

Strength of Materials (SOM) Concept Inventory

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Presentation Outline

- Background
- Preliminary Assessment Results
- Example Questions from Inventory

Purpose

Purpose: Assess students' mastery of
SOM concepts

Motivated by personal experience

SOM's Place in the Curriculum

- Calculus → Physics → Statics → SOM
- SOM concepts are new to students
- May preclude “pre-testing”
- SOM concepts are essential to follow-on courses

SOM Concepts

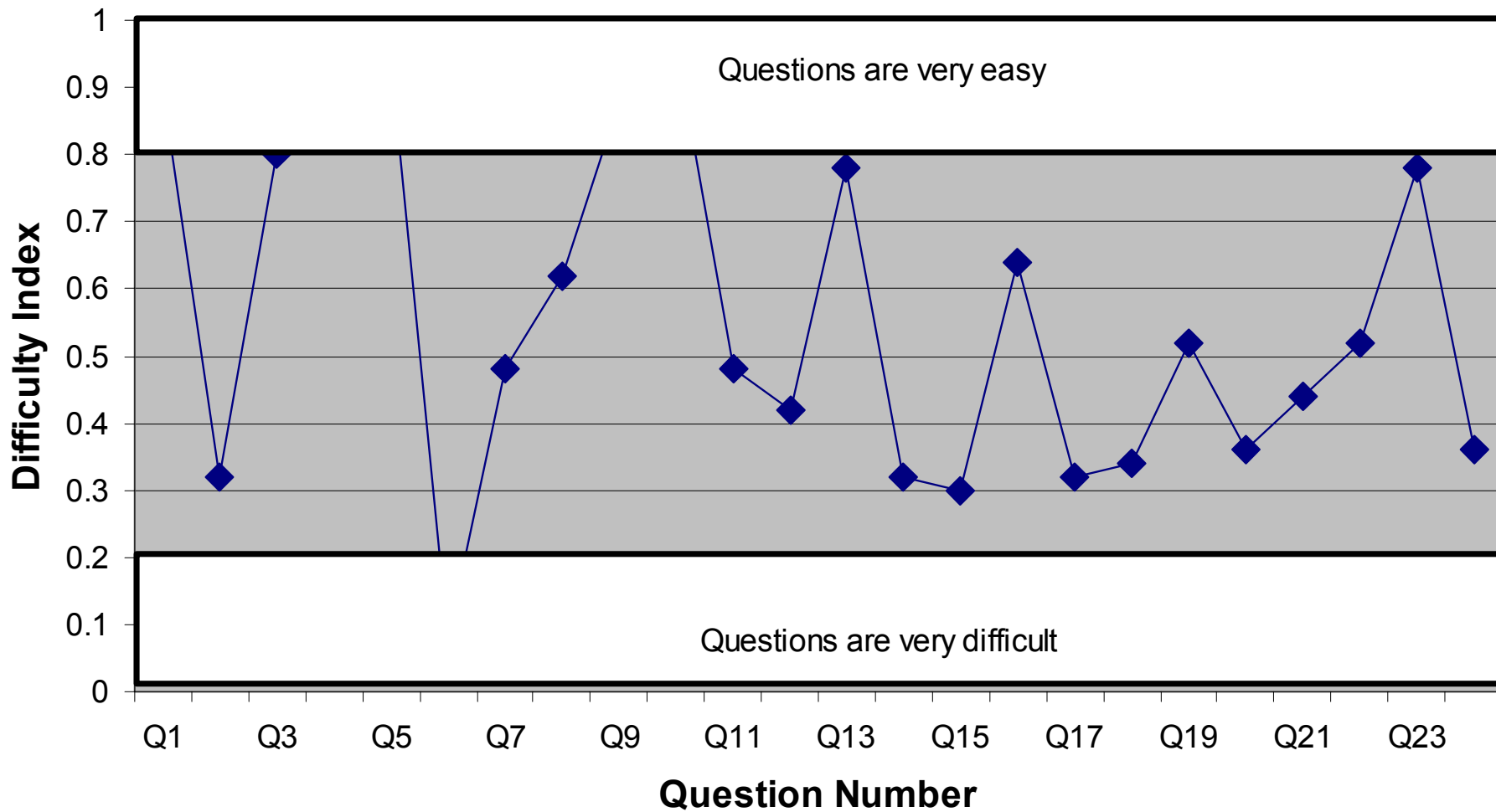
- Shear & Bending Moment Distributions
- Stress & Strain
 - Axial & Torsional on Rods
 - Axial, Shear & Bending on Beams
- Axial Buckling
- Pressure Vessels
- Failure of Ductile & Brittle Materials

