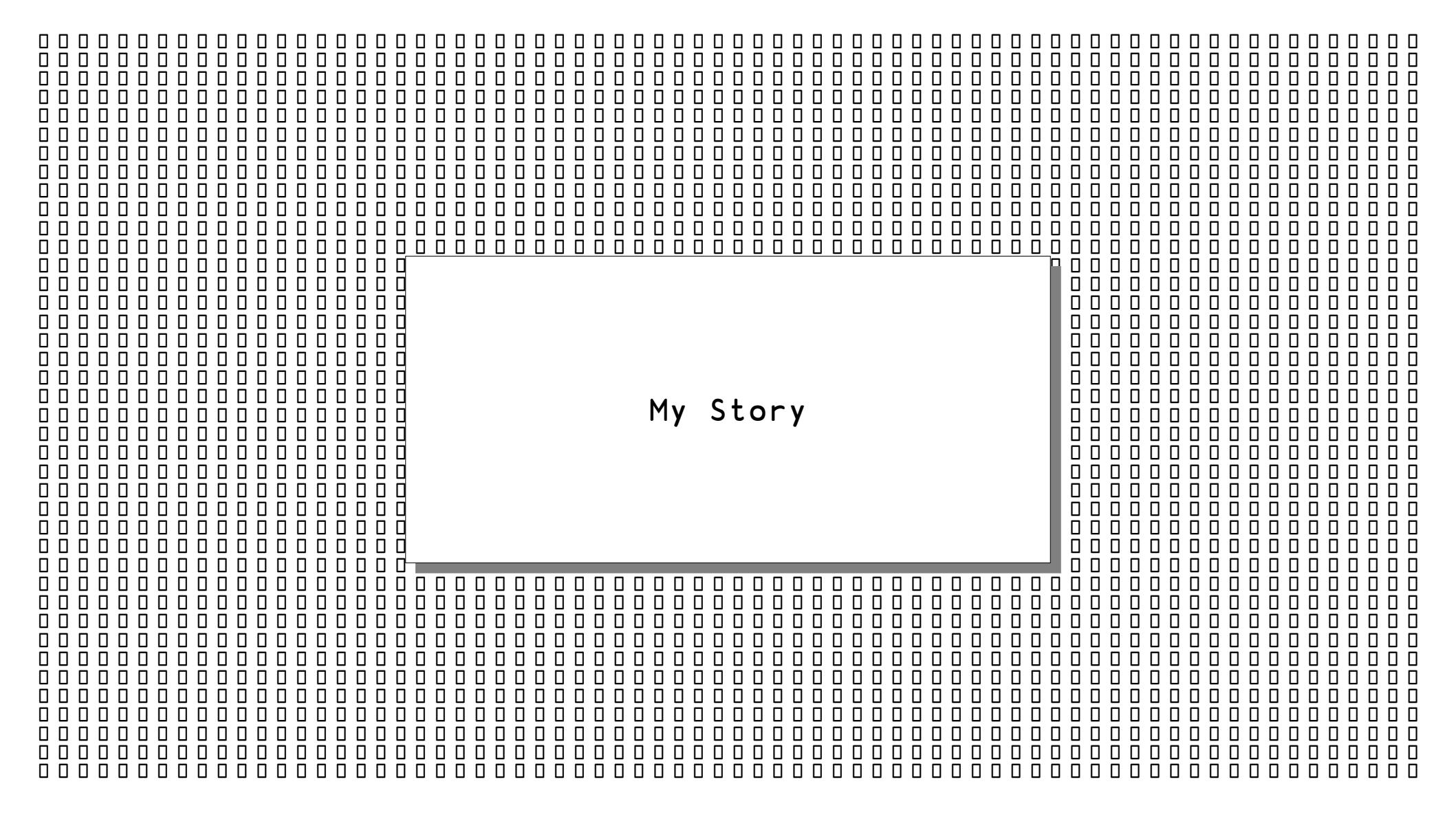
