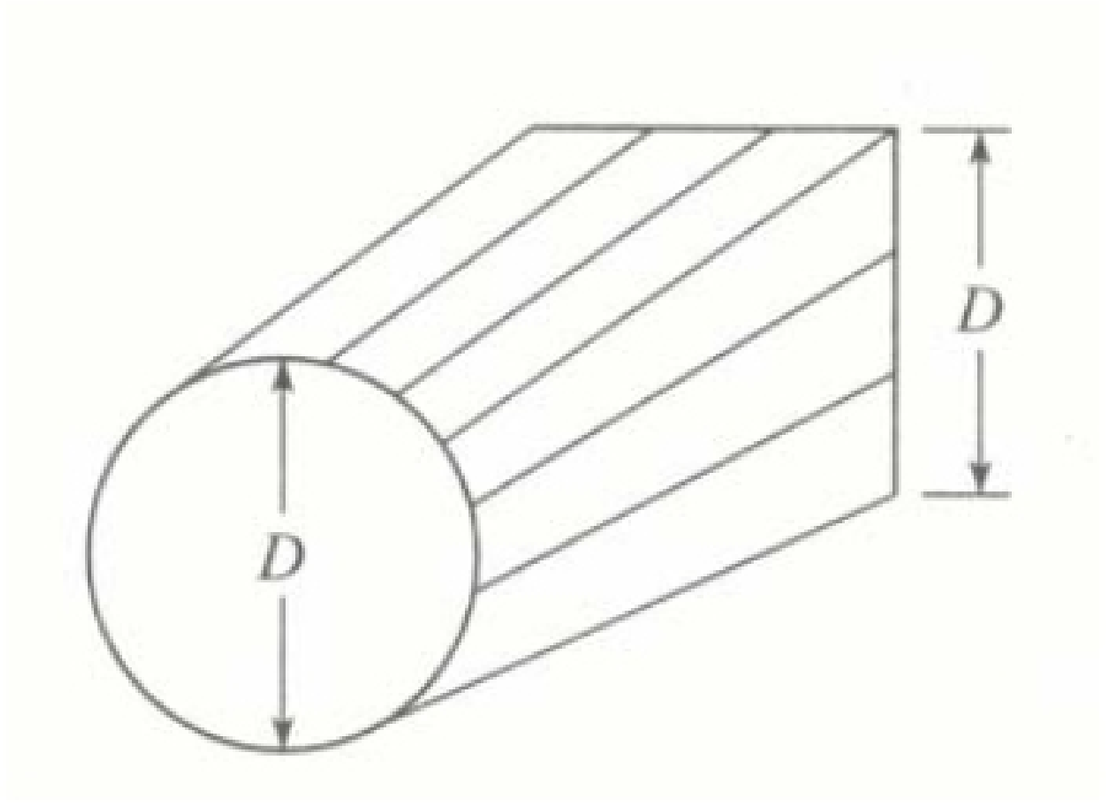
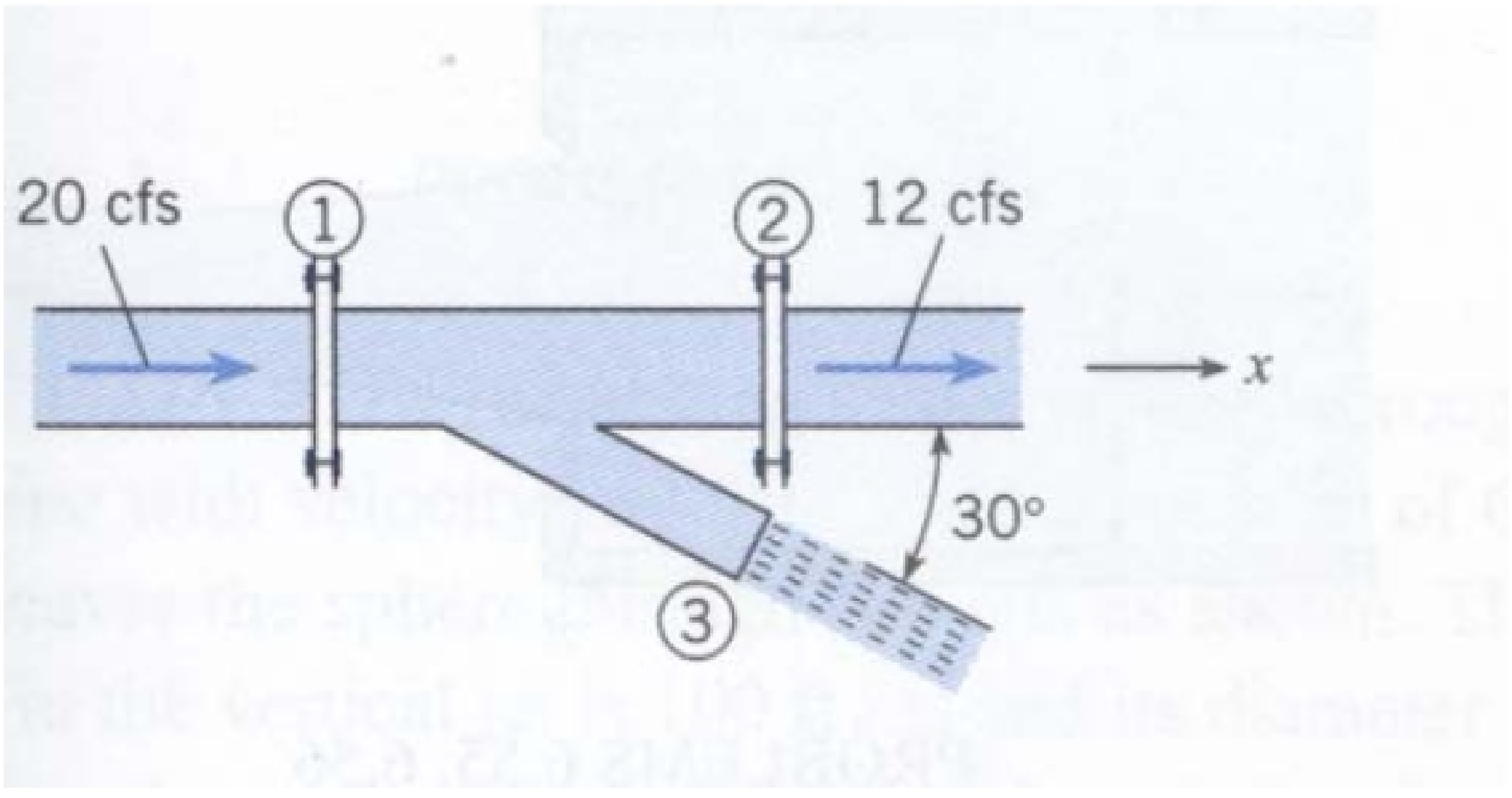
057:20 TEST # 2 **Fall 2004**

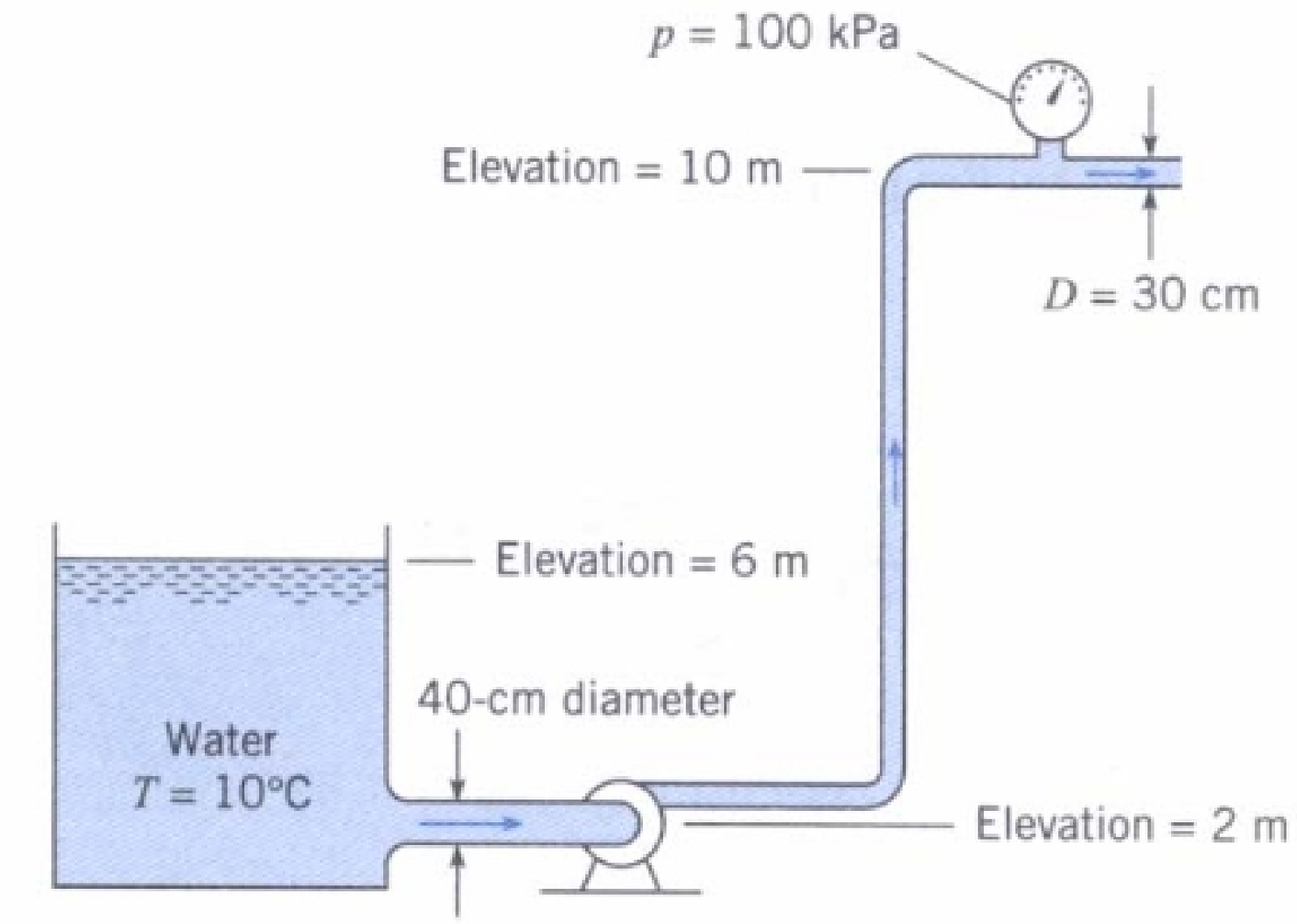
1. A circular duct of diameter D is connected to a square duct with sides of length D, as shown. Air flows in the circular duct at $100\,ft/\sec$. There is no elevation difference between the circular and the square section. Assume the flow is steady, inviscid, irrotational and incompressible. The specific weight of air is $0.075\,lbf/ft^3$. Find the pressure change between the circular and square section.



2. For this wye fitting, which lies in a horizontal plane, the cross-sectional areas at sections 1, 2, and 3 are $1\,ft^2$, $1\,ft^2$, and $0.25\,ft^2$, respectively. At these same respective sections the pressures are $1000\,psfg$, $900\,psfg$, and $0\,psfg$, and the water discharges are $20cfs$ to the right, $12cfs$ to the right, and $8cfs$. What x component of force would have to be applied to the wye to hold it in place?



3. Water is flowing at a rate of $0.25\,m^3/s$, and it is that $h_L = 2V^2/2g$ from the reservoir to the gage, where V is the velocity in the 30-cm pipe. What power must the pump supply?



4. A drying tower at an industrial site is $10m$ in diameter. The air inside the tower has a kinematic viscosity of $4\times10^{-5}\,m^2/s$ and enters at $10\,m/s$. A 1/10 scale model of this tower is fabricated to operate with water that has a kinematic viscosity of $10^{-6}\,m^2/s$. What should the entry velocity of the water be to achieve Reynolds-number scaling?