Development Process

- Met with developer of FCI
 - Shared with professors
 - Interviewed students
 - Psychometric assessment (on students who have already taken SOM)
-
- Modify concept inventory
 - Beta version available by Jan. 2002
- to do
↓

Item Difficulty

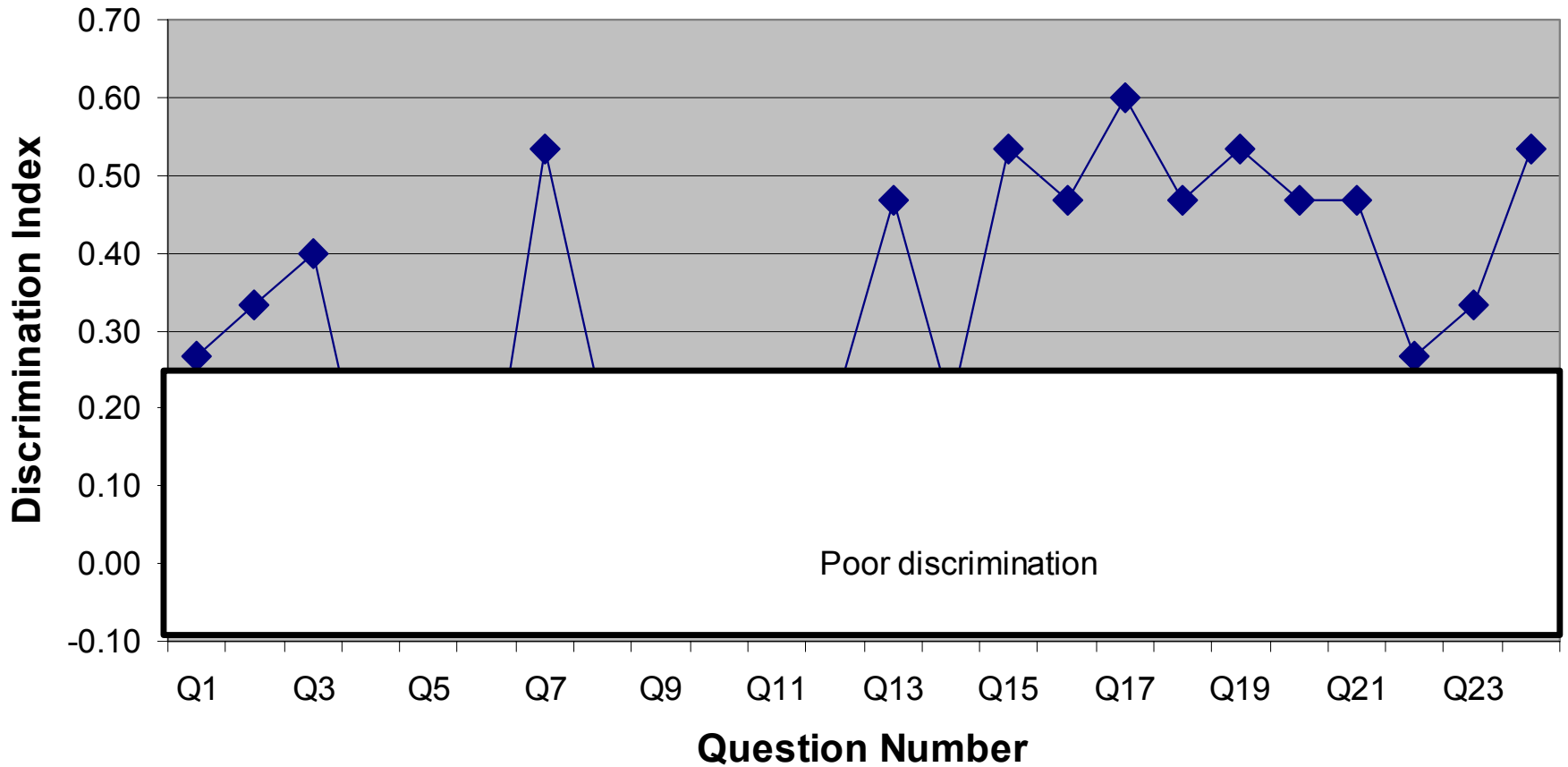
(Percent who got the item correct)



