

Physics 122: Newton's 2nd Law in 2D

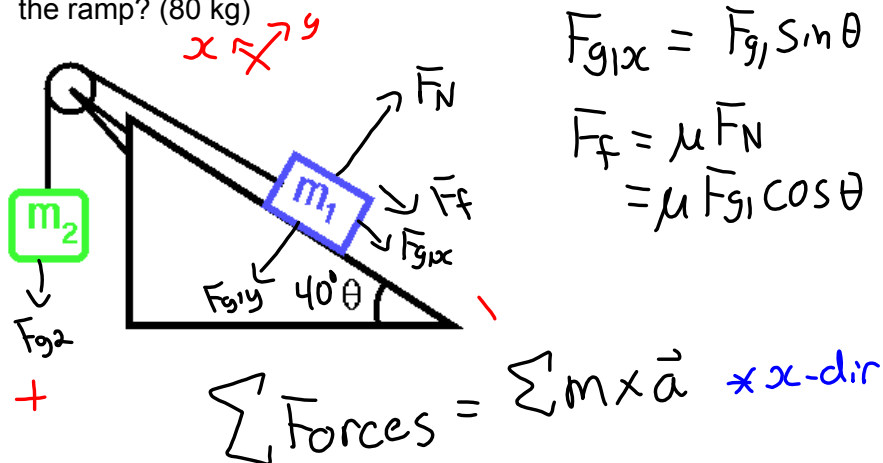
A counterweight is used to slide an object up an inclined plane that makes a 40° angle with the horizontal.

The counterweight has a mass of 35 kg and is suspended with a massless string and a frictionless pulley.

The coefficient of kinetic friction on the plane is 0.23.

a) Calculate the mass that would result in an acceleration of 0.42 m/s^2 up the ramp. (39 kg)

b) What mass would result in an acceleration of 0.21 m/s^2 down the ramp? (80 kg)



$$F_{g2} + F_{g1x} + F_f = (m_1 + m_2) a$$

$$(35)(9.81) - m_1(9.81) \sin 40 - (0.23)m_1(9.81) \cos 40 = (35 + m_1)(0.42)$$

$$343 - 6.3m_1 - 1.7m_1 = 14.7 + 0.42m_1$$

$$328.3 = 8.42m_1$$

$$\boxed{39 \text{ kg} = m_1}$$

Attachments

ramp-forces-and-motion_en.jar