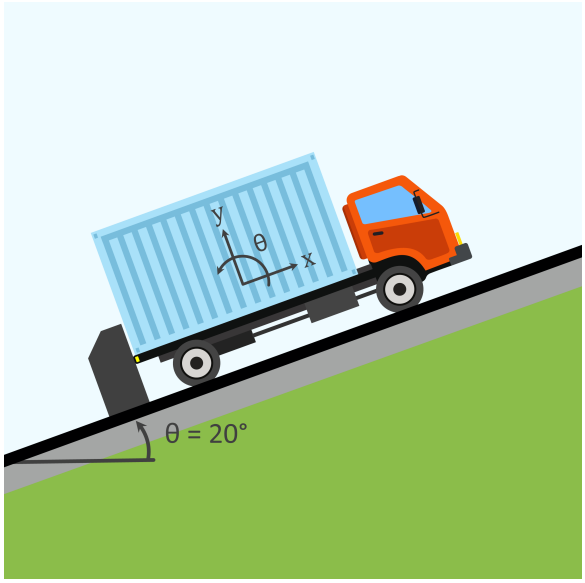
Retractable Wall



A retractable wall is holding a truck from falling down a slope as shown in the figure. If the mass of the truck is 600 kg and the mass of the wall is 40 kg, determine the reaction force on the wall in the x-direction. Take $g = 10$ m/s^2.

Using known expressions:

$$\sum F_x = m \cdot a_x \tag{1}$$

Given:

Mass of truck: $m_{truck} = 600$ kg
Mass of wall: $m_{wall} = 40$ kg
Gravitational constant: $g = 10$ m/s^2
Angle: $\theta = 30°$

Solution:

Figure 1 shows a FBD of the problem. From this figure it can be seen that F_g in the x-direction is equal to $F_{g,x} = \sin\theta \cdot F_g = \sin\theta \cdot m_{wall} \cdot g$. The reaction for of the truck

on the wall is equal to $F_{truck} = \sin\theta \cdot m_{truck} \cdot g$. Inserting it in Equation 1 results in.

$$\sum F_x = m \cdot a_x = F_{reaction} - F_{truck} - F_{g,x} = 0 \tag{2}$$

$$\Rightarrow \quad F_{reaction} = \sin\theta \cdot m_{truck} \cdot g + \sin\theta \cdot m_{wall} \cdot g$$

$$\Rightarrow \quad F_{reaction} = \sin\theta \cdot g \cdot (m_{truck} + m_{wall})$$

$$\Rightarrow \quad F_{reaction} = \sin(20°) \cdot 10 \cdot (600 + 40) = 2189 \text{ N}$$

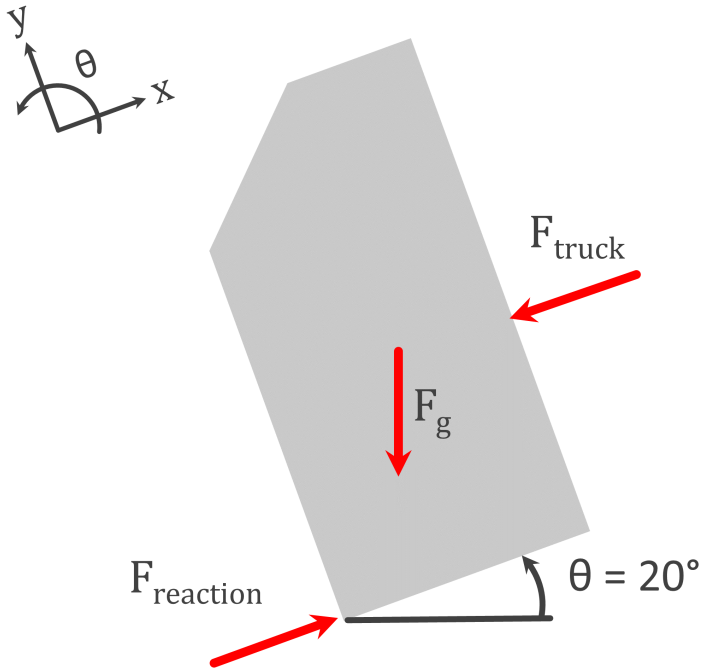


Figure 1: FBD of retractable wall