

Imperial Measurements – Interesting Facts

There are two Imperial Systems, one for land and one for sea.

Land Measurements

There are a hundred **links** to a chain and ten **chains** to a furlong. A link is about 20 cm. Horse racing is always in furlongs. There are 8 furlongs to a mile.

This system combines the best of all worlds – it's "metric" and also "octal" so subdivisions are easy.

An acre is one chain by one furlong so there are 640 acres in a square mile.

There are 100 hectares in a square kilometre so 0.4 hectares is about an acre.

Nautical Measurements

There are 100 **fathoms** in a cable and 10 **cables** in a nautical mile so again "metric".

The nautical mile subtends one minute of arc at the equator. So the distance round the world is by definition 21 600 nautical miles (360×60).

The nautical mile is a bit longer than the mile (1.2 miles).

Feet and Inches

The British never quite managed to combine both systems into an overarching scheme.

In Land Measure there are exactly 0.66 links in a foot.

However in Nautical Measure because the circumference of the earth was an arbitrary length, the nautical mile was defined as 6080 feet but in practice the fathom was considered to be 6 feet.

The inch is now defined as **exactly** 2.54 cm and there are 12 inches in a foot. All modern conversions derive from this. All aircraft heights worldwide are given in **feet** despite the metre being the standard unit of distance.

The distance from the North Pole to the equator was designed to be 10 million metres but the calculations went a bit awry despite the French spending six years on an international survey.

Comparing the two systems, 8 kilometres $\cong$ 5 miles

Weight

The imperial standard is one pound (lb). There are 16 ounces in a pound, 14 pounds in a stone, 2 stone in a quarter, 4 quarters in a hundredweight (cwt) and 20 cwt in a ton. That all calculates out to 2240 lbs in a ton.

This was never the easiest of systems but drummed into me endlessly at primary school. As a pound is about 2.2 kg and there are 100 kg in a tonne, it so happens that a **ton** and a **tonne** are about the same weight.

Capacity

Capacity is defined as the quantity of liquid a body can hold. In the imperial system a fluid ounce was defined as the amount of water that weighed exactly an ounce. There are twenty fluid ounces in a pint and eight pints in a gallon. A gallon therefore is the amount of water that weighs ten pounds (*a pint of water weighs a pound and a quarter*)

The Metric system also attempted to combine capacity with weight and a cubic centimetre was supposed to weigh exactly a gram but again it was miscalculated. However for all intents and purposes, a cubic metre of water is 1 million cubic centimetres and consequently weighs 1000 kilograms or **one tonne**.

In cooking there are six teaspoons in a fluid ounce.

1 tablespoon equals three teaspoons and so measures half a fluid ounce.

In metric one fluid ounce $\cong$ thirty millilitres so a teaspoon is five millilitres.

Modern Conversions

Metric units are now defined from arbitrary fixed values for key physical constants. For example the speed of light is defined as **exactly** 299 792 458 metres. This means as we measure the speed more accurately, it's the metre that changes not the speed!

Imperial units are then defined from metric units. 2.54 cm. is **exactly** equal to one inch.

The pound is **exactly** 0.453 592 67 kilograms. The last decimal place was chosen to make the figure divisible by 7 because there happen to be 7000 grains in a pound. It's nice to know international conversions were fiddled to match the vagaries of the Imperial system. Would that happen today?

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