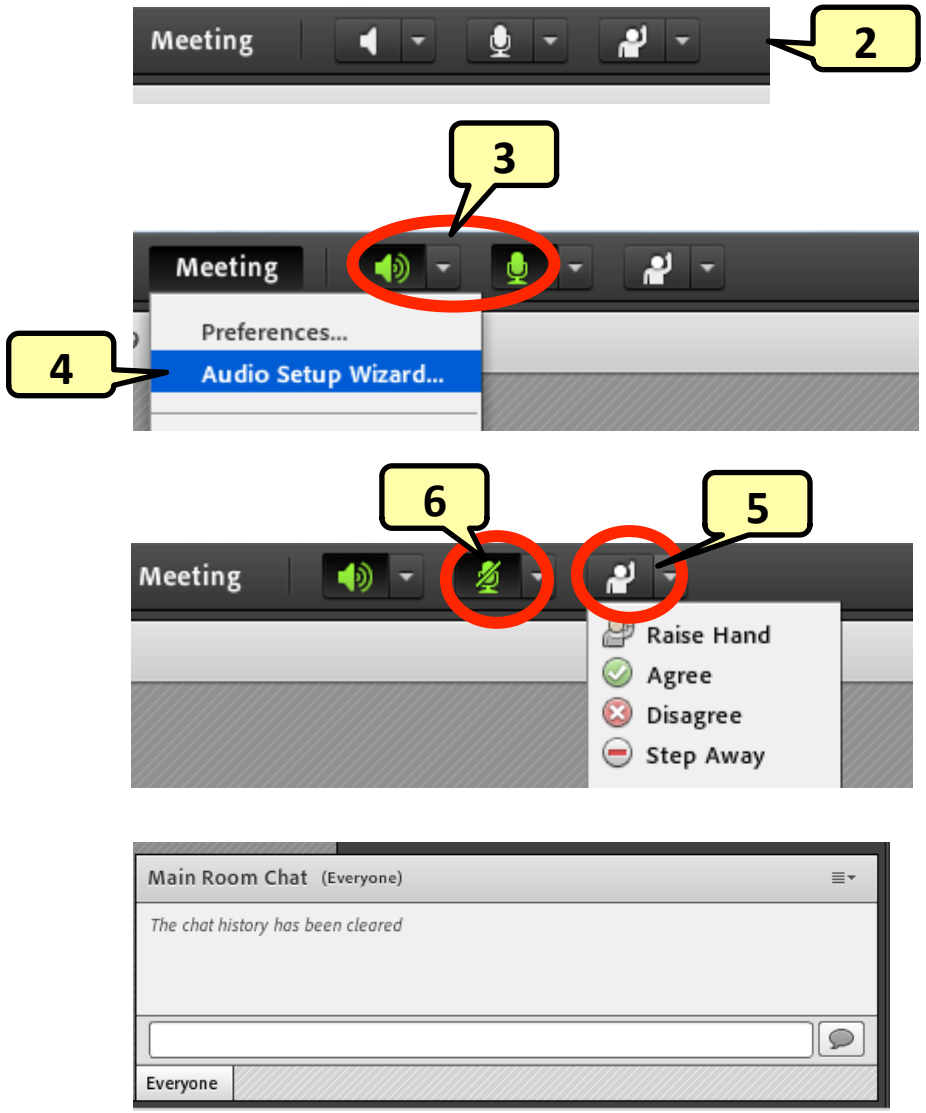
Welcome! As you enter the room, please…

1. Plug in your headset (if available).
2. Familiarize yourself with the **top bar** on the screen
3. Make sure your **speakers and mic are enabled** (the icons on the top bar should be **highlighted in green**).
4. Run the **audio setup wizard** (this option is available from the "Meeting" menu on the left right of the screen).
5. Once you have run the wizard, "**raise your hand**" by clicking on the icon available on the top bar. This will indicate hosts you are ready to test your mic.
6. After testing your mic, **mute yourself** by clicking on the mic icon on the top bar (this will help to avoid background noise).

Note: Feel free to use the chat at any time!



Record the Session

Mechanics VCP Session 4
April 25, 2013

USING ACTIVE LEARNING TECHNIQUES TO ALIGN OBJECTIVES, ACTIVITIES, AND ASSESSMENT

<u>Agenda</u>:
(i) Objectives for today's session
(ii) Structuring classroom activities and assessment to match learning objectives
(iii) Active learning examples, including your own concept questions
(iv) Assignments for Session 5 (2 May 2013)

Session 4 Learning Objectives

Ed

- **At the end of this session, participants will be able to:**
  - ***describe*** **alignment of objectives, activities, and assessments**
  - ***select*** **assessment strategies consistent with both activities and objectives**
  - ***articulate*** **to students why the class is organized and executed the way it is**
  - ***deploy*** **a variety of active learning approaches in class**

Introductions

Ed

Anyone not have a chance to introduce themselves yet?

