J

a programming language

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Roger Hui

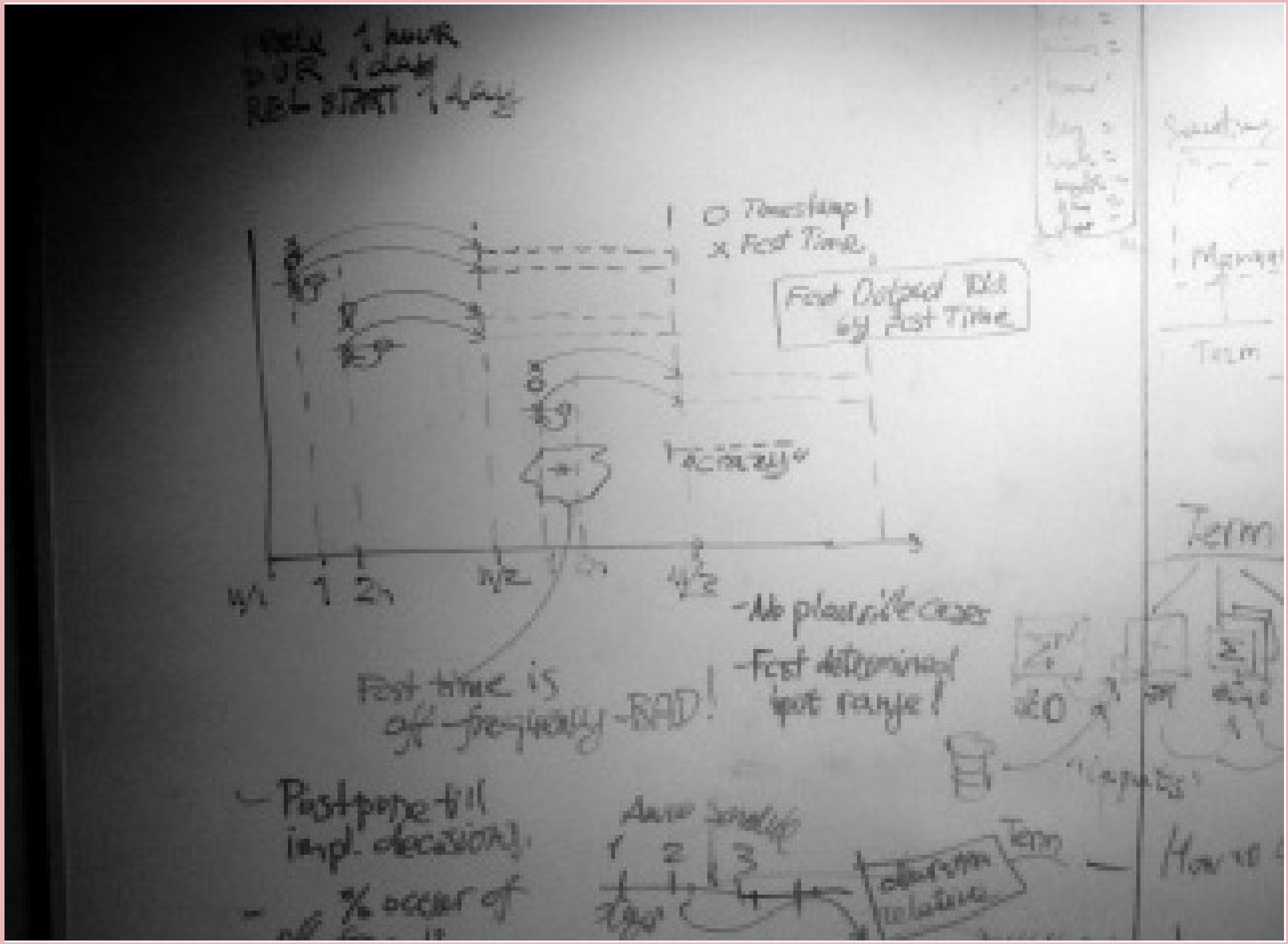
(and select advisors)

