
Connections

The Chapter Problem

This *Chapter Problem* examines the motion of a pendulum. It investigates the relationship between the angle it passes through, the time it takes and its length.

Students apply the theory learned in the previous chapter to a practical problem. They relate the time required for one swing to the period of a cosine function. They solve right angled triangles for both an angle and a side. Solutions use both radian and degree measure. Students will reinforce the relationship between the algebraic representation of a trigonometric function and its graphical representation. The graph from the TI-83 Plus will provide accuracy beyond that of a manually drawn graph. Students can use the graph or algebra to solve a trigonometric equation for time. Finally, students must use data to solve a simple quadratic equation.

The mathematics of this problem, for the most part, is not the challenge: the challenge is in the interpretation of the question and the application of an appropriate model.

Students in the Functions course can use a pragmatic approach to the investigation in CP6 and those in the Functions and Relations course can use a theoretical approach, but both methods should be valued.

This problem can be used on an ongoing basis as the chapter develops. Alternatively, the problem could be solved as an assignment after the entire unit has been taught. A blackline master listing all of the questions is provided at the end of the chapter. In addition, the answers/solutions to these questions are provided.

Challenge 1

This problem in three dimensions challenges the students to amalgamate many relatively simple trigonometric concepts. Until section 6.2, students have no trigonometric experience in three dimensions. There is a helpful model on page 519, example 2. Many students in both the Functions and Relations course and Functions course may need to use a concrete model. Basic trigonometric ratios are used, as is the cosine law.

Students in the Functions course can use a pragmatic approach to the entire investigation and those in the Functions and Relations course can use a theoretical approach, but both methods should be valued.

Challenge 2

Once the concept of an identity is understood (rather than simply a verification of an equation), this *Challenge* involves substitution of specific values from the special triangles learned in section 6.3. It is then one small step to develop the addition identities for $\sin^2 x$ and $\cos^2 x$. Finally, after practice solving identities, students prove an identity involving their newly developed addition identity, as well as those learned in the chapter.

Web Challenge

You will find support for this Internet activity at the teachers' Web site: www.math.nelson.com.

All three, the *Chapter Problem* and both *Challenges*, can be used as rich learning tasks or for formative / summative assessment purposes. Refer to the front matter of this *Teacher Resource* for more detailed instructions.