
and why study it?

- Isn't all computing "numeric" ?
  - not really ... (automata?)

- Numeric "methods"
  - as opposed to analytical methods

- Numeric computing simply borrowed the name

# Study Plan

- Traditional "numeric methods" contents
  - Representation / Errors
  - Solving non-linear equations
  - Solving linear equations
  - Interpolation
  - Numeric differentiation / integration

- Python!
- Matrix and vector representation
- Machine learning "helpers"
- Libraries

> "The purpose of computation is insight, not numbers"
>
> – Richard Hamming

Let's begin by discussing the concept of numbers!

What types are there?

— Scalars

- Real
  - transcendental
  - algebraic
    - rational
      - whole
      - fractions
    - irrational
- Imaginary

What is a scalar?

— "Has no direction" ...

set of natural #s

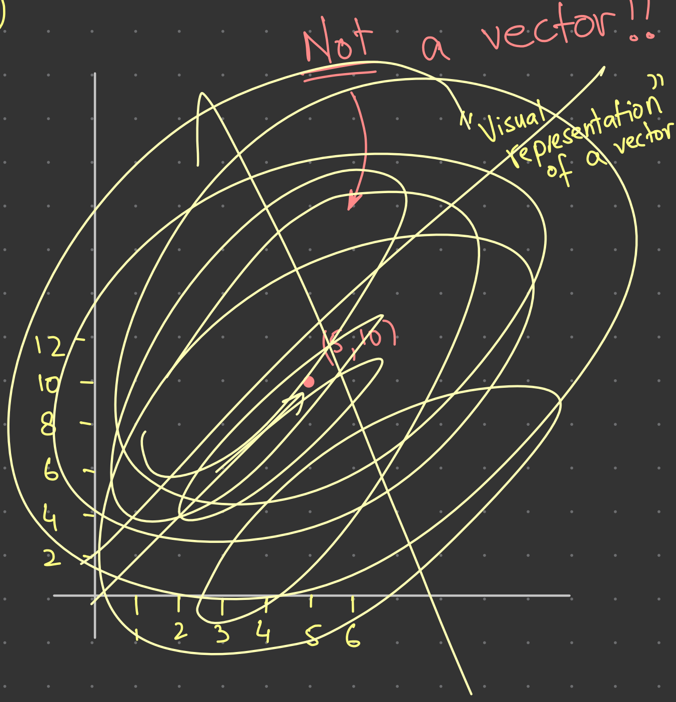
$x = 2$ $\qquad x \in \mathbb{N}$ $\qquad \mathbb{N} = \{ \ldots, -3, -2, -1, 0, 1, 2, 3, \ldots \}$

$y = 1.92$ $\qquad y \in \mathbb{R}$

$x$

# Representing vectors (in code)

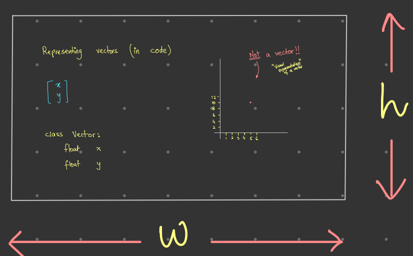
$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 10 \end{bmatrix} \leftarrow \begin{pmatrix} 2 \\ 14 \end{pmatrix}$$




```
class Vector:
    float x
    float y

    add (vector b):
        c = Vector()
        c.x = self.x + b.x
        c.y = self.y + b.y
        return c

    # and so on...
```




$v = \begin{bmatrix} h \\ w \end{bmatrix}$ ⇝ Does not have a direction!

$v \in \mathbb{R}^2$ $v \in \mathbb{R}$

$R^2 = R \times R$

$( \ , \ )$

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$p \in R^3$