Computational Basics

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July 20, 2008

Algorithms

Algorithm = Set of instructions

- unambiguous
- terminate
- complete

Floating Point Numbers I

$$\pm 0.x_1 x_2 x_3 \cdots x_{16} \mathrm{E} \pm e_1 e_2,$$

$$\begin{aligned} 71 &\approx 0.71E2 \\ 7.1 &\approx 0.71E1 \\ 0.71 &\approx 0.71E0 \\ 0.071 &\approx 0.71E-1 \end{aligned}$$

Floating Point Numbers II

Surprise!

$$0.1E1 + 0.1E - 20 = 0.1E1$$

Floating Point Numbers III

Conversion / truncation:

$$0.1E1 = .0001100110011...$$

Thus:

$$0.1E1 \times 10 \neq 1$$

Floating Point Numbers IV

Never use:

$$x == y$$

Instead:

$$\mathrm{abs}(x - y) < 0.1E - 10$$

The Patriot Disaster

Radar unit floats
$\neq$
control unit floats:
28 fatalities.