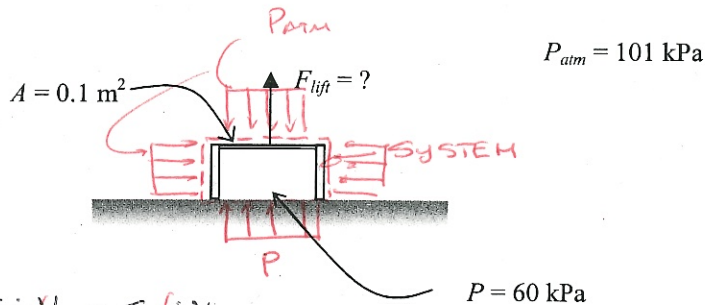


EXAMPLE

A suction cup sits on a smooth surface. If the pressure of the air under the cup is  $P = 60 \text{ kPa}$  and atmospheric pressure is  $P_{atm} = 101 \text{ kPa}$ , calculate the force needed to remove the cup from the surface.

NEGLECT  
 WEIGHT of  
 CUP.



↑  
 $\frac{dP}{dt} = \sum F + \sum mV_{in} - \sum mV_{out}$   
 why? → 0      → 0      → 0 CLOSED

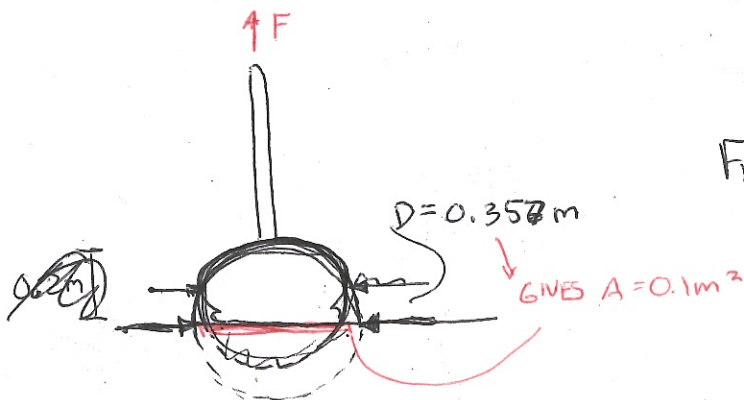
$0 = +PA - P_{ATM}A + F_{lift}$

$F_{lift} = (P_{ATM} - P)A$

$= (101 \text{ kPa} - 60 \text{ kPa})(0.1 \text{ m}^2)$

$= \boxed{4.1 \text{ kN}}$

b) REPEAT FOR PLUNGER.



$F_{lift} = 4.1 \text{ kN}$

SAME. WHY? ONLY

PROJECTED AREA NEEDED  
 TO FIND FORCE DUE TO  
 PRESSURE.