

Significant Figures

RULES FOR SIGNIFICANT FIGURES

1. **All non-zero numbers ARE significant.** The number 33.2 has THREE significant figures because all of the digits present are non-zero.

2. **Zeros between two non-zero digits ARE significant.** 2051 has FOUR significant figures. The zero is between a 2 and a 5.

3. **Leading zeros are NOT significant.** They're nothing more than "place holders." The number 0.54 has only TWO significant figures. 0.0032 also has TWO significant figures. All of the zeros are leading.

4. **Trailing zeros to the right of the decimal ARE significant.** There are FOUR significant figures in 92.00.

92.00 is different from 92: a scientist who measures 92.00 milliliters knows his value to the nearest 1/100th milliliter; meanwhile his colleague who measured 92 milliliters only knows his value to the nearest 1 milliliter. It's important to understand that "zero" does not mean "nothing." Zero denotes actual information, just like any other number. You cannot tag on zeros that aren't certain to belong there.

5. **Trailing zeros in a whole number with the decimal shown ARE significant.** Placing a decimal at the end of a number is usually not done. By convention, however, this decimal indicates a significant zero. For example, "540." indicates that the trailing zero IS significant; there are THREE significant figures in this value.

6. **Trailing zeros in a whole number with no decimal shown are NOT significant.** Writing just "540" indicates that the zero is NOT significant, and there are only TWO significant figures in this value.

7. **Exact numbers have an INFINITE number of significant figures.** This rule applies to numbers that are definitions. For example, 1 meter = 1.00 meters = 1.0000 meters = 1.00000000000000000000 meters, etc.

So now back to the example posed in the [Rounding Tutorial](#): *Round 1000.3 to four significant figures.* 1000.3 has five significant figures (the zeros are between non-zero digits 1 and 3, so by rule 2 above, they are significant.) We need to drop the final 3, and since 3 < 5, we leave the last zero alone. so 1000. is our four-significant-figure answer. (from rules 5 and 6, we see that in order for the trailing zeros to "count" as significant, they must be followed by a decimal. Writing just "1000" would give us only one significant figure.)

8. **For a number in scientific notation: $N \times 10^x$, all digits comprising N ARE significant by the first 6 rules; "10" and "x" are NOT significant.** 5.02×10^4 has THREE significant figures: "5.02." "10" and "4" are not significant.

Rule 8 provides the opportunity to change the number of significant figures in a value by manipulating its form. For example, let's try writing 1100 with THREE significant figures. By rule 6, 1100 has TWO significant figures; its two trailing zeros are not significant. If we add a decimal to the end, we have 1100., with FOUR significant figures (by rule 5.) But by writing it in [scientific notation](#): 1.10×10^3 , we create a THREE-significant-figure value.