How Learning Works*

Ed

1. **Students' prior knowledge can help or hinder learning**
2. **How students organize knowledge influences how they learn and apply what they know**
3. **Students' motivation determines, directs, and sustains what they do to learn**
4. **To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned**
5. **Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
6. **Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning**
7. **To become self-directed learners, students must learn to monitor and adjust their approaches to learning**

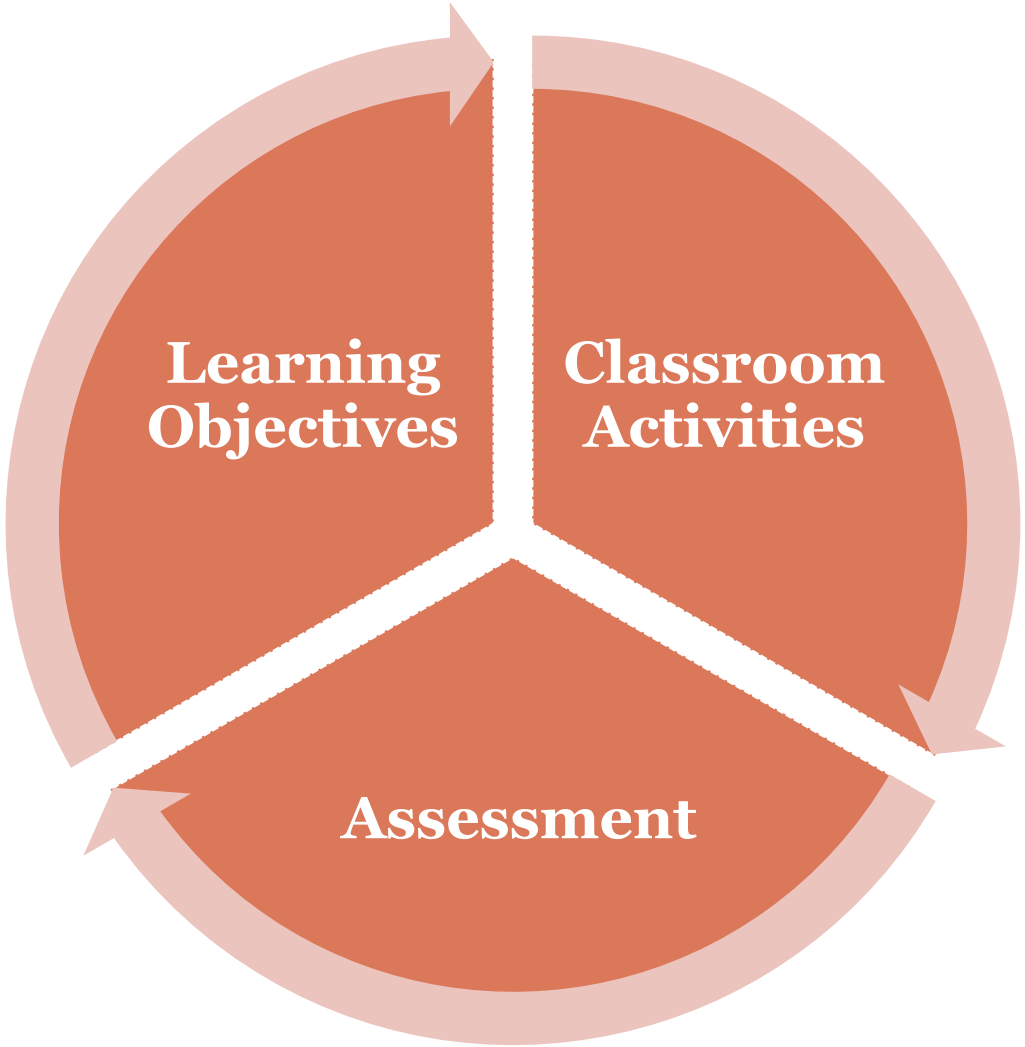
*Ambrose, Bridges, DiPietro, Lovett, and Norman, *How Learning Works* (2010)

A HLW Organizing Principle

Ed

- **Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
- **Two pieces**
  - **Goal-directed practice (the learning activities)**
  - **Targeted feedback (the assessment)**

Course Alignment



Targeted Feedback

Ed

- **Look for patterns of error**
- **Prioritize/focus your feedback**
- **Balance strengths and weaknesses in your feedback**
- **Use peer feedback, real-time if possible**
- **Design frequent opportunities for feedback**
- **Specify how students should use feedback in subsequent work**
- **Provide group-level feedback**

Assessments

Ed

- **Homework (OOC)**
- **Quiz, exam (IC)**
- **Clicker questions (IC)**
- **Projects (OOC)**
- **Observations (IC)**
- **Observations (OOC, office hours)**
- **Peer evaluations (IC or OOC)**
- **Participation/support (as on a blog, OOC)**
- **FORMATIVE vs. SUMMATIVE**

Frequent Feedback

Ed

- **Think-pair-share**
- **Clickers**
- **Other informal, formative feedback (conversation, observation)**
- **some teaching strategies emphasize very frequent, low-stakes (i.e., with no course grade attached to it), formative feedback:**
  - **Carl Wieman: "The design goal was to have the students spend all their time in class engaged in deliberate practice at 'thinking scientifically' in the form of making and testing predictions and arguments about the relevant topics, solving problems, and critiquing their own reasoning and that of others." [Deslauriers, Schelew, and Wieman, "Improved Learning in a Large-Enrollment Physics Class", *Science*, 332(6031):862-864, 2011.]**

Breakout Exercise!

Ed

- **How do you assign homework? Weekly, daily, how many problems?**
- **How do you do your grading? Online systems? Process vs. final answer?**
- **Do you ever use homework problems for in-class problem sessions?**
- **Advantages and disadvantages of different techniques?**
- **Instructions:**
  - **Set the timer for 10 minutes**
  - **1st person on the room list takes notes**
  - **3rd person on the room list reports out**

Group Discussion

Ed

- **Other than homework, what are the kinds of *formative and summative feedback and assessment* that you provide to students, either individually or in groups? Do you do anything "unconventional"?**
- **instructions:**
  - **raise your "virtual hand" and we will call on you to talk**
  - **keep your eye on the chat window and feel free to participate in the discussion there**

How Learning Works*

Brian

1. **Students' prior knowledge can help or hinder learning**
2. **How students organize knowledge influences how they learn and apply what they know**
3. **Students' motivation determines, directs, and sustains what they do to learn**
4. **To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned**
5. **Goal-directed practice coupled with targeted feedback enhances the quality of students' learning**
6. **Students' current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning**
7. **To become self-directed learners, students must learn to monitor and adjust their approaches to learning**

*Ambrose, Bridges, DiPietro, Lovett, and Norman, *How Learning Works* (2010)

Chinese Proverb

Brian

Tell me and I'll forget;

show me and I may remember;

involve me and I'll understand.

