

Exercise: Conversion of Units

སྒྱུར་བརྒྱུད་ཀྱི་ཆ་ཚད་གཞི།

Lengths རིང་ཆད།

$$6820 \text{ mm} = 6.82 \text{ m}$$

$$1.044 \text{ km} = 1044 \text{ m}$$

$$580 \text{ } \mu\text{m} = 0.580 \text{ mm}$$

$$6.65 \cdot 10^{-7} \text{ m} = 665 \text{ nm}$$

(nm = 10^{-9} m \rightarrow divided by 100 means 6.65 must be multiplied by 100)

exponential notation: མི་མངོན་པའི་ཐོབ་གངས་ཅན་གྱི་མཚན་རྟགས།

$$6378 \text{ km} = 6'378'000 \text{ m} \text{ or } 6.378 \times 10^6 \text{ m } (\rightarrow 6.4 \times 10^6 \text{ m})$$

$$8.7 \text{ LJ} = 9'460'800'000'000'000 \text{ m} \text{ or } 9.4608 \times 10^{15} \text{ m}$$

(1 year = $365 \times 24 \times 60 \times 60 \text{ s} = 31'536'000 \text{ s} \rightarrow 8.7 \text{ LY} = \text{distance covered in } 8.7 \text{ x}$

Remarks: LJ = Lightyear ; speed of light: $c = 3 \cdot 10^8 \text{ m/s}$

དོ་སྒྲུབ་བྱེད་པ། འོད་ཟེར་རྒྱ་ལའི་རིང་ཆད། འོད་གྱི་མགྱོགས་ཆད།

Areas ས་ཁྲུལ།

$$1690 \text{ mm}^2 = \underline{0.169 \text{ dm}^2} \quad (1.690 \times 10^3 \text{ mm}^2 \times 10^{-4} = 1.690 \times 10^{-1} \text{ dm}^2)$$

$$0.045 \text{ m}^2 = 4.5 \times 10^{-2} \text{ m} \times 10^4 = 4.5 \times 10^2 \text{ cm}^2 = \underline{450 \text{ cm}^2}$$

$$1.83 \text{ km}^2 = 1.83 \times 10^3 \text{ km}^2 \times 10^6 = 1.83 \times 10^9 \text{ m}^2 = \underline{1.8 \times 10^9 \text{ m}^2}$$

(1 km² contains 1000m x 1000m \rightarrow kilo x kilo and m x m)

$$79.1 \text{ dm}^2 = 7.91 \times 10^1 \text{ dm}^2 \rightarrow \times 10^{-2} = 7.91 \times 10^{-1} \text{ m}^2 = \underline{7.9 \times 10^{-1} \text{ m}^2}$$

(1m² contains 1/10 m x 1/10m \rightarrow dezi x dezi and m x m)

$$10 \mu\text{m} \cdot 4 \mu\text{m} = 10 \times 10^{-6} \text{ m} \times 4 \times 10^{-6} \text{ m} = 40 \times 10^{-6} \text{ m}^2 = \underline{4.0 \times 10^{-5} \text{ m}^2}$$

$$4 \cdot \pi \cdot (6378 \text{ km})^2 \approx \underline{5.1 \times 10^{14} \text{ m}^2}$$

$$4 \times \pi \times (6.378 \times 10^3 \text{ km})^2 \approx 12.56 \times 40.678 \times 10^6 \text{ km}^2$$

$$\approx 510 \times 10^6 \text{ km}^2 \rightarrow \times 10^6 (\text{km}^2 \rightarrow \text{m}^2 \text{ see above}) \approx 5.1 \times 10^{14} \text{ m}^2$$

($\pi = \text{Pi} = 3,14159265^*$)

Remarks and formulas concerning π , circles and spheres:


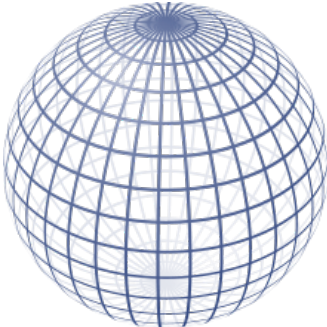
ཕི་ π , ལ་རྟེན་ནས་དོ་སྒྲུབ་དང་ཚ་ཆེག་ སྒོར་སྒོར་དང་རྒྱ་མ་གཟུགས།

$$\pi = \frac{C}{d}$$

π = Pi is one of the most important mathematical constants whose value is the ratio of any circle's circumference to its diameter.

