1 (a) State Newton's second law of motion.

....

....

.... [2]

(b) Two blocks X and Y, of masses 3.0 kg and 1.2 kg respectively, are connected by a light inextensible cord passing over a light, free-running pulley. Block X is released and it moves down the ramp.

The initial position of block X is 1.0 m from the edge of the smooth ramp inclined at 30° to the horizontal, as shown in Fig. 1.1.
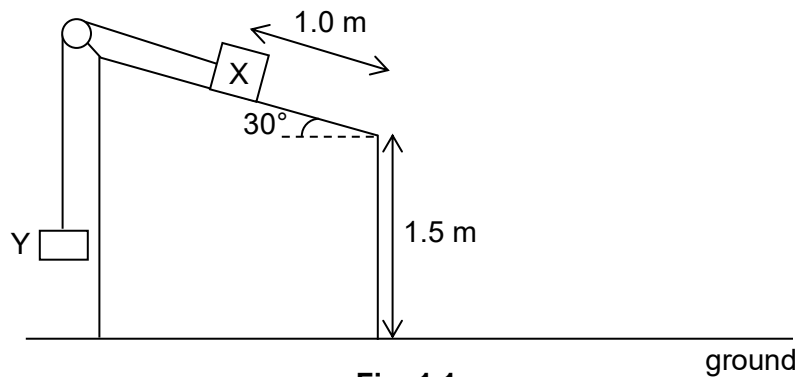

Fig. 1.1

When block Y moves up a distance of 0.50 m, the cord snaps.

(i) Show that the acceleration of block X on the smooth ramp while it is connected to block Y is 0.70 m s^{-2}.

[2]

(ii) Calculate the speed of block X at the instance when the cord snaps.

speed = ……………….. m s⁻¹   [2]

(iii)   Hence, calculate the speed at which block X leaves the ramp at the edge.

speed = ……………….. m s⁻¹   [2]

(iv)   Given that block X falls by a vertical height of 1.5 m after it leaves the ramp, calculate the total horizontal displacement moved by block X from its initial position when it is at rest on the smooth ramp.

total horizontal displacement = ……………….. m   [4]

[Total: 12]