EXAM

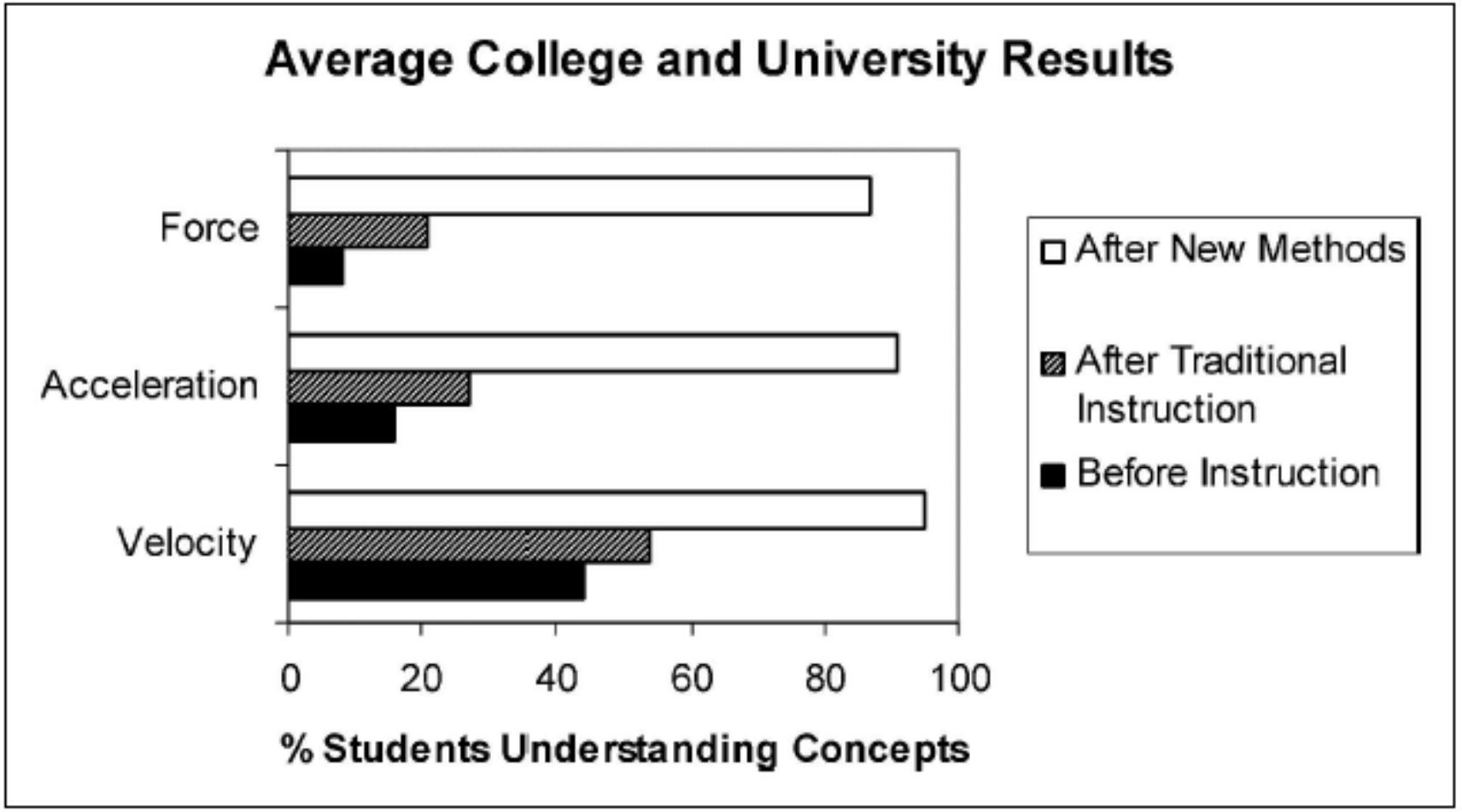


Figure 1. Active-engagement vs. traditional instruction for improving students' conceptual understanding of basic physics concepts (taken from Laws et al., 1999)

Conceptual Understanding

Brian

Procedural versus conceptual understanding
Concepts or "big ideas" function as organizers

Help students recognize errors

Develop novel procedures

May help with transfer

Deeper understanding

Some reasons for active learning….

Brian

- **Longer retention**
- **If you explain it, you learn it better**
- **Need practice working in teams**
- **I need to judge how well you understand what I am teaching**
- **Average person only has about a 12-minute attention span**
- **I want to try something new in my teaching**
- **I want to teach to all types of learning styles**
- **Other explanations?**

Active Learning Techniques

Brian

- **there are many active learning techniques that enhance student engagement, challenge their misconceptions, and get them focused on the *process*, not the *numerical answer***
  - ***But if the numerical answer is your goal, you can still use active learning!***

Explain What You are Doing!

