A block of mass m kg is on smooth horizontal ground with one end of a light inextensible rope attached to its upper surface. The other end of the rope is attached to an object of mass 5 kg. The rope passes over a small smooth pulley, and the object hangs vertically below the pulley. The part of the rope between the block and the pulley makes an angle of 50° with the horizontal. A force of magnitude X N acts on the block at an angle of 20° above the horizontal in the vertical plane containing the rope (see diagram).

You are given that the block is in equilibrium.

(a) Determine the value of X. **[3]**

You are also given that the magnitude of the contact force exerted by the ground on the block is 147 N.

(b) Determine the value of m. **[3]**