The Motion of a Pendulum

Some scientists, including Aristarchus of Samos in the 3rd century B.C. and Copernicus in the 16th century A.D., believed that the Earth rotates. However, no one had been able to demonstrate this rotation scientifically. In 1851, the French astronomer Jean Bernard Léon Foucault (1819-1868) constructed a 67-m long pendulum by suspending a 28-kg iron ball from the dome of the Panthéon in Paris. He used the pendulum to show that the Earth rotates about its axis.

In the Modelling Math questions on pages 445, 455, and 478, you will solve the following problem and other problems that involve the motion of a pendulum.

The period of a pendulum is the time it takes to complete one back-and-forth swing. On the Earth, the period, \( T \) seconds, is approximately given by the formula

\[
T = \frac{2}{\sqrt{g/a}},
\]

where \( l \) metres is the length of the pendulum.

If a 1-m pendulum completes its first period at a time of 10:15:30, or 15 min 30 s after 10:00,

a) at what time would it complete 100 periods?
151 periods?
b) how many periods would it have completed by 10:30:00?

Use your research skills to answer the following questions now.

1. Describe how Foucault demonstrated that the Earth rotates about its axis.

2. Describe one of the Foucault pendulums in Ontario. Examples include those at the University of Guelph and at Queen’s University.

3. The angle through which the floor under a Foucault pendulum rotates each day depends on the latitude. Describe the relationship between the angle and the latitude.

Web Connection

www.school.mcgrawhill.ca/resources/
To use the Internet for your research on Foucault pendulums, visit the above web site. Go to Math Resources, then to MATHEMATICS 11, to find out where to go next.