Brian

- **When students understand what you are doing (i.e., the specific learning exercises and their objectives, course policies, etc.) they will begin to understand your *research-based* (!) approach to teaching and learning**
- **Questions to ponder:**
  - **why do you have the homework policies that you have? (i.e., how do they relate to the idea of *goal-directed practice* and *targeted feedback*?)**
  - **why do you do certain activities in class? (ex.: some of the group-based problem solving, team quizzes, etc. that you mentioned in Session 3)**
  - **why do you use video or "flip" the class? (what benefits can the students expect to receive by participating in these activities)**
  - **why do you use clickers or similar formative feedback approach? (what is the feedback used for, and how do you use it to improve the class?)**
- **A clear explanation of the *benefits to students* sets the stage for better learning**

Socratic Questioning….

Brian

- **Pose a question, make it clear that you don't want someone to shout out the answer**
- **Wait – let people think**
- **Make sure they know it is okay to make mistakes ("I made lots mistakes when I first looked at this material")**
- **Learn (or attempt to learn) some names if possible**
  - **If let them discuss in teams, ask them "what did your group discuss?"**

Concept Questions During Class

Brian

- **Think-pair-share**
  - Give students the opportunity to think on their own
  - After a minute or two, have them talk with their neighbor (s)
  - Can use a lot of techniques to gauge how they are doing
- **Eric Mazur: "The goal of PI is to transform the lecture environment so that it actively engages students and focuses their attention on underlying concepts…lectures consist of a number of short presentations on key points, each followed by a [pre-]ConcepTest", peer discussion, then a post-test. [Crouch, Watkins, Pagen, and Mazur, "Peer Instruction: Engaging Students One-on-One, All at Once", Research-Based Reform of University Physics, 2007.**

Your concept questions…

Miller

- **A force in the x-y plane creates a moment:**

  a) In the x direction
  b) In the y direction
  c) In the z direction

- **How many independent stress components are there?**

  a) 18 **b) 9** **c) 6**

- **Other good concept questions include identification of the number of 2 force members in a frame or zero force members in a truss.**

Your concept questions…

Miller

- **A force in the x-y plane creates a moment:**

  a) In the x direction
  b) In the y direction
  c) In the z direction

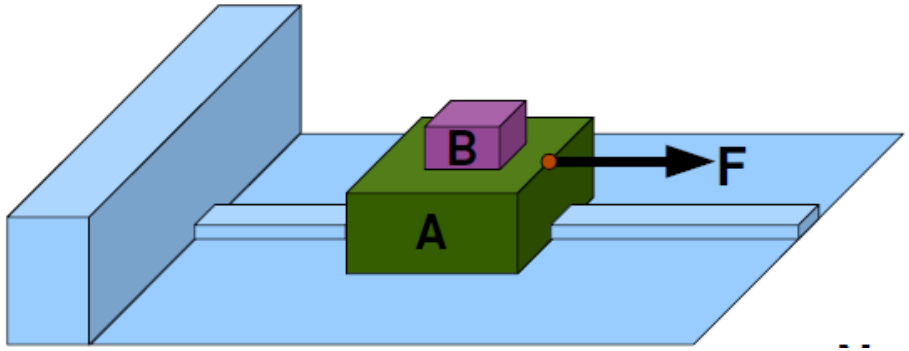
- **How many independent stress components are there?**

  a) 18 **b) 9** **c) 6**

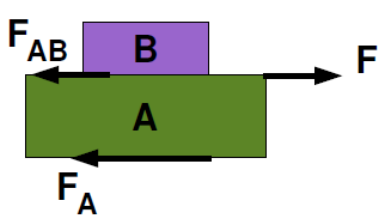
- **Other good concept questions include identification of the number of 2 force members in a frame or zero force members in a truss.**

2. A force F pulls the block shown. Assume that there is a sufficient amount of friction between the surfaces to maintain the system in static equilibrium. Which pair of free-body-diagrams below is correct (select one)?

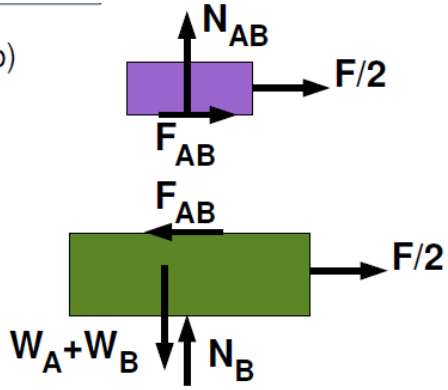
Miller



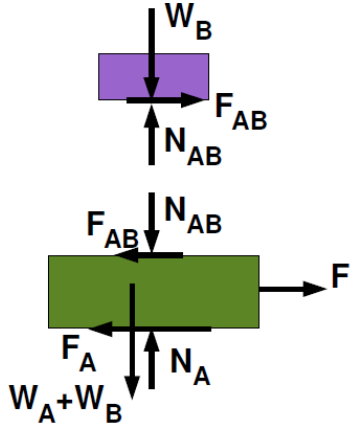
(a)



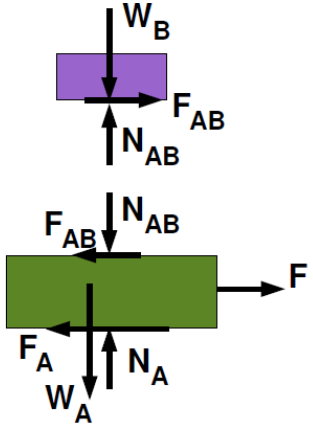
(b)



