

#3) Given:  
Goat-Piston  
 $m_1 = 181 \text{ kg}$   
 $A_1 = 1.8 \text{ m}^2$

Pygmy-Piston  
 $m_2 = 16.0 \text{ kg}$   
3 on Piston  
 $A_2 = ?$

Soln:  $P_1 = P_2$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$A_2 = \frac{A_1 F_2}{F_1}$$

$$= \frac{A_1 3 m_2 a}{m_1 a}$$

$$A_2 = .48 \text{ m}^2$$

$$F_1 = m_1 a$$

$$F_2 = 3 m_2 a \quad \left. \vphantom{F_2 = 3 m_2 a} \right\} \text{sub in}$$

$$= \frac{(1.8 \text{ m}^2) 3 (16.0 \text{ kg})}{(181 \text{ kg})}$$

4) Given:

Large Piston (complex)  
 $m_1 = 4.0 \times 10^7 \text{ kg}$   
 $A_1 = ?$

Small Piston  
 $F_2 = 1.2 \times 10^4 \text{ N}$   
 $A_2 = 5.0 \text{ m}^2$

Soln:

$$P_1 = P_2$$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$A_1 = \frac{A_2 F_1}{F_2}$$

$$= \frac{A_2 m_1 a}{F_2}$$

$$A_1 = 1.6 \times 10^5 \text{ m}^2$$

$$F_1 = m_1 a \quad \text{sub in}$$

$$= \frac{(5.0 \text{ m}^2) (4.0 \times 10^7 \text{ kg}) (9.81 \text{ m/s}^2)}{1.2 \times 10^4 \text{ N}}$$