History of Measurement

Time
What is needed to measure time?

• Remember from first week’s video
  • Unit
  • Measurement
  • Comparison

• Unit
  • Daytime
  • Night sky

• Measurement
  • Egyptians
  • Babylonian/Sumerians

• Comparison
  • Sunrise, sunset
  • Position of stars in night sky
Let’s Take A Minute

Video:

A Brief History Of (Keeping) Time

PBS – “It’s Okay To Be Smart”

Joe Hanson, PhD

https://youtu.be/mjSwRwAqQA4

(6:14)
Egyptian

The Egyptians used a shadow clock or what we would call a sundial

Circa 1500 BCE
Egyptian

Used Base 10

• Divided day into 10 parts plus 1 part for dawn and one part for dusk
• Divided night into 12 parts, each part set by a constellation visible in the night sky

Thus we get the 24 part day (notice I didn’t say 24 hour day)
Egyptian

All good and well except:

• Pharaohs set demanding schedules which required a finer definition of time

• The length of the day changed with the seasons of the year

• Most sundials were not easy to transport

• Difficult to interpret time of day

Circa 1300 BCE
First Let’s Talk Babylonia Math

• Used cuneiform symbols:
Next Let’s Talk Babylonia Math

• Developed circa 3100 BCE
• Used a Base 10 numbering system with emphasis on 60
• 60 is divisible by 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, and, of course, 60
• Easy to calculate and write fractions. For example, 10 parts of a whole of 60 is 10/60 or 1/6
• It easily fit into the 12 sections of the day the Egyptians created
Egyptian

Egyptians took each part of the day and divided into 60 parts (this eventually became the minute).

It also fit into the idea that there were 360 days in the year (at that time - Egyptians just used the five days as extra to make it work).

Circa 1300 BCE
Video

Hidden History: Why 24 hours yet 60 minutes?

Archaeosoup, 2013

https://youtu.be/OEaGxaUIUJw

(7:31)
Water Clocks

• The change of the seasons meant the length of daylight changed.
• The length of day was good for a given latitude but would change as the latitude changed – not good when conquering the world (think Alexander the Great)
• Thus another method was refined to measure the time – the water clock
Water Clocks

• Worked but as the water flowed out, the pressure would reduce and the flow became less
• Many improvements followed as a consequence as a variation of the basic setup
Mechanical Clocks

• Pendulum clocks (Galileo credited as inventor)
• Spring clocks (Christian Hyugens credited as inventor)

Worked well but still lost up to 10 minutes per day
Mechanical Clocks

Galileo pendulum clock
1642
Mechanical Clocks

Christian Hyuguen escapement, 1656
Mechanical Clocks

Christian Hyugen spring clock design, 1673
As We Move Forward In Time
Will This Sound Vaguely Familiar?

• Most type of clocks were still in place by early 1600’s
• Global trade (shipping specifically)
• Advancements in research & testing
• Transportation schedules (Each city set their own noon)
• Development of Business Investment
• Incorporation of seconds to better measure movement of celestial objects (Tycho Brahe clock of 1587)

Need For More Accurate Timekeeping
Standardization 1750s

• The British Royal Academy and French Academy of Science work together to create a better clock
• Second defined as $1/86,400$ of a day at the equator (Tropical Day)
• Where to start the “time zero” for the earth
Video

Video:
A Brief History of Timekeeping
Hosted by: Michael Aranda (2015)
https://youtu.be/URK9Z2G71j8

(8:22)
Questions?