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| **SIGNIFICANT FIGURES** | **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_\_\_\_\_\_\_\_** |

All ***Measurements*** have some degree of uncertainty to them (due to the instrument used.)

To indicate the degree of certainty in a measurement (or a number derived from a measurement), scientists use ***significant figures.*** Or numbers they know to be 100% accurate.

**\*\* Significant figures are important in the way we report different kinds of data!**

* A significant figure is a **measured** or **meaningful digit**

1. **What is Not Significant?**

Defined or counting numbers: A number which involves things which cannot realistically be subdivided.

Example:

1 book; 4 students (cannot have 1.5 books or 4.78 students)

Conversion factors are assumed to be an exact relationship (cannot have 1 kg = 1000.5 kg)

**Rules for identifying # of sig figs:**

**a)** An exact number (e.g. 25 students) has an infinite number of significant figures because the number was not rounded off. Exact numbers are not used to determine the significant digits.

b) For all measurements, the following rules apply to count the number of significant figures a number has.

1. Any digit between 1-9 is significant.

e.g. 234.566 has ***6*** sig figs

7.4586 has sig figs

1. A '0' at the beginning of a number is ***not significant*** because it only holds the decimal place. ***Leading zeros are NOT significant***

e.g. 0.00045 has ***2***  sig figs

0.02333 has sig figs

1. A '0' between two other sig figs is significant.

e.g. 50034.03 has ***7*** sig figs

e.g 534.034201 has \_\_\_\_\_\_\_ sig figs

1. A '0' at the end of a number is only significant IF a decimal point occurs in the number otherwise it is not significant. ***Be careful with this one!***

e.g. 750000 has  ***2***  sig figs 20000000 has sig fig

e.g. 750.000 has sig figs

Example:

If a balance gives a reading of 97.53 g when a beaker is placed on it, the reading is considered to have 4 significant figures. If the beaker is then put on a different balance and gives a reading of 97.5295 g, there are more significant figures to the measurement (6 significant figures).

How many significant figures do each of the following measurements have?

1. 1.25 kg \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 1255 kg \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 11s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 150 m \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. 1.283 cm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. 365.249 days \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. 2 000 000 years \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. 17.25 L \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. **Scientific Notation**

Scientific Notation is a way of writing numbers for values too large or small to be conveniently written in standard decimal notation.

Example:

10 = 1.0 x 101

25 = 2.5 x 101

250 = 2.5 x 102

0.000 0350 000 = 3.5000 x 10-5

Write the following numbers in scientific notation:

1. 3570 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 41.400 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 0.000 572 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 41.50 x 10-4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. 0.000 410 x 107 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. **Adding or Subtracting Significant Figures**

When adding or subtracting significant figures, round off the answer to the least number of decimal places contained in the calculation.

Example:

12.56 cm *(2 SF after decimal)* + 125.8 cm *(1 SF after decimal)* = 138.36 cm 🡪 138.4 cm *(1 SF after decimal)*

Exercise:

1. 15.1 + 75.32 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 178.904 56 – 125.8055 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 4.55 x 10-5 + 3.1 x 10-5 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 1.805 x 104 + 5.89 x 102 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Multiplying or Dividing Significant Figure**

When multiplying or dividing significant figures, round off the answer to the least number of significant figures contained in the calculation.

Example:

2.00 *(3 SF)* x 3.000 00 *(6 SF)* = 6.00 *(3 SF)*

Exercise:

1. 12.5 x 0.50 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 0.15 x 0.0016 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 40.0 / 30.000 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 2.5 x 7.500 / 0.150 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. (6.40 x 108) x (5 x 105) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. 4.37 x 103 / 0.008 560 0 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. 0.51 x 10 -4 / 6 x 10 -7 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. 0.000 01 / 0.1000 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Summary Practice Exercises:**

In the following mixed calculations, perform multiplications and divisions before doing the additions and subtractions. Keep track of the number of significant figures at each stage of a calculation.

1. 25.00 x 0.100 – 15.87 x 0.1036 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 35.0 x 1.525 + 50.0 x 0.975 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. (0.865 – 0.800) x (1.593 + 9.04) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. (0.3812 - 0.4176) / (0.0159 – 0.0146) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. 9.34 x 0.071 46 – 6.88 x 0.081 15 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. **Reading A Scale**

The number of significant figures is equal to all the certain digits PLUS the first uncertain digit.

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|  | In the figure to the left, the liquid level is somewhere between 24 mL and 25 mL. You know that it is at least 24 mL so you are “certain” about the first two digits.  As a guess, it could be 24.9 mL. There is some significance to the last digit but but not completely certain. For example, there are the reading is not 24.1 mL. As a result, there are two certain digits, (2 and 4) and one uncertain (9). |
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