J first released in 1990

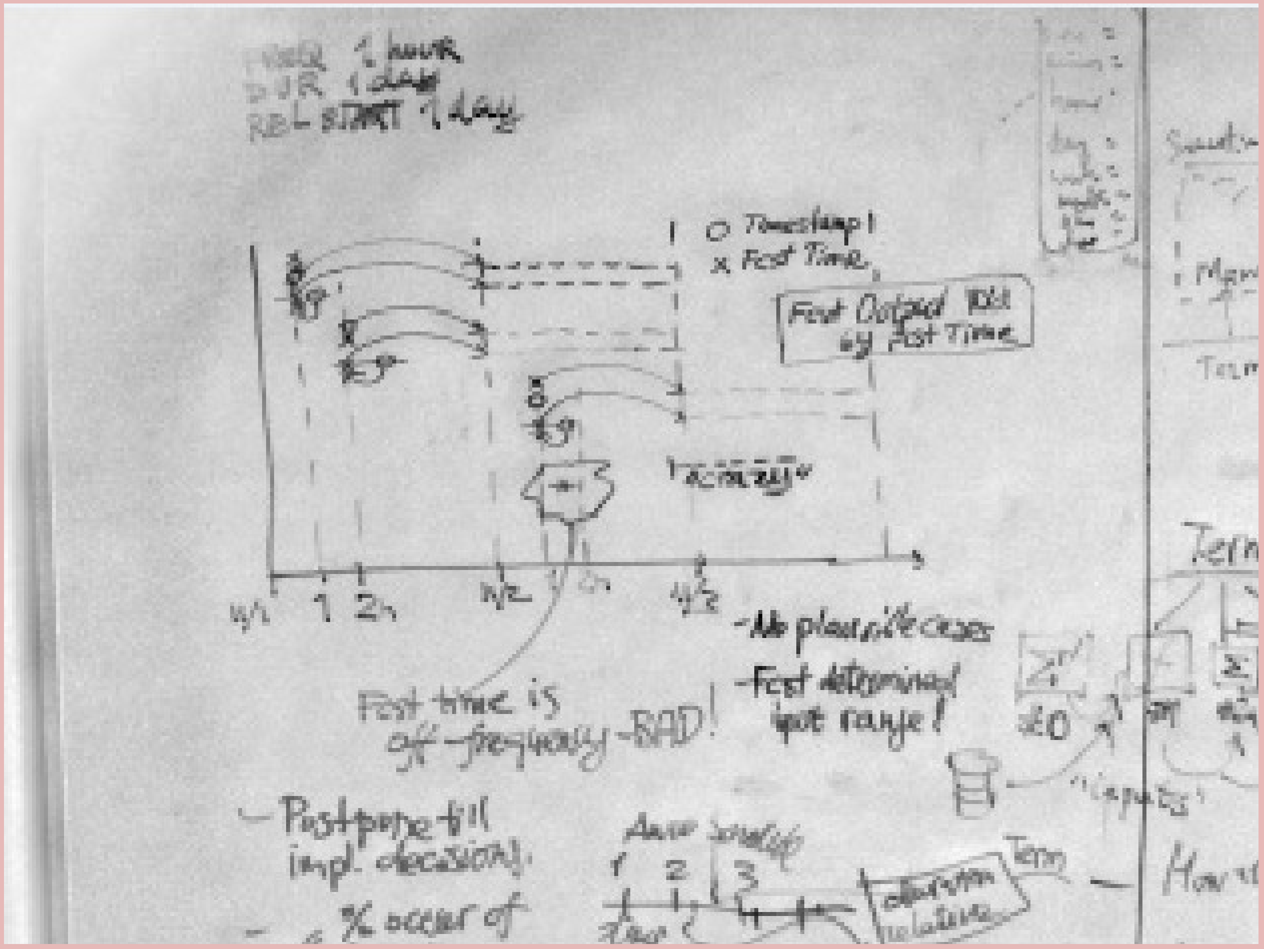
What sort of problem does J fit well?

subtraction!

subtraction:



o Timestamp
x Fst Time
Fst Output Rel by Fst Time
Fst time is off-frequency - BAD!
-No plausible cases
-Fst determined by range!
- Postpone till impl. decision
Term



FREQ 1 hour
DUR 1 day
REL START 1 day
o Timestamp
x Fcst Time
Fcst Output Rel by Fcst Time
No plausible cases
Fcst determined by input range!
Fcst time is off-frequency - BAD!
Postpone till impl. decision!
% occur of

```
   load'media/platimg'                NB. image reader
   load'viewmat plot'
                                      NB. gray scale viewer
   viewgray=: (16b010101*i.256)&viewmat
   glwh=: 3 : 'wd''pmovex '',(*0 0,y-glqwh_jgl2_@$@#)&.".wd''qformx'''
   viewwh=: glwh@|.@$ [ viewgray

   $M=: 16bff (17 b.) readimg jpath'-temp\input.jpg'
1200 1600
   viewwh M

   $R=: |:_5(+/%#)\|: _5(+/%#)\ M     NB. reduced large image
240 320
   viewwh R
   'surface;mesh 0' plot R            NB. notice features below smooth light

   S=: |: _10(>./)\|: _10(>./)\ M     NB. apply max filter to remove features

   Z=: 2#"1]2#S                       NB. restore size
   W=: |: 8(+/%#)\|: 8(+/%#)\ Z       NB. smooth with moving average
   viewwh W

   viewwh N=: (($W){.R) - W           NB. remove shadow
```

