

But It's The Same Thing

An Impedance Mismatch With Our Students

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Abstract

- We all ask our students to perform various tasks. When we are disappointed with the results or when we are grading and take off points, how often have you had the student claim that what they wrote or drew or calculated was “the same thing” as you wanted. It’s one thing if the student is just bucking for points – the real problem is how often our students truly believe that what they’ve done IS “the same thing”. There is clearly a disconnect in language, math and drawing between our expectations and “the same thing.” Examples and some suggestions.



Hearken Back to 1989...

- A Computer Programming Class for JH/HS
- FORTRAN 77
- Actual Students More Young JH Than HS
- Little Computer Experience
- Did a Couple of BASIC examples
- Had Them Type In A FORTRAN Program
- “Type It Just Like You See It On The Page”

A Simple Sample Program

- PROGRAM ONEA
- 80 FORMAT(1X, 'HOW MANY STEPS TO SUM UP?')
- PRINT 80
- READ 90, J
- 90 FORMAT(I6)
- X = 0.0
- DO 120, I=2, J
- X = X + (1.0/I)
- 120 CONTINUE
- PRINT 130, I, X
- 130 FORMAT(1X, 'LAST STEP', I6, ' SUM OF
1/X', F10.6)
- END

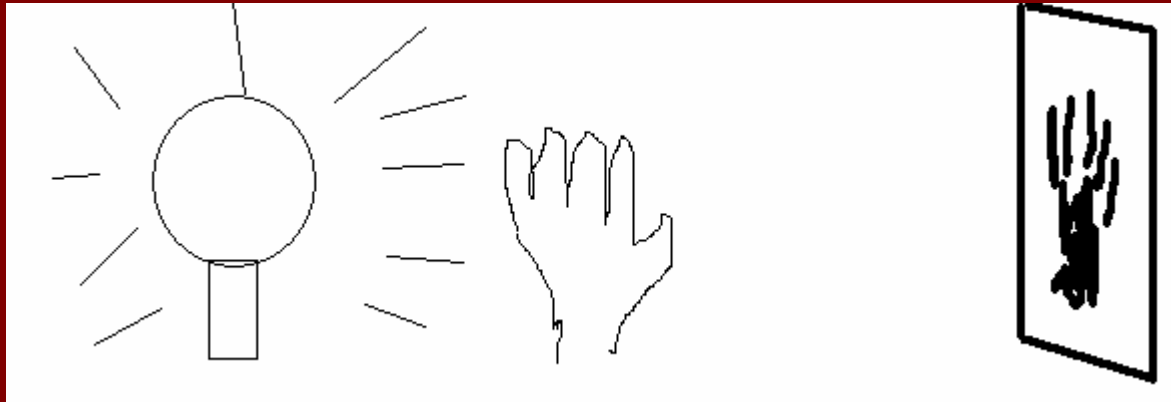
You Can Imagine What Happened

- Random Spacing
- Random Spelling
- Random Spaces INSIDE Words
- No Column Alignment
- Simple PC FORTRAN Interpreter...
- ... Threw Up All Over The Monitors

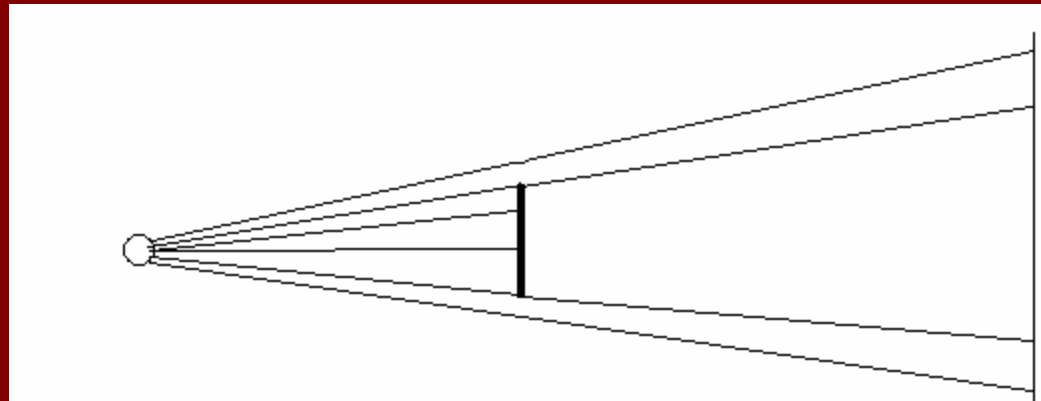
I Got Thinking About This Again

- Because Every Day I See Students Trying To Explain...
- “But Dr. Phil – It’s The Same Thing!”
- Most Recently – PHYS-1800 Physical Science for Elementary Education
 - Artistic Drawings versus Physics Drawings

