

GRACE Educational Curriculum GRAVITY	
Teachers	Grades 6-8
Science & Math	

Earth's Gravity Field

Background: GRACE is the name of a pair of satellites that will measure the gravity field of Earth. GRACE stands for Gravity Recovery and Climate Experiment. GRACE will help study problems in geophysics, oceanography and atmospheric science.

Objective: To find the value for gravity (g) for your location on Earth.

Standards: Science: unifying concepts and processes; science as inquiry;

physical science; science and technology

Math: measurement; problem solving

Vocabulary: geophysics gravity

Materials:

Ring stand	Plumb bob
Stop watch	String
Protractor	Meter stick
Calculator	

Procedure:

1. Suspend a 1 meter plumb bob from the ring stand so that it clears the laboratory table. Start the pendulum swinging by releasing the plumb bob at an angle of 10 degrees or less from vertical.
 2. Determine the period of the pendulum with a stopwatch by counting the number of swings per minute. Repeat the count two more times to obtain the average value. A complete swing begins from the release position and ends with the return to that position.
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Earth's Gravity Field Data Sheet

Trial #	Swings Per Minute
1	
2	
3	
Average	

Conclusions: Answer each using *complete sentences*!

Round all answers to the tenths!

1. What is the average number of swings per second? (This is also called the frequency.)

2. The time for one swing of the pendulum is its period. The period can be calculated from the frequency as follows: **period = 1/frequency**

What is the period of the 1 meter pendulum, in seconds?

3. To find the acceleration of gravity (g), we use the following formula: $g = L \frac{4\pi^2}{T^2}$

Where T = the period of the pendulum

L = the length of the pendulum

F = frequency

G = gravity acceleration

$\pi = 3.14$

Use the formula and find the acceleration of gravity for the 1 meter pendulum.
(HINT: Units are m/sec ².)

4. How do you think that the gravity field of Earth differs over the surface?

Answer Sheet

Conclusions: Answer each using *complete sentences*!

Round all answers to the tenths!

1. What is the average number of swings per second? (This is also called the frequency.)

After students have computed swings per minute, change to swings per second by dividing by 60, they should add up their three results and divide by three. A typical answer is about 0.5 swings per second with a 1-meter long plumb bob.

2. The time for one swing of the pendulum is its period. The period can be calculated from the frequency as follows:

period = 1/frequency

What is the period of the 1-meter pendulum, in seconds?

With a frequency of 0.5 swings per second, the period would be 2 seconds.

3. To find the acceleration of gravity (g), we use the following formula: $g = L \frac{4\pi^2}{T^2}$

Where T = the period of the pendulum

L = the length of the pendulum

F = frequency

G = gravity acceleration

π = 3.14

Use the formula and find the acceleration of gravity for the 1-meter pendulum.

(HINT: Units are m/sec ².)

The acceleration of gravity should be about 9.8 meters per second squared. Allow for experimental error...

4. How do you think that the gravity field of Earth differs over the surface?

Since gravitational attraction depends on mass, differences in mass will cause differences in gravity.... Some considerations are the density of basement rock,

altitude, etc...
