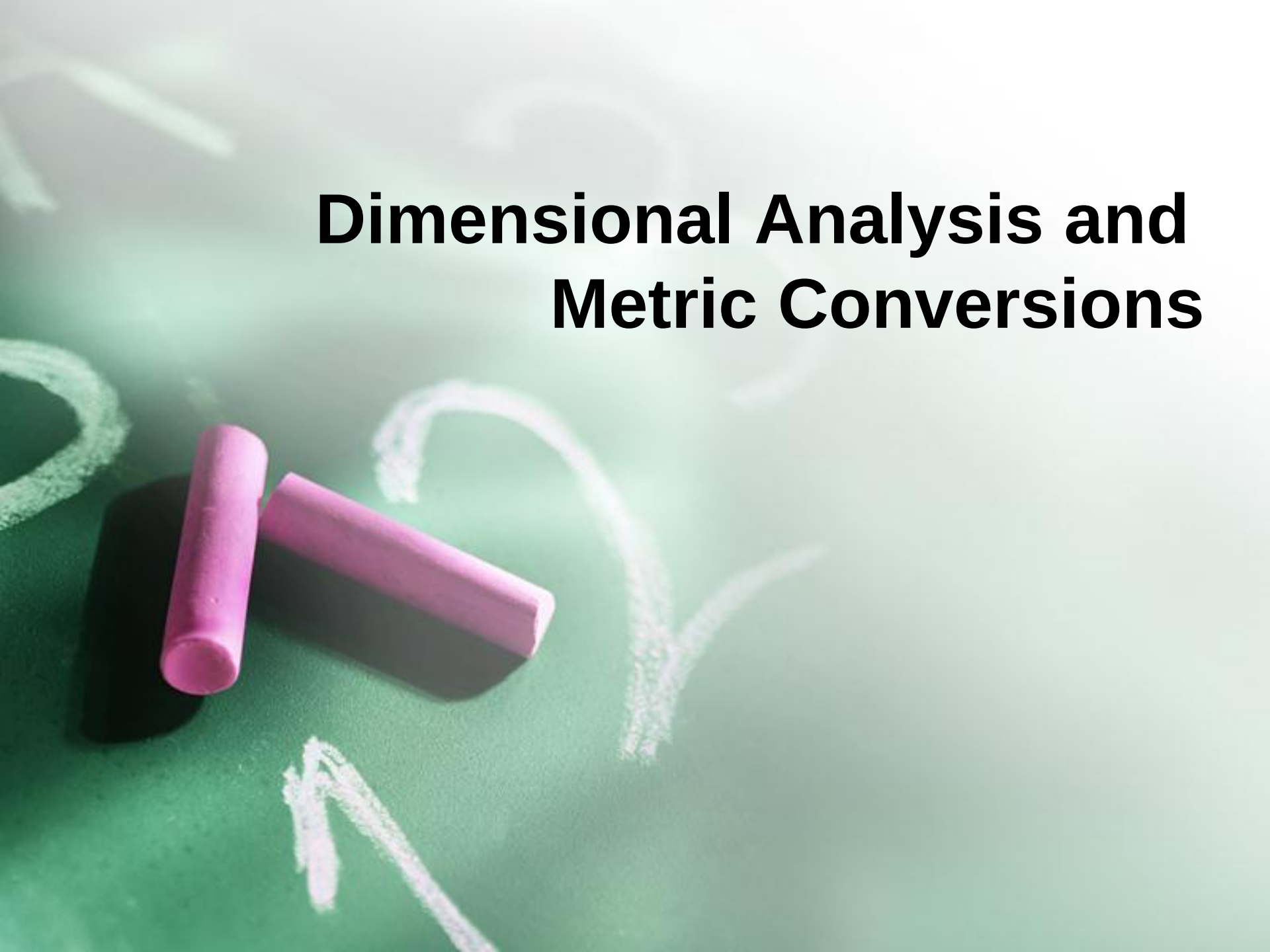
Dimensional Analysis and Metric Conversions



SC Standards

PS-1.5

Organize and interpret the data from a controlled scientific investigation by using mathematics (including formulas and dimensional analysis), graphs, models, and/or technology.

