Week 1: Unit of measure ⚡

We use all sorts of units to measure things, and in many cases, deal with scale by converting between units.

So instead of counting the day in seconds (=86400s), we invent minutes and hours as units and define them. To convert, we divide by the largest unit that leaves an non-zero integer and a remainder. For example:

- 25s → 25s (no division needed)
- 250s → 250/60 minutes = 4 min + 10s rem = 4m 10s or 0:4:10
- 2500s → 2500/(60x60) hours < 1, so 2500/60 min = 41m 40s
- 25000s → 25000/3600 hours = 6h 56m 40s = 6:56:40

Notice how the factor of 10 each time is completely lost in the unit conversion. Did you know that 4:10 = 10*25?

Repeat this using 24 seconds instead.

Units of measure 2

How to calculate:

What is total length of 27 boxes 11'7" wide?

- Convert size to inches
- Do the multiplication
- Convert back to yards, feet, inches.
- Here the factors are different for each scale

How to calculate

When is April 22nd + 200 days?

- One way is to convert April 22nd to a 'day number'
  - 22 + 31 (mar) + 28 (feb) + 31 (jan) = 112
  - target date is 112+200 = 312.
  - Have fun converting this to a date.
- Another way is to count forward. Same trouble…

Here the factors don't even add up uniformly within a scale!!

Units of measure 3

- All units of measure have two components:
  - a scale factor,
  - a dimension,
  - For now, let's not worry about the dimension part.
- The key to the confusion of the previous slide is that the ***factors between all the scales are different*** (12 inches → 1 foot, 3 feet → 1 yard, …)
- The French solves this by inventing the metric system, where the scaling factors are factors of 10 and ***are all the same***, which makes them powers of 10.

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