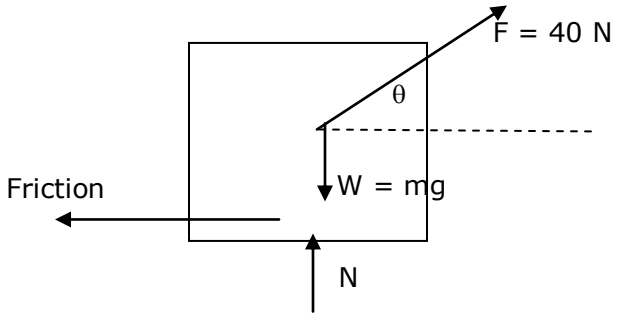
Q1- A woman at an airport is towing her 15.0 kg suitcase at constant speed by pulling on a strap at an angle above the horizontal. She pulls on the strap with a 40 N force, and the friction force on the suitcase is 20.0 N.
(a) Draw a free-body diagram of the suitcase.
(b) What angle does the strap make with the horizontal?
(c) What normal force does the ground exert on the suitcase?

(a)



(b) The horizontal component of her force must be equal and opposite to the friction force and hence gives

$40*\cos\theta$ = Friction = 20

Or $\cos\theta = 20/40 = 0.5$

Gives $\theta = 60^0$

(c) The force N and the vertical component of the force applied balances the weight of the suitcase

Hence $N + F \sin\theta = mg$

Or $N = mg - F\sin\theta$

Or $N = 15.0*9.8 - 40 \sin 60 = 147 - 40*0.866 = 112$ N

Q2- A 9.00 kg hanging weight is connected by a string over a pulley to a 5.00 kg block that is sliding on a flat table. The string is light and does not stretch; the pulley is light and turns without friction. The coefficient of kinetic friction between the sliding block and the table is 0.190. Find the tension in the string.

Let the tension in the string is T then equation of motion for the lower weight is

$Mg - T = Ma$

Or $9*9.8 - T = 9*a$

And that for the block on the table

$T - \mu mg = ma$

Or $T - 0.190*5*9.8 = 5*a$

Solving the two equations by eliminating a we have

$T = 37.38$ N