Dimensional Analysis

Conversion factors:

- using ratios of equivalent values to convert from one unit of measure to another.

1 gram = 1000 milligrams

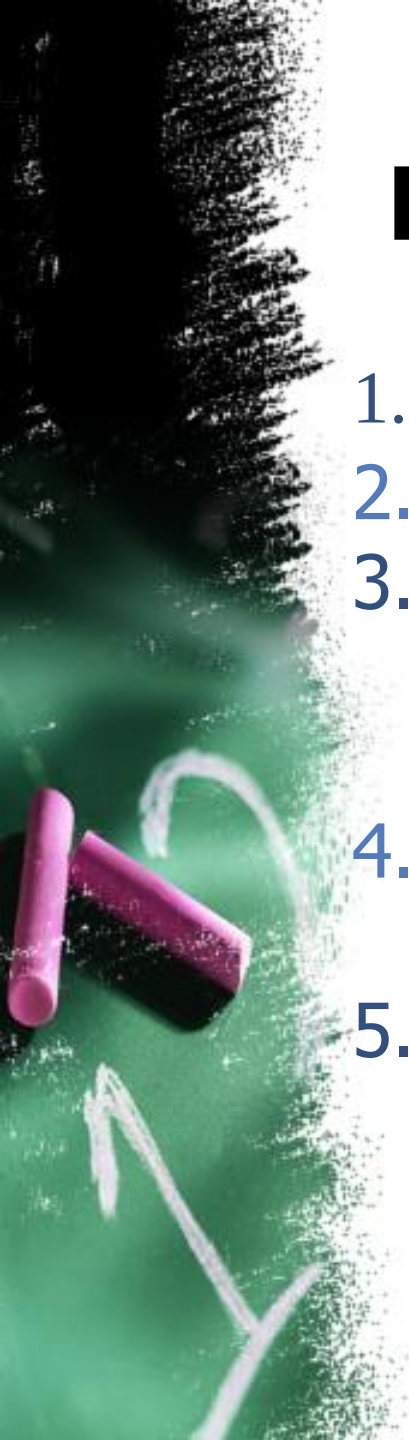
$$\frac{1\text{ g}}{1000\text{ mg}} \quad \text{or} \quad \frac{1000\text{ mg}}{1\text{ g}}$$

60 sec = 1 min.

$$\frac{60\ \text{sec}}{1\ \text{min.}} \quad \text{or} \quad \frac{1\ \text{min.}}{60\ \text{sec}}$$

What would the conversion factors be for years and days?

$$\frac{365\ \text{days}}{1\ \text{year}} \quad \text{or} \quad \frac{1\ \text{year}}{365\ \text{days}}$$



Dimensional Analysis

1.) Write down given number and unit
2.) Write down "x" and a line
3.) Put given unit on side of line so it will cancel and the desired unit on the other side (may take more than 1 step)
4.) Fill in appropriate numerical relationship for the ratio
5.) Multiply the top and divide by the bottom

...see examples...

- Example #1
  - How many minutes are there in 1 year?

$$1 \text{ year} \times \frac{365 \text{ days}}{1 \text{ year}} \times \frac{24 \text{ hr}}{1 \text{ day}} \times \frac{60 \text{ min.}}{1 \text{ hr}}$$

$$= \underline{525{,}600 \text{ minutes!!}}$$

Example #2 - How many inches are there in 85.6 cm? (1in = 25.4mm)

$$85.6\text{cm} \times \frac{10\ \text{mm}}{1\ \text{cm}} \times \frac{1\ \text{in}}{25.4\ \text{mm}}$$

$$= 33.7\ \text{in.}$$

Example #3 - How many fluid ounces are there in 2.0 gallons?