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```

```
((($W){.R) - W
```

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W=: |: 8(+/%#)\ |: 8(+/%#)\ Z
N=: (($W){.R) - W
```

Background removal calculation by Oleg Kobchenko

http://www.jsoftware.com/jwiki/OlegKobchenko/Background%20Removal

*

A noun is a collection.

Nouns are regular.

A verb applies across a whole noun.

Over fifty years of refinement

“APL is an array language with a highly-functional flavour, and a rich set of carefully-thought-out array operations.”

Simon Peyton Jones

1957 chalkboards

1957 chalkboards

mathematical notation
to express computation

1957 chalkboards
1962 a book

1957 chalkboards
1962 a book

A Programming Language

1957 chalkboards
1962 a book
1964 a paper

1957 chalkboards
1962 a book
1964 a paper

a formal description of the
IBM System/360 series machine
architecture and functionality

1957	chalkboards
1962	a book
1964	a paper
1966	interpreters

1957	chalkboards	
1962	a book	
1964	a paper	
1966	interpreters	APL

1957	chalkboards	
1962	a book	
1964	a paper	
1966	interpreters	APL
1968	release	

1957	chalkboards	
1962	a book	
1964	a paper	
1966	interpreters	APL
1968	release	
...	...	

1957	chalkboards	
1962	a book	
1964	a paper	
1966	interpreters	APL
1968	release	
...	...	
1989	redesign	J

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1962	a book	
1964	a paper	
1966	interpreters	APL
1968	release	
...	...	
1989	redesign	J
...	...	
2011	open source	

example verb:
average

