

How all the equations was develop before of create the functions into ConvUnidVelocidade.py module.

The physicist use the *Conversions Factors* in the conversions between any two speeds units.

In the appendix of books of the higher physics all students, teachers, and developers will can access the following *Conversions Factors*:

$$1 \frac{mi}{h} = 1.466 \frac{ft}{s} = 0.4470 \frac{m}{s} = 1.609 \frac{km}{h} \quad (1.)$$

and

$$1 \frac{mi}{min} = 60 \frac{mi}{h} = 88 \frac{ft}{s} \quad (2.)$$

All the students, teachers, and developers know:

$$1 \frac{mi}{h} = \frac{1 * mi}{h} ==> \frac{mi}{h}$$

$$1 \frac{km}{h} = \frac{1 * km}{h} ==> \frac{km}{h}$$

$$1 \frac{ft}{s} = \frac{1 * ft}{s} ==> \frac{ft}{s}$$

$$1 \frac{m}{s} = \frac{1 * m}{s} ==> \frac{m}{s}$$

$$1.466 \frac{ft}{s} = \frac{1.466 * ft}{s}$$

$$0.4470 \frac{m}{s} = \frac{0.4470 * m}{s}$$

$$1.609 \frac{km}{h} = \frac{1.609 * km}{h}$$

$$1 \frac{mi}{min} = \frac{1 * mi}{min} ==> \frac{mi}{min}$$

$$60 \frac{mi}{h} = \frac{60 * mi}{h}$$

and

$$88 \frac{ft}{s} = \frac{88 * ft}{s}$$

Of the same manner will can get the Conversion Factor to two any others Speeds Units.

Example:

Convert $152 \frac{mi}{h}$ to $\frac{km}{h}$ using the Conversion Factor.

Solution:

$$152 \frac{mi}{h} = 152 \frac{mi}{h} * 1 = 152 * \frac{mi}{h} * \frac{1.609 * km}{1 * \frac{mi}{h}} = 152 * 1.609 * \frac{km}{h} = 244.568 * \frac{km}{h} = 244.57 * \frac{km}{h}$$

Example: The Conversion Factor between two speeds units: $\frac{mi}{h}$ and $\frac{km}{h}$

will be geted by following equation: $1 \frac{mi}{h} = 1.609 \frac{km}{h}$ (1.1)

Divide the equation(1.1) by $1 \frac{mi}{h}$ get:

$$\frac{1 \frac{mi}{h}}{1 \frac{mi}{h}} = \frac{1.609 \frac{km}{h}}{1 \frac{mi}{h}} \implies 1 = \frac{1.609 \frac{km}{h}}{1 \frac{mi}{h}} \text{ is the first Conversion Factor geted and after divide}$$

the equation (1.1) by $1.609 \frac{km}{h}$ will get:

$$\frac{1 \frac{mi}{h}}{1.609 \frac{km}{h}} = \frac{1.609 \frac{km}{h}}{1.609 \frac{km}{h}} \implies \frac{1 \frac{mi}{h}}{1.609 \frac{km}{h}} = 1 \text{ is the second Conversion Factor calculated.}$$

Only is possible get an Conversion Factor between two any speed units as:

$$\frac{mi}{h} \text{ and } \frac{ft}{s} \text{ or } \frac{mi}{h} \text{ and } \frac{m}{s} \text{ or } \frac{mi}{h} \text{ and } \frac{km}{h} \text{ or } \frac{ft}{s} \text{ and } \frac{m}{s} \text{ or } \frac{ft}{s} \text{ and } \frac{km}{h} \text{ or } \frac{m}{s} \text{ and } \frac{km}{h}$$

and

$$\frac{mi}{min} \text{ and } \frac{mi}{h} \text{ or } \frac{mi}{min} \text{ and } \frac{ft}{s}$$

Example:

A leopard reach speed limit of $112,63 \frac{km}{h}$. Convert to $\frac{mi}{h}$ using Conversion Factor.

Solution:

$$112.63 \frac{km}{h} = 112.63 \frac{km}{h} * 1 = 112.63 * \frac{km}{h} * \frac{\frac{mi}{h}}{1.609 * \frac{km}{h}} = \frac{112.63}{1.609} * \frac{mi}{h} = 70 * \frac{mi}{h}$$

Before of begun the development of the ConvUnidVelocidade.py module the Collaborator and I think in a manner more easy that the used by physicist to develop the ConvUnidVelocidade.py module and the algconbunveloc.py program.

In the equation (1.1) changed to: $1 * \frac{mi}{h} = 1.609 * \frac{km}{h}$.

If do $\frac{km}{h} = 112.63$ in this equation and solve, will get that:

$$1 * \frac{mi}{h} = 1.609 * 112.63 = 198.92067 \implies \frac{mi}{h} = 198.92 \neq 70 \text{ geted in the previous example.}$$

[Note]: Is not possible use the equation (1.1) changed to convert of the speed unit $\frac{km}{h}$

to the speed unit $\frac{mi}{h}$.

All the [equations geted] that are functions into of the ConvUnidVelocidade.py module been finded only using Inverse Functions was study in the Differential and Integral Calculus.

[Note]: Is not possible get all the equations using only Algebra.

