**What is Temperature?**

In a qualitative manner, we can describe the temperature of an object as that which determines the sensation of warmth or coldness felt from contact with it.

It is easy to demonstrate that when two objectsof the same material are placed together (physicists say when they are put in thermal contact), the object with the higher temperature cools while the cooler object becomes warmer until a point is reached after which no more change occurs, and to our senses, they feel the same. When the thermal changes have stopped, we say that the two objects (physicists define them more rigorously as systems) are in thermal equilibrium . We can then define the temperature of the system by saying that the temperature is that quantity which is the same for both systems when they are in thermal equilibrium.

If we experiment further with more than two systems, we find that many systems can be brought into thermal equilibrium with each other; thermal equilibrium does not depend on the kind of object used. Put more precisely,

if two systems are separately in thermal equilibrium with a third, then they must also be in thermal equilibrium with each other, and they all have the same temperature regardless of the kind of systems they are.

The statement in italics, called the zeroth law of thermodynamics may be restated as follows:

If three or more systems are in thermal contact with each other and all in equilibrium together, then any two taken separately are in equilibrium with one another. (quote from T. J. Quinn's monograph Temperature)

Now one of the three systems could be an instrument calibrated to measure the temperature - i.e. a thermometer. When a calibrated thermometer is put in thermal contact with a system and reaches thermal equilibrium, we then have a quantitative measure of the temperature of the system. For example, a mercury-in-glass clinical thermometer is put under the tongue of a patient and allowed to reach thermal equilibrium in the patient's mouth - we then see by how much the silvery mercury has expanded in the stem and read the scale of the thermometer to find the patient's temperature.