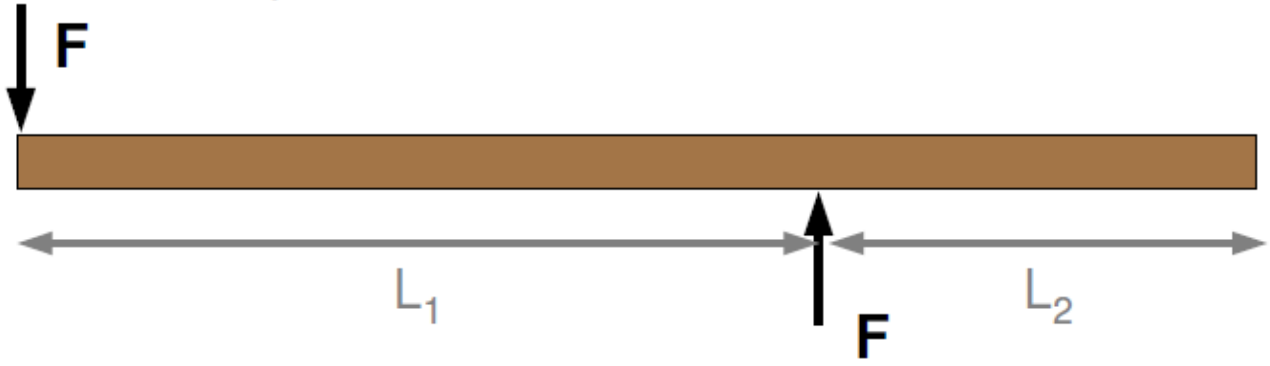
(c)



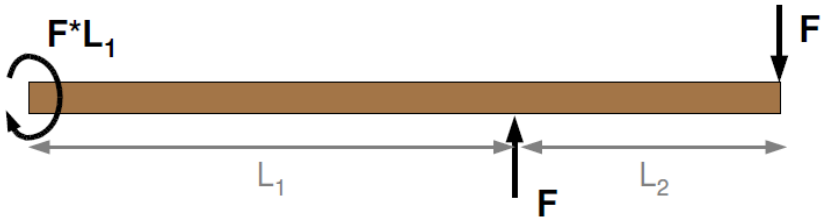
(d)



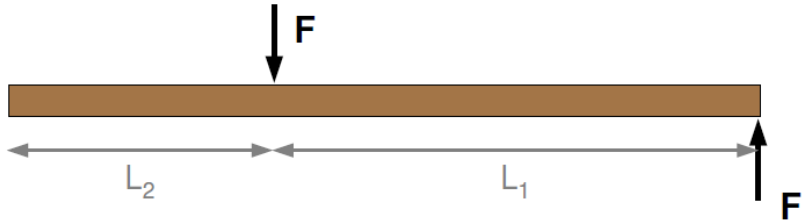
3. Which of the loading conditions shown below is equivalent to the loads at the top (select one)?



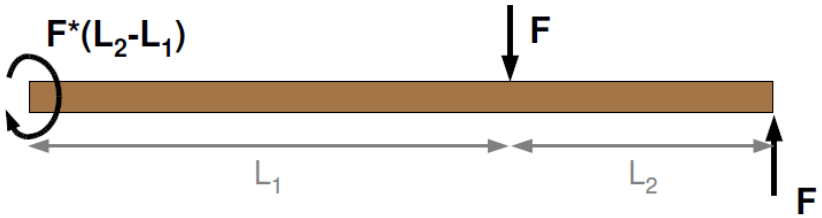
(a)



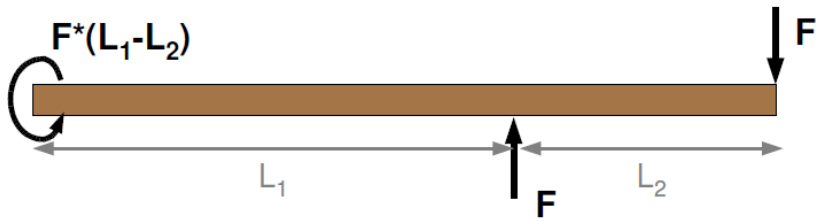
(b)



(c)



(d)



(e) *None of the above*

Your concept questions…

You weigh 175 lb. While you are standing on a scale in an elevator, the scale reads 225 lb. Which of the following could be true of the motion of the elevator (circle all that apply)?

a) The elevator is moving up at constant speed.
b) The elevator is speeding up while moving up.
c) The elevator is slowing down while moving up.
d) The elevator is moving down at constant speed.
e) The elevator is speeding up while moving down.
f) The elevator is slowing down while moving down.

The correct answers are b) and f); in both cases the acceleration is up.

Your concept questions…

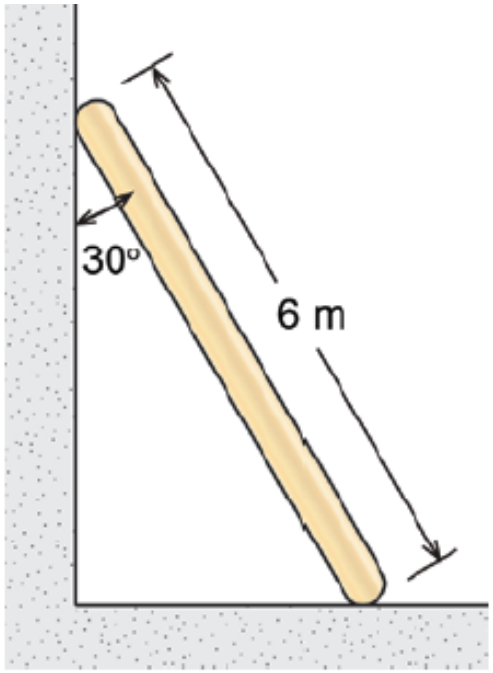
Hill

A 24-kg ladder is released from rest in the position shown. You may model the ladder as a slender uniform bar and neglect friction. If you wish to determine the angular acceleration of the ladder at the instant of release, which kinetic analysis approach would you employ?

