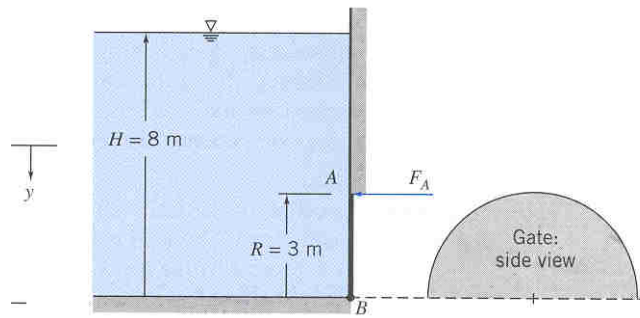


#1.

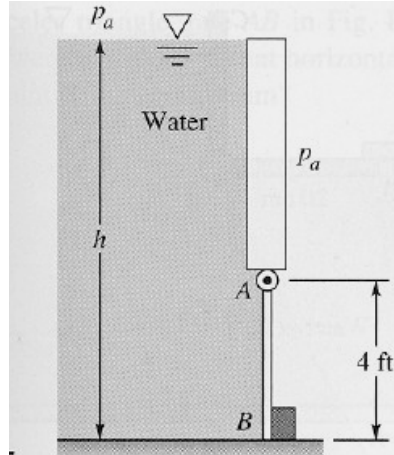
Semicircular plane gate  $AB$  is hinged along  $B$  and held by horizontal force  $F_A$  applied at  $A$ . The liquid to the left of the gate is water. Calculate the force  $F_A$  required for the equilibrium.



#2.

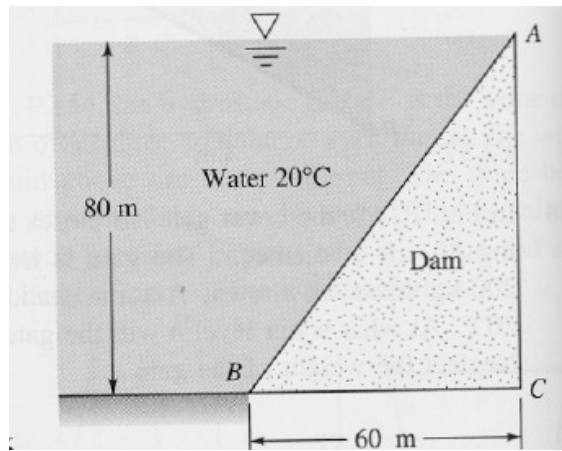
Gate  $AB$  in Fig. is 5 ft wide into the paper, hinged at  $A$ , and restrained by a stop at  $B$ . The water is at  $20^\circ\text{C}$ . Compute (a) the force on stop  $B$  and (b) the reactions at  $A$  if the water depth  $h = 9.5$  ft.

Stop  $B$  will break if the water force on it equals 9200 lbf. (c) For what water depth  $h$  is this condition reached?



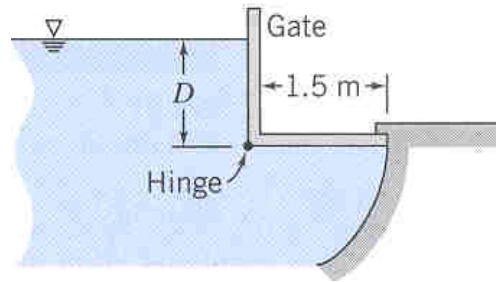
#3.

Dam  $ABC$  is 30 m wide into the paper and made of concrete (SG = 2.4). Find the hydrostatic force on the surface  $AB$  and its moment about  $C$ . Assuming no seepage of water under the dam, could this force tip the dam over?



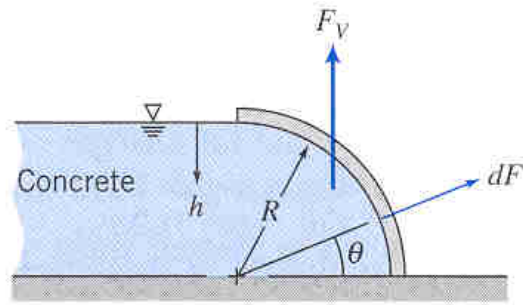
#4.

As water rises on the left side of the rectangular gate, the gate will open automatically. At what depth above the hinge will this occur? Neglect the mass of the gate.



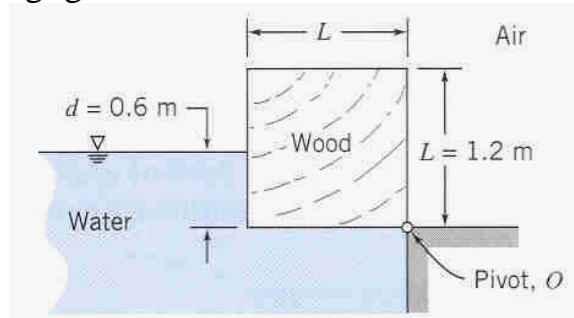
#5.

Liquid concrete is poured into the form shown ( $R = 0.313$  m). The form is  $w = 4.25$  m wide normal to the diagram. Compute the magnitude of the vertical force exerted on the form by the concrete.



