Self-Test 1

1. Find the geometric mean between 3 and 15.
2. The diagram shows the altitude drawn to the hypotenuse of a right triangle.
   a. $x = \underline{\quad?\quad}$
   b. $y = \underline{\quad?\quad}$
   c. $z = \underline{\quad?\quad}$
3. The sides of a triangle are given. Is the triangle acute, right, or obtuse?
   a. 11, 60, 61   b. 7, 9, 11   c. 0.2, 0.3, 0.4
4. A rectangle has length 8 and width 4. Find the lengths of the diagonals.
5. Find the perimeter of a square that has diagonals 10 cm long.
6. The sides of an equilateral triangle are 12 cm long. Find the length of an altitude of the triangle.
7. How long is the altitude to the base of an isosceles triangle if the sides of the triangle are 13, 13, and 10?
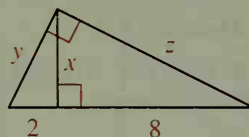
| **Biographical Note** | *Nikolai Lobachevsky* |

Lobachevsky (1793–1856) was a Russian mathematician who brought a new insight to the study of geometry. He realized that Euclidean geometry is only one geometry, and that other geometric systems are possible.

A modern restatement of Euclid's fifth postulate, often called the Parallel Postulate, is "Through a point outside a line, there is exactly one line parallel to the given line." It is this postulate that defines *Euclidean* geometry. For 2000 years, mathematicians tried to prove this fifth postulate from the other four.

Lobachevsky tried a different approach. He created a geometric system where Euclid's first four postulates were the same but the fifth was changed to allow *more than one* parallel through a given point. The antique model at the left shows such a system. Other geometric systems based on a different fifth postulate followed. (See Extra: Non-Euclidean Geometries, page 233.)

Although Lobachevsky thought our universe was Euclidean, some physicists have decided the universe may be better described by Lobachevsky's system. Even so, over small regions Euclidean geometry is accurate. Similarly, although the surface of the Earth is a sphere, we treat small areas of it as flat.