a) Newtonian mechanics

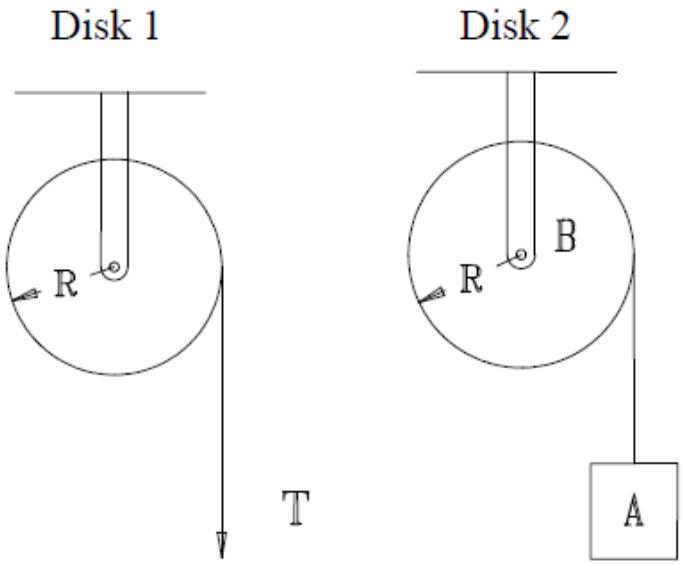
b) Work-energy

c) Impulse-momentum



Your concept questions…

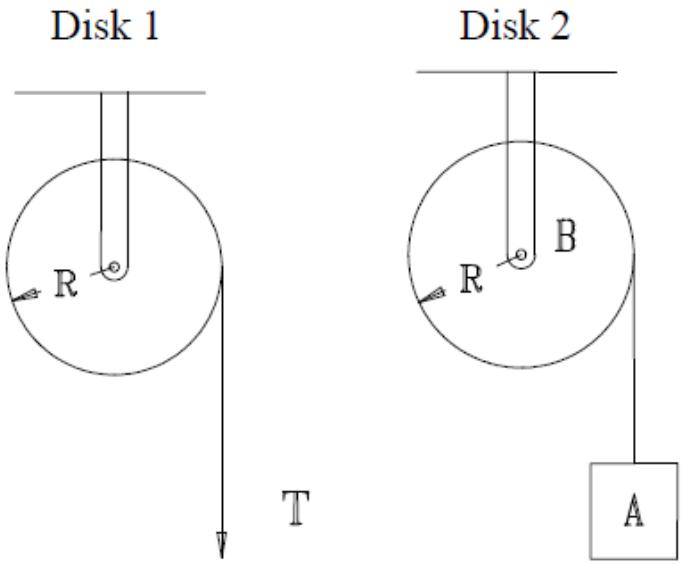
Enriquez



5. Two identical disks are supported by smooth pins as shown. Knowing that the weight of the block A is equal to the tension T, what can be said about the motion of this disks:

a. The angular acceleration of Disk 1 is bigger than that of Disk 2.
b. The angular acceleration of Disk 1 is smaller than that of Disk 2.
c. The two disks will have the same angular acceleration.
d. Insufficient information to make a conclusion.

