

Ex: 0.111999 is approximated by 0.111 to 2 significant digits.

$$\frac{|0.111999 - 0.111|}{0.111999} = 0.0089197225 = 0.89197225 \cdot 10^{-2}$$

If we chop,  $p^*$  approximates  $p$  to  $t$  significant digits if we chop at the  $t+1$  digit.

Ex: 0.378256 is approximated by 0.378 to 2 significant digits.

## 5) Propagation of errors in the basic arithmetic operations

In addition to the inexact representation of numbers, the arithmetic performed in the computer is not exact.

Let  $x, y$  - 2 real numbers

$fl(x), fl(y)$  - their floating-point representation

$\oplus, \ominus, \otimes, \oslash$  - machine addition, subtraction, multiplication, division

Then

$$x \oplus y = fl(fl(x) + fl(y))$$

$$x \otimes y = fl(fl(x) * fl(y))$$

$$x \ominus y = fl(fl(x) - fl(y))$$

$$x \oslash y = fl(fl(x) \div fl(y))$$