A Practical Guide for Using Significant Figures

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The main idea of using significant figures in calculations is relatively simple.

Your answer can't be any better (can't be more precise) than your data!

However, putting this into practice can be difficult. Use the following rules.

1. Determine the number of significant figures.
   (a) All non-zero numbers are significant (45.23 mm has 4).
   (b) Zeros in-between significant numbers are significant (6.07 mm has 3).
   (c) Zeros to the left of the first non-zero number are not significant because they are just placeholders (0.04 mm has 1).
   (d) When a number ends in a zero after the decimal point, that final zero is significant (0.20 mm has 2, 60.00 mm has 4).
   (e) When a number ends in a zero (or zeros) before the decimal point, the zero (or zeros) could or could not be significant. Use scientific notation or overbars or underlines to make it clear which numbers are significant ($5\overline{0}00 = 5\underline{0}00 = 5.0 \times 10^3$ hectares has 2.)
2. Some numbers are exact. They have an infinite number of significant figures, which means they will never determine the number of significant figures in a calculation.
   (a) There are 60 minutes in an hour (60 has an infinite number of significant figures).
   (b) A plant has 7 leaves (7 has an infinite number of significant figures).
3. When adding or subtracting, round the answer so the answer's least significant digit is in the same place as the largest place of any least significant figure in the data. $5.4 + 4.98 + 6.9111 + 7 = 24$ because 7's least significant figure is in the ones place so the answer's least significant figure must also be in the ones place. Or $5.4+4.98 = 10.4$. The answer can't be more precise than the data!
4. When multiplying or dividing, round the answer so it has the same number of significant figures as the number you multiplied that has the least number of significant digits. $8 \times 542 \times 4\overline{0} = 200,000 = 2 \times 10^5$ because 8 has only one significant figure so the answer can have only one significant figure. $8.00 \times 542 \times 4\overline{0} = 170,000 = 1.7 \times 10^5$ because $4\overline{0}$ has two significant figures. The answer can't be more precise than the data!