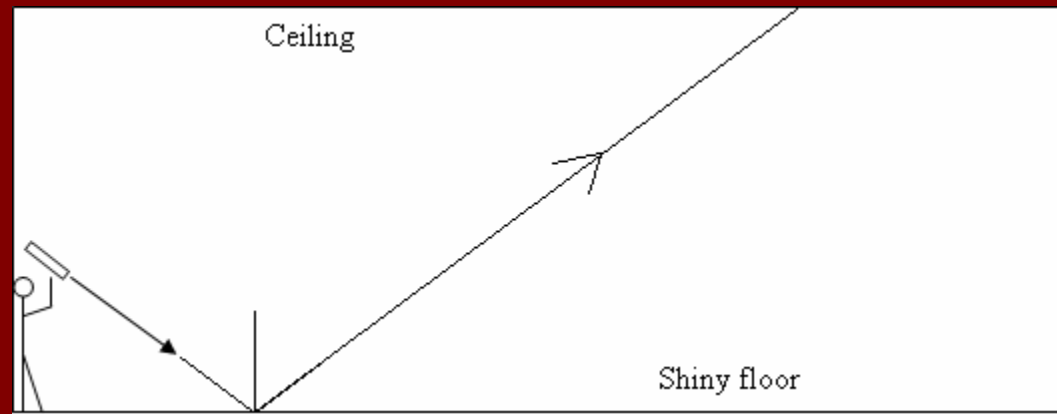
An Artistic Sketch Of A Hand Shadow



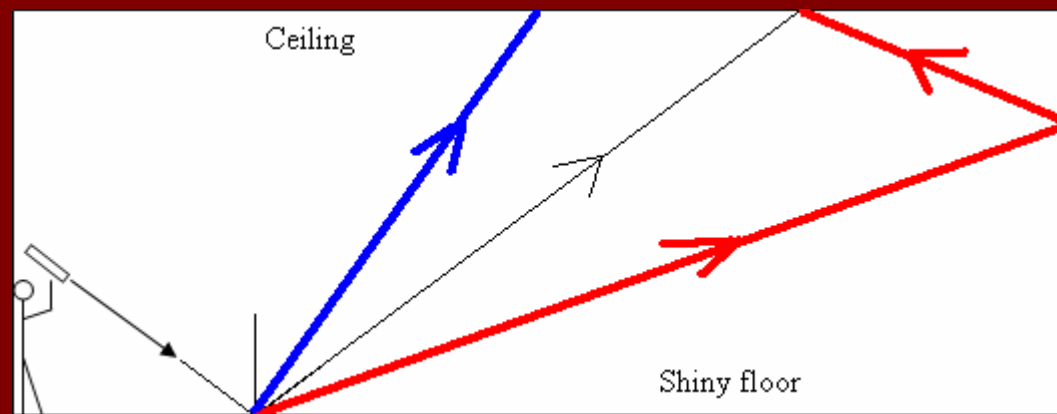
A Physics Sketch of Casting a Shadow



The Law of Reflection... Equal Angles...

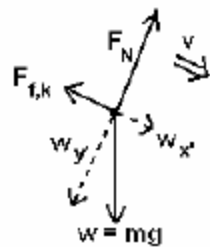


But When They Draw “The Same Thing”...



A Standard Algebra Based Physics Problem...

(b) Now we will add in friction. The coefficients of friction are 0.13 and 0.19. Use a F.B.D. and forces to find the acceleration, a , of the block down the ramp.



$$\mu_s = 0.19 ; \mu_k = 0.13$$

$$\sum F_y = F_N - w_y = 0 ; F_N = w_y = mg \cos \theta$$

$$F_{f,k} = \mu_k F_N = \mu_k mg \cos \theta$$

$$\sum F_x = w_x - F_{f,k} = ma_x$$

$$w_x = mg \sin \theta$$

$$mg \sin \theta - \mu_k mg \cos \theta = ma_x$$

$$a_x = g \sin \theta - \mu_k g \cos \theta$$

$$= (9.81 \text{ m/s}^2) \sin 28^\circ - (0.13)(9.81 \text{ m/s}^2) \cos 28^\circ$$

$$= 3.479 \text{ m/s}^2$$

$$9.81 \times 12.5 = 122.6250 - .13 \times 9.81 \times 12.5 = 106.6838$$

divide by 12.5 = 8.534700000

But it's the Same Thing!

The Simple Conclusion is That “They” ...

- Can't Spell, Can't Write
- Can't Draw
- Can't Do Math
- Can't Do Algebra
- Can't Understand

- Can't Do Physics

But What If The Problem Is...

- They don't understand what it means to say something is "The Same Thing" ?
- That there are times for "Close Enough"
- And times for "Follow The Procedure"
- That the WORK is sometimes more important than the ANSWER.
- And the ANSWERS come out better with the right WORK.

Conclusions

- Maybe this is all obvious...
- and old hat to us jaded Physics Teachers.
- But maybe we can spend more time at the beginning of the semester stressing
 - Following the template
 - Copying the results
 - Comparing “my work” with “your work”

URL's

- Dr. Phil's Homepage
 - <http://homepages.wmich.edu/~kaldon/>
- Dr. Phil's Email
 - philip.kaldon@wmich.edu
- The Coolest YouTube Video
 - <http://www.youtube.com/v/1BvaHZIrt0o>

