

# Exploring an Electronic Polling System for the Assessment of Student Progress in Two Biomedical Engineering Courses

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# Classroom Communications Systems (CCS)

- Objectives -
  - Increase interaction with students in larger lecture settings >100
  - Real time feedback on students' understanding
  - Stimulate collaboration and communication through group interaction
  - Encourage students to process information during class

# Classtalk

- Classtalk -University of Massachusetts
  - Physics
  - Chemistry
- Small HP Palmtop computers
  - Picked up at the beginning of class
  - Groups of 2-4 students



# TI Navigator



TI | **navigator**

A CLASSROOM LEARNING SYSTEM

Classroom Configuration

What are the components of a TI-Navigator™ classroom?

Network Hubs

Network Charging Bays

Internet Gateway, Access Point and Ethernet Hub

Classroom Computer\*

TI-83 Plus\*

TI ViewScreen™ Panel\*



\*Not included with the TI-Navigator system.

Main  
Menu

Setup  
Intro


 TEXAS INSTRUMENTS

# Wireless Options

- Infrared
  - CPS - the Classroom Performance System
  - PRS- the Personal Response System

M15: If ball 1 in the arrangement here is pulled back and then let go, ball 5 bounces forward. If ball 1 and 2 pulled back and then let go, balls 4 and 5 bounce forward. The number of balls bouncing on each is equal because:

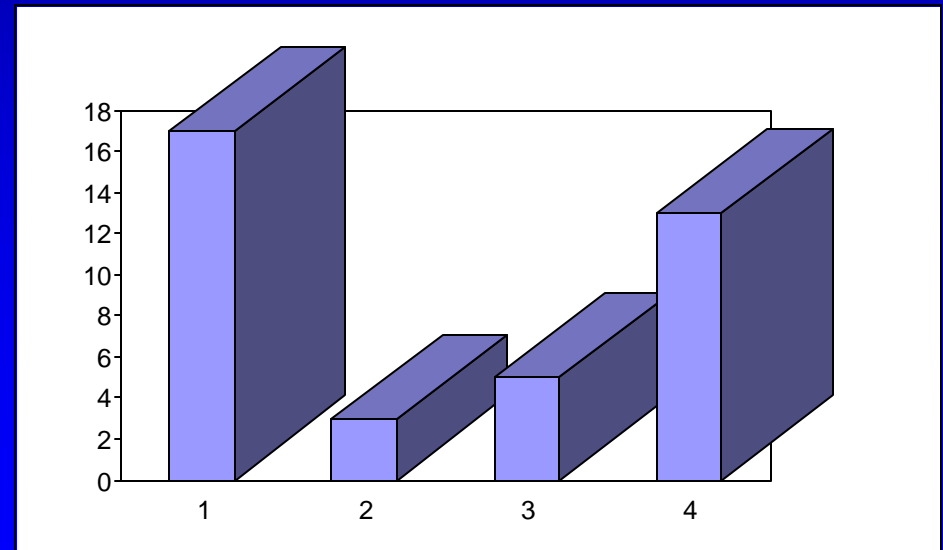
1. of conservation of momentum.
2. the collision are elastic.
3. neither of the above.



Question by Eric Mazur. "Peer Instruction: A User's Manual". Prentice Hall, 1997.



# Formative Assessment: Personal Response System (PRS)



# Advantages of the Personal Response System

- Full participation (anonymous)
- Instant feedback to instructor
- Instant feedback to student
  - Preconceptions
  - Reflect on material
  - Not alone in their misconceptions

# Views on Classtalk

- Many benefits to CCS system



# Some ways to use the Personal Response System

- Pre-test or preconceptions
- Stimulate interest
- Assessment of material recently covered
- Reassessment of material recently covered

Q7: Which animal's front legs provide a greater mechanical advantage?



