BASIC RULES FOR SIGNIFICANT FIGURES

This is just a summary of the rules for significant figures. For deeper explanations, more examples, and extra practice with these rules, please see the "Significant figures review" from the course website.

How many significant figures in a number:

If the number has a decimal point in it: Start at the RIGHT of the number and count to the left until you get to the last NONZERO number, this is the number of sig. figs. Any additional zeros to the left are NOT significant.

Examples: 195.3040 has **7** sig. figs. (195.3040)

0.003081 has **4** sig. Figs. (0.003081)

If the number does NOT have a decimal point in it: Start at the LEFT of the number and count to the right until you get to the last NONZERO number, this is the number of sig. figs.

Examples: 160 has **2** sig. figs. (160)

20000 has **1** sig. figs (20000)

Significant figures in calculations

You never round a value until you are ***completely finished*** with a calculation. This is especially important in situations where you are mixing operations or when the answer to one question is then used in the next question.

	calculation	calculator	write	***and*** write
Example:	845.0265512 ÷ 16.1 =	52.48612116 →	$52.\overline{4}86$ →	52.5

Addition and/or subtraction:

When adding and/or subtracting values, the resulting answer MUST have the same precision as the LEAST precise value used in the calculation.

Example:

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   2500.0
+     1.236
+   367.01
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   2868.246
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The precision allowed in the answer is dictated by the first value (because that value is the *least* precise measurement / fewest decimal places), so you must round to that digit (the 2 in 2868.246 here).

The answer is **2868.2**

Multiplication and/or division:

The value in the calculation that has the ***FEWEST*** number of **SIGNIFICANT FIGURES** determines the number of sig. figs. in your answer

Example: 0.01116 × 23.44600 = 0.26165736

0.01116 has 4 s.f. and 23.44600 has 7 s.f. Therefore the answer is limited to 4 s.f.

The answer would be rounded to **0.2617**

more on the back →

Mixed operations – multiplication/division AND addition/subtraction in the same problem:

In a problem that involves both mult/div AND add/sub, each operation must be carried out one at a time using order of operations and following the mult/div OR add/sub for that individual operation. Use a line over the last digit allowed in that individual step to keep track of the limiting sig fig at each step in the calculation. NO ROUNDING BEFORE END!

Example: $\frac{(3.21-238.0)}{(0.238+4.00)}$

$$\frac{(3.21-238.0)}{(0.238+4.00)} \Rightarrow \frac{(-234.\bar{7}9)}{(4.2\bar{3}8)}$$

Do each set of parentheses first making sure to mark the last sig. fig. you are allowed to keep (for this question, based of course on the addition/subtraction rules)

The final step is a division, so follow that rule. The top value as four sig. figs. and the bottom has three sig. figs. [Remember that the 7 in the numerator and the 3 in the denominator were marked in previous steps as the last digits allowed, so while the digits following the 7 and 3 must be included in the calculation (no rounded numbers in a calculation!), they are *not* included as significant figures.]

$$\frac{(-234.\bar{7}9)}{(4.2\bar{3}8)} = -55.401 \Rightarrow$$ **–55.4** which is the answer

Logarithms:

When taking the logarithm of a number, log(x), the number of *significant figures* in x dictates the number of *decimal places* required in log(x).

Example: log(0.00052) = –3.283997

0.00052 has two s.f., so the result will have two decimal places.

–3.28 is the answer. (two decimal places)

Example: log(381000000000) = 11.58092498

381000000000 has three s.f., so the result will have three decimal places.

11.581 is the answer. (three decimal places)

When taking the inverse logarithm, 10^x, the number of *decimal places* in x is equal to the *significant figures* in 10^x.

Example: $10^{3.251}$ = 1782.378767

3.251 has three decimal places, so the result will have three sig. figs.

1780 is the answer. (three significant figures)

Example: $10^{-2.78167}$ = 0.001653217

–2.78167 has five decimal places, so the result will have five sig. figs.

0.0016532 or 1.6532×10^{-2} is the answer. (five significant figures)