3   Fig. 3.1 shows a wheel that is being pulled over a kerb of height 0.080 m by a horizontal force *F*. The weight of the wheel is 700 N and the wheel has a radius of 0.60 m.
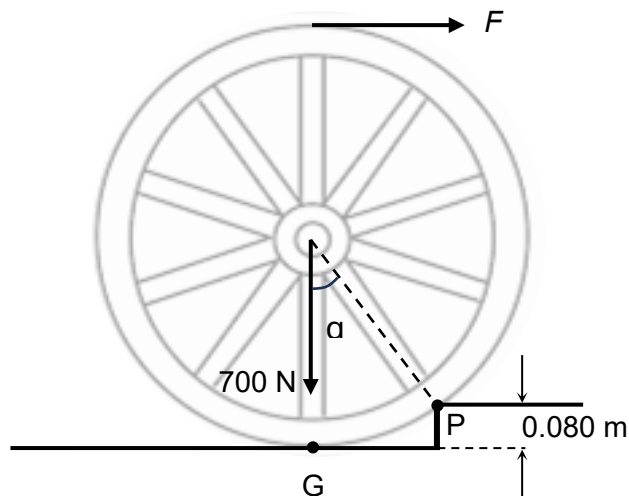

Fig. 3.1 (Not to scale)

At the instant shown, the wheel just loses contact with the ground at G.

(a)   Show that θ is 30°.

[1]

(b)   On Fig. 3.1, draw an arrow to represent the contact force exerted on the wheel at P.   [1]

(c)   Show that the minimum value of *F* is 190 N.

[1]

(d)   Hence, determine the magnitude of the contact force at P.

magnitude = ……………….. N [3]

[Total: 6]