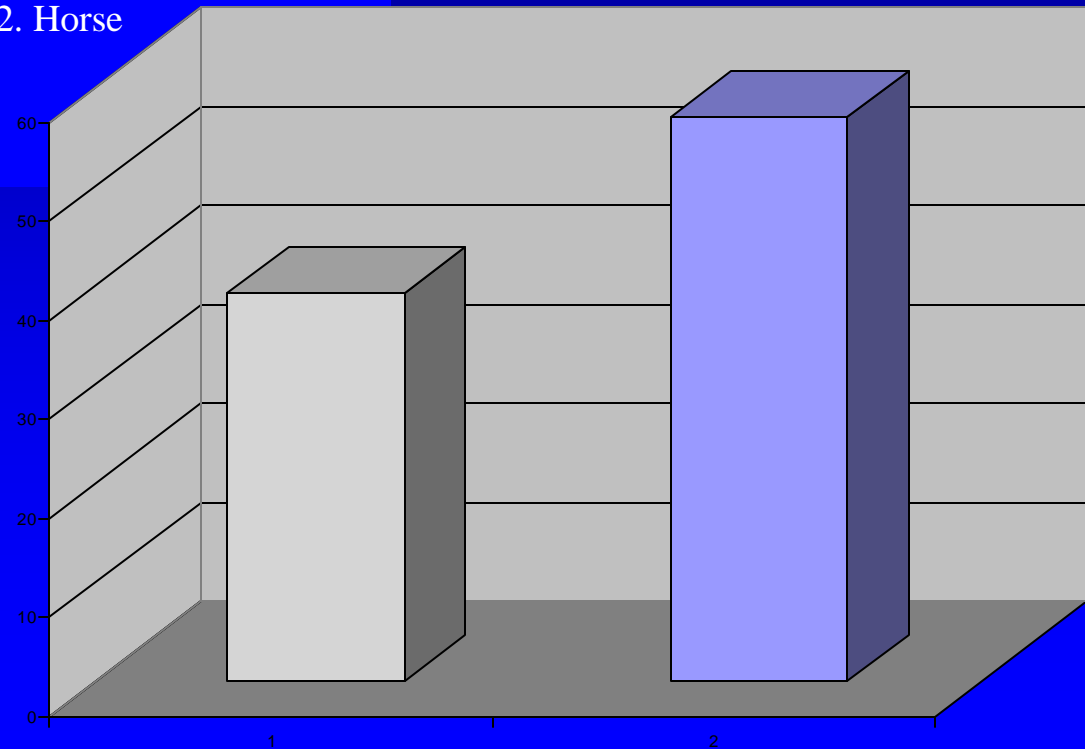
1. Armadillo



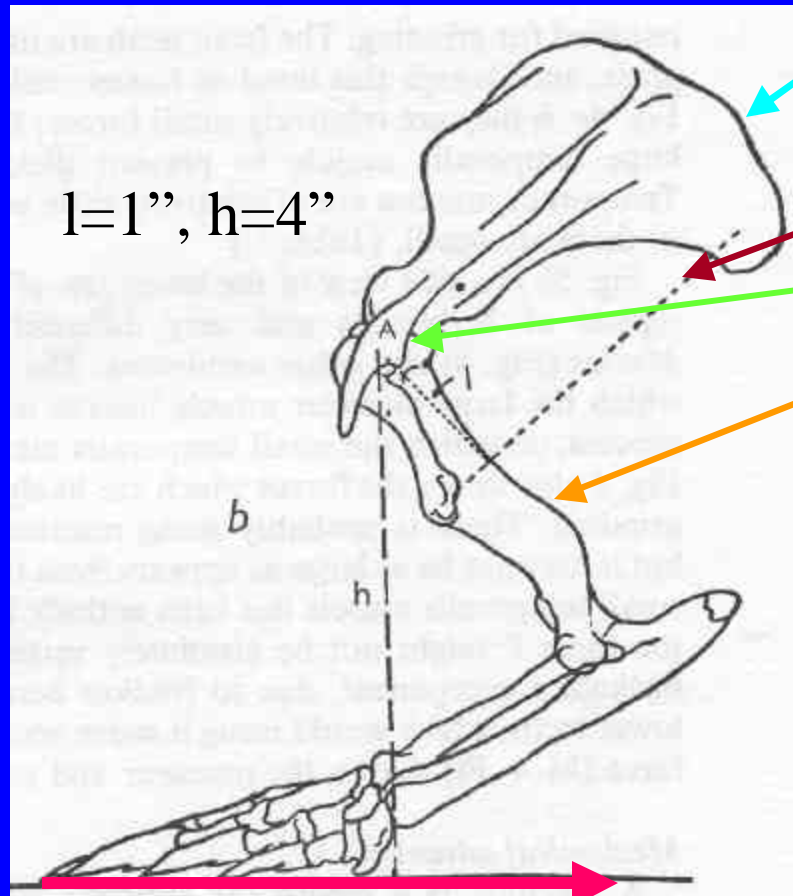
2. Horse

Pre/Posttest  
Example

Pretest

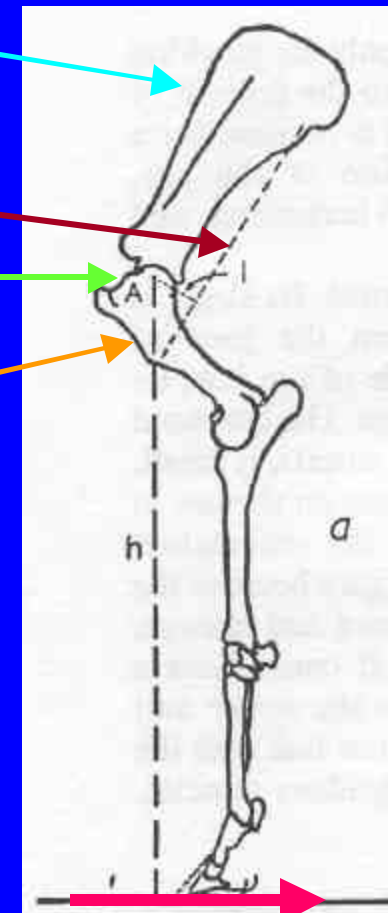


# Armadillo vs. Horse



Armadillo

$l=4.6''$ ,  $h=5'$



Horse

Force by  
foot ON  
ground

Q8: Which animal's front legs provide a greater mechanical advantage?



