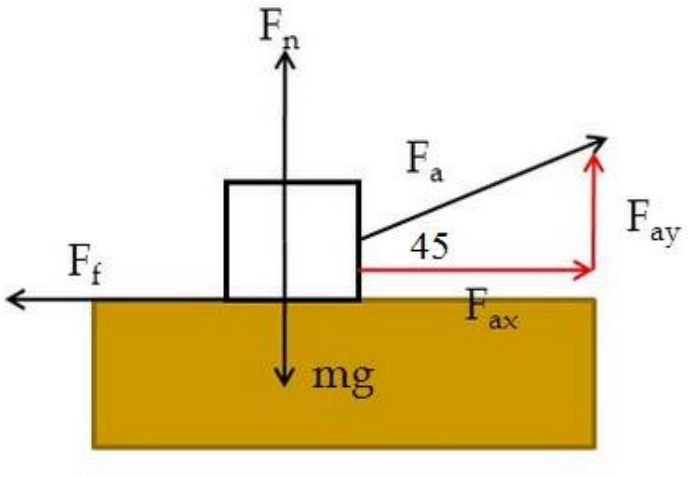
Answer on Question #64204, Physics / Mechanics | Relativity |

A box, mass of 10kg, is being pulled to the right with a force of 100N at an angle of 45 degrees above the horizontal. The coefficient of kinetic friction between the box and the floor is 0.2 , what is the acceleration of the box?

Solution:



$$ma = F_{ax} - F_f$$

$$F_{ax} = F_a \cos 45° = (100\ \text{N}) \cos 45° = 70.71\ \text{N}$$

The friction force is

$$F_f = \mu F_n$$

The normal force is

$$F_n = mg - F_{ay}$$

where

$$F_{ay} = F_a \sin 45° = (100\ \text{N}) \sin 45° = 70.71\ \text{N}$$

So,

$$F_f = \mu(mg - F_{ay}) = 0.2\big((10\ kg)(9.80\ m/s^2) - 70.71\ N\big) = 5.46\ \text{N}$$

Thus, the acceleration is

$$a = \frac{F_{ax} - F_f}{m} = \frac{70.71 - 5.46}{10} = 6.525\ \text{m/s}^2$$

Answer: $6.525\ \text{m/s}^2$