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# Decimal places and significant figures

By KATIE ROSS

In the GCSE exams for any of your science subjects (and in Maths, of course) you could be asked to write an answer to a certain number of decimal places (d.p.) or significant figures (s.f.). It's important to get this right, to avoid losing marks.

The ideas are straightforward, but the details can be tricky. If you're uncertain about decimal places and significant figures, read this short guide, do plenty of practice questions and it'll become second nature. 😊



## Decimal places

The method for rounding a number is as follows:

- For the number of decimal places stated, count that number of digits to the right of the decimal and underline it.
- The next number to its right is called the '*rounder decider*'.
- If the '*rounder decider*' is 5 or more, then round the previous digit up by 1.
- If the '*rounder decider*' is 4 or less then keep the previous digit the same.

### Example 1

Take the number **7.83478**.

To round this number to **2 d.p.** underline the *second* digit after the decimal point: the '3'. The next digit to its right (the '4') is the '*rounder decider*'. As this is less than 5 the previous digit remains the same. All the following digits are discarded, to give an answer of **7.83**.

To round the number to **3 d.p.** underline the *third* digit after the decimal point: the '4'. The next digit to its right (the '7') is the '*rounder decider*'. This time, as '7' is greater than 5, you round the previous digit up by 1, to give an answer of **7.835**.

### Example 2

Take the number **0.695**.

To round this to **2 d.p.** underline the digit 9. The digit 5 is the '*rounder decider*'. That means decides that 9 needs to be rounded up by 1 to the number 10. As this is a 2-digit number, the 0.69 is therefore rounded up to the final answer of **0.70**.

Don't forget the last zero! The answer is **0.70** not just 0.7. It's easy to forget to add the zero, but if you do forget, your answer will only be to 1 d.p. and you will lose marks.



## Significant figures

Here are the golden rules that you must learn and apply (by practising!)

### 1. All non-zero digits are significant.

- 0.345 (3 s.f.)
- 123.34 (5 s.f.)
- 42.5 (3 s.f.)

### 2. Zeros sandwiched between non-zero digits are significant.

- 4205 (4 s.f.)
- 32.002 (5 s.f.)
- 50.90402 (7 s.f.)

### 3. Zeros that come before all non-zero digits are not significant.

- 0.32 (2 s.f.)
- 0.00067 (2 s.f.)
- 0.00204 (3 s.f.)

### 4. Zeros after non-zero digits within a number without decimals are not significant.

### 5. Zeros after non-zero digits within a number with decimals are significant.

- 34,000 (2 s.f.)
- 34.000 (5 s.f.)
- 5,400,678.002 (10 s.f.)

## Rounding significant figures

If you're asked in the exam to round a number to a specified number of significant figures, do the following:

- Identify the significant figures in the number using the rules above.
- Count from the first significant figure to the specified number.
- Underline that number and use the next number as the 'rounder decider'.
- If the decider is 5 or above, increase the previous value by 1.

This rounding method is exactly the same as that used for decimal places. **EXCEPT** that there's an extra rule for significant figures: fill any gaps between the last significant figure and a subsequent decimal place with zeros!

This is best explained with an example. The following numbers are rounded to 2 s.f.

- 0.00245 → 0.0025
- 0.04051 → 0.041
- 2345.07 → 2300 (In this last example you apply the extra rule.)