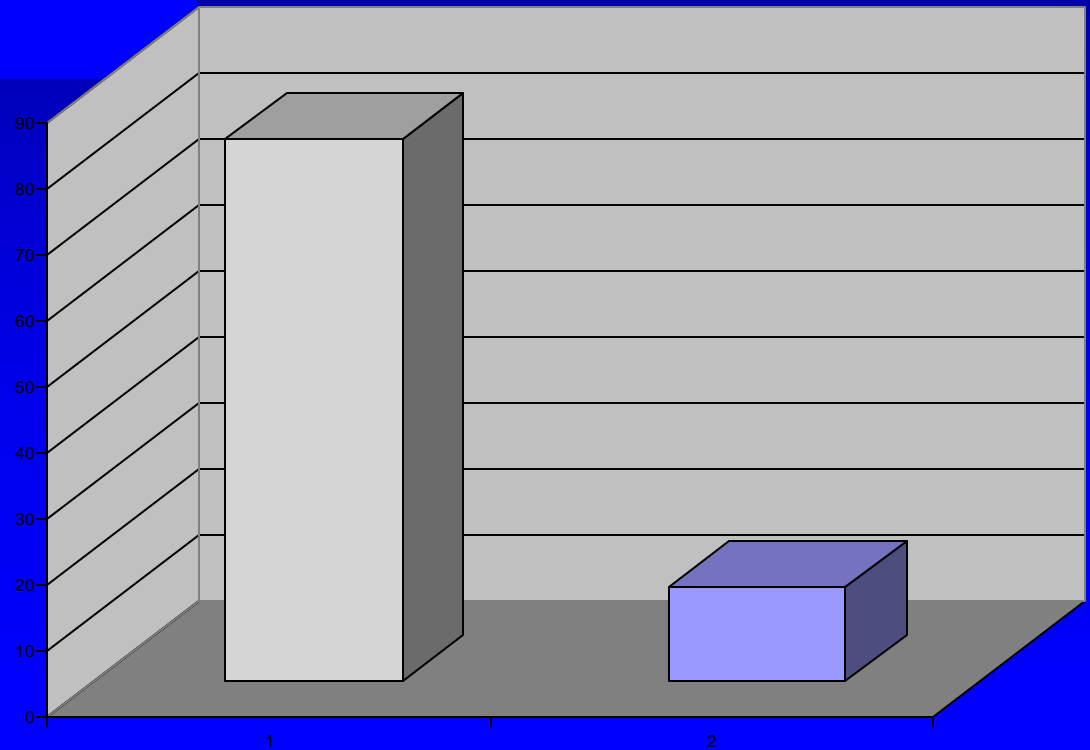
1. Armadillo



2. Horse

Pre/Posttest  
Example

Posttest

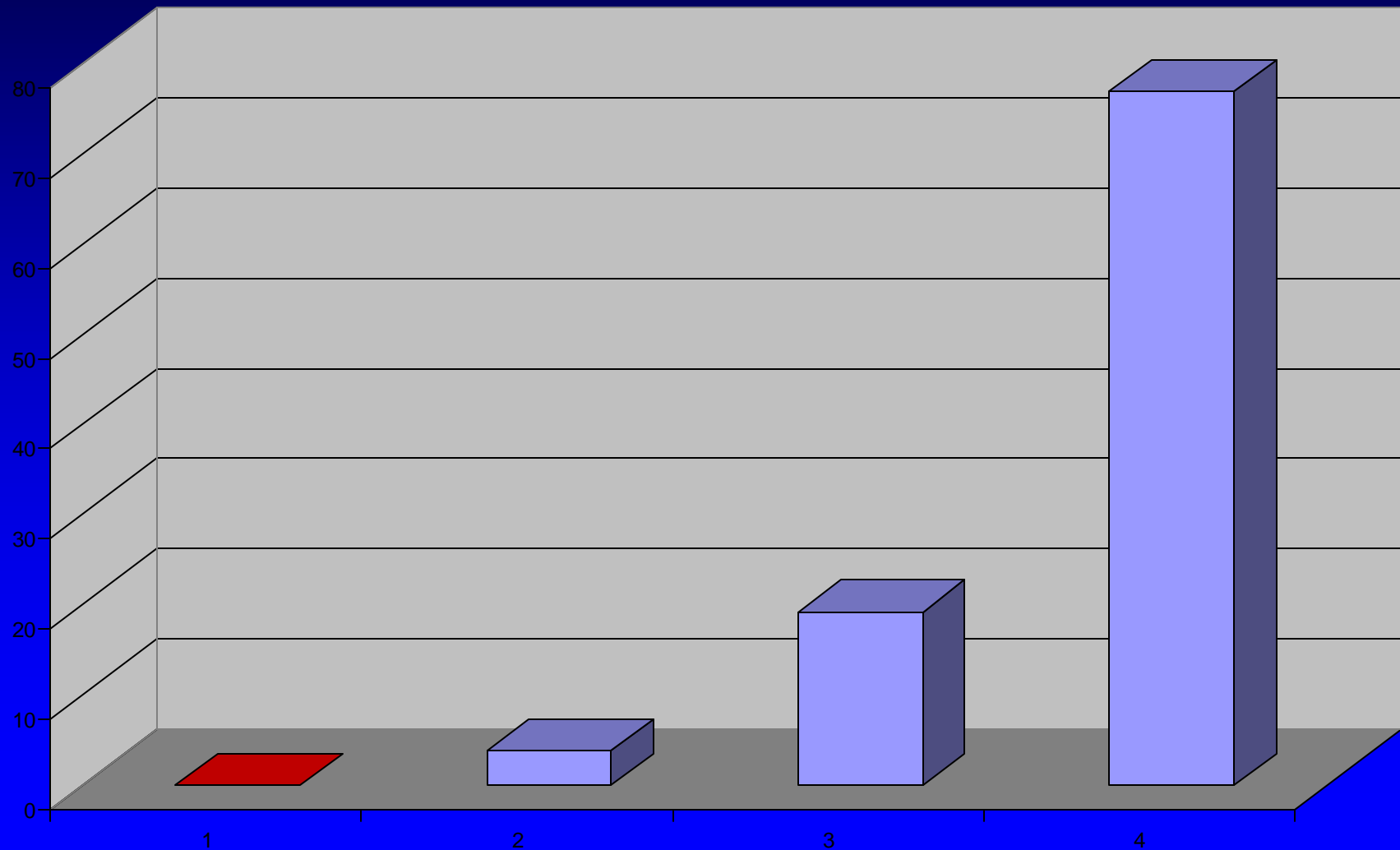


## Question to Stimulate Interest

**Q3. What percentage of falls by the elderly result in hip fracture?**

1. 2%
2. 10%
3. 25%
4. 45%

# Q3. Student Response

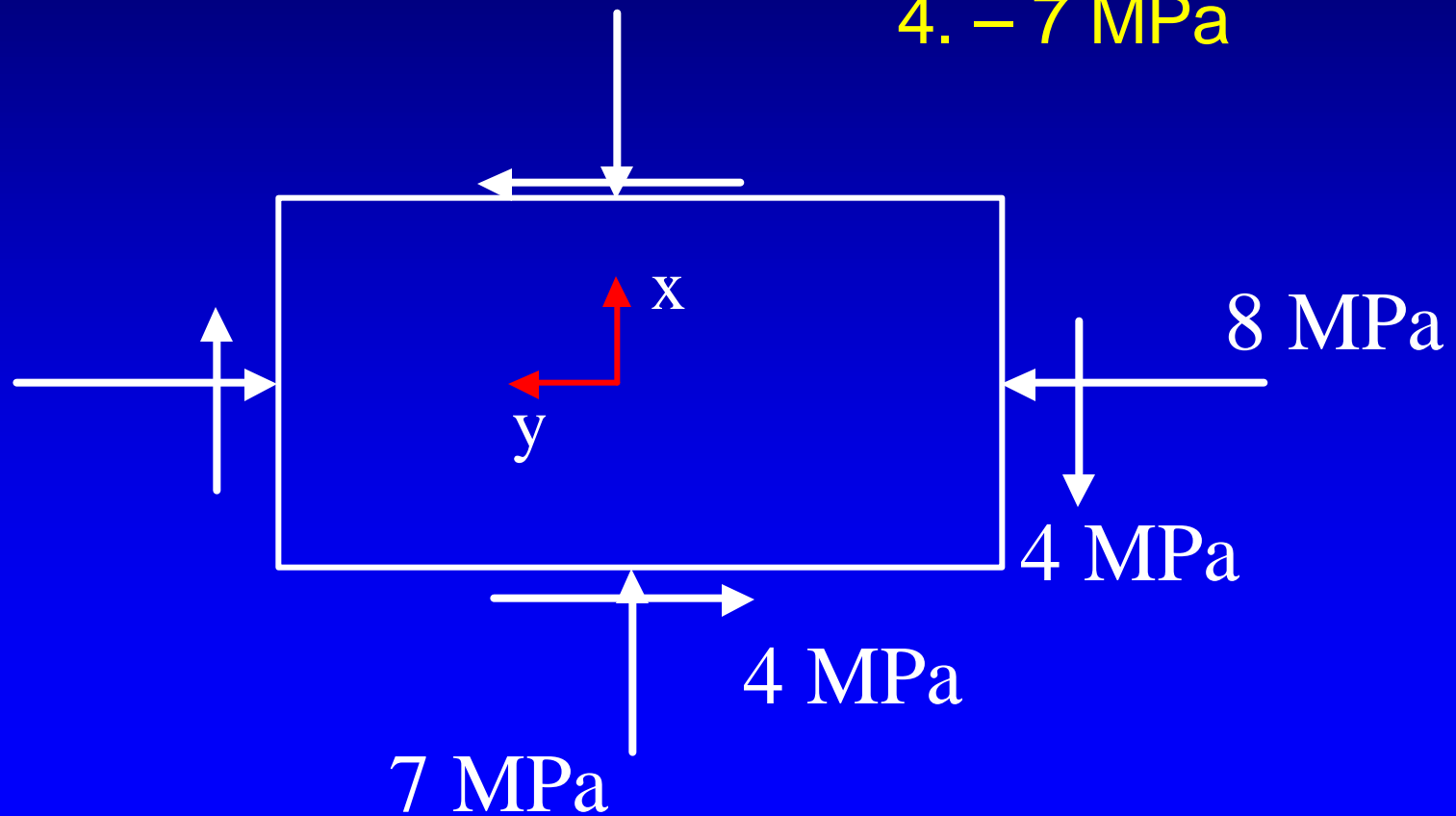


You can use PRS to find out  
what concepts students find  
difficult

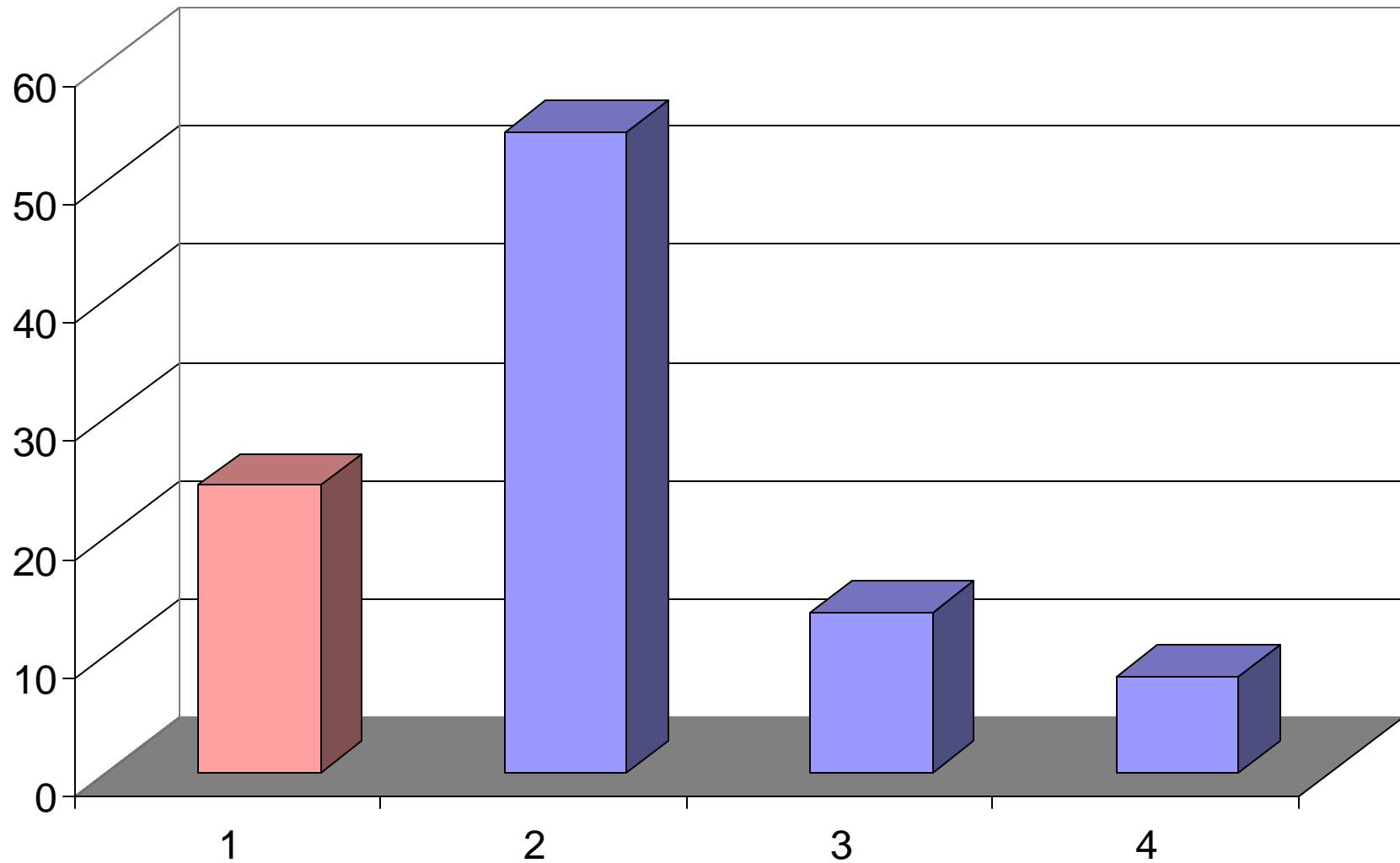
You'll be surprised!!!

