

Decimal Places and Significant Figures

When doing a calculation, you may be asked to give your answer to a certain number of decimal places or significant figures, rather than giving a precise answer. To do this, you need to know how to round your answer.

Remember that you should always use several extra decimal places or significant figures in your working than you need in your final answer, otherwise there might be a rounding error in the final answer.

Decimal Places

If asked to give a number to n decimal places, we first look at the digit in the $(n + 1)$ th decimal place. We now have two options.

- If this $(n + 1)$ th digit is 4 or lower then round down - leave the n th digit as it is.
- If this $(n + 1)$ th digit is 5 or higher then round up - add 1 to the n th digit.

For example, if we want to give the number 1.4836095 to 3 decimal places then we consider the digit in the 4th decimal place, which is 6. As this is greater than 5 we will round up, so we add 1 to the third digit and 1.4836095 is 1.484 to 3 decimal places. If we want to give 1.4836095 to 4 decimal places then we consider the digit in the 5th decimal place. This is 0, so is less than 4 and so we round down by leaving the 4th digit as it is. Thus 1.4836095 is 1.4836 to 4 decimal places.

Significant Figures

When rounding to a specified number of significant figures, the process is similar to rounding to a number of decimal places. The difference is that any leading zeros do not count as significant figures, so the first n significant figures are the first n digits after the first non-zero digit.

For example, 0.010428 is 0.0104 to 4 decimal places, but is 0.01043 to 4 significant figures. Note that the 0 in the the third decimal place does count as a significant figure, as it comes after a non-zero entry.

Note that zeros may also be necessary after the significant figures to ensure that your answer has the correct magnitude. For example, 16849 is 16800 to 3 significant figures - the final two zeroes are not significant figures.