

Problem

We build a simple pendulum by attaching a 2 kg point mass to a 4 m string of negligible mass. The pendulum oscillates with an amplitude of 25° .

Find the period of this pendulum on Earth's surface. Use $g=9.81 \text{ m/s}^2$.

$$T = 2\pi \sqrt{\frac{L}{g}} = 2\pi \sqrt{\frac{4 \text{ m}}{9.81 \text{ m/s}^2}} = 4.01 \text{ s}$$

Find the period of this pendulum if the amplitude decreases to 15° .

The SAME because it IS a SIMPLE HARMONIC MOTION

$$T = 4.01 \text{ s}$$

Assume that the pendulum is on the surface of planet Mars. Find its period when the amplitude of the oscillations is 25° and when the amplitude is 15° . Observe that Mars has 0.1 times the mass of Earth and half its radius.

The SURFACE GRAVITY on MARS IS :

$$g = \frac{GM_{\text{Mars}}}{R_{\text{Mars}}^2} = \frac{G(0.1)M_E}{(R_E/2)^2} = (0.4) \frac{GM_E}{R_E^2}$$
$$= (0.4)(9.81 \text{ m/s}^2) = 3.924 \text{ m/s}^2$$

$$T = 2\pi \sqrt{\frac{4 \text{ m}}{3.924 \text{ m/s}^2}} = 6.24 \text{ s}$$