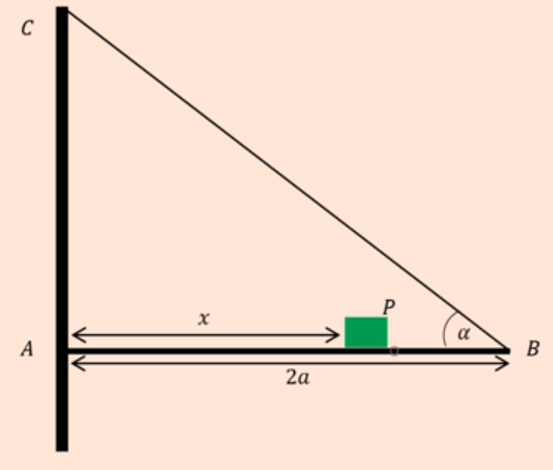
**7D Hinges**

1. A Plank AB of mass M and length 2a, rests with its end A against a rough vertical wall. The plank is held in a horizontal position by a rope. One end of the rope is attached to the plank and the other end is attached to the wall at the point C, which is vertically above A.

A small block of mass 3M is placed on the plank at the point P, where AP = x. The plank is in equilibrium in a vertical plane which is perpendicular to the wall. The angle between the rope and the plank is , where tan, as shown.



The plank is modelled as a uniform rod, the block is modelled at a particle and the rope is modelled as a light inextensible string.

1. Using the model, show that the tension in the rope is

The magnitude of the horizontal component of the force exerted on the plane AB by the wall is 2Mg.

1. Find x in terms of a

The forces exerted on the plank by the wall acts in a direction which makes an angle with the horizontal.

1. Find the value of tan

The rope will break if the tension in it exceeds 5Mg.

1. Explain how this will restrict the possible values of P