

HOW MANY THIS OF THAT?



UNITS & CONVERSION MADE EASY.

WANT TO KNOW:

- » how many “G”s are in a meters-per-second-squared?
- » how many megameters in a parsec?
- » fathoms in a furlong?

NEED TO CONVERT FROM:

- » hours to picoseconds?
- » from troy ounces to carats?

You're about to find out how!

Measurements,
Units,
& Dimensions,
OH MY!

IN FOUNDATION SINCE IOS 10.

“Label numeric quantities with physical dimensions to allow locale-aware formatting and conversion between related units.”

» https://developer.apple.com/documentation/foundation/units_and_measurement

MEASUREMENT OF A DIMENSION IN UNITS

AN EXAMPLE

```
let inFeet = Measurement(value: 600,  
                         unit: UnitLength.feet)
```

AN EXAMPLE

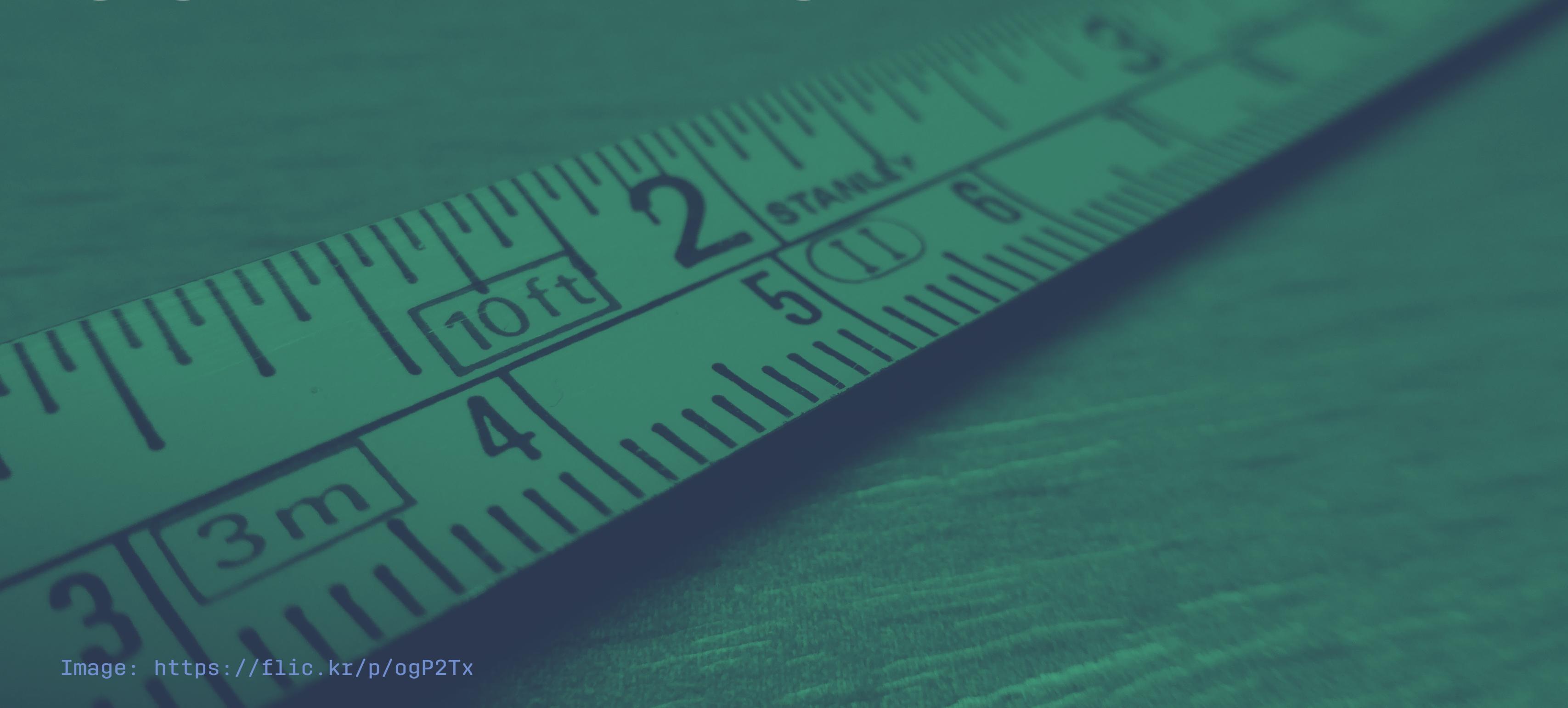
```
let inFeet = Measurement(value: 600,  
                         unit: UnitLength.feet)
```

"600.0 ft"

AN EXAMPLE (ALTERNATE SYNTAX)

```
let inFeet = Measurement<UnitLength>(value: 600,  
                                      unit: .feet)
```