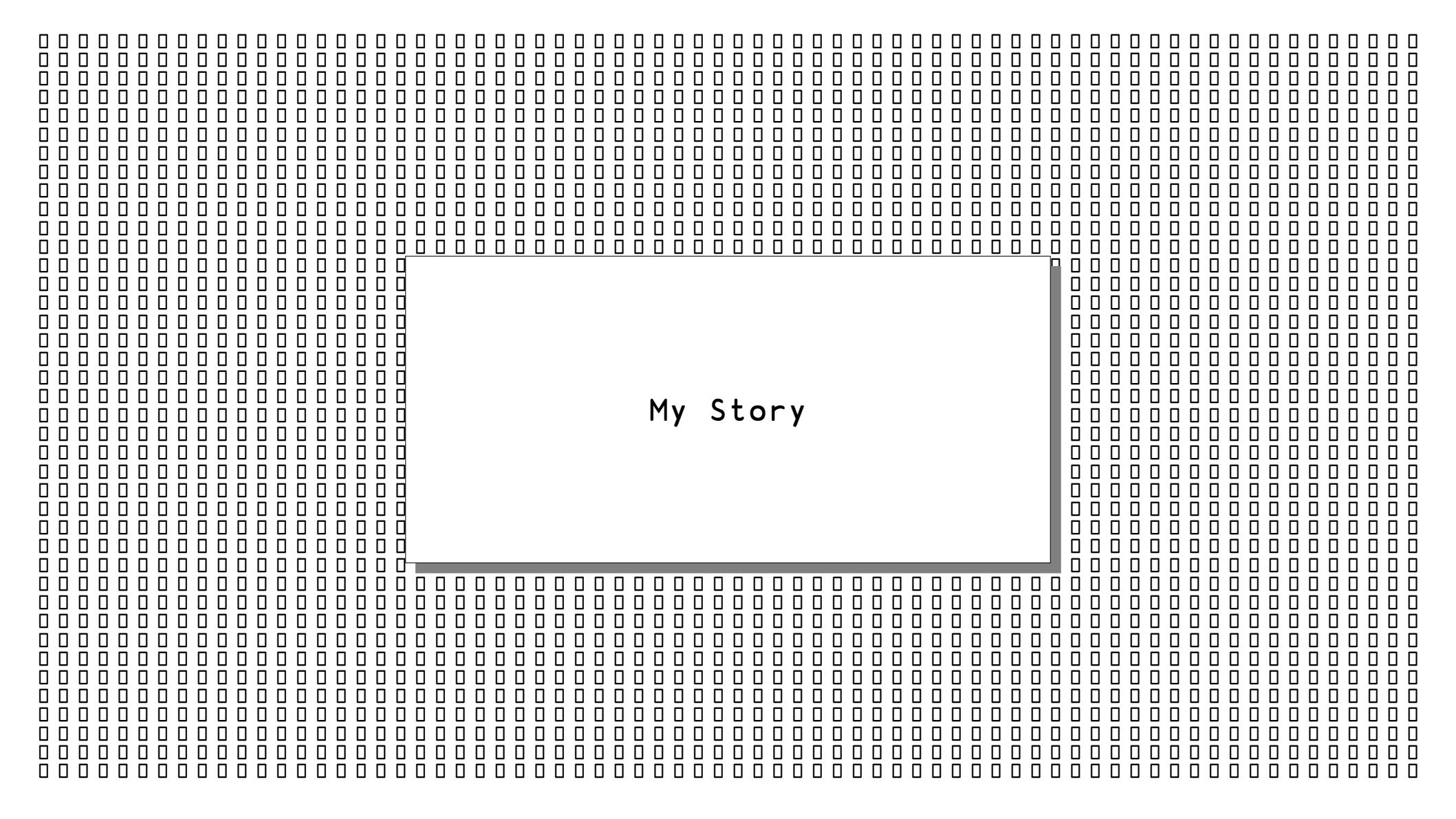


