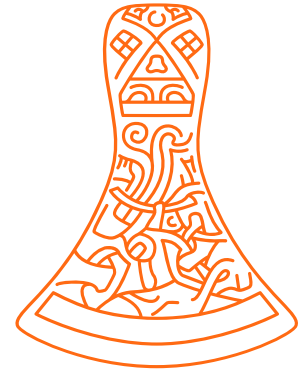


# DYALOG

Glasgow 2024

## Problem Solving with APL



Rich Park



Stefan Kruger

# Format: For each problem...

- ◆ Problem statement (ask if unclear)
- ◆ Solve the problem (bonus task if you're fast)
- ◆ We collect and show solutions (be brave)
- ◆ Discussion (learning opportunity)

# It Is All Right

Write a dfn that takes the length of the legs of a triangle as its left argument, and the length of the hypotenuse as its right argument and returns 1 if the triangle is a right triangle, 0 otherwise.

```
1 3 4 YourFunction 5
0 2 3 YourFunction 4
```

**Hint:** In a right triangle, the square of the hypotenuse equals the sum of squares of the legs.

# Being Whole is Overrated

Write a function which selects the non-integer numbers from a numeric vector.

```
YourFunction 14.2 9 3 3.1 0 -1.1
```

```
14.2 3.1 -1.1
```

```
YourFunction 1 3 5
```

```
YourFunction 3.1415 2.71828
```

```
3.1415 2.71828
```

**Bonus task:**  
Keep integers  
instead

# Zero Nulls

Write a function replaces all `⊞NULL`s with 0s in a simple array.

```
YourFunction 1 2 ⊞NULL 4 5 6  
1 2 0 4 5 6
```

```
YourFunction 2 2 2⍪'A' ⊞NULL 'B'  
A 0  
B A
```

```
0 B  
A 0
```

**Bonus task: Handle nested arrays**

# Move to the Front

Write a function that, given vector arguments, reorders the right argument so elements in the left argument come first.

```
'rb' YourFunction 'abracadabra'  
brbraacadaa  
42 YourFunction 0  
3 YourFunction ,1  
1
```

**Bonus task:**  
Use the order of  
the left argument:  
rrbbaacadaa

# What Is In a Word

Write a function which returns the number of words in the given character vector. For simplicity's sake, you can consider the space character ' ' to be the only word separator.

```
YourFunction 'Testing one, two, three'
4
YourFunction 'many blanks'
2
YourFunction ''
0
```

**Bonus task:**  
Multiple word  
separators as  
left argument

# Like an Arrow

Write a function that takes a size and creates a corresponding Boolean matrix with the top triangle being 1s.

```
YourFunction 4
1 1 1 1
0 1 1 0
0 0 0 0
0 0 0 0
```

```
YourFunction 5
1 1 1 1 1
0 1 1 1 0
0 0 1 0 0
0 0 0 0 0
0 0 0 0 0
```

**Bonus task:**  
Left argument  
(0–3) is arrow  
direction



# Longest Streak

Write a function that takes a non-empty numeric vector and returns the length of the longest streak of positive growth.

YourFunction 1 2 3 4 5 6 7 8 9 → 8

YourFunction 9 5 4 3 2 6 7 8 → 3

**Bonus task:** Length of longest streak of consistent growth/stagnation/fall

# You're Unique, Just Like Everyone Else

Write a function that takes a vector as its right argument and returns elements that occur only once in the vector.

```
YourFunction 1 2 3 4 5 4 3 2 1 2  
5
```

```
YourFunction 'bye' 'bye' 'hello' 'world'  
hello world
```

**Bonus task:** Sort by ascending frequency

# See (Through) Me

Write a replacement for  $\underline{\epsilon}$  on simple vectors where the left argument is a pair: what to search for and a Boolean mask vector indicating which elements must match.

```
w ← 5 2 18 5 3 5 4 5 2 18 5
(5 6 5)(1 0 1) YourFunction w
0 0 0 1 0 1 0 0 0 0 0
```

```
w ← 'mississippi'
'issixxi'(1 1 1 1 0 0 1) YourFunction w
0 1 0 0 1 0 0 0 0 0 0
```

**Bonus task:**  
Handle  
higher ranks

# Separation Anxiety

Write a function that takes a right argument character vector and a left argument character scalar separator character. It should then insert the separator after every group of 3 characters from the right, but not at the far left.

```
      ', ' YourFunction '123456789'  
123,456,789  
      ' ' YourFunction 'abcde'  
ab cde
```

**Bonus task:**  
Do it fast!

# Chop Chop

A gene has 3xn characters and ends with TAG, TAA, or TGA.  
Chop the given character vector into genes.

```
s←'TAG' 'TAA' 'TGA'  
⊞RL←4  
⊞←g←ε{ω≥4:'ACTG'[?3ρ4] ⋄ ω>s}¨?10ρ8  
GTCCTAACCTAATTATGATAACGGCCGTAA  
YourFunction g  
GTCCTAACCTAA TTATGA TAA CGGCCGTAA
```

# Keeping Things In Balance

Write a function which returns a 1 if the opening and closing parentheses in a character vector are balanced, or a zero otherwise.

YourFunction	'((2×3)+4)'	→	1
YourFunction	''	→	1
YourFunction	'hello world!'	→	1
YourFunction	')(2×3)+/4('	→	0
YourFunction	'(())'	→	0

**Bonus  
task:**  
Handle  
[ ] too!

Thank you for playing!

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