```
   MyList=: 7 4 6 8 2 3

   MyList
7 4 6 8 2 3
```

```
   MyList=: 7 4 6 8 2 3

   MyList
7 4 6 8 2 3

   +/MyList
30

   # MyList
6
```

```
   MyList=: 7 4 6 8 2 3

   MyList
7 4 6 8 2 3

   +/MyList
30

   # MyList
6

   30 % 6
5
```

÷

```
   +/MyList
30
   # MyList
6

   (+/MyList) % (#MyList)
5
```

```
   +/MyList
30
   # MyList
6

   (+/MyList) % (#MyList)
5

   (+/ % #) MyList
5
```

```
   +/MyList
30
   # MyList
6

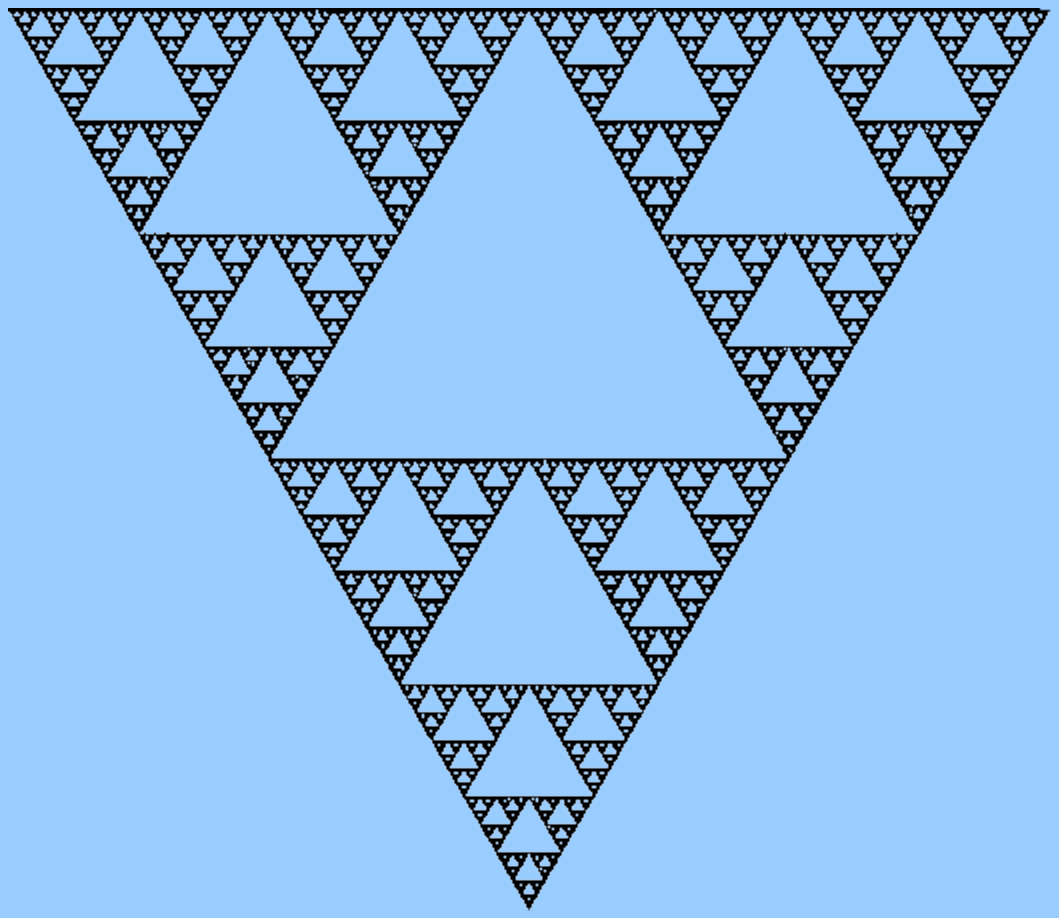
   (+/MyList) % (#MyList)
