Rules for determining which digits in a measurement are significant:

1. Every nonzero digit in a recorded measurement is significant.
   i.e. 24.7m, 0.743m, 714m (all have 3 significant digits)

2. Zeros appearing between nonzero digits are significant.
   i.e. 2003m, 40.79m, 1.503m (4 significant digits)

3. Zeros appearing in front of all nonzero digits are not significant. They are place holders (leading zeros)
   i.e. 0.0071m, 0.42m, 0.000 099 (2 significant digits)

4. Zeros at the end of a number and to the right of a decimal point are significant.
   i.e. 43.00m, 1.010m, 9.000m (4 significant digits)

5. Terminal zeros in a number without an explicit decimal point may or may not be significant.
   i.e. 900 cm, (it is uncertain whether 1, 2 or 3 significant digits are intended - the uncertainty can be removed by expressing the measurement in scientific notation)

   i.e. If a person writes 900. cm, the zeros are significant.

Rules for significant figures used in calculations:

An answer cannot be more precise than the least precise measurement.

1. **Addition and subtraction:**
   when adding or subtracting measured quantities, give the same number of decimal places in the answer as there are in the measurement with **the least number of decimal places.**

   i.e. 12.52 m + 349.0 m + 8.24 m equals 369.76m
   The answer must be rounded off to one digit after the decimal point. (369.8)

   i.e. 74.646 m - 28.34 m equals 46.306
   The answer must round to 2 digits after the decimal point (46.31)

2. **Multiplication and division:**
   when multiplying or dividing measured quantities, give as many significant figures in the answer as there are in the measurement with **the least number of significant figures.**

   i.e. 7.55 m x 0.34 m equals 2.567 m^2
   0.34 m has 2 significant figures. (2.6 m^2)

   i.e. 2.4526 m divided by 8.4 m equals 0.291 976 m.
   8.4 has 2 significant figures. (0.29 m)

Rounding:

is the procedure of dropping nonsignificant digits in a calculation result and adjusting the last digit reported.

The procedure involves looking at the right-most significant digit.

1. If this digit is 5 or greater, add 1 to the last digit to be retained and drop all digits farther to the right. Rounding 1.2151 to 3 significant figures gives 1.22.

2. If the digit is less than 5, simply drop it and all digits farther to the right. Rounding 1.2143 to 3 significant figures gives 1.21.

Scientific Notation:

is a convenient method of expressing either a very large, or a very small number as a number between 1 and 10 called the coefficient multiplied by an exponent or power of 10.

A coefficient is a number greater than or equal to 1 and less than 10.

An exponent indicates how many times the coefficient must be multiplied by 10.

i.e. 100 ⇨ 1.0×10^2 ($1.0 \times 10 \times 10$ ⇨ 100)

1000 ⇨ 1.0×10^3 ($1.0 \times 10 \times 10 \times 10$ ⇨ 1000)

When writing numbers greater than 10 in exponential form the exponent is equal to the number of places that the decimal point has been moved to the left.

12 000 000 ⇨ 1.2×10^7

85 130 ⇨ 8.513×10^4

Numbers less than 1 have a negative exponent when written in exponential form.

0.000 72 ⇨ 7.2×10^{-4}

The negative exponent -4 indicates that the coefficient 7.2 is divided 4 times by 10 to equal the number 0.000 72

i.e. 7.2×10^{-4} ⇨ $\dfrac{7.2}{10 \times 10 \times 10 \times 10}$ ⇨ 0.000 72

0.000 05 ⇨ 5×10^{-5}

0.0342 ⇨ 3.42×10^{-2}

Moving the decimal to the left results in a positive power of ten.

Moving the decimal to the right results in a negative power of ten.

Convert each of the following into scientific notation:

3200	0.000855	4.045	47 800
2 560 000	0.0305	25	0.07554
1.0005	10 250	9500	0.44785

Mathematical Operations using Scientific Notation:

1. 0.0001 kg + 150 kg = __________kg ⇨
2. 0.0001 kg + 0.004 kg = ________ kg ⇨
3. 45 g x 50 g = _________ g ⇨
4. 0.0054 n / 45 n = __________ n ⇨
5. (14000 kg + 45 kg) (25000 kg - 4500 kg)

   = (_________ kg) (_________ kg)

   = _______________

   = _________________

Scientific Notation and Operations:

1. 4.5×10^{3} N + 6.45×10^{4} N

   ___________ N ⇨ ______________N

2. (5.88×10^{-4} kg) (4.35×10^{-2} kg)

   ______________ kg

This information is covered in your text from pages344-348. Read over these pages and also do :

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