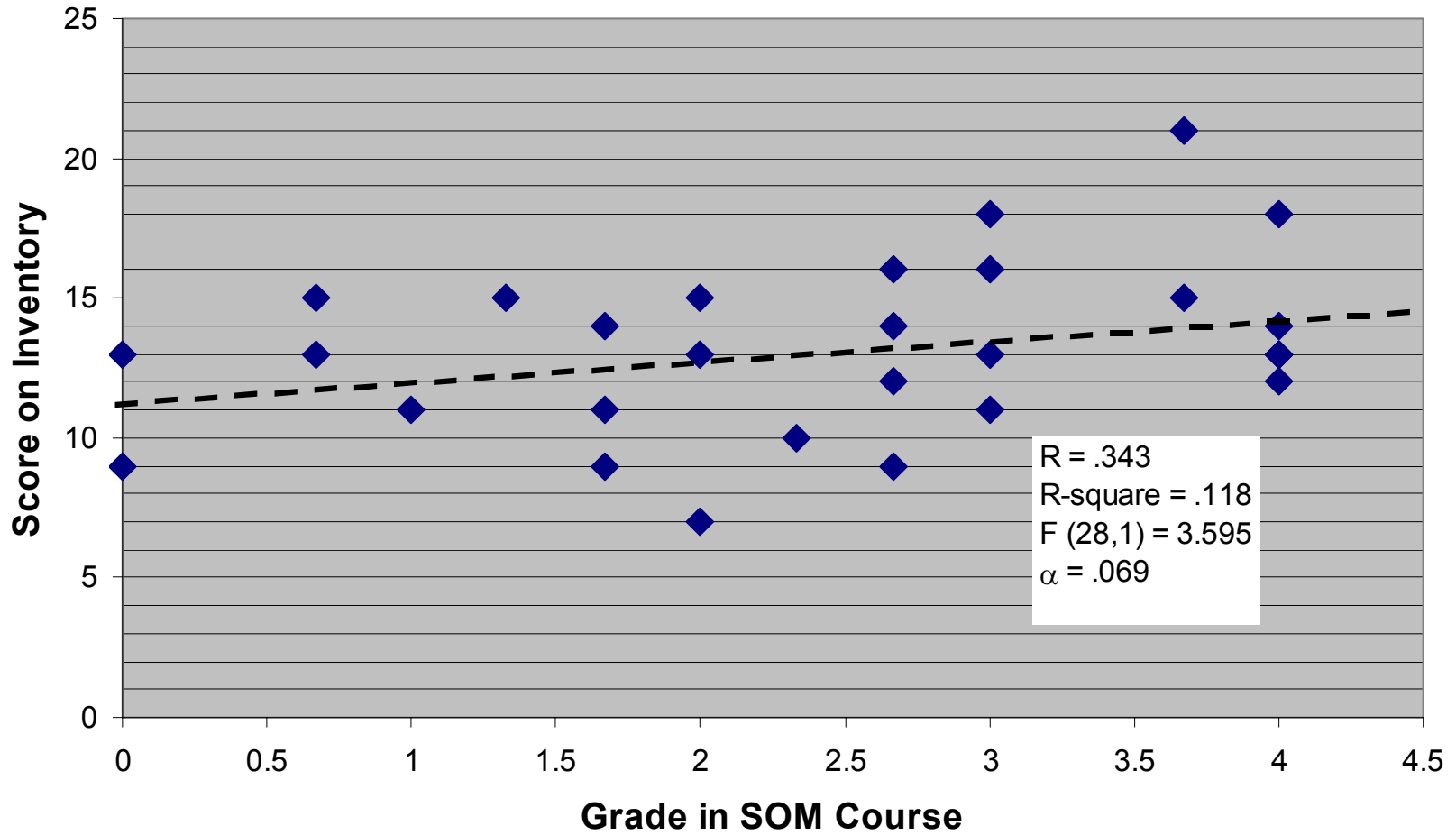
Discrimination

How well do questions discriminate between high and low scorers?

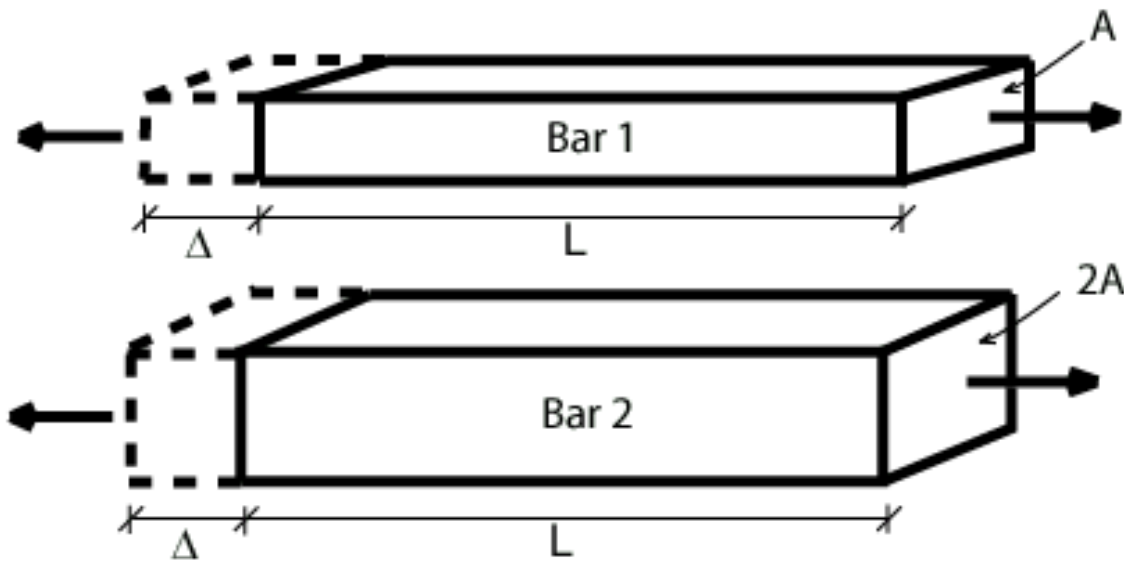
(Interpret as percent more high scorers than low scorers who got the question correct)



Correlation of Inventory to SOM Grade



2. Two constant cross-section steel bars have the same initial length L and the same elongation Δ . If the cross-sectional area of Bar 2 is twice that of Bar 1, the axial stress of Bar 2 is:



