History of Measurement

Length

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What is needed to measure length?

- Remember from last week's video
  - Unit
  - Measurement
  - Comparison
- Unit
  - Using body parts
  - Using plants
- Measurement
  - Which body part (ie, hand, foot, etc)
  - Which plant (ie, barleycorn)
- Comparison
  - Whose body part
  - What parts (ie, seeds)

Also need method to count

Video:

Brief History of Numerical Systems

Alessandra King, TED Ed

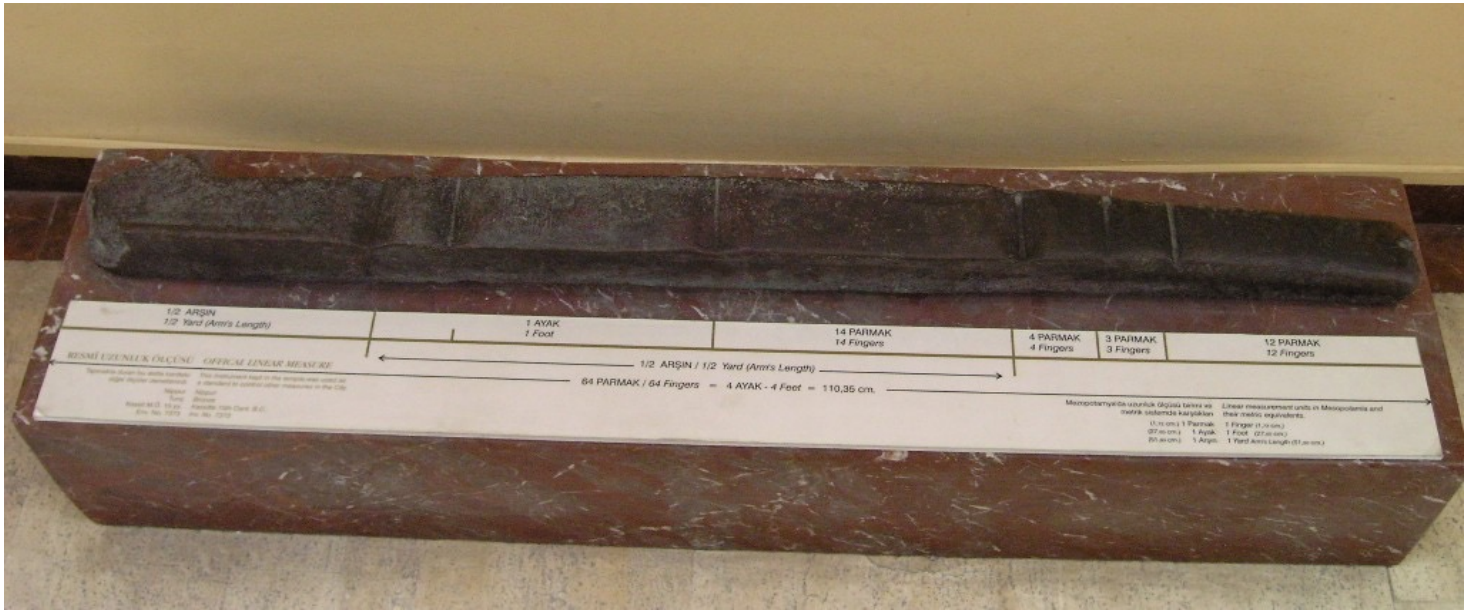
https://youtu.be/cZH0YnFpjwU

Cubit

The distance from the elbow joint to the tip of the longest finger (fully extended)

Earliest Known Measurement

- Nipper Measuring Rod
  - Sumerian area
  - Circa 2650 BC
  - Copper alloy
  - 20 inches long
  - Possibly represented the Sumerian Cubit

