Transit of Venus
June 5-6, 2012

On June 5, 2012 at sunset on the East Coast of
North America and earlier for other parts of the
U.S., you will see the planet Venus as it moves
across the face of the sun. The last time this
event occurred was on June 8, 2004 when it
was watched by millions of people across the
world. The main quest of astronomers for over a
century a half has been to pin down the distance
between Earth and Sun (the Astronomical
Unit), which would give them a key to the size
of the solar system. Careful studies of the
transit of Venus became the gold mine they
would harvest to reveal this measure. This
event will not occur again until 2117.

Shadows of the Sun

SUN-EARTH DAY 2012

Annual Equinox Celebration: March 19, 2012
Transit of Venus Celebration: June 5, 2012

Eclipse path over United States in 2017.
Introduction:

Astronomers can use the transit of Venus to determine the distance between the Sun and Earth using a method based on the geometric properties of the Right Triangle.

Objectives:

- The students will apply the concepts of vertical angles and trigonometric ratios to calculate lengths and angles.
- The students will determine congruent angles.

Benchmarks:

- 6-8 Technology is essential in science for such purposes as access to outer space, sample collection, measurement, storage and computation.
- 12 Distances and angles that are inconvenient to measure directly can be found from measurable distances and angles using scale drawings.
- 12 Problem solving in problems by substituting numerical values in simple algebraic formulas.

Materials:

Student Worksheets, Scientific Calculator – degree mode

Prior Knowledge:

- Vertical angles, Trigonometric ratios, Radius, Diameter

Procedure:

Step 1 Teacher provides the students with the Student Worksheet.
- The students complete Problem 1 and Problem 2. Teacher and students discuss the answers to Problem 1 and Problem 2.

Step 2 Teacher and students discuss how Problem 3 is created from Problem 2. The students answer Problem 3 and the teacher and students discuss the answers.

Step 3 Teacher and students discuss how the drawing in Problem 3 was formed and changed to create the drawing in Problem 4. Teacher can guide the students through the questions for Problem 4 or provide time for the students to complete Problem 4. Discuss the answers to the questions.

Step 4 Teacher and students discuss and answer Problem 5.

Problem 1

Using the diagram below, solve the following problems.

\[ \angle 1 = \angle 3 \]
\[ \angle 2 + \angle 3 = \angle 5 + \angle 6 \]

Problem 2

Next, picture the Sun in the Center of the angles below. List the congruent angles.

Problem 3

Now, suppose that \( \angle 1 \) and \( \angle 2 \) connect to form an isosceles triangle and the Sun is at the top vertex. List all congruent angles and congruent sides.

Problem 4

Suppose that the isosceles triangle was rotated 90 degrees clockwise. Picture the base of the triangle intersecting the Earth. (Note: not to scale)

Earth Radius 6378 km

Problem 5

Can the measure of \( \angle Y \) be determined? Explain your reasoning.

The Earth’s radius is 6378 km, and \( \angle X = 0.00244 \) degrees. Is it possible to mathematically determine the distance to the Sun?

In addition, \( \angle Y = 90.0 \angle X = 89.9976° \)