

Rounding (sursa [aici](#))

With the exception of the enumeration of discrete objects (e.g., 5 oranges, 113 orangutans), a measurement is always an approximation. For example, a friend asks you what time it is. You look at your watch and see that it says: 22:44:35. Are you going to tell your friend, "It's 2:44 and 35 seconds"? I suspect not! You'll probably be thoughtful enough to approximate by **rounding up** to 2:45. If, on the other hand, it's 2:32:14, you might **round down** to 2:30.

Mathematically, rounding has a more formal definition. The final digit (or [significant figure](#)) of any number is actually an approximation. To round off a number to N significant figures, the following rules apply:

1. If the digit to the right of the last digit you want to keep (that is, the first digit you want to drop off, N+1) is less than 5, then drop it (and everything to its right.) The value left behind is your rounded value.

2. If the digit in the N+1 place is greater than 5, then drop it (and everything to its right), and raise the last remaining digit by 1.

3. If the digit in the N+1 place is equal to 5, drop it, and if the preceding (Nth) digit is even -- leave N alone; if the Nth digit is odd, raise it by 1. This convention is necessary to keep a set of numbers as "balanced" as possible; i.e., if you round down for digits 1-5 (five cases) and up for 6-9 (only 4 cases), the sum of the resulting numbers will be, on average, lower than the sum of the unrounded terms [HUH??]

Examples:

1. *Round 4.3127 to four significant figures.* 4.3127 has 5 significant figures; we need to drop the final "7". That leaves us 4.312. But following rule 1 above, we note that since 7 is greater than 5, we need to add 1 to the last number we're keeping (the 2.) So our rounded number becomes 4.313.

You can appreciate that 4.313 is a better approximation of 4.3127 than 4.312 would be. Since the "7" we dropped indicates that the true value of the number is "closer" to 4.313 than it is to 4.312, we've created a better approximation by making that change.

2. *Round 10.412 to three significant figures.* 10.412 has 5 significant figures, so we get rid of the last two. That leaves 10.4. The digit to the right of the "4" is 1 -- and 1 is less than 5. So we leave the 4 alone. Our final estimate is 10.4.

3. *Round 14.65 to three significant figures.* Here, $N+1 = 5$. To decide what to do with 6 (our N), recall rule 3. If the number before the 5 is even, we leave it alone when we drop the 5. 6 is even, so our final value is 14.6.

4. *Round 1000.3 to four significant figures.* This one's more complex, because it involves zeros. The rules governing whether a digit qualifies as "significant" are more complicated for zeros. Make sure you read the [Significant Figures Tutorial](#) before you try to solve this example.

Significant Figures (sursa aici)

RULES FOR SIGNIFICANT FIGURES

- [illegible]

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.