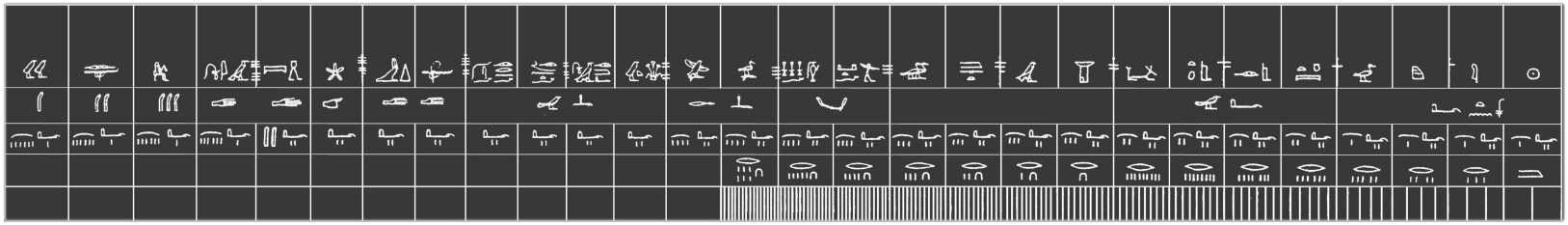


Gudea Rod

- Lagash Area
- Circa 2150 BC
- Marble
- Subdivided into sections

Ancient Egyptian

- Representative of Royal Cubit
- Circa 1350 BC
- Marble



Cubits, Cubits, Everywhere a Cubit

CUBIT	INCHES
Sumerian	19.76
Assyrian	19.45
Egyptian “Royal”	20.62
Egyptian “Short”	17.72
Greek	18.23
Roman	17.48
Talmudist	21.85
Palestinian	25.24

Roman Length Measurements

Unit	Equals	Length
4 digiti	1 palmus	7.4 cm (2.9 in)
4 palmi	1 pes	29.5 cm (11.6 in)
5 pes	1 passus	1.48 m (58.3 in)
125 passus	1 stadium	184.5 m (607 feet)
8 stadia	1 milliare	1,474 m (4858 feet)

Body Parts, Inch

- King David I of Scotland
  - Circa 1150 CE
  - “The thowmys [thumbs] of iii [3] men, that is to say a mekill [big] man, and a man of messurabel [moderate] statur, and of a lytell. The thoums [thumbs] are to be mesouret at [across] the rut [root] of the nayll.”
  - Take the measurement and divide by 3
  - Inch derived from Latin uncia, or unus, meaning “one”

Body Parts, Hand

- Transverse length of four extended fingers
- Set by King Henry VIII as four inches
- Definition was greater than actual measurement of four fingers (about 2.9 inches)

Body Parts, Foot

- Names varied:
  - Persian – vitasi 10.7 inches
  - Romans – pes 11.6 inches
  - Chinese – cheh 14.6 inches
  - Japan – shaku 11.9 inches
  - Costa Rica – tercia or pie 10.97 inches
  - Philippine – piye 12 inches
  - Iran – charac 10.24 inches
  - etcetera….

Plants

- Barleycorn
  - Inch
    - King Edward II of England, 14th century
    - Defined as “three grains of barley, dry and round, placed end to end, lengthwise”
  - One barleycorn was 1/3 inch, 1/36 foot or 1/108 yard
  - One barleycorn split into four equal parts, each part called a line
    - 12 lines to an inch
    - 12 inches to a foot
  - In 1566 England rule said “foure grains of barley make a finger; foure fingers a hande; four hands a foote.”

Plants

- Poppyseed
  - Inch
    - Length of 12 poppyseeds
  - 12 poppyseeds do not meaure the same length as 3 barleycorns

Surveying

- Rood
  - Used to measure land area
  - Derived from Germanic *rute* and Old English *rod*
  - Varied from 16.5 feet to 24 feet

Surveying

Queuing-up to arrive at a "right and lawful" rood in the 16th century. This authentic old depiction of the process laid down by Master Koebel does indeed place 16 assorted individuals toe-to-heel, old and young, obscure and important, just as they happen to come out of the door of the church at right. The three observing personages in the background are very likely the local commissioners for weights and measures, overseeing this averaging-out operation. (COURTESY OF ZEITLIN AND VER BRUGGE, BOOKS AND PRINTS, OF LOS ANGELES)

France Length Measurements

Unit	Length	
Ligne		2.255 mm (.088 in)
Pouce	12 ligne	2.71 cm (1.07 in)
Pied	12 pouces	32.5 cm (12.8 in)
Toise	6 pieds	1.95 m (76.77 in)
League	3000 toise	5850 m (3.63 mile)

What was Next?

- Most type of measurements were still in place by early 1500's
- However…..
  - Global trade
  - Advancements in research & testing
  - Commodization of land; ownership, buying, selling
  - Country boundaries [land = power]

Standardization Starts 1740s

- In England, Royal Academy of Weights and Measures formed to create repeatable standards
- In France, French Academy of Weights and Measures formed for same reason
- Primary focus:
  - Length
  - Weight
  - Time

Standardization 1750s

- The British Royal Academy and French Academy of Science work together to create a standard system
- Progress on using “natural” or ”nature” as basis for weights and length

Standardization 1760s

- Politics intervenes and the academies stop working together
- British politician named their system the “Imperial” System

Land Surveying

Video:

Surveying Land in the 1800s

https://youtu.be/t6xA7-h8ZLg