5

   (+/ % #) MyList
5

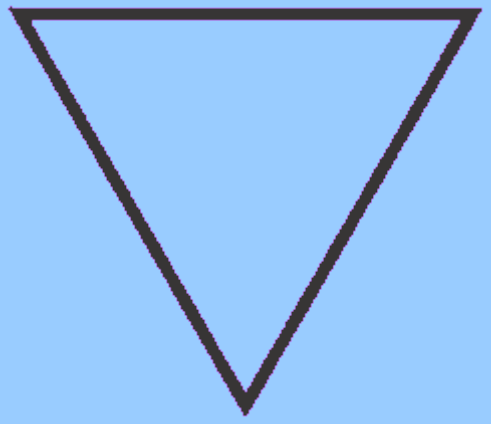
   average=: +/ % #

   average MyList
5
```

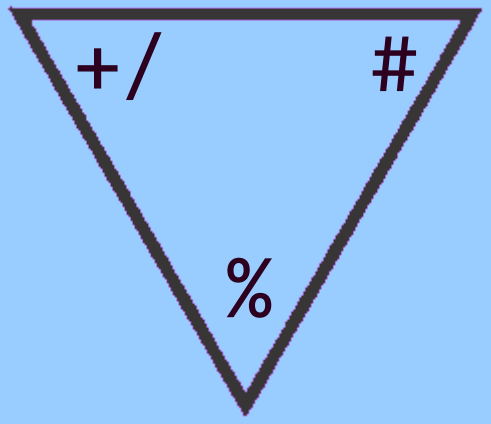
verb trains



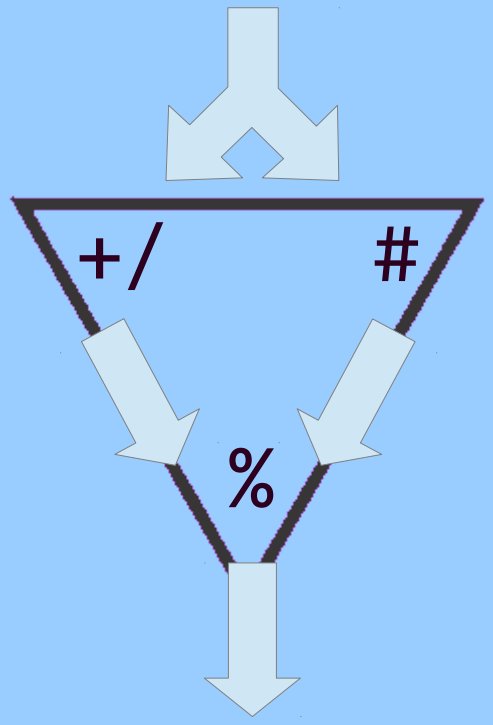
verb trains

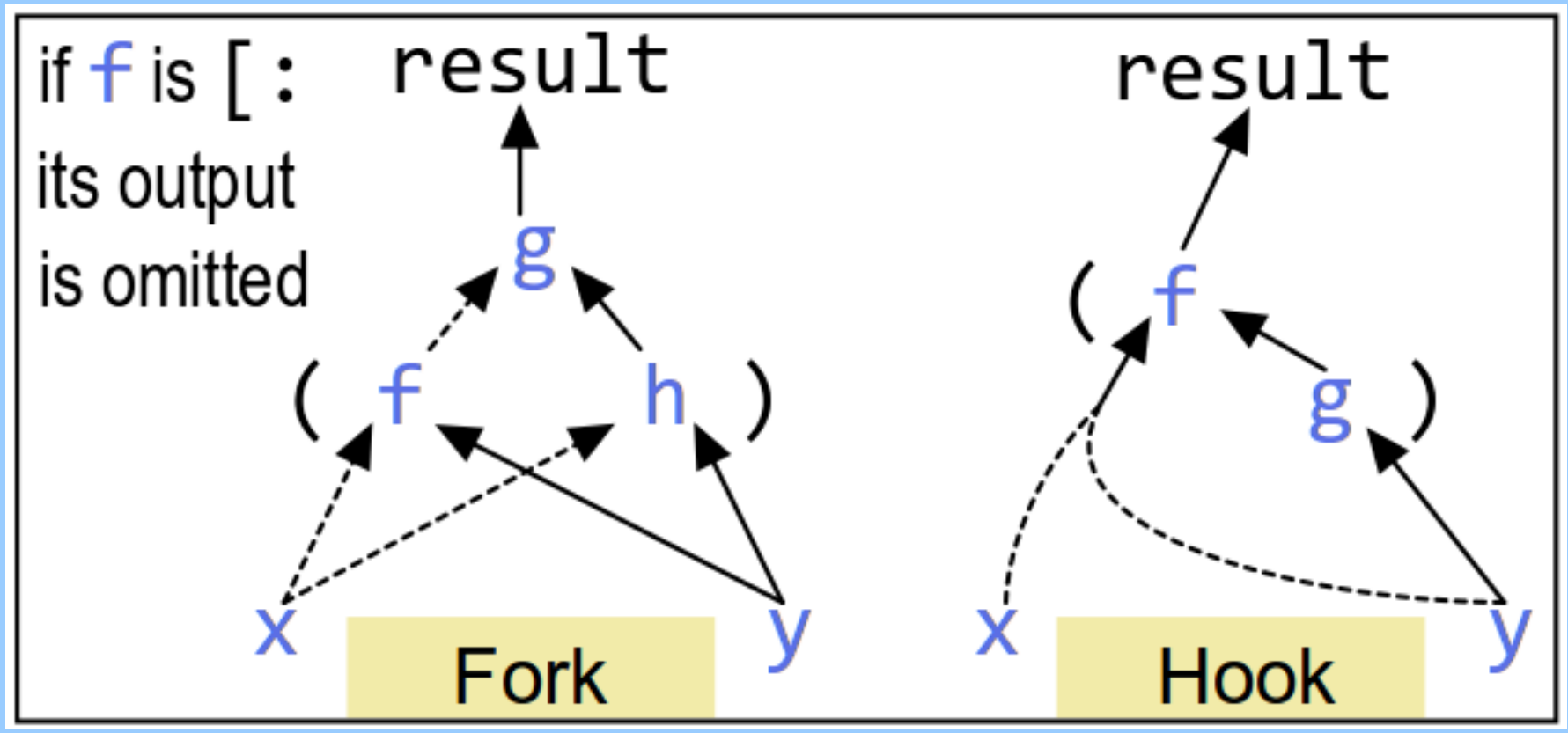


```
average=: +/ % #
```



```
average=: +/ % #
```




if f is [:
its output
is omitted
result
g
(f h)
x
y
Fork
result
(f
g)
x
y
Hook

f g h

f g

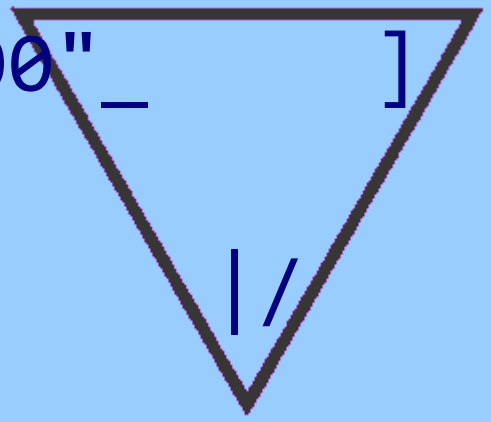
```
   isLeap=: 0 -/@:= 4 100 400 |/ ]

