lab to him

Representative Assembly

Studies: up to 80% of difficulties students have with their courses relate to communication not content

- Representative Assembly: to discuss issues of communication and organisation of PHY138
  - We will not discuss Physics
- Each tutorial group will choose a representative
- Friday October 20, 3 – 4 PM, MP222
  - 2nd Floor – North Wing - McLennan

Class Time: a Limited Resource

A. "Value Added": Problem Solving Strategy, Study Techniques, etc.
B. Discussing Physics Content
C. Examples
D. Clicker Questions
E. Questions from the class via GuoYing

Doing more of one of these means less time for the others

Doing less of one of these means more time for the others

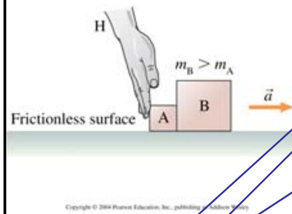
Last Time

- Fictitious Forces
  - Only arise in non-inertial ("accelerating") reference frames
- Non-uniform circular motion
  - $a_t \neq 0$
  - $v_t \neq$ constant
- Newton's Third Law
  - Example 8.3 from the text
  - I will review this example in a moment

Today

- A series of examples extending Example 8.3
- Application: Ballistocardiogram
- Chapter 9: Impulse and Momentum

Last Time: Example 8.3



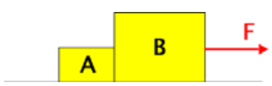
$a = F_H/(m_A + m_B)$

$F_{A\text{ on }B} = m_B F_H/(m_A + m_B)$, to right

$F_{B\text{ on }A} = m_B F_H/(m_A + m_B)$, to left

1. System: both masses → acceleration
2. System: single mass → forces acting on it

2 Blocks Glued Together



$a = F/(m_A + m_B)$

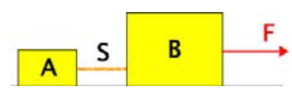
$F_{A\text{ on }B} = m_A F / (m_A + m_B)$, to left

$F_{B\text{ on }A} = m_A F / (m_A + m_B)$, to right

3rd Law

1. System: both masses → acceleration
2. System: single mass → forces acting on it

Massless String S



$a = F / (m_A + m_B)$

$\vec{F}_{B\text{ on }S} = -\vec{F}_{A\text{ on }S}$

1. System: both masses → acceleration

Massless String S

$a = F / (m_A + m_B)$

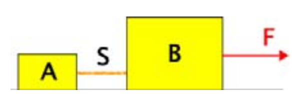
$\vec{F}_{B\text{ on }S} = -\vec{F}_{A\text{ on }S}$ Not 3rd Law!

$T = F_{S\text{ on }B} = m_A F / (m_A + m_B)$, left

$T' = F_{S\text{ on }A} = m_A F / (m_A + m_B)$, right

1. System: both masses → acceleration
2. System: single mass → forces acting on it

Mass of String $m_S > 0$



$a = F / (m_A + m_B + m_S)$

$\vec{F}_{B\text{ on }S} \neq -\vec{F}_{A\text{ on }S}$

$T = F_{S\text{ on }B} = (m_A + m_S)F / m_{tot}$, left

$T' = F_{S\text{ on }A} = m_A F / m_{tot}$, right

$T > T'$

Newton's Laws in Compact Form

- Second Law

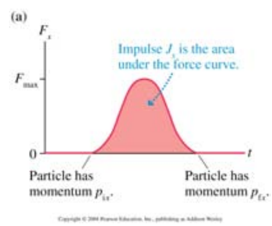
$$d\vec{p} = \vec{F}_{net}\, dt \qquad \vec{F}_{net} = \frac{d\vec{p}}{dt}$$

- Third Law

$$\vec{F}_{A\ on\ B} = -\vec{F}_{B\ on\ A}$$

This is all of classical mechanics!

Figure 9.4 (a)



Impulse J_x = area under the curve = $F_{avg}\,\Delta t$

$$= \int F_{inst}\, dt$$

Newton's 2nd Law:

$J_x = \Delta p_x = p_{fx} - p_{ix}$