Dimensional Analysis

IB PHYSICS | MOTION

Conversions

Convert the Following:

26.2 miles → kilometers

1 Mile = 1.609 Kilometers

Conversions with fractions

Convert the Following:

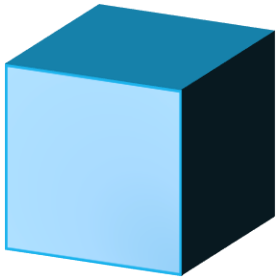
35 mi hr^{-1} → m s^{-1}

1 Mile = 1609 meters

Conversions with Exponents

How many cm^2 are there in 1 m^2?

How many cm^3 are there in 1 m^3?



Conversions with Exponents

Convert the Following:

$0.05\ km^2 \rightarrow m^2$

Conversions with Exponents

Convert the Following:

1 meter = 3.28 feet

$5\ m^2 \rightarrow ft^2$

$5\ m^3 \rightarrow ft^3$

Dimensional Analysis

Start with the formula and substitute units in for variables

$$v = \frac{d}{t}$$

Is this formula valid?

$$d = at$$

Dimensional Analysis

We can use equations with units that we know to find units that we don't.

$$p = m \times v$$

Variable	Unit
Momentum **p**	
Mass **m**	Kilogram [kg]
Velocity **v**	Meters per second [ms^{-1}]

Dimensional Analysis

Constants have units too! That's what makes our equation valid

$$F = G\frac{m_1 m_2}{d^2}$$

Variable	Unit
Force **F**	Newton [N]
Mass $\mathbf{m_1}$ and $\mathbf{m_2}$	Kilogram [kg]
Distance **d**	Meter [m]
Universal Gravitation Constant **G**	

Normalized Scientific Notation

Helpful for very **big** numbers

89,000,000 =

750,000,000,000 =

8,759,000,000 =

Normalized Scientific Notation

Helpful for very **small** numbers

0.00125 =

0.0000008255 =

0.00000082550 =

Lesson Takeaways

- ❑ I can convert fraction units and exponential units using Dimensional Analysis
- ❑ I can use dimensional analysis to verify a formula
- ❑ I can use dimensional analysis to determine the units for a solution
- ❑ I can represent large and small numbers using scientific notation