

Topic 3: Approximation and Estimation

Estimation

Notes:

Approximation:

1. To make an **approximation** means to round off a number to a required degree of accuracy according to the set of instructions given.

To give an example:

- (i) A given place value (like hundreds, thousands)
 - (ii) A given number of decimal places (like 2 d.p. / 4 d.p.)
 - (iii) A given number of significant figures (s.f.)
2. To round off a number to a specified place value or decimal place, revise your Primary 5 topic of Rounding Off!
 3. A number should only be rounded off from its original value, not from the rounded off value.

To give an example:

I rounded off 21 758 (to the nearest hundreds) to 21 800. I cannot then round off 21 800.

Significant Figures:

4. **Significant figures** are the number of digits used to denote an exact value to a specified degree of accuracy (like rounding off)
5. How to identify significant digits?
 - All **non-zero** digit(s) are **significant**.
e.g. 56 (2 s.f.), 34.56 (4 s.f.)
 - **Zero(s)** between **non-zero** digits are **significant**.
e.g. 403 (3 s.f.), 6.002 (4 s.f.)
 - **Zero(s)** that come before the **first non-zero digit** are not **significant**.
e.g. 0.00021 (2 s.f.), 0.001023 (4 s.f.)
 - **Zero(s)** following a **non-zero digit** *after* the decimal point are **significant**.
e.g. 0.50 (2 s.f.), 2.800 (4 s.f.)
 - **Zero(s)** following a **non-zero digit** *in a whole number* **can or cannot be significant**, depending on the estimation made, e.g. 56700 can be either 3 s.f., 4 s.f., or even 5 s.f..
6. When solving problems, the value in the intermediate steps should be given 4 significant figures to avoid a rounding error.

Rounding Off VS Truncation

7. Calculators might not always give the exact answer as the number of digits stored and used for calculating the answer depends on the capacity of the calculator. Sometimes, you might have an issue with figuring out

whether the calculator **rounded it off**, or simply **truncated** it.

8. **Rounding Off** is to make a number change to a required degree of accuracy.

To give an example:

$$0.\overline{6} = 0.666\dots \text{ (round off to 5}^{\text{th}} \text{ significant)} = 0.66667$$

9. **Truncation** is simply cutting off the digits you do not want without going through the rounding off process.

To give a similar example like above:

$$0.\overline{6} = 0.666 \text{ (truncated value for 5 d.p.)} = 0.66666 \text{ (last d.p. not rounded to 7)}$$