Begin change the equation (1.) of the following manner:

$$1 * \frac{mi}{h} = 1.466 * \frac{ft}{s} = 0.4470 * \frac{m}{s} = 1.609 * \frac{km}{h} \quad (1.2)$$

Will use the equation(1.1) to find the inversa equation using inverse functions.

Solution:

In the equation(1.1) changed: $1 * \frac{mi}{h} = 1.609 * \frac{km}{h}$ swap the speed unit $\frac{mi}{h}$ to $\frac{km}{h}$ and $\frac{km}{h}$ to $\frac{mi}{h}$ and will find the following equation:

$$1 * \frac{km}{h} = 1.609 * \frac{mi}{h} \implies \frac{km}{h} = 1.609 * \frac{mi}{h}$$

In this new [inverse equation] finded that will possible do $\frac{mi}{h} = 70$ and solve this [new equation].

Will get the following result:

$$1 * \frac{km}{h} = 1.609 * 70 = 112.63 \implies \frac{km}{h} = 112.63 \text{ the speed of the leopard.}$$

Now will find the value of $1 \frac{km}{h} = ?$ using the equation(1.1) changed:

$$1 * \frac{mi}{h} = 1.609 * \frac{km}{h}$$

Divide the prior equation by 1.609:

$$\frac{1}{1.609} * \frac{mi}{h} = \frac{1.609}{1.609} * \frac{km}{h}$$

$$0.6215 * \frac{mi}{h} = 1 * \frac{km}{h}$$

To theorem have:

$$1 * \frac{km}{h} = 0.6215 * \frac{mi}{h}$$

Will find the [inversa equation] of this last equation geted swap the speed unit $\frac{km}{h}$

to $\frac{mi}{h}$ and $\frac{mi}{h}$ to $\frac{km}{h}$ and will find:

$$1 * \frac{mi}{h} = 0.6215 * \frac{km}{h} \implies \frac{mi}{h} = 0.6215 * \frac{km}{h}$$

Therefore conclude that:

$$\frac{km}{h} = 1.609 * \frac{mi}{h} \text{ and } \frac{mi}{h} = 0.6215 * \frac{km}{h}$$

are the two [inverse equations] begin that was insert into the ConvUnidVelocidade.py module.

Will follow now find with the Conversions Units: $\frac{m}{s}$ and $\frac{km}{h}$

To equation(1.1) we can edit:

$$0.4470 * \frac{m}{s} = 1.609 * \frac{km}{h} \quad (1.2)$$

Divide this [new equation] to 0.4470:

$$\frac{0.4470}{0.4470} * \frac{m}{s} = \frac{1.609}{0.4470} * \frac{km}{h}$$

$$1 * \frac{m}{s} = 3.59955... * \frac{km}{h}$$

$$1 * \frac{m}{s} = 3.6 * \frac{km}{h}$$

Follow with the use of the [Inverse function] with swap of the speed unit $\frac{m}{s}$ to $\frac{km}{h}$ and of $\frac{km}{h}$ to $\frac{m}{s}$.

$$1 * \frac{km}{h} = 3.6 * \frac{m}{s} ==> \frac{km}{h} = 3.6 * \frac{m}{s}$$

Now divide to 1.609 the equation(1.2)

$$\frac{0.4470}{1.609} * \frac{m}{s} = \frac{1.609}{1.609} * \frac{km}{h}$$

$$0.2778 * \frac{m}{s} = 1 * \frac{km}{h}$$

To theorem have:

$$1 * \frac{km}{h} = 0.2778 * \frac{m}{s}$$

Follow with the use of the [Inverser Function] with swap of the speed unit $\frac{km}{h}$ to $\frac{m}{s}$ and of $\frac{m}{s}$ to $\frac{km}{h}$.

$$1 * \frac{m}{s} = 0.2778 * \frac{km}{h} ==> \frac{m}{s} = 0.2778 * \frac{km}{h}$$

Therefore conclude that:

$$\frac{km}{h} = 3.6 * \frac{m}{s} \quad \text{and} \quad \frac{m}{s} = 0.2778 * \frac{km}{h}$$

are the two new [inverse equations] that was insert the ConvUnidVelocidade.py module.

All the others equations been geted of the same manner and any user will can test following this tutorial.

Below are all the equations that been developed to the functions into the ConvUnidVelocidade.py module:

$$\frac{mi}{h} = 0.6215 * \frac{km}{h}$$

$$\frac{mi}{h} = 2.2361 * \frac{m}{s}$$

$$\frac{mi}{h} = 0.6818 * \frac{ft}{s}$$

$$\frac{km}{h} = 1.609 * \frac{mi}{h}$$

$$\frac{km}{h} = 3.6 * \frac{m}{s}$$

$$\frac{km}{h} = 1.0969 * \frac{ft}{s}$$

$$\frac{m}{s} = 0.4472 * \frac{mi}{h}$$

$$\frac{m}{s} = 0.2778 * \frac{km}{h}$$

$$\frac{m}{s} = 0.3047 * \frac{ft}{s}$$

$$\frac{ft}{s} = 1.477 * \frac{mi}{h}$$

$$\frac{ft}{s} = 0.9117 * \frac{km}{h}$$

$$\frac{ft}{s} = 3.2820 * \frac{m}{s}$$

After was have finded all the prior equations the collaborator begun the development of the code of the functions into the [ConvUnidVelocidade.py] module and too the [algconbunvelocity.py] program.

Author: Cristovom A. Girodo