Measurement and Calculations

Significant Digits
- Certainty in a calculation is measured by the number of **significant digits** it has.
    - All digits included in a stated value (except leading zeros) are significant digits. Examples:
        - 307.0 cm
        - 61 m/s
        - 0.03 m
        - 0.5060 km
        - 240 cm
    - Counted or defined values (ex. 60 min/h) are considered to have an infinite number of significant digits.
        - Consequently, these values are not used when determining the number of significant digits to include in the answer of a calculation.
    - When <u>multiplying and dividing</u>, the answer has the same number of significant digits as the measurement with the fewest number of significant digits.
    - When <u>adding and subtracting</u> measured values of a known precision, the answer has the same number of decimal places as the measured value with the fewest number of decimal places.
        - When **rounding**, remember to round up if the digit after the digit to be retained as significant is 5 or greater.

SCIENTIFIC NOTATION
- **Scientific notation** is used to indicate extremely small or extremely large quantities.
- It can also be used to express a value with a number of significant digits that wouldn't be possible otherwise.
- Most commonly, scientific notation includes the first non-zero digit and then the decimal placed after it.
- Rules
    1. Move the decimal to give the correct number of significant digits.
    2. Add "x10" with an exponent to show how many places you moved it.
        a) Exponent is + if moved to the left.
        b) Exponent is - if moved to the right.
- Example: The speed of light is 300000000 m/s OR 3.00×10^8 m/s

REARRANGING EQUATIONS
- Sometimes we have to isolate a variable in an equation.
- An equation must remain equal by performing the same operation on both sides.

SI UNITS AND SYMBOLS
- The international community of scientists has agreed on a system of measurement and communication.
- Abbreviated **SI** from the French name *Système international d'unités*

SI base units		
Quantity	**Name**	**Symbol**
Length	meter	m
Time	second	s
Mass	kilogram	kg

CONVERTING UNITS
- Sometimes we have to convert a value from one unit to another (e.g., a measurement in km must be converted to m).

- The **Boxes Method** of converting units can be used in any science and any situation.
  - start with what you have
  - use boxes to convert each unit to what you want (up/down)
  - cross out units that are the same
  - do the math (multiply everything on top, divide by everything on bottom)