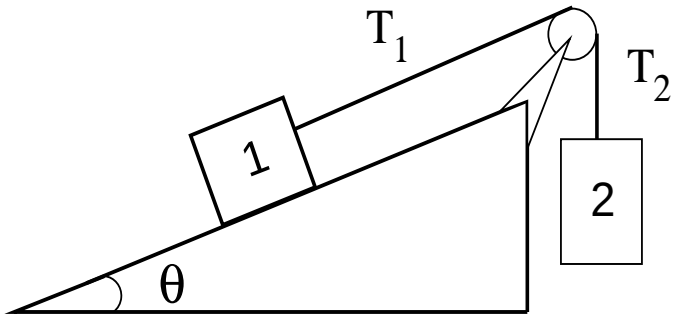
Ex : Case #4 :



Assume: Frictionless pulley,
Massless rope,
System initially at rest

Find : a, T

1). Draw **"free-body"** diagrams to identify the forces.

$$T_1 = T_2 = T$$
$$a_1 = a_2 = a$$

2). Write ΣF components using Newton's second law.

Problem simplifies if we choose coordinate system cleverly.

$$T - m_1 g \sin\theta = m_1 a \qquad m_2 g - T = m_2 a$$

◯ Add equations to find a: $$a = \left(\frac{m_2 - m_1 \sin\theta}{m_1 + m_2}\right) g$$

◯ Now find T: $$T = \frac{m_1 m_2}{m_1 + m_2} g(1 + \sin\theta)$$