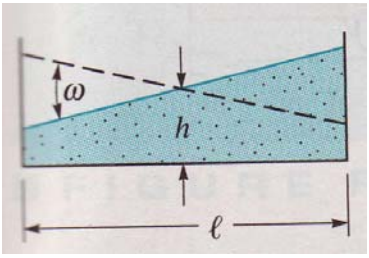
ID:----------	**Quiz: No. 6**	**Time: 15 minutes**
Name: ----------	**Course: 58:160, Fall 2009**	

Water sloshes back and forth in a tank as shown in the figure. The frequency of sloshing, ω, is assumed to be function of the acceleration of gravity, *g*, the average depth of water, *h*, and the length of the tank, *l*. (a) Develop a suitable set of dimensionless parameters. (b) How ω would be changed if *g* increases to 4*g*?



Solutions:

$$\omega = \underbrace{f(h,l,g)}_{1}$$

$\omega = T^{-1}; \quad h = L; \quad l = L; \quad g = LT^{-2}$ (1)

$\Rightarrow n = 4, j = 2 \Rightarrow k = 2$ (1)

We choose *h* and ω as reaping variables: (1)

$$\pi_1 = \underbrace{lh^a\omega^b = [L][L^a][T^{-b}] = L^0T^0}_{1} \Rightarrow \begin{cases} 1+a=0 \Rightarrow a=-1 \\ -b=0 \Rightarrow b=0 \end{cases} \Rightarrow \underbrace{\pi_1 = \frac{l}{h}}_{1}$$

$$\pi_2 = \underbrace{gh^a\omega^b = [LT^{-2}][L^a][T^{-b}] = L^0T^0}_{1} \Rightarrow \begin{cases} 1+a=0 \Rightarrow a=-1 \\ -2-b=0 \Rightarrow b=-2 \end{cases} \Rightarrow \underbrace{\pi_2 = \frac{g}{h\omega^2}}_{1}$$

$$\Rightarrow \underbrace{\frac{g}{h\omega^2} = F\left(\frac{l}{h}\right)}_{1}$$

Since $\frac{g}{h\omega^2}$ is only function of $\frac{l}{h}$, $\frac{g}{h\omega^2}$ would be constant if only gravity is changed. Therefore increasing g to 4g has to increase ω to 2ω. (1)