Dyalog APL  
Problem Solving Competition

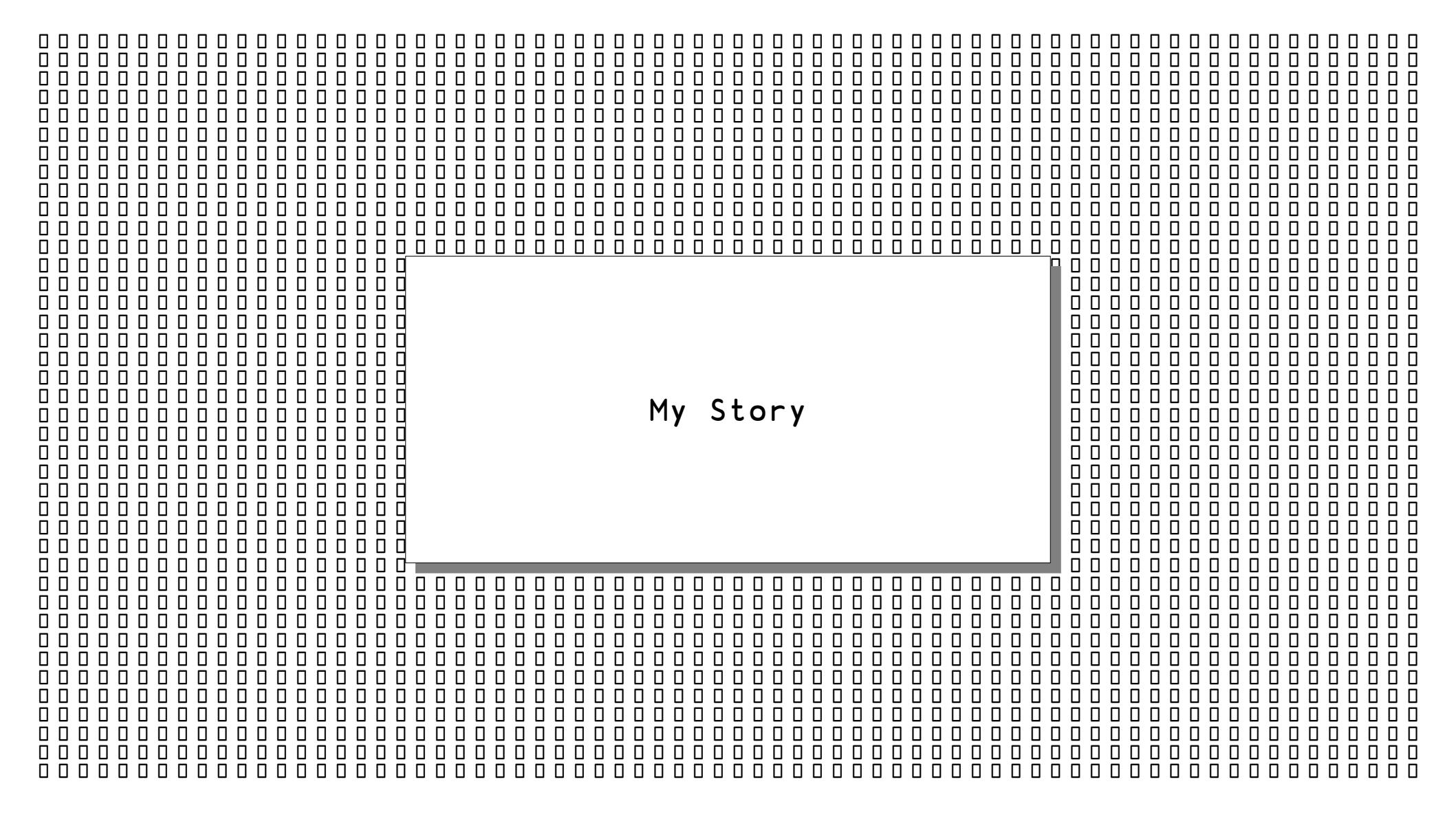
Michael Higginson



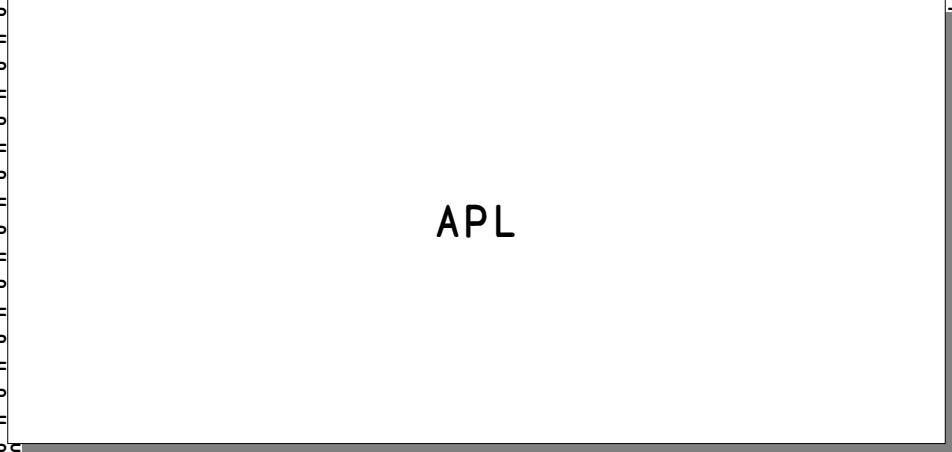
My Story



My Story



My Story



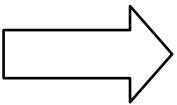
APL

APL Competition

## 2.1 Sub-space Journey (fill, subspaces)

5 5 fill m

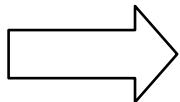
2 2 2 2



0	0	0	0	0
0	1	1	0	0
0	1	1	0	0
0	0	0	0	0
0	0	0	0	0

5 5 fill m

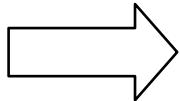
2 2 2 2  
4 4 1 2



0	0	0	0	0
0	1	1	0	0
0	1	1	0	0
0	0	0	2	2
0	0	0	0	0

5 5 fill m

2	2	2	2
4	4	1	2
4	3	2	1



0	0	0	0	0
0	1	1	0	0
0	1	1	0	0
0	0	3	2	2
0	0	3	0	0

## 5 5 fill m

```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    io<-`1+i``↓sh                A Subspace (i)ndex (o)ffsets
    ix<-io+``c``↓sp              A Subspace (i)nde(x)es

    vol<-x/sh                     A Subspace (vol)umes
    lab<-,,/volρ``i≠ω            A Subspace (lab)eles, flattened

    ix<-(≤a)↓,,/,,ix             A Cap and flatten indexes
    r[ix]←lab                     A Assign labels
    r
}
```

## 5 5 fill m

```
fill<{
    → r←αρ0          A (R)esult array
    k←≠α            A Space ran(k)

    sp←k↑[2]ω        A Subspace (s)tarting (p)oints
    sh←k↓[2]ω        A Subspace (sh)apes
    io←~1+i``↓sh     A Subspace (i)ndex (o)ffsets
    ix←io+``c``↓sp   A Subspace (i)nde(x)es

    vol←x/sh         A Subspace (vol)umes
    lab←~,/volρ``i≠ω A Subspace (lab)eles, flattened

    ix←(≤α)└~,/,``ix A Cap and flatten indexes
    r[ix]←lab        A Assign labels
    r
}
```

## 5 5 fill m

```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    io<-`1+i``↓sh                A Subspace (i)ndex (o)ffsets
    ix<-io+``c``↓sp              A Subspace (i)nde(x)es

    vol<-x/sh                     A Subspace (vol)umes
    lab<-,,/volρ``i≠ω            A Subspace (lab)eles, flattened

