# Maths skills – M0.4 Estimate results

### Tutorials

Learners may be tested on their ability to:

* Estimate results to sense check that the calculated values are appropriate.

It’s very easy to write the wrong number or to press the wrong number on a calculator. Without having an estimation, your result can clearly be wrong but go unnoticed. You need to ask yourself, “Does that look right?”. By comparing your calculated answer with your estimation it is easier to spot whether you have made a mistake.

For example, say we surveyed a small area of woodland and found 8 mice in 10 m2. And we wanted a rough estimate of how many there might be in the woodland which was 1 km2. We know that 1 km2 is equal to 106 m2 (see M0.1 if you are unsure about this bit) so we know that the answer will be many orders of magnitude higher than the number of 8 mice in 10 m2. The sum is 8 mice x 106 m2 divided by 10 m2. Which is 800,000 mice in 1 km2. If you put the numbers into the calculator in the wrong order, or divide when you should be multiplying, you know that a number that has not got five or six zeros after it, is wrong.

In this example you could work out the number without a calculator but what if you found 8 mice in 14 m2 and the woodland had an area of 2.3 km2.

Knowing that there are 106 m2 in a km2 tells you that the answer will be around 106 mice.

The calculation is 8 mice x 2.3 x 106 m2, divided by 14 m2. The answer is 1,314,286, rounded to the nearest whole mouse. This is better communicated in standard form (see M0.2 if you are not sure about this) which gives 1.3 x 106 mice.

The key message is to think about your answer, and have a rough idea of its order of magnitude before you get out your calculator.

Sometimes the best way to make estimations in calculations is to round numbers (particularly decimals) up or down to a number you’re happier working with. For example, the calculation: 4.9/11.2 could be estimated as 5/10 = 0.5

If you get the answer 54.88 then the estimate shows that you have done something wrong – in this case you would have pressed the multiply key instead of the divide key on your calculator.

Estimating is a useful skill for any biologist and can be used in all sorts of contexts – from the working out the number of bacteria in a dilution, to measuring lengths when using a microscope, to ecological sampling.

Think about your answer, and ask yourself, “Does this answer make sense?”. I cannot stress enough how important this is, in all calculations you do..

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