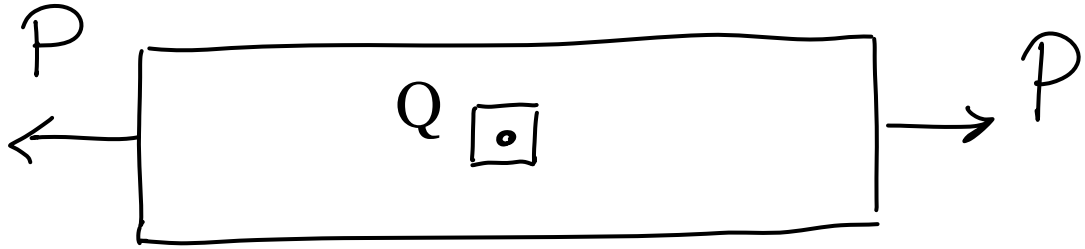
Your concept questions…

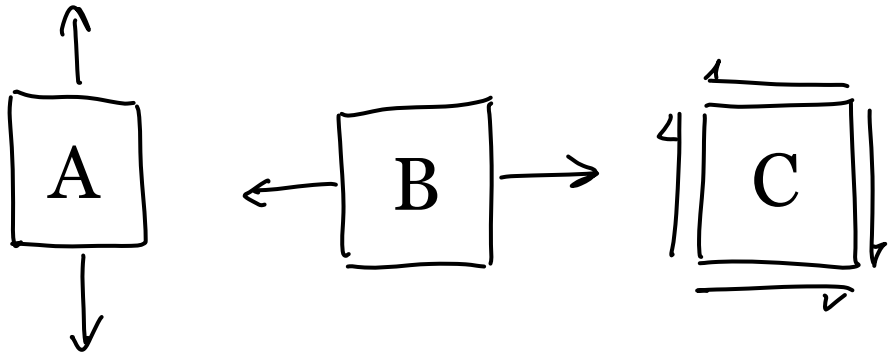


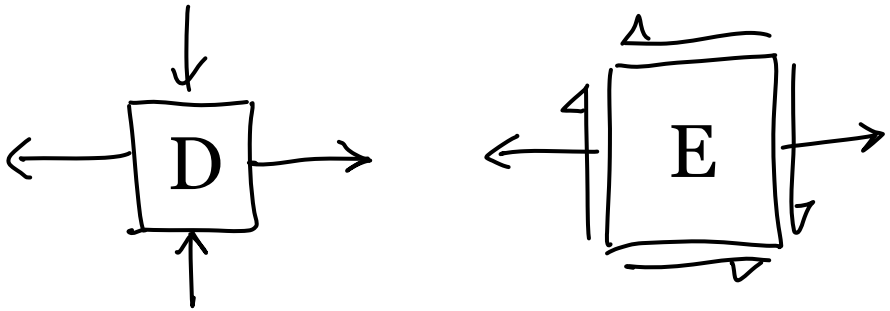
5. Two identical disks are supported by smooth pins as shown. Knowing that the weight of the block A is equal to the tension T, what can be said about the motion of this disks:

a. The angular acceleration of Disk 1 is bigger than that of Disk 2.
b. The angular acceleration of Disk 1 is smaller than that of Disk 2.
c. The two disks will have the same angular acceleration.
d. Insufficient information to make a conclusion.

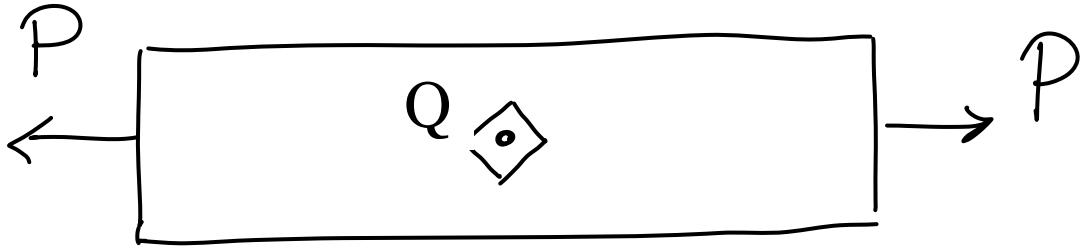
Given the loading shown, pick the correct stress state for point Q

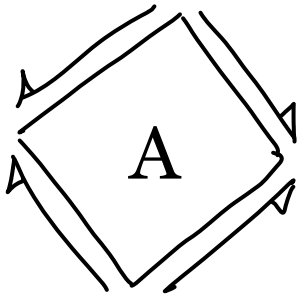


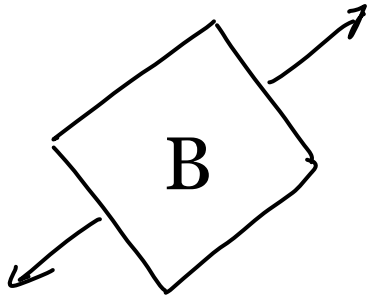


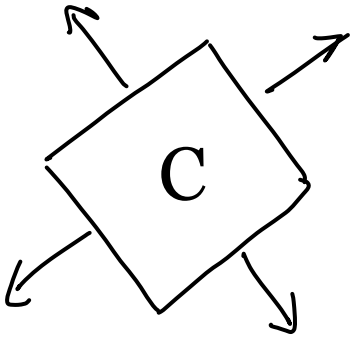


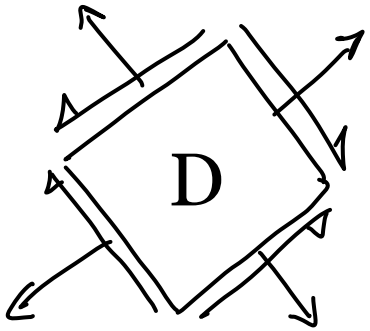
Given the loading shown, pick the correct stress state for point Q

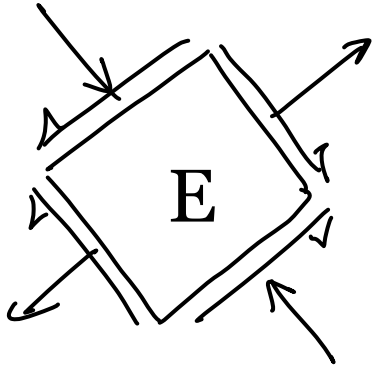








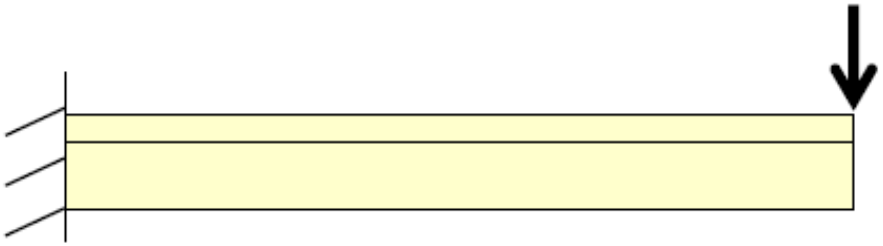




Your concept questions…

May

3. For the cantilevered T-beam shown below, how are the maximum tensile stress and maximum compressive stress due to bending related:
    a. They are equal
    b. The tensile stress exceeds the compressive stress
    c. More information is needed
    d. The compressive stress exceeds the tensile stress



Question A

The principle of superposition can be applied when

A. **Loading is small**
B. **Loading is complex**
C. **Hooke's law applies**
D. **Strain is small**
E. **More than one of the above**