   isLeap 1900 1996 1997 2000
0 1 0 1
```

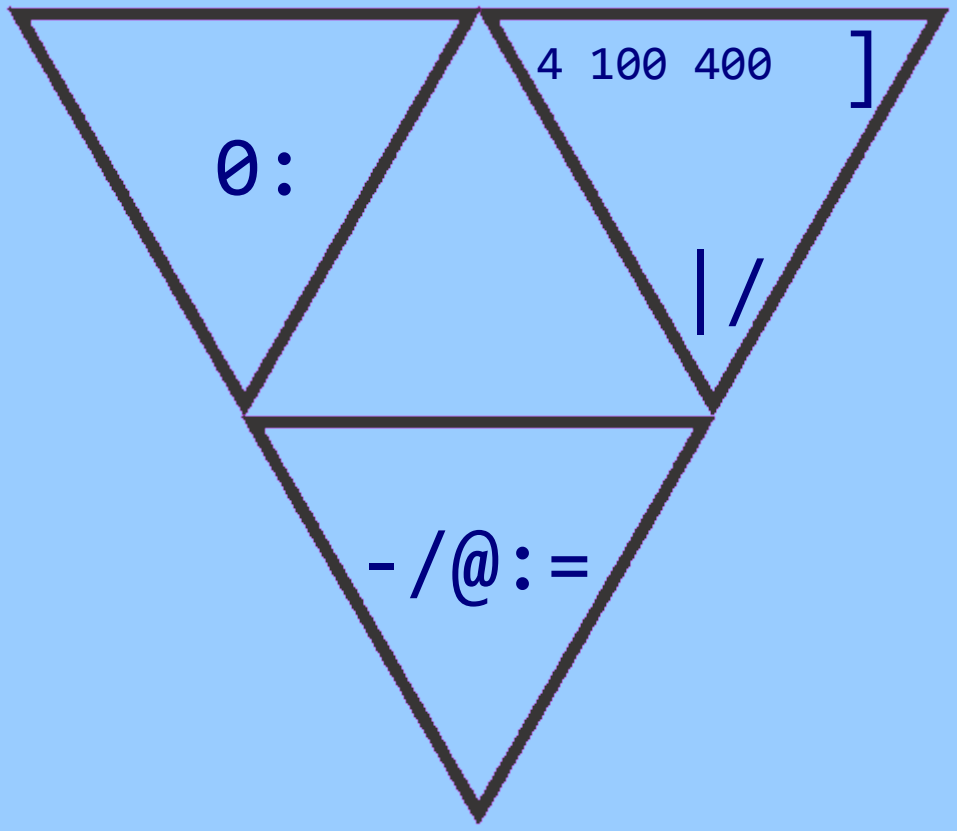
```
isLeap=: 0 -/@:= 4 100 400 |/ ]
```

