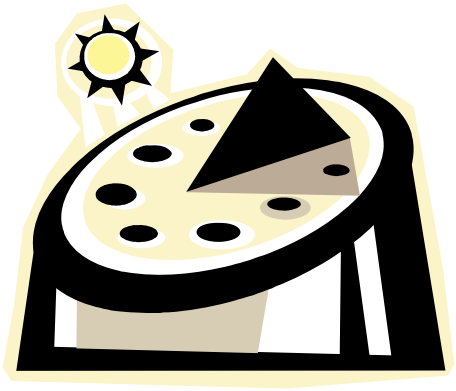
A Short History of Time



If we have time, we seem to talk about 'Time' all the time, so what are we talking about??

We can begin the story around five thousand years ago, with the people called the **Sumerians**, who lived in the river valley between the Tigris and Euphrates rivers in the area now called **Iraq**, formed what is thought to be the first settled society or **'civilization'** in the world.

They produced many innovations including arithmetic using several different number systems including a system based on the number 60. This system became the basis of the time units of 60 seconds, 60 minutes, and 12 hours, and the 12 month calendar which is still in use. The Sumerians were also excellent astronomers and developed an astronomical system based on the phases of the moon and used these time units to predict the lunar changes.

The physical measurement of time is thought to have begun with the invention of sundials in ancient Egypt over three thousand years ago. For the Egyptians, the basic unit of time was the period of daylight. Although they acquired some of the Sumerian ideas their approach differed as their astronomical system was based on the sun

The Egyptians divided the period from sunrise to sunset into twelve equal parts. As a result, the Egyptian hour varied with length of the day, the season and location.

The need for a way to measure time without requiring sunlight brought about the invention of sandglasses, water clocks and candle clocks. These either used the flow of water or sand to measure time, or in the candle's case, the reduction in height as it burned. These devices were marked to indicate time based on the sundial.

However it was not until the **Middle Ages** that technology advanced significantly when in 13th century Europe, the first mechanical clocks were invented to help the performance of religious activities in monasteries throughout the day.

With the invention of the clock, the basic unit of time was no longer the day but became the hour.

In 1583 the great Italian scientist **Galileo Galilei** realized that how quickly a pendulum would swing depended on its length and opened the way for the idea of the far more accurate pendulum clocks, first invented in 1657 by Christian Huygens.

With the arrival of accurate clocks a problem began to develop about what was the 'right' time. This came about in Europe in the 18th century, with the introduction of mail coach services. The coaches kept to a strict schedule, in order to maintain a good reputation for reliability and punctuality. The problem with keeping to a strict timetable was that the actual "time of day" varied from town to town. Even in a small country like England, towns to the west of London could be up to twenty minutes behind the capital.

The problem became much worse with the arrival of the railway network in the 19th century. The greater speeds, together with the need to change from one line to another made the different local times confusing.

In England, the railroads decided that they would run their operation to London time, as determined by the Royal Observatory at Greenwich, and by 1848 practically all British railroad companies operated according to what would eventually become known as **Greenwich Mean Time (GMT)**. By 1855, almost all public clocks throughout Great Britain showed GMT.

The next big leap in timekeeping technology came in 1928, when W. A. Marrison of Bell Laboratories in the US built the first **quartz-crystal clock**. The quartz clock was so accurate and reliable, that by 1939 it had replaced the mechanical clocks at the Observatory in Greenwich.

However, even quartz-crystal clocks are not sufficiently accurate measurement required for many present-day applications.

In 1945 US physicist Isador Rabi suggested making a clock based on the study of atoms and subsequently in 1949 the US National Bureau of Standards built the first **atomic clock**. Developments with atomic clocks continued and currently the NIST-7, an atomic clock at the US National Institute of Standards and Technology is accurate to about a billionth of a second per day.

Phew! With that kind of accuracy we should never run late.

Link to the Curriculum Framework

Learning Area: Society and Environment
Strand: Time, Continuity and Change
Substrand: Time and Change
TCC 3.1 The student understands that there have been significant events, people and ideas in communities and societies at particular times in the past.

Substrand: Understanding the Past
TCC 3.2 The student understands that at particular times there are various factors which result in change.