Ranking Tasks

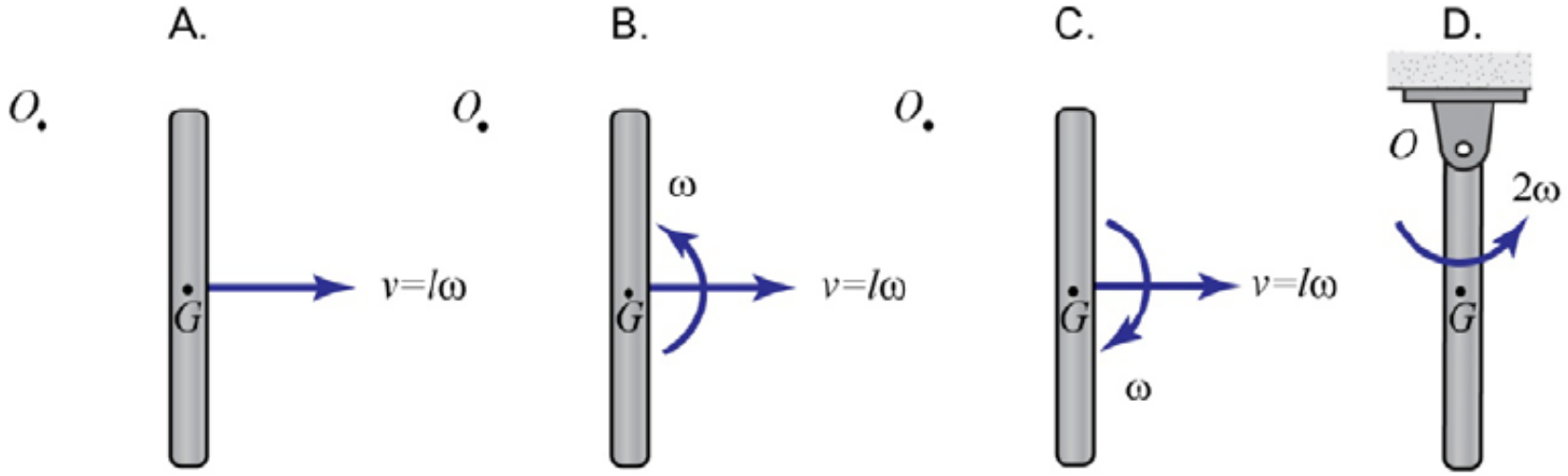
- **Given a set of different choices, students rank according to a certain criteria**
- **May involve one major concept or parameter, or multiple ones**
- **Entire book on this for Physics; intro at**
  - **http://galileo.phys.virginia.edu/classes/641.stt.spring06/Demos_Labs_Curriculum/Curriculums/ranking_task_exercises/RTINTROD.PDF**

Ranking Task

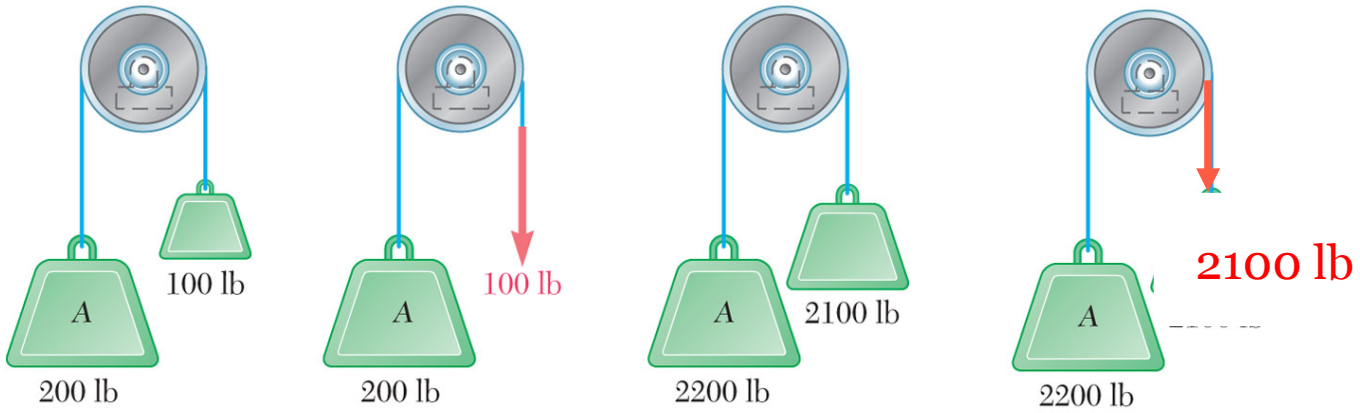
Hill

A bar of mass m and length l moves differently in each of the situations shown. Rank the angular momentum of the bar with respect to the fixed-point O from greatest to least for the given situations.

Greatest _____ Next _____ Next _____ Least _____



Rank on which "Block A" goes down fastest



(a) **(b)** **(c)** **(d)**

FASTEST **SLOWEST**

Be prepared to explain your reasoning:

Breakout Exercise!

Brian

- **What are some things that you do in class to encourage active participation of your students?**
- **Instructions:**
  - **Set the timer for 10 minutes**
  - **4st person on the room list takes notes**
  - **2nd person on the room list reports out**

For Session 5 (May 2, 2013)

Brian

- **Update your user profile (with a picture!)**
- **Connect with our community on the blog**
- **Review materials placed in Session 5 Resources folder**
- **Upload a team-based project assignment that you have used in your class, or a team project idea (if you don't typically use team-based projects), to the folder Session 5>Projects/ Project Ideas**