```
isLeap=: 0 -/@:= 4 100 400 |/ ]
```

```
4 100 400"_      ]
```



```
isLeap=: 0 -/@:= 4 100 400 |/ ]
```



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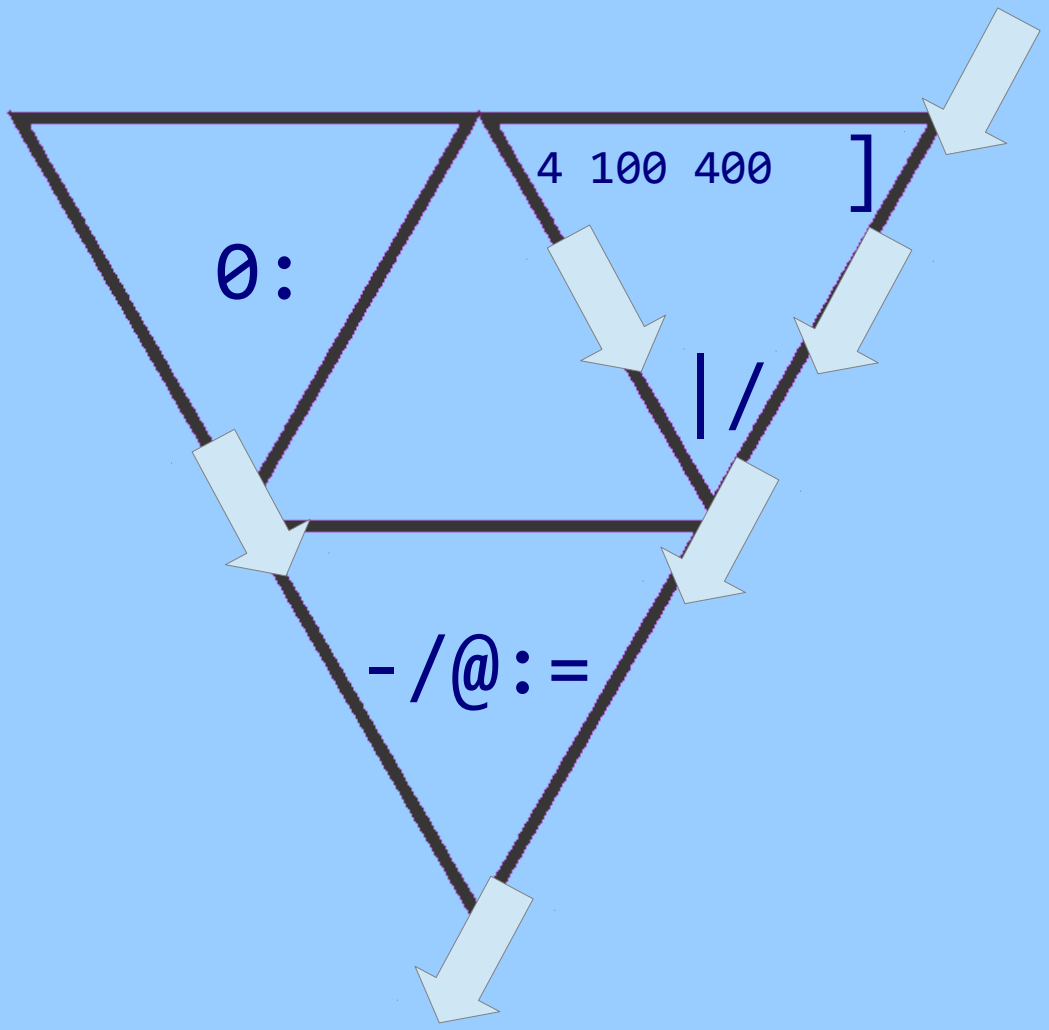
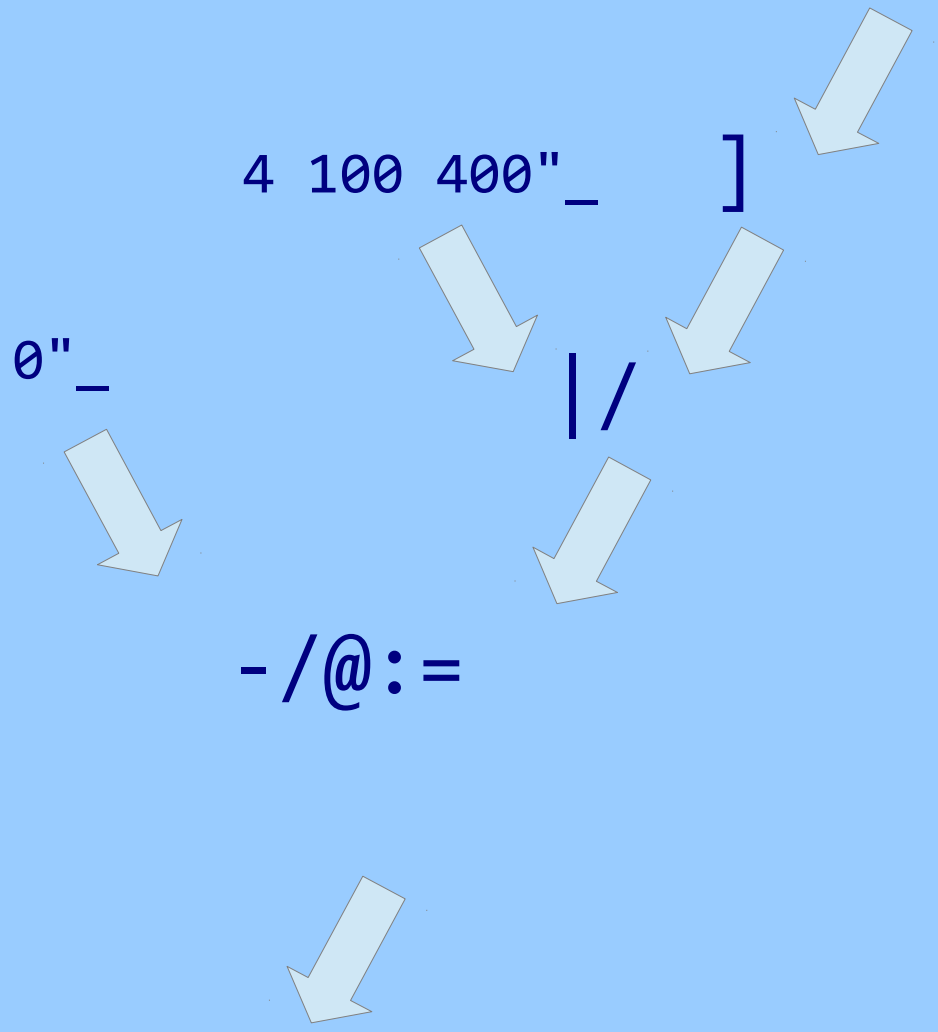
isLeap=: 0 -/@:= 4 100 400 |/ ]
```



```
isLeap=: 0 -/@:= 4 100 400 |/ ]
```



A verb train is denoted by adjacency.

