Suppose we have a real (not machine) number

$$x = 0.d_1 d_2 ... d_k d_{k+1} ... \times 10^n.$$

If we're working with k-digit decimal arithmetic, then chopping x would produce the machine number

$$chop(x) = 0.d_1 d_2 ... d_k \times 10^n,$$

i.e., to chop for k-digit arithmetic you drop every piece of information past the kth digit.

Rounding for k-digit arithmetic depends on the $(k+1)$st digit. If $d_{k+1} \geq 5$, then we round up (which will change d_k but may or may not change any other digits). If $d_{k+1} < 5$, then we round down (which is equivalent to chopping for k-digit arithmetic).

The formula

$$fl(x) = chop(x + 5 \times 10^{n-(k+1)})$$

summarizes succinctly the rules for rounding. If $d_{k+1} < 5$, then adding 5 to d_{k+1} and then chopping is the same as rounding down. If $d_{k+1} \geq 5$, then adding 5 to d_{k+1} will add 1 to d_k (because you have to carry the 1 when you add), which is the same as rounding up.

Here are some examples.

e.g.) Suppose $x = 193.2534$ are we use 5-digit arithmetic. Since

$$x = 0.1932534 \times 10^3,$$

we have

$$chop(x) = 0.19325 \times 10^3,$$

and according to the formula for rounding

$$\begin{aligned} fl(x) &= chop(0.1932534 \times 10^3 + 5 \times 10^{3-(5+1)}) \\ &= chop(0.1932534 \times 10^3 + 0.000005 \times 10^3) \\ &= chop(0.1932584 \times 10^3) \\ &= 0.19325 \times 10^3 \\ &= 193.25 \end{aligned}$$

e.g.) Suppose $x = 92.346098$ are we use 7-digit arithmetic. Since

$$x = 0.92346098 \times 10^2,$$

we have

$$chop(x) = 0.9234609 \times 10^2,$$

and according to the formula for rounding

$$\begin{aligned} fl(x) &= chop(0.92346098 \times 10^2 + 5 \times 10^{2-(7+1)}) \\ &= chop(0.92346098 \times 10^2 + 0.00000005 \times 10^2) \\ &= chop(0.92346103 \times 10^2) \\ &= 0.923461 \times 10^2 \\ &= 92.3461. \end{aligned}$$