

Approximation and rounding

Tip: revise the factsheets in the topic 'Rounding and estimating' before doing this section.

Approximation and rounding are important skills, particularly when **checking** or **estimating** an answer. For example, 19.6×1.9 should give an answer of about 40, because it's approximately 20×2 . Using a calculator can give an answer that's more accurate than you need. For example, $100 \div 11$ gives 9.090909. - but a more convenient answer might be **9.09**.

Example 1: we have some lengths in metres. They are written as decimal fractions. Suppose we want to round them to the nearest whole metre. This is known as 'rounding decimals to the nearest whole number'.

Length (m)	Nearest whole number
163.2	163
205.7	206
14.66	15
109.91	110

The halfway mark between any two whole numbers is 0.5. If the digit in the **first** decimal place (d.p.) is 5 or more round the number up, if it's less than 5 round it down (Ignore digits **after** the first d.p.)

So 163.2 m is rounded to 163 m (to the nearest whole metre) because it's nearer to 163 m than to 164 m. This is because the '2' in the first decimal place is less than 5. But 205.7 m is rounded to 206 m (to the nearest whole metre), as it's nearer to 206 m than 205 m. This is because the '7' in the first decimal place is 5 or more.

Example 2: rounding to 2 decimal places.

Jean used a calculator to work out some prices. The answers were recorded as £ and pence, so needed to be written to two decimal places only. However, the calculator gave some of the prices to more than two decimal places. This meant that Jean had to round each answer off to two decimal places. To get the second decimal place right she looked at the third decimal place in each number to decide whether to round up or down.

If the digit in the third decimal place is 5 or more, round up .	Calculator display	£
	1.2975	1.30
If the digit in the third decimal place is less than 5, round down .	2.3333...	2.33
	0.125	0.13
	4.5	4.50

The calculator gave an answer of 4.5, but because this is a money value, you must add a final zero to give an answer to 2 decimal places.