A fork is a HOF. Adjacent verbs are its arguments.

Branching & converging.

verb: numeronym

verb: numeronym

internationalization
i18n

```
   # 'word'
4
   {.'word'
w
   {:'word'
d
```

```
   # 'word'
4
   {.'word'
w
   {:'word'
d
   ( {. , {: ) 'word'
wd
```

```
   # 'word'
4
   {.'word'
w
   {:'word'
d
   ( {. , {: ) 'word'
wd
   'w2d'
w2d
```

```
    'w2d'
w2d
    'w','2','d'
w2d
```

```
   'w2d'
w2d
   'w','2','d'
w2d
   'w',2,'d'
|domain error
|   'w',2    ,'d'
```

```
   'w2d'
w2d
   'w','2','d'
w2d
   'w',2,'d'
|domain error
|   'w',2    ,'d'

   ": 2            NB. ": means format
2
```

```
   'w2d'
w2d
   'w','2','d'
w2d
   'w',2,'d'
|domain error
|   'w',2    ,'d‘

   ": 2              NB. ": means format
2
   '2' = ": 2
1
```

```
   'w2d'
w2d
   'w','2','d'
w2d
   'w',2,'d'
|domain error
|   'w',2    ,'d‘

   ": 2              NB. ": means format
2
   '2' = ": 2
1
   'w',(": 2),'d'
w2d
```

```
   'w',(": 2),'d'
w2d

   {. , ": , {:          NB. kinda
```

```
   'w',(": 2),'d'
w2d

   {. , ": , {:         NB. kinda

   # 'internationalization'
20
   (#-2:) 'internationalization'
18
```

```
   'w',(": 2),'d'
w2d

   {. , ": , {:         NB. kinda

   # 'internationalization'
20
   (#-2:) 'internationalization'
18
   datatype (#-2:) 'text'
integer
   datatype ([: ": #-2:) 'text'
literal
```

```
middle=: [: ": #-2:
```

```
middle=: [: ": #-2:

numeronym=: {. , middle , {:
```

```
middle=: [: ": #-2:

numeronym=: {. , middle , {:

numeronym 'internationalization'
i18n
```

success!

```
   middle=: [: ": #-2:

   numeronym=: {. , middle , {:

   numeronym 'internationalization'
i18n

   NB. but short words, ewww...

   numeronym&> ;:'by the way'
b0y
t1e
w1y
```

```
middle=: [: ": #-2:
numeronym=: {. , middle , {:

long=: #>3:

n7m=: ]`numeronym @. long
```

```
   middle=: [: ": #-2:
   numeronym=: {. , middle , {:
   long=: #>3:
   n7m=: ]`numeronym @. long

   n7m &> ;:'alphabetize if you will'
a9e
if
you
w2l
```

```
middle=: [: ": #-2:
numeronym=: {. , middle , {:
long=: #>3:
n7m=: ]`numeronym @. long
```

substitutability

```
middle=: [: ": #-2:
numeronym=: {. , middle , {:
long=: #>3:
n7m=: ]`({.,middle,{:) @. long
```

```
middle=: [: ": #-2:

long=: #>3:
n7m=: ]`({.,middle,{:) @. (#>3:)
```

```
middle=: [: ": #-2:
```

```
n7m=: ]`({.,([: ": #-2:),{:) @. (#>3:)
```

```
n7m=: ]`({.,([: ": #-2:),{:) @. (#>3:)
```

www.jsoftware.com

J

Thank you!

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@kaleidic

Special thanks to Emerging Language Camp 2013
for the invitation to speak.
http://emerginglangs.com/about.html

Code and image credit:

“Unshadow” background removal
http://www.jsoftware.com/jwiki/OlegKobchenko/Background%20Removal

Sierpinski fractal
http://www.zeuscat.com/andrew/chaos/sierpinski.clear.gif

Fork-and-hook diagram
http://www.jsoftware.com/jwiki/Books#J_Reference_Card

Leap-year qualifier
http://jsoftware.com/help/phrases/date_time.htm