PRS Q11:  $\tau_{yx}$   
equals:

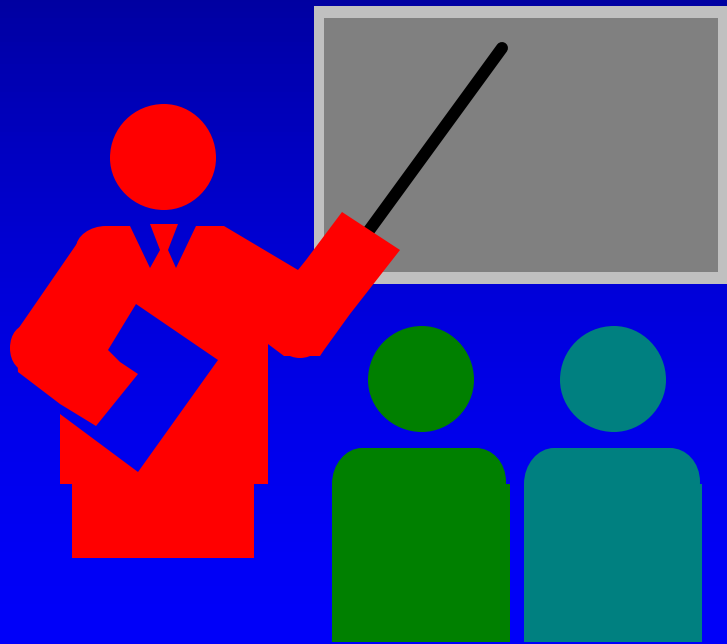
1. 4 MPa
2. -4 MPa
3. 7 MPa
4. -7 MPa



# Response, PRS 11



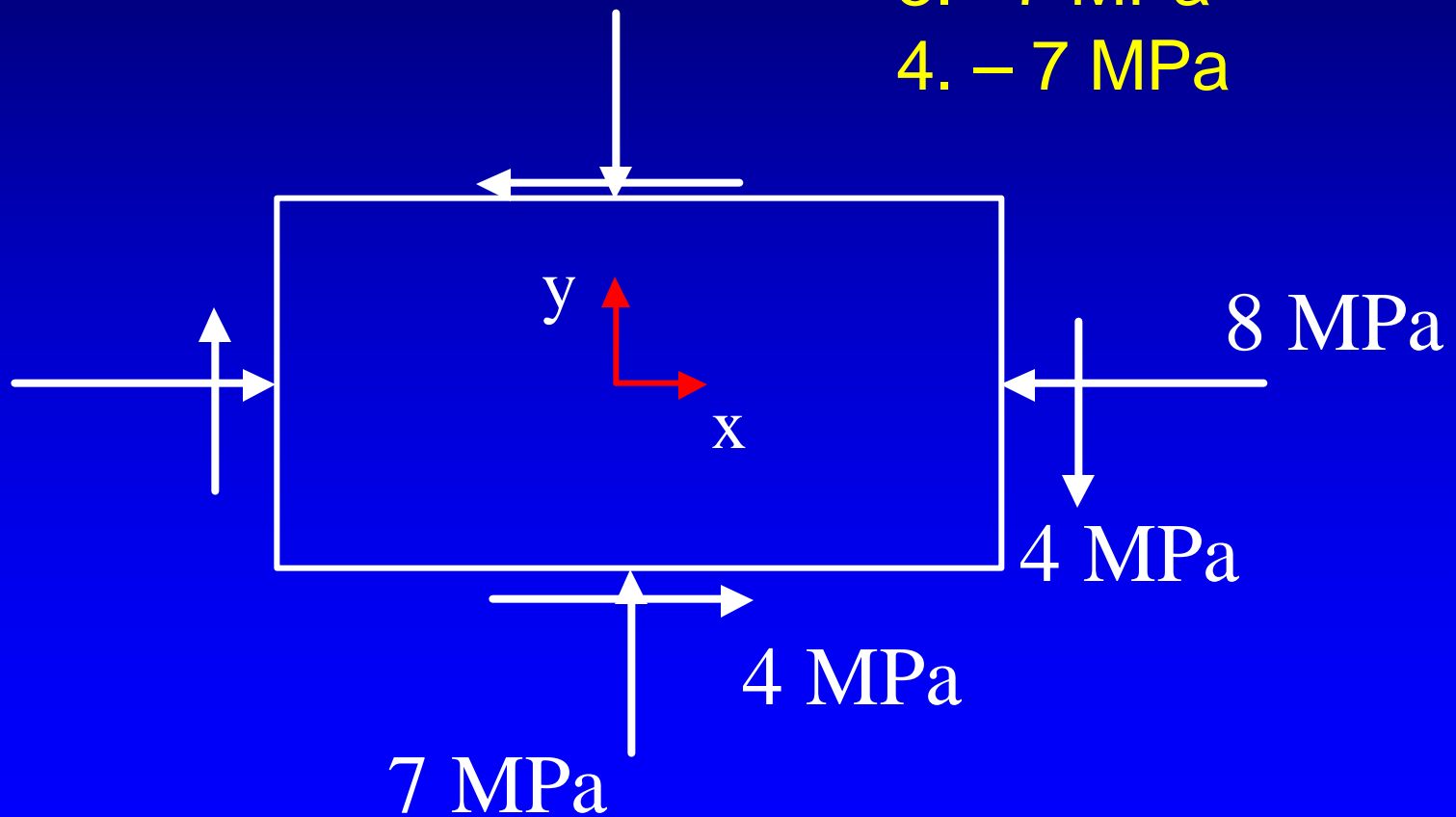
# Back to the Drawing Board...