    ix<-(≤a)↓,,/,,ix             A Cap and flatten indexes
    → r[ix]←lab                  A Assign labels
    r
}
```

## 5 5 fill m

```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    → io<-1+i..↓sh              A Subspace (i)ndex (o)ffsets
    ix<-io+..c..↓sp              A Subspace (i)nde(x)es

    vol<-x/sh                     A Subspace (vol)umes
    lab<-,,/volρ..i≠ω            A Subspace (lab)eles, flattened

    ix<-(≤a)\>,/,..ix          A Cap and flatten indexes
    r[ix]←lab                     A Assign labels
    r
}
```

## 5 5 fill m

```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    io<-`1+i``↓sh                A Subspace (i)ndex (o)ffsets
    → ix<-io+``c``↓sp            A Subspace (i)nde(x)es

    vol<-x/sh                     A Subspace (vol)umes
    lab<->,/volρ``i≠ω            A Subspace (lab)eles, flattened

    ix<-(≤a)\>,/,``ix          A Cap and flatten indexes
    r[ix]←lab                     A Assign labels
    r
}
```

## 5 5 fill m

```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    io<-`1+i``↓sh                A Subspace (i)ndex (o)ffsets
    ix<-io+``c``↓sp              A Subspace (i)nde(x)es

    → vol<-x/sh                  A Subspace (vol)umes
    lab<->,/volρ``i≠ω            A Subspace (lab)eles, flattened

    ix<-(≤a)↓,/,``ix             A Cap and flatten indexes
    r[ix]←lab                     A Assign labels
    r
}
```

## 5 5 fill m

```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    io<-`1+i``↓sh                A Subspace (i)ndex (o)ffsets
    ix<-io+``c``↓sp              A Subspace (i)nde(x)es

    vol<-x/sh                     A Subspace (vol)umes
    → lab<->,/volρ``i≠ω          A Subspace (lab)eles, flattened

    ix<-(≤a)↓>,/,``ix            A Cap and flatten indexes
    r[ix]←lab                     A Assign labels
    r
}
```

