

## Answer on Question #39214, Physics, Other

A student conducted an experiment to measure the acceleration due to gravity,  $g$ , of a simple pendulum.

The data obtained are tabulated:

LENGTH O THREAD, L/M	0.35	0.65	1.00	1.45	1.95
TIME FOR 20 OSCILLATIONS, T/S	24.1	32.4	40.1	47.5	56.3

Given that the relation between the periodic time,  $T = 2\pi \sqrt{L/G}$ , find the value of  $g$  using a graphical approach.

### Solution:

A simple pendulum is one which can be considered to be a point mass suspended from a string or rod of negligible mass. For small amplitudes, the period of such a pendulum can be approximated by:

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

For  $g$  we have:

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

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Period of pendulum, the time of one oscillation is  $\frac{\text{TIME FOR 20 OSCILLATIONS}}{20}$ :

LENGTH O THREAD, L, m	0.35	0.65	1.00	1.45	1.95
Period of pendulum, T, s	1.205	1.62	2.005	2.375	2.815
Square of the period, $T^2$	1,45203	2,6244	4,02002	5,64063	7,92422

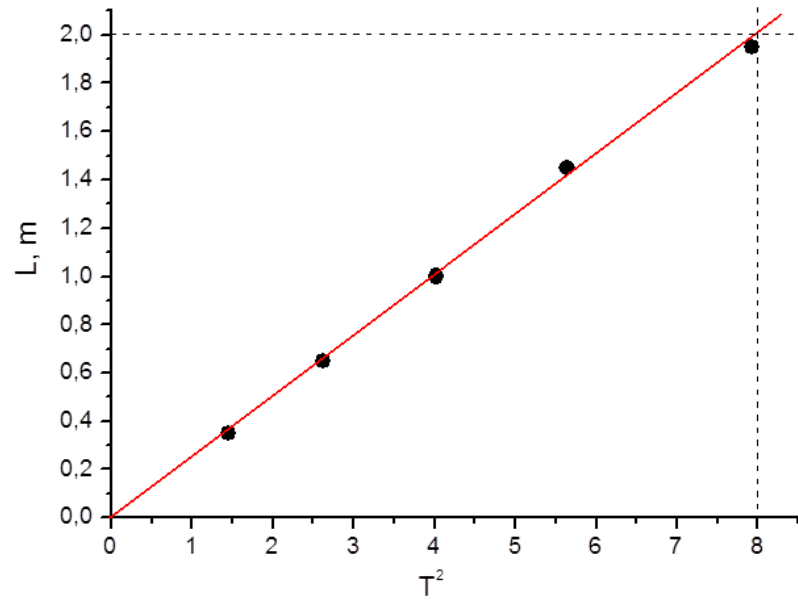
We draw a graph of  $L$  with respect to  $T^2$ . We get a straight line passing through origin. The slope of this line is:  $g/(4\pi^2)$ .

For example, the slope of line is  $\tan(\alpha) = 2/8 = 1/4$ .

Thus,

$$\frac{g}{4\pi^2} \approx \frac{1}{4}$$

$$g \approx \pi^2 = 3.14^2 = 9.86$$



**Answer.** Finding graphically  $g=9.86 \text{ m/s}^2$ .