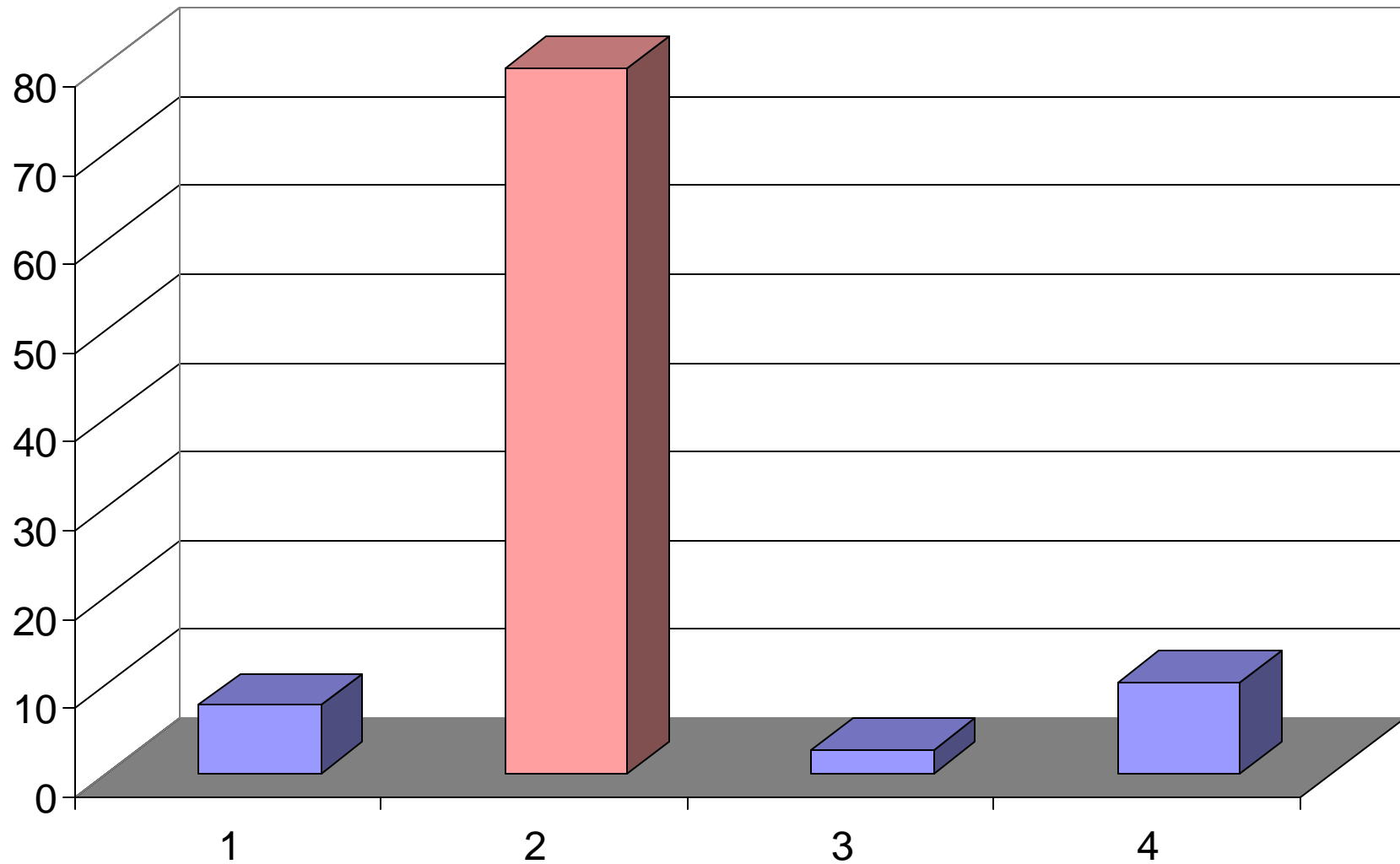
PRS Q12:  $\tau_{xy}$

equals:

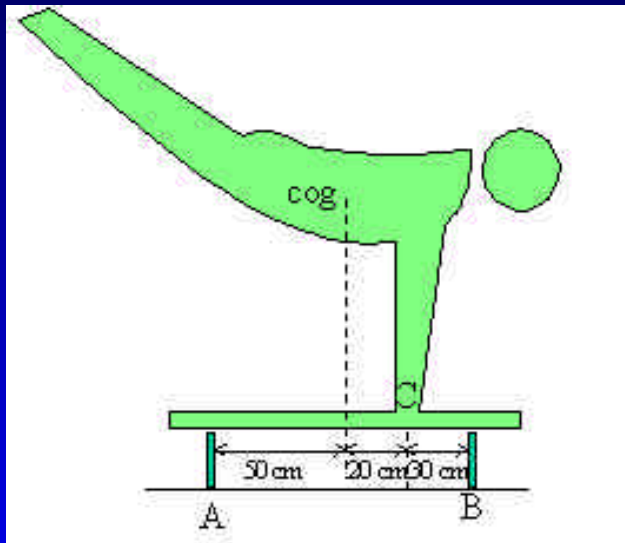
1. 4 MPa
2. -4 MPa
3. 7 MPa
4. -7 MPa



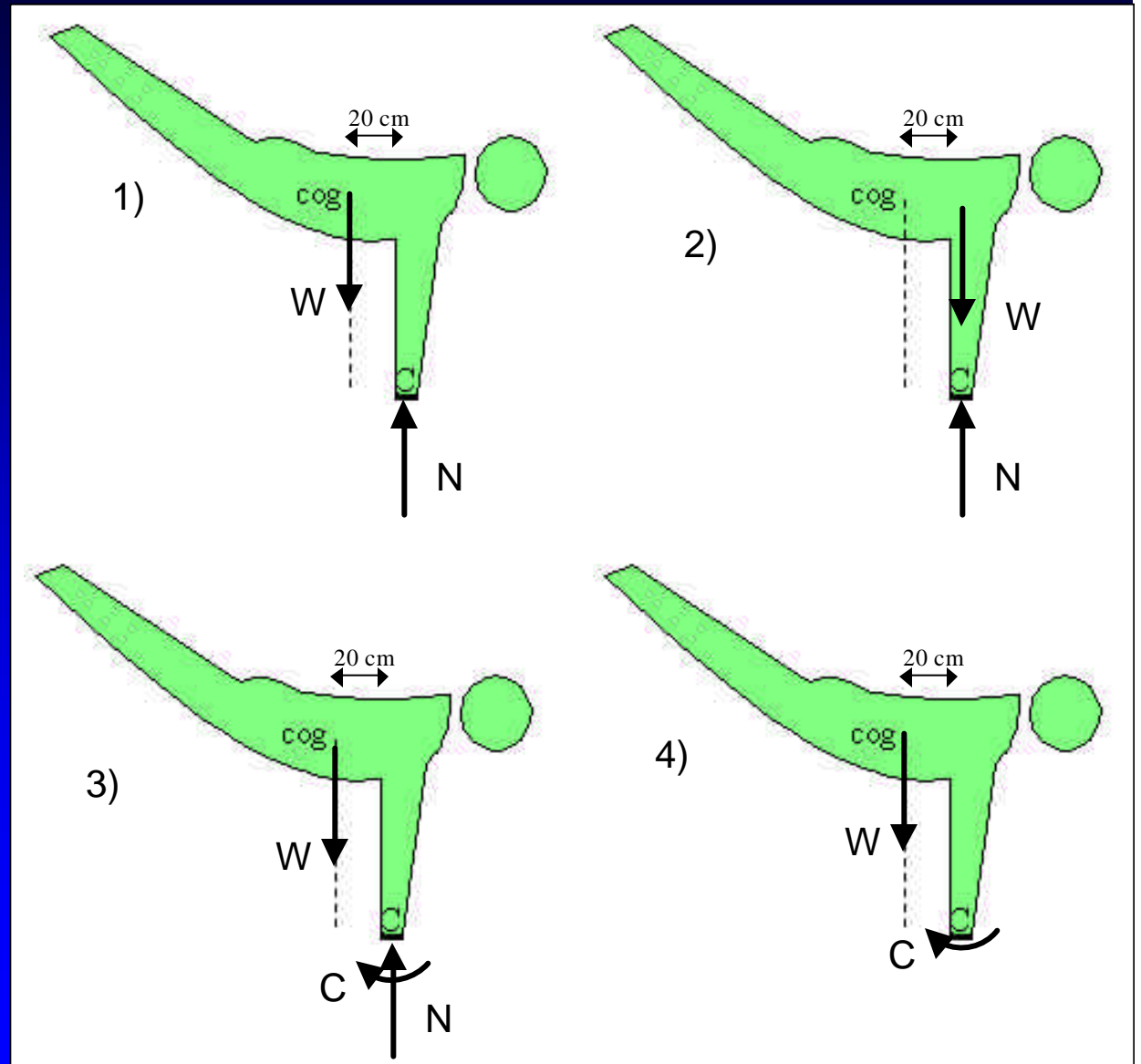
# Response, PRS 12



# Example: Personal Response System

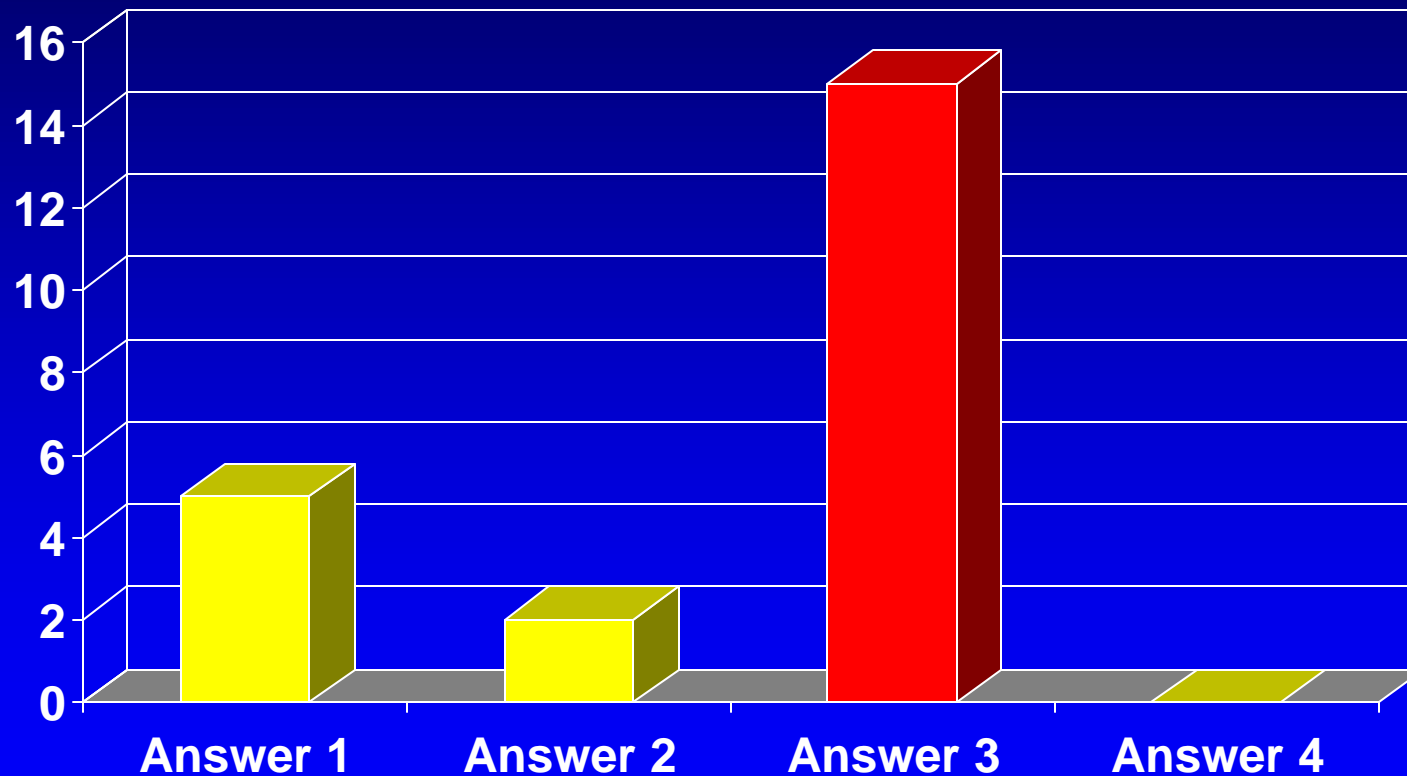


Select the correct FBD for the gymnast

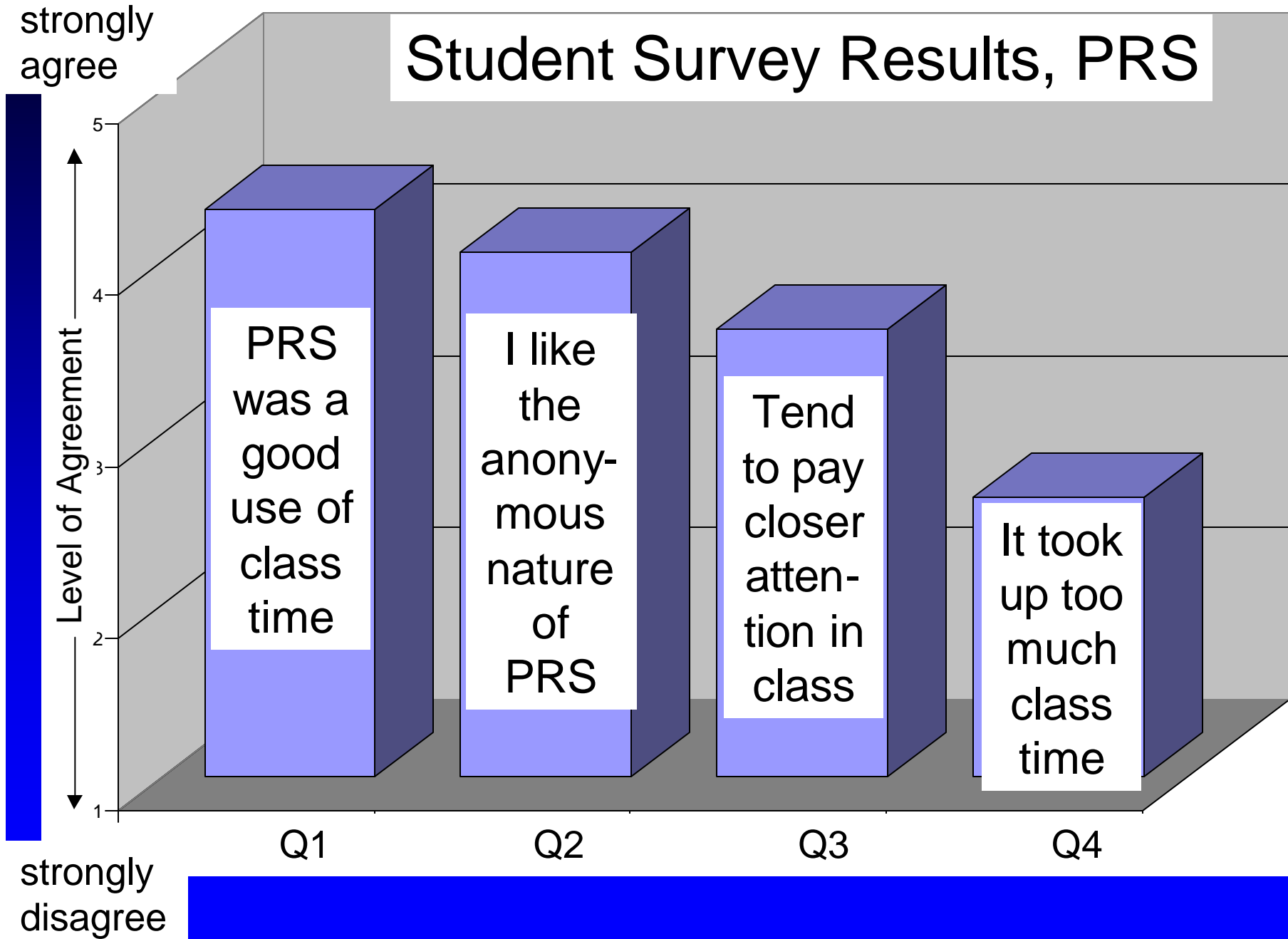


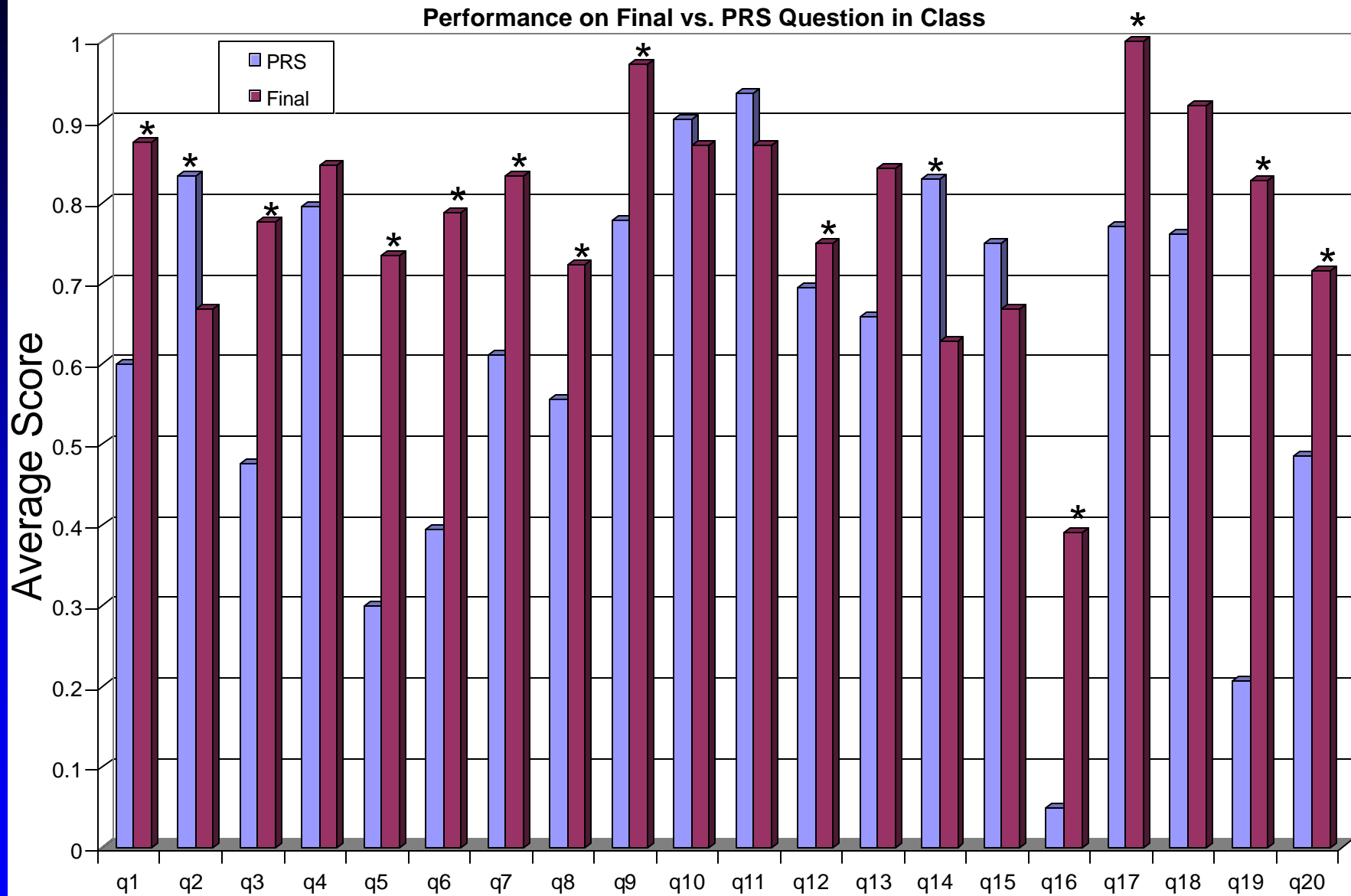
