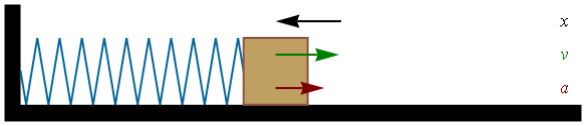
PRACTICE	LABS	TESTS
• Unit 13 Problems (1-8) • Video example problems	• Mass on a Spring Interactive • Pendulum Interactive	Unit 13 Test Wednesday (4/17/19)

Simple Harmonic Motion

13.3 I can define, analyze, and solve problems involving simple harmonic motion of simple pendulums.



Periodic Motion

A motion that repeats itself over and over is referred to as **periodic motion**.

The **period, T,** is the time required for one cycle of periodic motion.

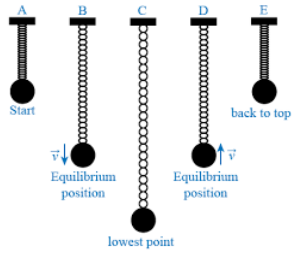
The **frequency, *f*,** is the number of oscillations per unit time.

$$f = \frac{1}{T}$$

The Period of a Mass on a Spring

$$T_s = 2\pi\sqrt{\frac{m}{k}}$$

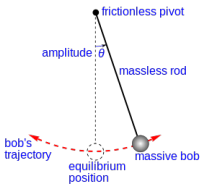
k = spring constant
m = mass



The Pendulum

A simple pendulum consists of a mass *m* hanging from a string or rod of length *L* and fixed at a pivot point. When displaced to an initial angle and released, the pendulum will swing back and forth with simple harmonic motion.

From the interactive, you may have noticed that a larger length *l* results in a larger period. On the other hand, a larger acceleration due to gravity *g* results in a smaller period.

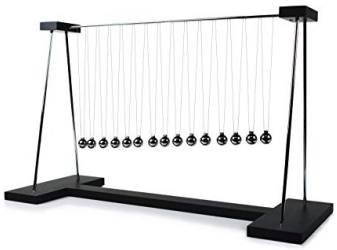


The Period of a Pendulum

$$T_p = 2\pi\sqrt{\frac{\ell}{g}}$$

ℓ = length
$g = 9.8\ \mathrm{m/s^2}$

The Pendulum Wave



Unit 13 In-Class Problems

6. You are doing a yo-yo trick called *rock the baby*. In the trick the yo-yo swings back and forth at the end of a string that is 20 cm in length. What is the period of oscillation for the yo-yo?

7. The pendulum in a grandfather clock is designed to take one second to swing in each direction; 2.00 seconds for a complete period. Find the length of the pendulum that is required to keep the correct time.

Unit 13 In-Class Problems

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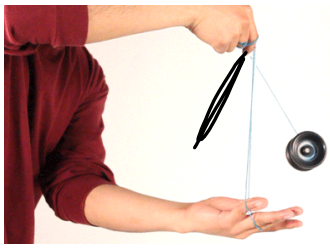

$g = 9.8\ m/s^2$

$L = 0.20\ m$

Unit 13 In-Class Problems

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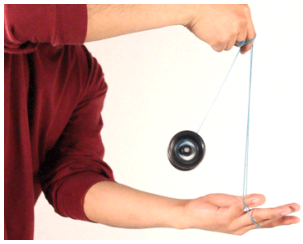


$$T = 2\pi\sqrt{\frac{L}{g}} = 2\pi\sqrt{\frac{0.20\ m}{9.8\ m/s^2}}$$

$$T = 0.9\ s$$

Unit 13 In-Class Problems

5. The pendulum in a grandfather clock is designed to take one second to swing in each direction; 2.00 seconds for a complete period. Find the length of the pendulum that is required to keep the correct time.

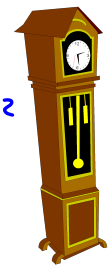
$T = 2\pi\sqrt{\frac{L}{g}}$

$\left(\frac{T}{2\pi}\right)^2 = \left(\sqrt{\frac{L}{g}}\right)^2$

$\frac{T^2}{4\pi^2} = \frac{L}{g}$

$T = 2.00\ s$

$g = 9.8\ m/s^2$



Unit 13 In-Class Problems

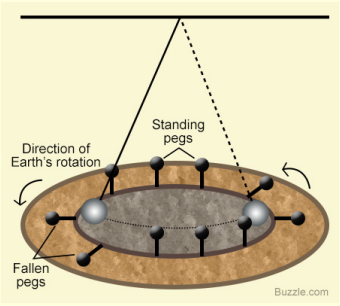
5. The pendulum in a grandfather clock is designed to take one second to swing in each direction; 2.00 seconds for a complete period. Find the length of the pendulum that is required to keep the correct time.

$$T = 2\pi\sqrt{\frac{L}{g}} \qquad L = \frac{gT^2}{4\pi^2}$$

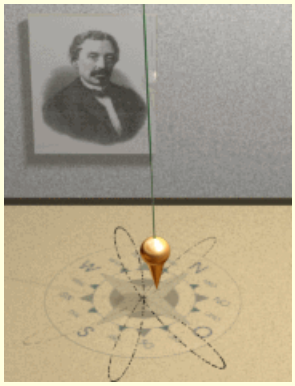
$\frac{4\pi^2 L}{T^2} = g$

$L = 0.994\ m$

Foucault Pendulum



Foucault Pendulum



Unit 13 Problems (13-17)