Holt Physics Chapter 11
Pendulum Activity Sheet

In this graphing calculator activity, you will enter the period (T) of a pendulum on Earth. The calculator will determine L, the length of the pendulum, from the following equation:

$$L = (9.81T^2)/(4\pi^2)$$

Using this length, the calculator will display a graph showing how the period of this pendulum (Y_1) changes with changes in the free-fall acceleration (X), as given by the following equation:

$$Y_1 = 2\pi\sqrt{(L/X)}$$

From this graph, you will be able to calculate the period of a pendulum on different planets, which have different values for free-fall acceleration.

Download the VIB program to your TI-83/84 calculator. Press PRGM, then scroll down to VIB by pressing ▼. Press ENTER twice to start the program. Enter the value for the period on Earth (see below). The calculator will produce a graph of period vs. free-fall acceleration. Use TRACE to determine the period on different planets (see below). Press 2nd[QUIT] to stop viewing the graph. Press ENTER to restart the program.

a. Why does the number 9.81 appear in the equation for L given above?

b. Calculate the periods of oscillation on different planets for two pendulums: one with a period of 2.0 s on Earth and the other with a period of 6.0 s on Earth.

Earth ($g = 9.81$ m/s^2)	Mars ($g = 3.71$ m/s^2)	Venus ($g = 8.78$ m/s^2)	Neptune ($g = 11.8$ m/s^2)
2.0 s			
6.0 s			

c. The period of a pendulum _____ (increases, decreases, remains the same) as the free-fall acceleration increases.

d. The ratio on the periods of two pendulums _____ (increases, decreases, remains the same) as the free-fall acceleration increases.

e. The length of the pendulum with period 6.00 s is _____ (longer than, shorter than, the same as) the length of the pendulum with period 2.00 s.

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ANSWER KEY

a. Why does the number 9.81 appear in the equation for L given above?

This is the free-fall acceleration constant on Earth, 9.81 m/s^2.

b. Calculate the periods of oscillation on different planets for two pendulums: one with a period of 2.00 s on Earth and the other with a period of 6.00 s on Earth.

Earth ($g = 9.81\ m/s^2$)	Mars ($g = 3.71\ m/s^2$)	Venus ($g = 8.78\ m/s^2$)	Neptune ($g = 11.8\ m/s^2$)
2.00 s	3.25 s	2.11 s	1.82 s
6.00 s	9.76 s	6.34 s	5.47 s

c. The period of a pendulum _____ (increases, decreases, remains the same) as the free-fall acceleration increases.

decreases

d. The ratio on the periods of two pendulums _____ (increases, decreases, remains the same) as the free-fall acceleration increases.

remains the same

e. The length of the pendulum with period 6.00 s is _____ (longer than, shorter than, the same as) the length of the pendulum with period 2.00 s.

longer than