Question.

A 40 N force applied at an angle of 37 degrees above the horizontal pulls a 5-kg box on a horizontal floor. The acceleration of the box is 3m/s2. How large a frictional force must be retarding the motion of the box.

Given:

$F = 40\ N$

$m = 5\ kg$

$a = 3\ \dfrac{m}{s^2}$

$\alpha = 37°$

Find:

$F_{fr} = ?$

Solution.

Let remember Newton's second law:

$$\sum_i F_i = ma$$

Projection on horizontal axis gives:

$$F \cos \alpha - F_{fr} = ma$$

Therefore,

$$F_{fr} = F \cos \alpha - ma$$

Calculate:

$$F_{fr} = 40 \cdot 0.8 - 5 \cdot 3 = 32 - 15 = 17\ N$$

Answer.

$F_{fr} = F \cos \alpha - ma = 17\ N$