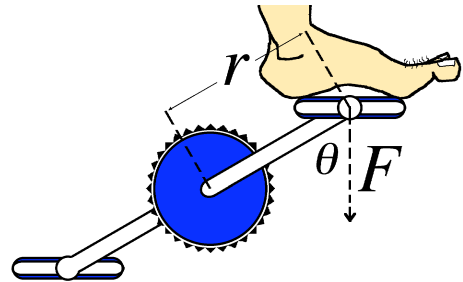


Bicycle pedal

The length of a bicycle pedal arm is $r = 0.152$ m, and a downward force of $F = 111$ N is applied by the foot.

What is the magnitude of torque about the pivot point when the angle θ between the arm & vertical is:

- (a) 30.0°
- (b) 90.0°
- (c) 180.0°



Solution:

- (a) When the angle θ between the arm and the vertical is 30.0° , the torque τ is
$$\tau = r F \sin 30^\circ = 0.152 \times 111 \times 0.5 = 8.44 \text{ Nm}$$
- (b) When $\theta = 90^\circ$, $\sin \theta = 1$ so
$$\tau = 0.152 \times 111 \times 1 = 16.9 \text{ Nm}$$
- (c) When $\theta = 180^\circ$, $\sin \theta = 0$ so the force exerts *no torque* on the pedal. This is the situation when the pedal is at the bottom; no amount of pushing down at this point can produce any torque on the pedal.