- 26 % a) half the axial stress in Bar 1.
- 42 % b) twice the axial stress in Bar 1.
- 32 % c) equal to the axial stress in Bar 1. **correct answer**

7. An axial force is applied to two steel rods having the same length, cross-sectional area A and support conditions. Which rod will buckle at a lower force?

48 %

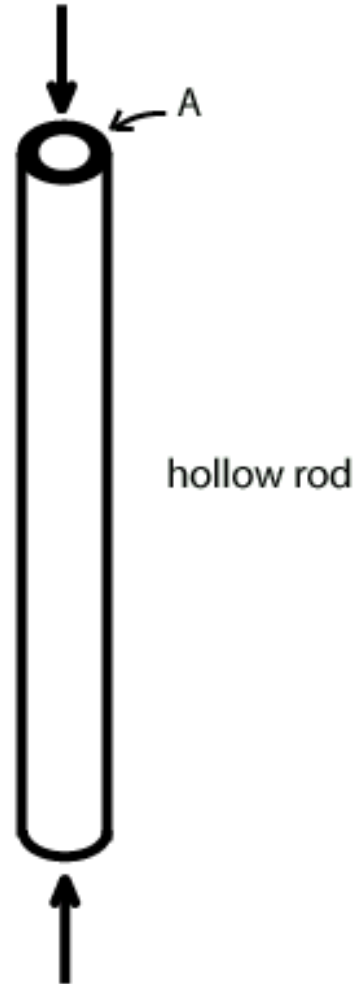
a)

correct
answer



40 %

b)

