1 A pendulum bob moves at constant speed in a horizontal circle. The bob is attached to a light, inextensible string.

The other end of the string is attached to a fixed point directly above the centre of the circle, as shown in Fig. 1.1.
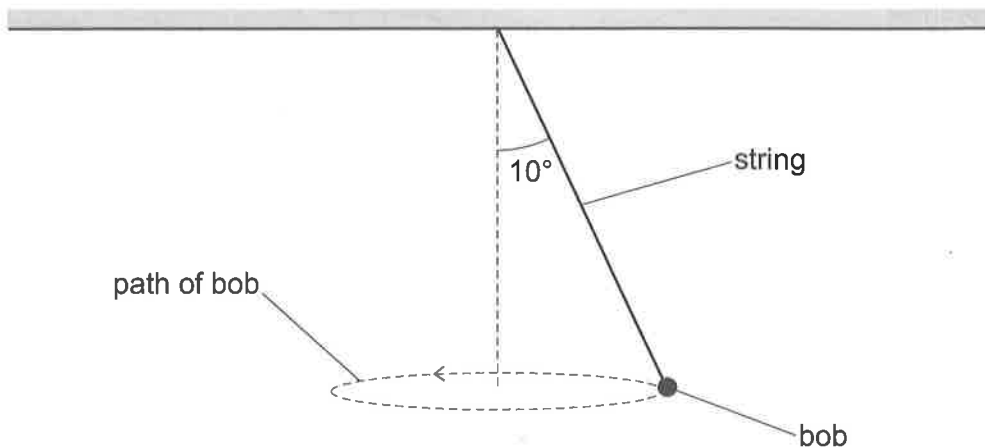

Fig. 1.1 (not to scale)

The bob takes a time of 3.4 s to complete one revolution. At time $t = 0$, the bob is at the position shown in Fig. 1.1 and its angular displacement in the horizontal plane is zero.

(a) Calculate the angular displacement, in rad, of the bob in the horizontal plane at $t = 0.53$ s.

angular displacement = ... rad [1]

(b) (i) Show that the bob has an angular velocity of 1.85 rad s⁻¹.

[1]

(ii) The angle between the string and the vertical direction is 10°.

Calculate the radius of the horizontal circle.

radius = ... m [3]

(c) Explain why neither the weight of the bob nor the tension in the string does any work on the bob.

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.... [2]