

iversonian array languages

pacman

EUPLv1.2



<https://computerbetrug.jetzt/olaf/iverson.pdf>

qr-code • paradigm • APL • tacidity • uiua • thanks

- “Notation as a Tool of Thought”¹
 - mathematical notation
 - compact
 - context sensitive
 - programming languages
 - universal
 - rarely expand how we think about problems
- APL aims to combine both advantages

- Iversons characteristics for a tool of thought
 1. ease of expressing constructs arising in problems
 2. suggestivity
 3. ability to subordinate detail
 4. economy
 5. amenability to formal proofs

- arrays are the basic datastructure of APL
 - all primitives natively act on tensors
 - operate on the whole, not on the elements
 - focus on transformations, not on iterations



- built in functions are called primitives
- distinction on their arity (unary / binary)
 - functions overloading through arity



```
f ← {ω+(α×ω)}
6 f 9
↓
63
```



```
4--2 @ 4 - (-2)
↓
6
```

- operators as higher order functions
 - / “reduce”, \ “scan”



```
+ / 1 2 3 4
⌈ 1+2+3+4
↓
10
```



```
× \ 1 4
↓
1 2 6 24
```

- functions have no explicit parameters



```
{ (+/ω) ÷ ≠ ω } 3
```

```
4.5 7 21
```



```
8.875
```



```
(+ / ÷ ≠) 3 4.5 7
```

```
21
```



```
8.875
```



```
(+ / ÷ ≠)
```



```
┌──┐
│  │
│ / │ ÷ │ ≠
└──┘
┌──┐
│  │
│ + │
└──┘
```

- changes how we talk/reason about code²
 - leave out detail
 - composing patterns
- use reoccurring patterns
 - combinators

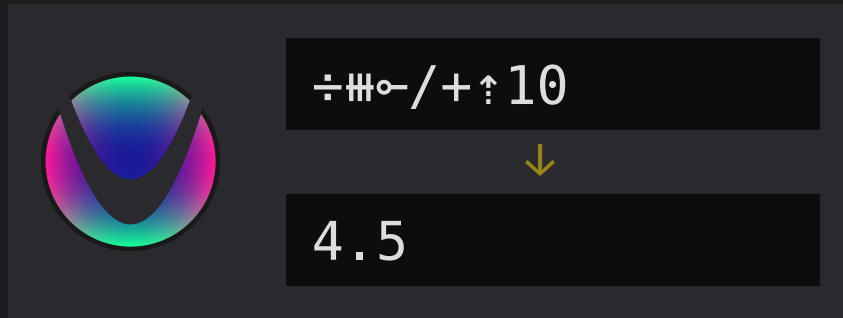


```
sum :: [a] -> a  
sum as = foldl(+)0 as
```



```
sum = foldl(+)0
```

- stack based
- fully tacit
- no function overloading
 - fixed arity



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1. Kenneth Iverson (1979). Notation as a Tool of Thought.
2. Amar Shah (2016). Point-Free or Die: Tacit Programming in Haskell and Beyond.
3. BQN Docs.
4. APL Wiki.
5. Michael Vanier (2023). Array programming 1. https://mvanier.github.io/blog/posts/array_programming/.
6. Michael Vanier (2023). Array programming 2. https://mvanier.github.io/blog/posts/array_programming2/.
7. Emily Bache (2013). An introduction to Array Languages. <https://coding-is-like-cooking.info/2013/09/an-introduction-to-array-languages/>.
8. Aidan Zabalo (2024). Notation as a tool of thought. <https://gitabaz.github.io/blog/notation-as-a-tool-of-thought/>.
9. ArrayBox <https://arraybox.dev/>.

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