

DIMENSIONAL ANALYSIS AND UNIT CONVERSIONS

Dimensional analysis is a useful problem strategy for dealing with problems involving measurements. Measurements must have both a value and a unit, which must also be accounted for in any mathematical manipulation of the measurement. Dimensional analysis can be summarized in five simple steps, as shown below:

1. Write the value and unit of the known quantity
 2. Draw a bracket (or a new fraction)
 3. Place the known's unit on **BOTTOM** of the bracket/fraction
 4. Place the desired unit on **TOP** of the bracket/fraction
 5. Fill in the conversion factor and calculate!
- TIP: it is easier if the bigger unit always receives the value "1" in the conversion factor

EXAMPLE: If the earth has a diameter of 12756 km, then how many miles is the diameter of the earth? (1km=1.6miles)

$$12756 \text{ km} \times \frac{1 \text{ mile}}{1.6 \text{ km}} = 7973 \text{ miles}$$

Complete the following conversions, showing ALL work.

1. A bullet has a mass of 452.2g. Express this in kilograms.

2. The distance from the earth to the sun is approximately 9.6×10^8 miles. How many kilometers is this? (1 mile = 1.6 km)

3. A block of wood has a volume of 455 mL. How many nanoliters does it occupy?

4. An arrow is travelling with a velocity of 357 ft/s. How many meters per second is this? (2.54cm = 1in)

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5. A candy bar can supply 325000 calories when burned. How many joules of energy is this? (1cal = 4.184J)

6. A car engine is making 3600 rotations per second. How many rotations is the car making per day?

7. A certain book measures 25.25cm on one side. Express this value in micrometers.

8. Calculate the number of kilomoles of lead present in 452 centimoles of lead.

9. 400K is equivalent to what temperature in degrees Celsius?

10. If you are travelling down the interstate and the speed limit is 70 miles per hour, are you speeding if you are travelling 0.022 kilometers per second?