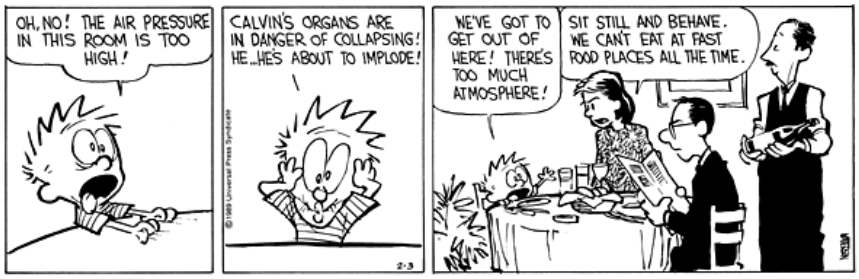
November 2, 2015 Physics 131 Prof. E. F. Redish

■ Theme Music: ZZ Top

Got Me Under Pressure

■ Cartoon: Bill Watterson

Calvin & Hobbes



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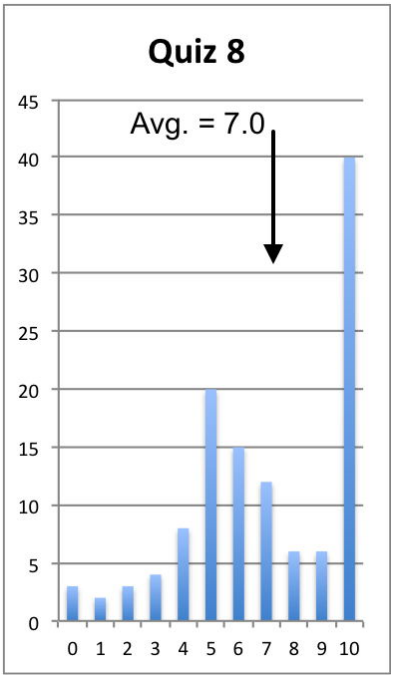
Quiz 8

	1.1	*1.2*		*2.1*		*2.2*
a	3%	4%	L2/T	59%	m/r	65%
b	5%	73%			DIM	13%
c	82%	8%			mixed	5%
d	3%	4%			r/m	10%
e	3%	5%			mr	1%
f	0%	1%			1/mr	1%



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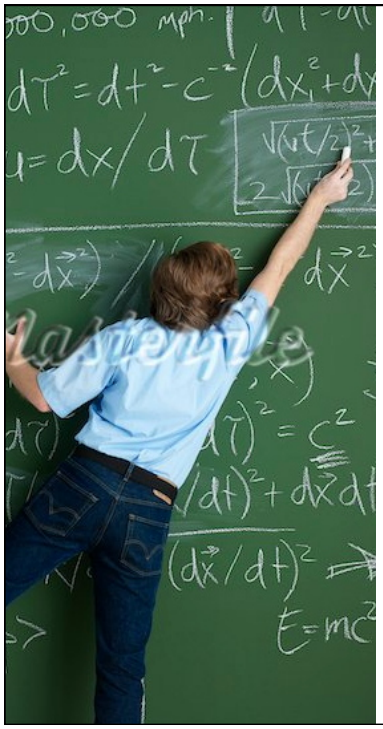

The Equation of the Day

Pressure and depth

$$p = p_0 + \rho g d$$

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Foothold ideas: Liquids

- In a liquid the molecules are close enough that their mutual (short ranged) attractions hold them together (e.g. H-bonding in H_2O).
- A liquid maintains its volume but changes its shape easily in response to small forces.
- The relation of p, V, and T in a liquid is WAY more complicated than in a gas.

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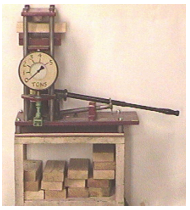
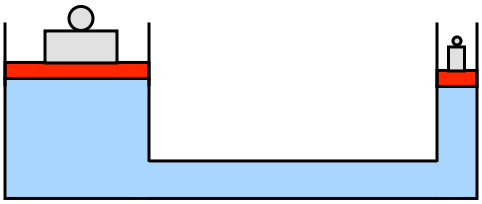
Pascal's Principle

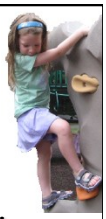
A force exerted on a part of a fluid is transmitted through the fluid and expressed in all directions.

$$\frac{W_1}{A_1} = \frac{W_2}{A_2}$$





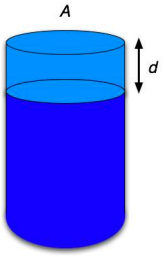
Foothold ideas: Pressure 2



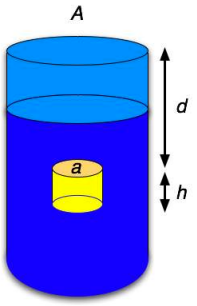
- A constrained fluid has an internal pressure –like an internal force at every point in all directions. (Pressure has no direction.)
- At a boundary or wall, the pressure creates a force perpendicular to the wall. $\vec{F} = p\vec{A}$
- The pressure in a fluid increases with depth.

$$p = p_0 + \rho g d$$

- The pressure in a fluid is the same on any horizontal plane no matter what the shape or openings of the container.



Foothold ideas: Buoyancy



- ***Archimedes' principle***:
  When an object is immersed in a fluid (in gravity), the result of the fluid's pressure variation with depth is an upward force on the object equal to the weight of the water that would have been there if the object were not.
- As a result, an object less dense than the fluid will float, one denser than the fluid will sink.
- An object less dense than the fluid floats with a fraction of its volume under the fluid equal to $\frac{\rho_{object}}{\rho_{fluid}}$