# Actual Student Response Gymnast FBD

Recognition vs. Generation



# Student Survey Results, PRS





\*  $p < 0.05$ , paired t-test

Average E.S. = .4

# PRS System

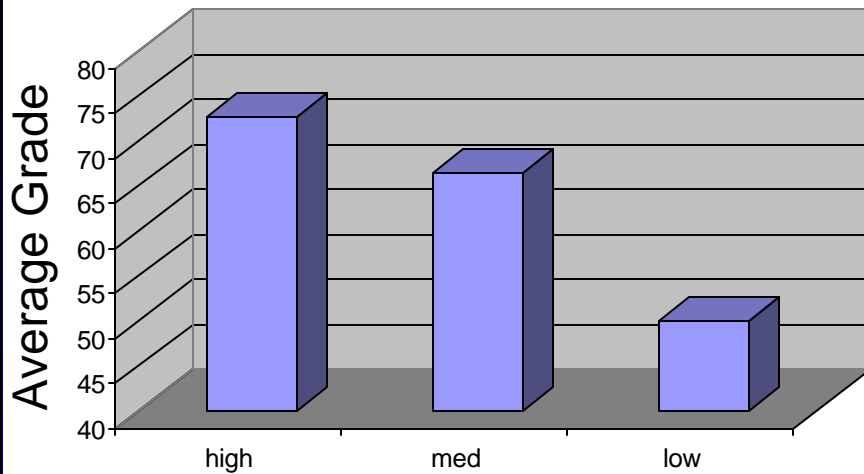
## BME 101, Spring 2002

### Performance vs. Participation

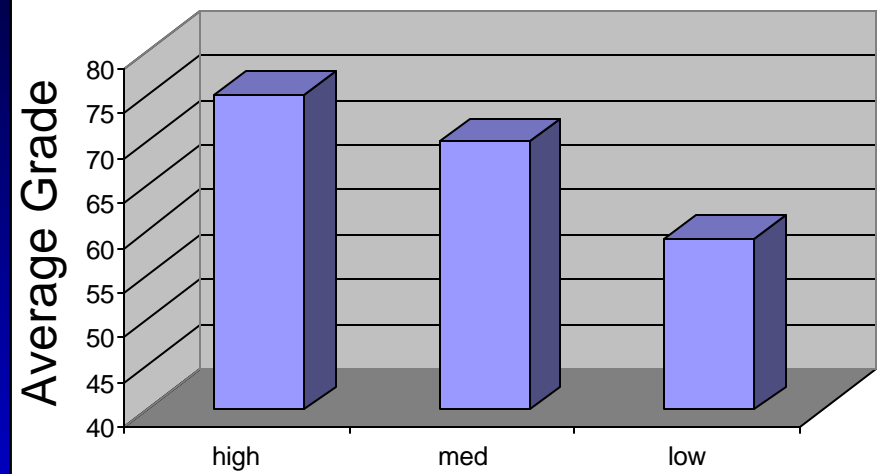
Number of Questions Answered	Participation Group
24-64 (n=15)	Low
72-84 (n=14)	Medium
85-94 (n=17)	High