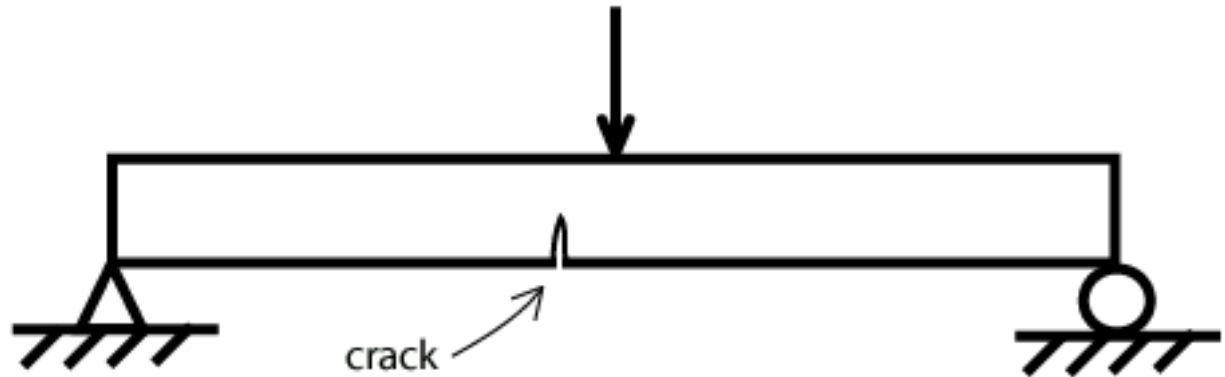


12 %

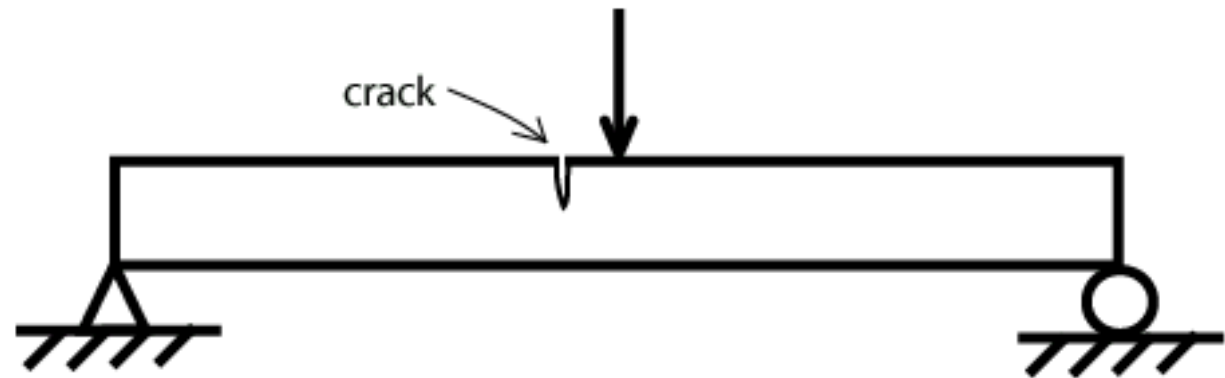
c) Both rods will
buckle at the
same force

9. A beam is loaded in the middle. Which beam will fail at the smaller load?

88 % a)
correct
answer



2 % b)



10% c) Both beams will fail at the same load.

Conclusion

- Good start on a SOM concept inventory
- Psychometrics show it needs more work
- We plan to modify the inventory this Fall
- Release the beta version in Jan. 2002