(1gall = 4 qts, 1 qt = 2 pints, 1 pint = 2 cups, 1 cup = 8 fl. oz.)

$$2.0\ \text{gall} \times \frac{4\ \text{qts}}{1\ \text{gal}} \times \frac{2\ \text{pt}}{1\ \text{qt.}} \times \frac{2\ \text{cup}}{1\ \text{pt.}} \times \frac{8\ \text{fl. oz.}}{1\ \text{cup}}$$

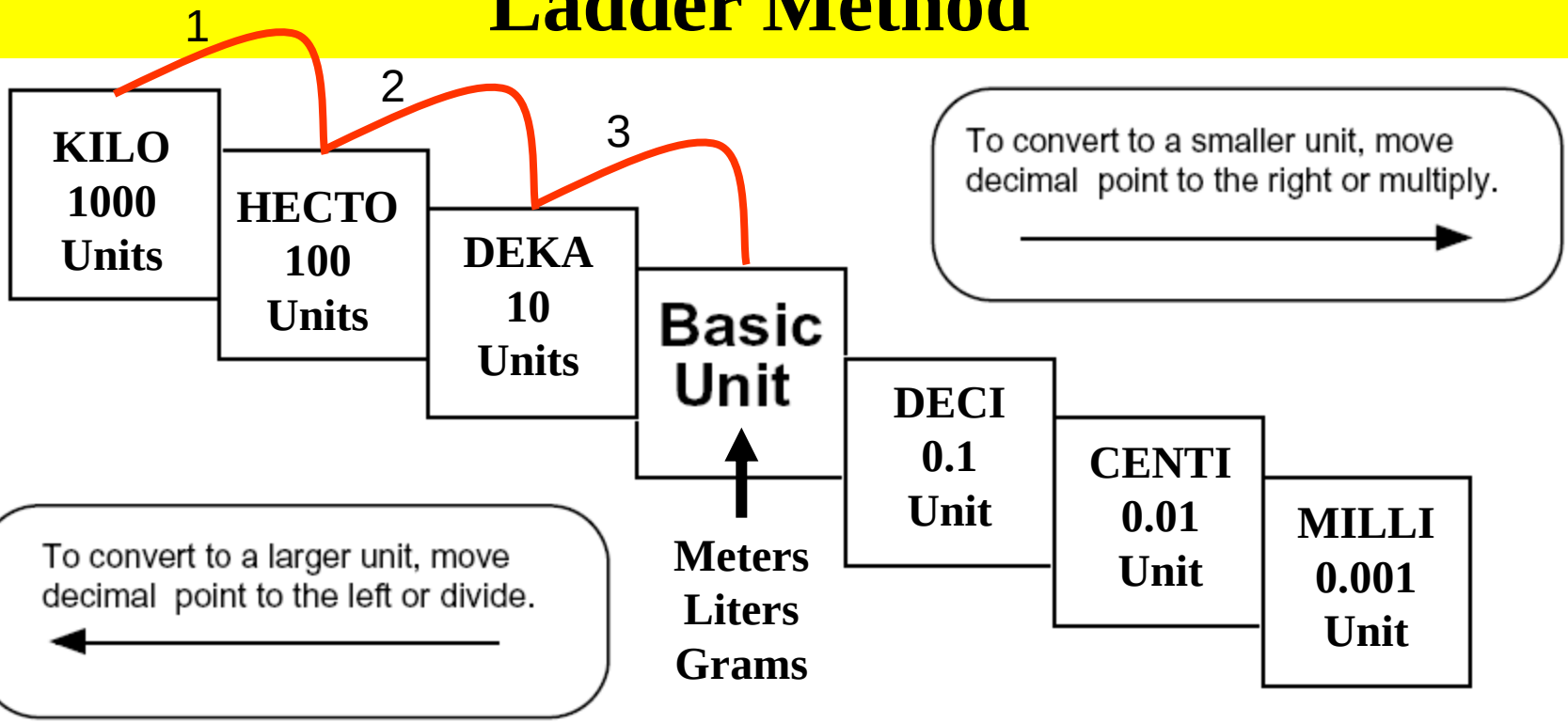
$$= 256\ \text{fl. oz.}$$

Metric Mania

Metric Conversions
Ladder Method

T. Trimpe 2008 http://sciencespot.net/

Ladder Method



How do you use the "ladder" method?

1st – Determine your starting point.

2nd – Count the "jumps" to your ending point.

3rd – Move the decimal the same number of jumps in the same direction.