# Performance is Related to Participation

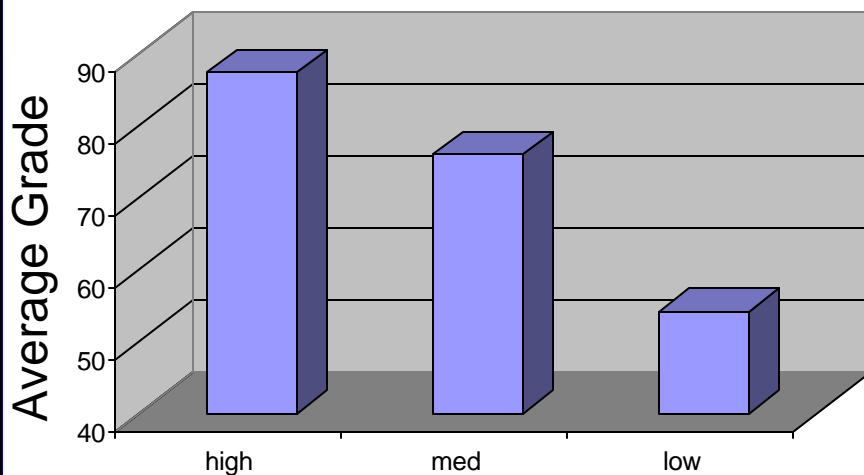
## Final Exam vs. Participation



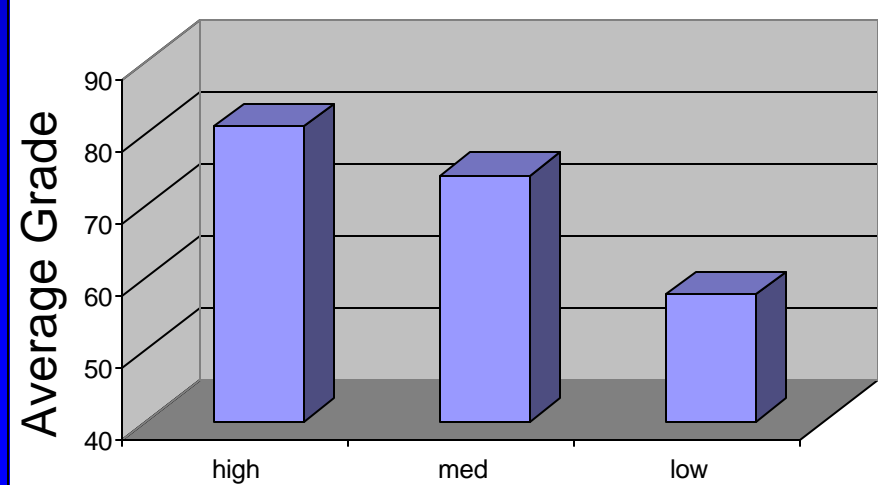
## Exam Average vs. Participation



## Homework Average vs. Participation

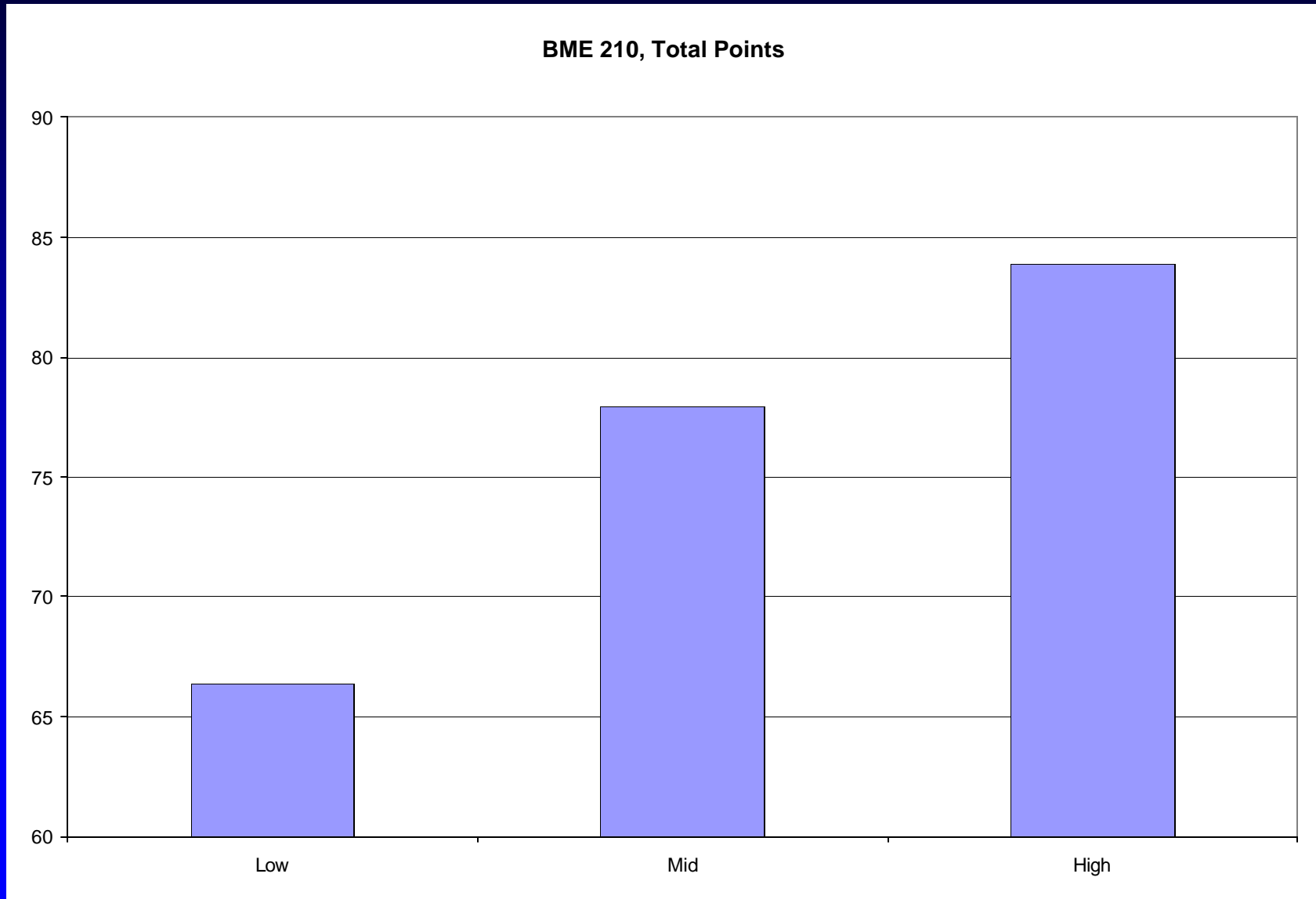


## Total Points vs Participation



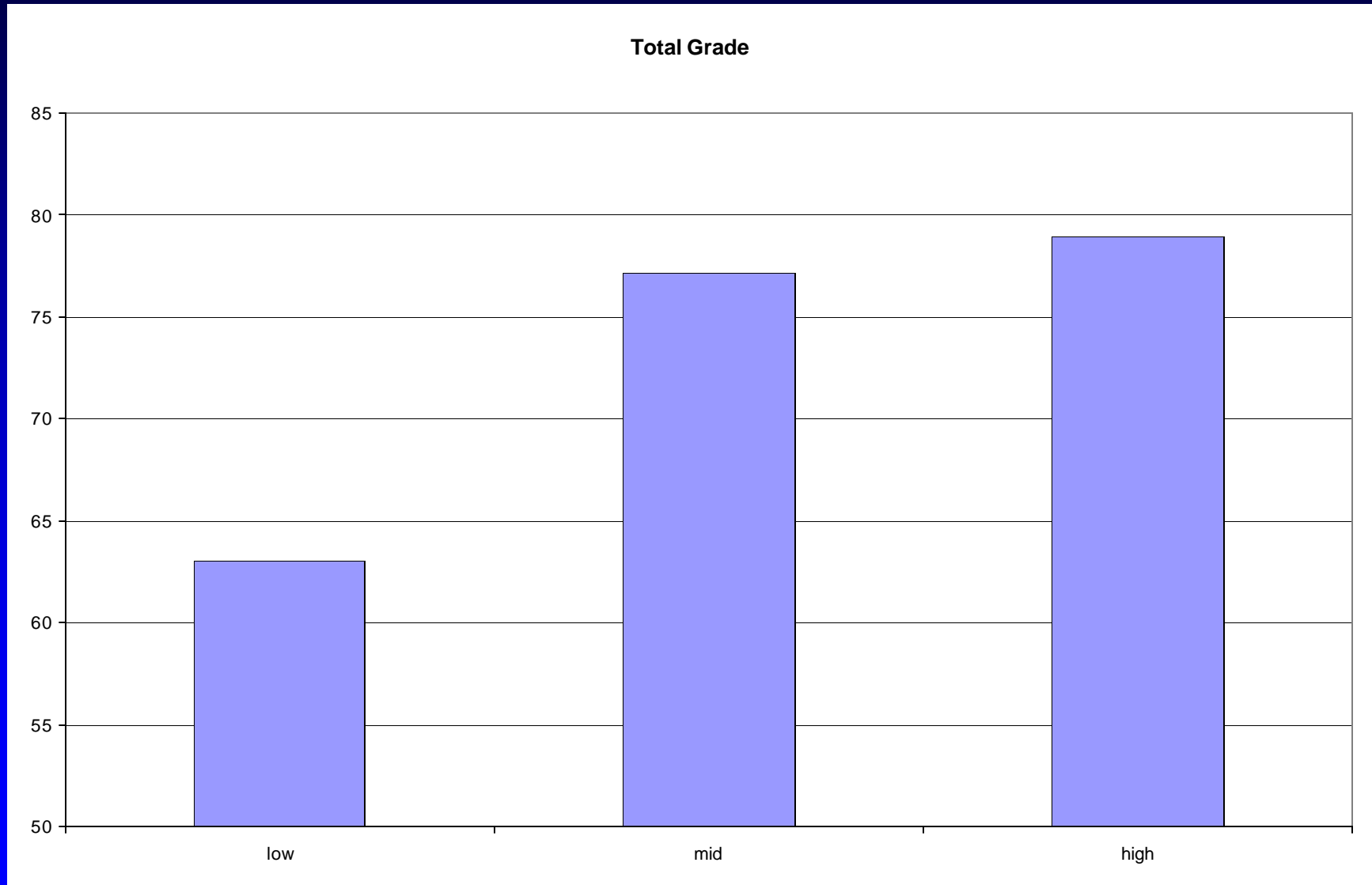
# Final Grade vs. Participation Group

## BME 210, Fall 2001



# Final Grade Performance vs. Participation Group

## BME 101, Spring 2001



# Disadvantages

- Limited to Multiple Choice Questions
- Setup/Breakdown Time
- Computer & Electronic Difficulties

# Summary

- PRS is an effective method for providing formative feedback to students.
- Students like the PRS and agree that it is a good use of class time. (Instructors do too!!)
- Periodic use of PRS uncovers concepts that students find difficult.
- Student performance in three courses was related to class participation.