ཁི་ π ,

ཞེས་པ་དེ་ཨང་ཅི་ནང་གལ་ཆེ་ཤོས་ཐེར་ཟུག་དེ་རིང་ཐང་ཉེ་ཆ་སྒོར་སྒོར་གྱི་མཐའ་སྒོར་དཀྱིལ་ཐེག་ཡིན།

Circle (2D)		$C = 2\pi r = \pi d$
སྒོར་སྒོར།		$Area = \pi r^2.$ $Area = \frac{\pi d^2}{4} \approx 0.7854d^2,$
Sphere (3D)		$V = \frac{4}{3}\pi r^3$
རྒྱུ་མ་གཟུགས།		$A = 4\pi r^2.$

Volumina བྱ་ཁྲོན།

$$92'500 \text{ mm}^3 = 92.5 \text{ cm}^3 = 0.0925 \text{ dm}^3$$

$$\text{mm}^3 = \text{milli} \times \text{milli} \times \text{milli} = 10^{-3} \times 10^{-3} \times 10^{-3} \text{ m}^3 = 10^{-9} \text{ m}^3;$$

$$\text{cm}^3 = \text{centi} \times \text{centi} \times \text{centi} = 10^{-2} \times 10^{-2} \times 10^{-2} \text{ m}^3 = 10^{-6} \text{ m}^3$$

$$\rightarrow \text{conversion factor } \text{mm}^3 \rightarrow \text{cm}^3 = 10^{-3}$$

$$\text{same procedure for dezi } (=10^{-1}) \rightarrow \text{conversion factor } \text{mm}^3 \rightarrow \text{dm}^3 = 10^{-6}$$

$$65.8 \text{ dm}^3 = 0.0658 \text{ m}^3$$

$$1 \text{ dm}^3 = \text{dezi} \times \text{dezi} \times \text{dezi} = 10^{-1} \times 10^{-1} \times 10^{-1} \text{ m}^3 = 1.0 \times 10^{-3} \text{ m}^3$$

$$\rightarrow \text{conversion factor } \text{dm}^3 \rightarrow \text{m}^3 = 10^{-3}$$

$$34.5 \text{ hl} = 3450 \text{ dm}^3$$

$$1 \text{ liter} = 1 \text{ dm}^3; 1 \text{ hektoliter} = 100 \text{ dm}^3 \text{ conversion factor } \text{hl} \rightarrow \text{l} (= \text{dm}^3) = 100$$

$$0.0285 \text{ m}^3 = 28.5 \text{ l} \quad (\text{l} = \text{Liter})$$

$$1 \text{ m}^3 \text{ contains } 10 \times 10 \times 10 = 1000 \text{ dezi}(=10^{-1}) \text{ meters or liters}$$

$$\rightarrow \text{conversion factor } \text{m}^3 \rightarrow \text{dm}^3 = 10^3$$

$$387'000 \text{ l} = 0.387 \text{ km}^3$$

$$1 \text{ liter} = 1 \text{ dm}^3 = 1.0 \times 10^{-3} \text{ m}^3 = 1.0 \times 10^{-6} \text{ km}^3$$

(multiply prefix with 1000 → divide number with 1000)

$$\rightarrow \text{conversion factor } \text{dm}^3 \rightarrow \text{km}^3 = 10^{-6}$$

$$25.3 \text{ ml} = 25.3 \text{ cm}^3 = 0.0253 \text{ dm}^3$$

$$1 \text{ milliliter} = 1.0 \times 10^{-3} \text{ l} = 1.0 \times 10^{-3} \text{ dm}^3 = 1.0 \times 10^{-6} \text{ m}^3 \quad (\text{see above: } \text{dm}^3 \rightarrow \text{m}^3 = \times 10^{-3})$$

$$\text{cm}^3 = 10^{-2} \times 10^{-2} \times 10^{-2} \text{ m}^3 \text{ (see above)} = 10^{-6} \text{ m}^3$$

$$\rightarrow \text{conversion factor } \text{ml} \rightarrow \text{cm}^3 = 1$$

$$\text{same procedure for dezi } (=10^{-1}) \rightarrow \text{conversion factor } \text{cm}^3 \rightarrow \text{dm}^3 = 10^{-3}$$

