DIMENSIONAL ANALYSIS

What is Dimensional Analysis

It is a technique used to convert from one unit to another. It can be used for metric to metric, metric to English, or English to metric units.

It is used extensively in chemistry to convert between grams, moles, and particles!

It is based on a pattern, just like dominoes!

Dimensional Analysis uses Fractional Conversion Factors

- A conversion factor is an equality that relates two different units of measure

- Ex. 1 dozen = 12 objects

- Ex. $1.00 US dollars = 20.34 Peso

- Ex. 1 meter = 1000 millimeters

- Conversion factors can be written as fractions having a value of "1".

Now try a problem with real units…..

2 m = _____ cm?

STEP 1

Obtain a list of conversion factors (facts that help you convert). See p. 3 of your packet:

$$1 \text{ m} = 100 \text{ cm}$$

STEP 2

Draw a sideways "t", and put what you are starting with in the upper left corner.

2 m

Note: The bottom left corner often remains blank.

STEP 3

Write your conversion factors as fractions, and arrange these fractions so that old **units cancel**...and you get the units you want! Remember, each fraction has a value of one so you are multiplying by "1".

$$\frac{2\ \text{m}}{} \cdot \frac{100\ \text{cm}}{1\ \text{m}}$$

Note: The units cancel, but the numbers do not!

STEP 4

Multiply the top through, and divide by the bottom on your calculator….

$$\frac{2 \text{ m} \quad 100 \text{ cm}}{1 \text{ m}} = \frac{2 \times 100 \text{ cm}}{1}$$

Your answer should have the same number of sig. figs. as the **starting** measurement. Conversion factors have infinite sig. figs and do not limit you.

$$= \textbf{200 cm}$$

Try this one….

- 7 triangles = 5 squares
- 12 circles = 8 triangles
- 6 ovals = 4 circles
- 4 diamonds = 2 squares

- So, 25 diamonds = _____ ovals?

Now try a more challenging problem with real units…..

$$2 \text{ m} = \underline{\hspace{2cm}} \text{ feet?}$$

STEP 1

Obtain a list of conversion factors (facts that help you convert). See p. 3 of your packet:

1 m = 100 cm

1 inch = 2.54 cm

1 foot = 12 inches

STEP 2

Draw a sideways "t", and put what you are starting with in the upper left corner.

2 m

Note: The bottom left corner often remains blank.

STEP 3

Write your conversion factors as fractions, and arrange these fractions so that old **units cancel**...and you get the units you want! Remember, each fraction has a value of one so you are multiplying by "1".

$$\frac{2\ m}{} \quad \frac{100\ cm}{1\ m}$$

Note: The units cancel, but the numbers do not!

STEP 3

1 m = 100 cm
1 inch = 2.54 cm
1 foot = 12 inches

Write your conversion factors as fractions, and arrange these fractions so that old **units cancel**...and you get the units you want! Remember, each fraction has a value of one so you are multiplying by "1".

2 m	100 cm	1 in
	1 m	2.54 cm

Note: The units cancel, but the numbers do not!

STEP 3

Write your conversion factors as fractions, and arrange these fractions so that old **units cancel**...and you get the units you want! Remember, each fraction has a value of one so you are multiplying by "1".

$$\frac{2\ m}{} \times \frac{100\ cm}{1\ m} \times \frac{1\ in}{2.54\ cm} \times \frac{1\ ft}{12\ in} =$$

Note: The units cancel, but the numbers do not!

STEP 4

Multiply the top through, and divide by the bottom on your calculator....

2 m	100 cm	1 in	1 ft
1 m	2.54 cm	12 in	

$= \dfrac{2\text{x}100\text{x}1\text{x}1}{1\text{x}2.54\text{x}12}$

$\dfrac{200 \text{ ft}}{30.48}$

Your answer should have the same number of sig. figs. as the **starting** measurement. Conversion factors have infinite sig. figs and do not limit you.

$= \quad 6.56\text{ft}$

$= \textbf{7 ft}$