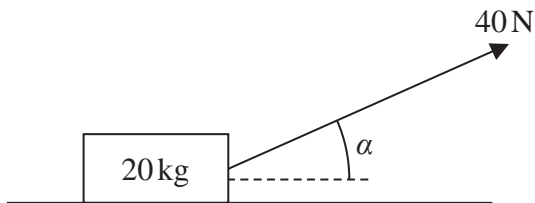


7.



**Figure 1**

A wooden crate of mass 20 kg is pulled in a straight line along a rough horizontal floor using a handle attached to the crate.

The handle is inclined at an angle  $\alpha$  to the floor, as shown in Figure 1, where  $\tan \alpha = \frac{3}{4}$

The tension in the handle is 40 N.

The coefficient of friction between the crate and the floor is 0.14

The crate is modelled as a particle and the handle is modelled as a light rod.

Using the model,

(a) find the acceleration of the crate.

(6)

The crate is now pushed along the same floor using the handle. The handle is again inclined at the same angle  $\alpha$  to the floor, and the thrust in the handle is 40 N as shown in Figure 2 below.



**Figure 2**

(b) Explain briefly why the acceleration of the crate would now be less than the acceleration of the crate found in part (a).

(2)