Remark: 1 Liter = 1 dm³

དེ་ལྟར་བྱེད།

Time and angles རྒྱུ་ཆོད་དང་ཟུར་ཁྱུག

$$14800 \text{ s} = 4 \text{ h } 6 \text{ min } 40 \text{ s}$$

$$4 \text{ h} = 14'400 \text{ s}$$

$$+ 6 \text{ min} = 360 \text{ s}$$

$$+ \quad \quad 40 \text{ s}$$

$$= 14'800 \text{ s}$$

$$0.615 \text{ y} = 19'384'640 \text{ s}$$

$$1 \text{ y} = 365 \text{ days} \times 24 \text{ h} \times 60 \text{ min} \times 60 \text{ s} = 31'536'000 \text{ s}$$

$$31'536'000 \text{ s} \times 0.615 = 19'394'640$$

$$270 \text{ } \mu\text{s} = 0.27 \text{ ms}$$

$$270 \times 10^{-6} \text{ s} = 0.27 \times 10^{-3} \text{ s}$$

the value remains the same when it is divided by 10³ (number itself) and multiplied by 10³

(Prefix: mikro → mili)

$$14 \text{ h } 22 \text{ min } 38 \text{ s} = 50'400 \text{ s} + 1'320 \text{ s} + 38 \text{ s} = 51'758 \text{ s} = 0.00164 \text{ years}$$

$$(= 51'758 \text{ s} / (365 \times 24 \times 60 \times 60 \text{ s}); 1 \text{ y} = 31'536'000 \text{ s})$$

Composed Units ཆོད་གཞི་གྱི་ཆགས་པ།

$$60 \text{ km/h} = 16.6 \text{ m/s}$$

$$6.0 \times 10^4 \text{ m} / (60 \times 60) \text{ s} = 6.0 \times 10^4 \text{ m} / (3.6 \times 10^3) \text{ s} = 6.0 / 3.6 \times 10^1 = 1.666 \times 10^1 \text{ m/s} = 16.6 \text{ m/s}$$

$$7400 \text{ hPa} = 74 \text{ N/cm}^2 \quad (1 \text{ Pa} = 1 \text{ N/m}^2)$$

$$7.4 \times 10^3 \text{ hPa} = 7.4 \times 10^5 \text{ Pa} = 7.4 \times 10^5 \text{ N/m}^2$$

$$1 \text{ m}^2 = 10^2 \text{ cm} \times 10^2 \text{ cm}$$

$$\frac{7.4 \times 10^5 \text{ N/m}^2}{10^4 \text{ cm}^2/\text{m}^2} = 7.4 \times 10^1 \text{ N/cm}^2 = 74 \text{ N/cm}^2$$

$$7.87 \text{ g/cm}^3 = 7.87 \text{ kg/dm}^3$$

$$(7.87 \times 10^{-3} \text{ kg}) / 10^{-3} \text{ dm}^3 = 7.87 \text{ kg/dm}^3$$

$$35 \text{ m/s} = 126 \text{ km/h}$$

$$35 \times 10^{-3} \text{ km/s} \times (60 \times 60) \text{ s/h} = 35 \times 3.6 \text{ km / h}$$

$$(10^{-3} \times 3.6 \times 10^3)$$

$$28.5 \text{ l/min} = 1.71 \text{ m}^3/\text{h}$$

$$1 \text{ liter} = 1 \text{ dm}^3 = 1.0 \times 10^{-3} \text{ m}^3$$

$$1 \text{ h} = 60 \text{ min}$$

$$\rightarrow 28.5 \times 10^{-3} \text{ m}^3/\text{min} \times 60 \text{ min/h} = 1.71 \text{ m}^3/\text{h}$$

The calculations with mixed (composed) units is challenging!

ཚད་གཞི་བྲལ་བའི་ཚི་རྒྱུ་ཏེ་ཁ་གཏད་གཅོག་པ་ཞིག་རེད།