4 km = _____ m

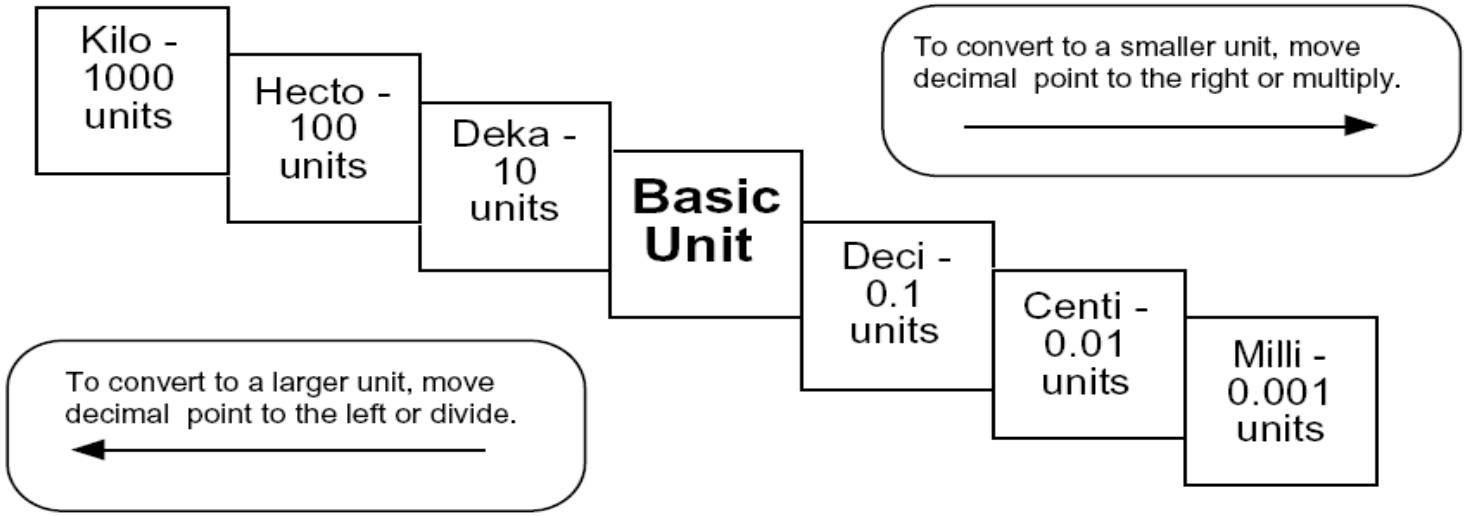
Starting Point Ending Point

How many jumps does it take?

4. _. _. _. = 4000 m

1 2 3

Conversion Practice



Try these conversions using the ladder method.

1000 mg = _____ g

1 L = _____ mL

160 cm = _____ mm

14 km = _____ m

109 g = _____ kg

250 m = _____ km

Compare using <, >, or =.

56 cm ◯ 6 m

7 g ◯ 698 mg

Metric Conversion Challenge

Write the correct abbreviation for each metric unit.

1) Kilogram _____

2) Meter _____

3) Gram _____

4) Milliliter _____

5) Millimeter _____

6) Liter _____

7) Kilometer _____

8) Centimeter _____

9) Milligram _____

Try these conversions, using the ladder method.

10) 2000 mg = _____ g

11) 104 km = _____ m

12) 480 cm = _____ m

13) 5.6 kg = _____ g

14) 8 mm = _____ cm

15) 5 L = _____ mL

16) 198 g = _____ kg

17) 75 mL = _____ L

18) 50 cm = _____ m

19) 5.6 m = _____ cm

20) 16 cm = _____ mm

21) 2500 m = _____ km

22) 65 g = _____ mg

23) 6.3 cm = _____ mm

24) 120 mg = _____ g

Compare using <, >, or =.

25) 63 cm ◯ 6 m

26) 536 cm ◯ 53.6 dm

27) 5 g ◯ 508 mg

28) 43 mg ◯ 5 g

29) 1,500 mL ◯ 1.5 L

30) 3.6 m ◯ 36 cm