CONVERTING



CONVERTING

```
let inMiles = inFeet.converted(to: UnitLength.miles)  
let inMeters = inFeet.converted(to: UnitLength.meters)
```

CONVERTING

```
let inMiles = inFeet.converted(to: UnitLength.miles)  
let inMeters = inFeet.converted(to: UnitLength.meters)
```

"0.1136363636363636 mi"

"182.88 m"

GO BIG, GO SMALL

```
let inParsecs = inFeet.converted(to: UnitLength.parsecs)
let inInches = inFeet.converted(to: UnitLength.inches)
let inAstro = inFeet.converted(to: UnitLength.astronomicalUnits)
let inNanoMeters = inFeet.converted(to: UnitLength.nanometers)
```

"5.926737164535855e-15 pc"

"7200.0 in"

"1.2224772929204532e-09 ua"

"18287999999.99997 nm"

AN EMBARRASSMENT OF DIMENSIONS

- » Physical , Mass , Weight , Force
- » Time , Motion
- » Energy , Heat , Light , Electrical
- » Concentration , Dispersion
- » Fuel Efficiency
- » Data Storage

PHYSICAL DIMENSIONS

- » UnitArea
- » UnitLength
- » UnitVolume
- » UnitAngle

UNITAREA

- » squareMegameters, squareKilometers,
squareMeters
- » squareCentimeters, squareMillimeters,
squareMicrometers, squareNanometers
- » squareInches, squareFeet, squareYards
- » squareMiles, acres, ares, hectares

MASS, WEIGHT, AND FORCE DIMENSIONS

- » UnitMass
- » UnitPressure

TIME AND MOTION DIMENSIONS

- » UnitAcceleration
- » UnitDuration
- » UnitFrequency
- » UnitSpeed

ENERGY, HEAT, AND LIGHT DIMENSIONS

- » UnitEnergy
- » UnitPower
- » UnitTemperature
- » UnitIlluminance

ELECTRICAL DIMENSIONS

- » UnitElectricCharge
- » UnitElectricCurrent
- » UnitElectricPotentialDifference
- » UnitElectricResistance

CONCENTRATION AND DISPERSION DIMENSIONS

- » UnitConcentrationMass
- » UnitDispersion

FUEL EFFICIENCY AND DATA STORAGE DIMENSIONS

- » UnitFuelEfficiency
- » UnitInformationStorage

OR, MAKE YOUR OWN

“You can create a direct subclass of NSUnit to represent a custom dimensionless unit, such as a count, score, or ratio.”

» <https://developer.apple.com/documentation/foundation/unit>

UNITCONVERTER

» Intended for subclassing.

“For units that can be converted by a scale factor or linear equation, use the concrete subclass `UnitConverterLinear`.”

» <https://developer.apple.com/documentation/foundation/unitconverter>

But, usually you can just do it as in the previous examples.

FORMATTING

MEASUREMENTFORMATTER

```
let speed = Measurement<UnitSpeed>(value: 80.0,  
                                     unit: .kilometersPerHour)  
let formatter = MeasurementFormatter()  
formatter.string(from: speed)
```

MEASUREMENTFORMATTER

```
let speed = Measurement<UnitSpeed>(value: 80.0,  
                                     unit: .kilometersPerHour)
```

```
let formatter = MeasurementFormatter()  
formatter.string(from: speed)
```

"80.0 km/h"

"49.71 mph"

» Uses the preferred unit of the current Locale
by default.

DELEGATES TO NUMBERFORMATTER

So, you can also take advantage of its options.

```
formatter.numberFormatter.usesSignificantDigits = true  
formatter.numberFormatter.maximumSignificantDigits = 3  
formatter.string(from: speed)
```

"49.7 mph"

MORE FORMATTING

```
formatter.unitOptions = [.providedUnit]
```

```
formatter.string(from: speed)
```

```
formatter.string(from: speed.converted(to: .knots))
```

"80 km/h"

"43.2 kn"

MORE FORMATTING

```
formatter.unitOptions = [.providedUnit]
formatter.string(from: inFeet.converted(to: .miles))
formatter.unitOptions = [.naturalScale]
formatter.string(from: inFeet.converted(to: .miles))
```

"0.114 mi"

"600 ft"

» There is also `.temperatureWithoutUnit`

MORE FORMATTING

```
formatter.unitStyle = .long  
formatter.unitStyle = .medium  
formatter.unitStyle = .short
```

"80 kilometers per hour"

"80 km/h"

"80km/h"

MORE FORMATTING

```
formatter.unitStyle = .long  
formatter.unitStyle = .medium  
formatter.unitStyle = .short
```

"600 feet"

"600 ft"

"600'"

"UNUSUAL"-BUT-RELATED WIKI LINKS (FOR FUN)

- » List of unusual units of measurement ↗
- » List of obsolete units of measurement ↗
- » List of humorous units of measurement ↗

QUESTIONS? ANSWERS?



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