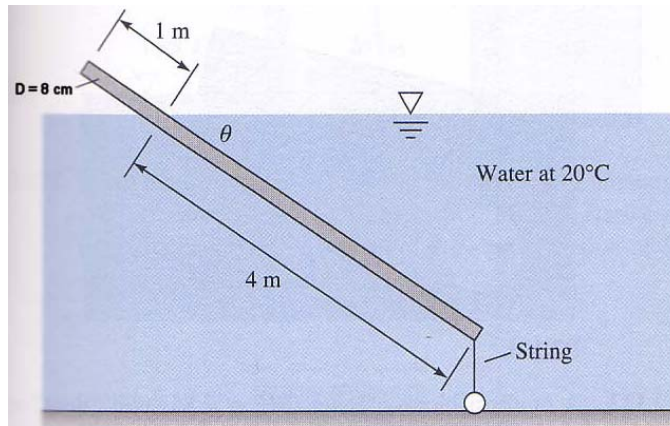
#6.

A long square wooden block is pivoted along one edge. The block is in equilibrium when immersed in water to the depth shown. Evaluate the *specific gravity* of the wood, if friction in the pivot is negligible.



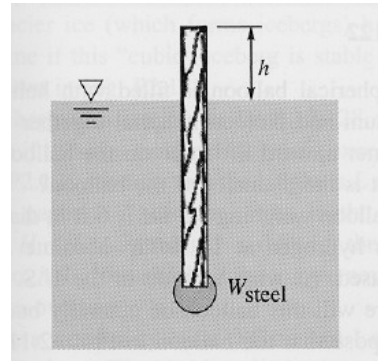
#7.

The uniform 5-m-long round wooden rod shown below is tied to the bottom by a string. Determine (a) the tension in the string and (b) the specific gravity of the wood. Is it possible for the given information to determine the inclination angle  $\theta$ ? Explain.



#8.

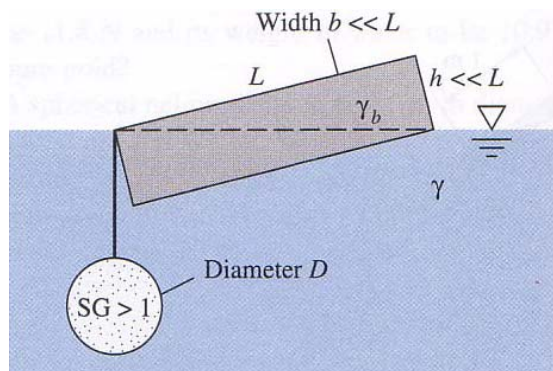
The *spar buoy* is a buoyant rod weighted to float and protrude vertically, as in Fig. It can be used for measurements or markers. Suppose that the buoy is maple wood ( $SG = 0.6$ ), 2 in by 2 in by 12 ft, floating in seawater ( $SG = 1.025$ ). How many pounds of steel ( $SG = 7.85$ ) should be added to the bottom end so that  $h = 18$  in?



#9.

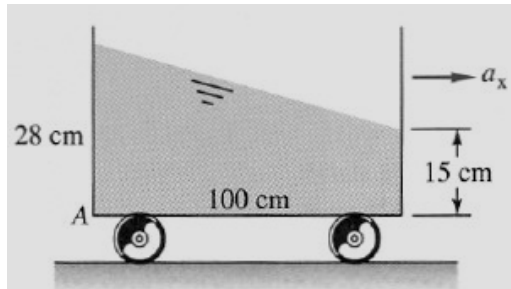
The uniform beam shown below has the dimensions  $L$  by  $h$  by  $b$  and with the specific weight  $\gamma_b$ , floats exactly on its diagonal when a heavy uniform sphere is tied to the left corner. Show that this can happen only (a) when  $\gamma_b = \gamma/3$  and (b) when the sphere has

size  $D = \left[ \frac{Lhb}{\pi(SG - 1)} \right]^{\frac{1}{3}}$



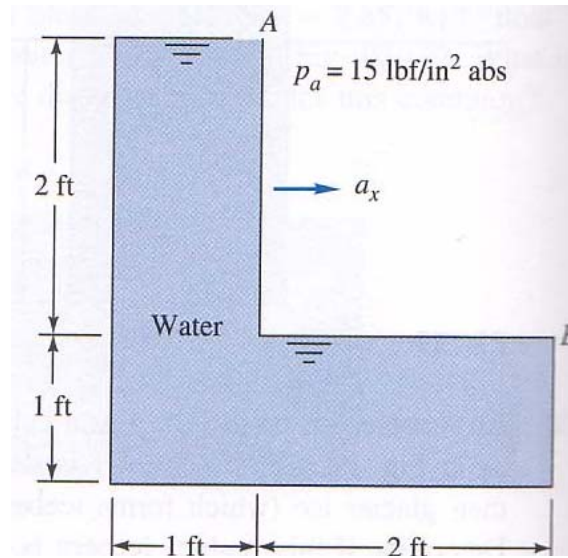
#10.

The tank of liquid in Fig. accelerates to the right with the fluid in rigid-body motion. (a) Compute  $a_x$  in  $\text{m/s}^2$  (b) Why doesn't the solution of part (a) depend on the density of the fluid? (c) Determine the gage pressure at point  $A$  if the fluid is glycerin at  $20^\circ\text{C}$



#11.

The tank of water below is full and open to the atmosphere at point  $A$ . For what acceleration  $a_x$  in  $ft/s^2$  will the pressure at point  $B$  be (a) atmospheric and (b) zero absolute?



#12.

A 16-cm-diameter open cylinder 27 cm high is full of water. Compute the rigid body rotation rate about its central axis, in rot/min, (*a*) for which one-third of the water will spill out and (*b*) for which the bottom will be barely exposed

#13.

An open 1 m-diameter tank contains water at a depth of 0.7 m at rest. As the tank is rotated about its vertical axis, the center of the fluid surface is depressed. At what angular velocity will the bottom of the tank first be exposed? No water is spilled from the tank.