## 5 5 fill m

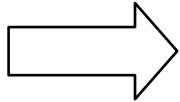
```
fill<{
    r<-ap0                      A (R)esult array
    k<-#a                        A Space ran(k)

    sp<-k↑[2]ω                    A Subspace (s)tarting (p)oints
    sh<-k↓[2]ω                    A Subspace (sh)apes
    io<-~1+i``↓sh                 A Subspace (i)ndex (o)ffsets
    ix<-io+``c``↓sp               A Subspace (i)nde(x)es

    vol<-x/sh                     A Subspace (vol)umes
    lab<-~,/volρ``i≠ω            A Subspace (lab)eles, flattened

    ix<-(≤a)↓~,/,``ix             A Cap and flatten indexes
    r[ix]←lab                     A Assign labels
    r
}
```

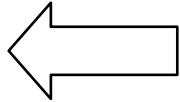
2	2	2	2
4	4	1	2
4	3	2	1



0	0	0	0	0
0	1	1	0	0
0	1	1	0	0
0	0	3	2	2
0	0	3	0	0

**subspaces r**

2	2	2	2
4	4	1	2
4	3	2	1



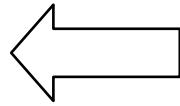
0	0	0	0	0
0	1	1	0	0
0	1	1	0	0
0	0	3	2	2
0	0	3	0	0

**subspaces  $\omega$**

$$\begin{matrix} 2 & 4 \\ 7 & 2 \end{matrix} \quad \Leftarrow \quad 0 \ 1 \ 1 \ 1 \ 1 \ 0 \ 2 \ 2 \ 0 \ 0$$

## subspaces $\omega$

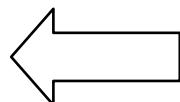
1 2 2 1 2 2  
1 4 4 2 2 1



0	0	0	0	0
0	1	1	0	0
0	1	1	0	0
0	0	0	2	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	2	0
0	0	0	0	0

# subspaces $\omega$

1	2	2	1	2	2
1	4	4	2	2	1



0 0 0 0 0  
0 0 0 0 0  
0 0 0 0 0  
0 0 0 0 0  
0 0 0 0 0  
0 0 0 2 0  
0 0 0 0 0

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  l<-ιΓ/f

  a<-fιl
  z<-1+(#f)-(φf)ιl
  a z<-(ρω)◦{↓Φ1+ατω-1}◦a z

  sh<-1+z-a
  ↑a,◦sh
}

  A Space's (r)ank
  A Space (f)lattened
  A Subspace (l)abels

  A Find first occurrences
  A Find last occurrences
  A Convert first/last to ω-index space

  A Compute subspace (sh)apes
  A Marry first indexes and shapes

```

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  l<-ιΓ/f
  → a<-fιl
  z<-1+(#f)-(φf)ιl
  a z<-(ρω)◦{↓Φ1+ατω-1}◦a z
  sh<-1+z-a
  ↑a,◦sh
}

```

A Space's (r)ank  
A Space (f)lattened  
A Subspace (l)abels

A Find first occurrences  
A Find last occurrences  
A Convert first/last to ω-index space

A Compute subspace (sh)apes  
A Marry first indexes and shapes

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  → l<-ιΓ/f
  a<-fιl
  z<-1+(#f)-(φf)ιl
  a z<-(ρω)◦{↓Φ1+ατω-1}◦a z
  sh<-1+z-a
  ↑a,◦sh
}

```

A Space's (r)ank  
A Space (f)lattened  
A Subspace (l)abels

A Find first occurrences  
A Find last occurrences  
A Convert first/last to ω-index space

A Compute subspace (sh)apes  
A Marry first indexes and shapes

# subspaces $\omega$

```

subspaces<-{
  r<-ppw
  f<-,ω
  l<-lΓ/f

  → a<-fᵢₗ
  → z<-1+(≠f)-(∅f)ᵢₗ
  a z<-(ρω)°{↓∅1+ατω-1}“a z
  sh<-1+z-a
  ↑a,“sh
}

  ↳ Space's (r)ank
  ↳ Space (f)lattened
  ↳ Subspace (l)abels

  ↳ Find first occurrences
  ↳ Find last occurrences
  ↳ Convert first/last to ω-index space

  ↳ Compute subspace (sh)apes
  ↳ Marry first indexes and shapes

```

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  l<-ιΓ/f
  a<-fιl
  z<-1+(≠f)-(φf)ιl
  → a z<-(ρω)◦{↓Φ1+ατω-1}◦a z
  sh<-1+z-a
  ↑a,◦sh
}

```

A Space's (r)ank  
A Space (f)lattened  
A Subspace (l)abels

A Find first occurrences  
A Find last occurrences  
A Convert first/last to ω-index space

A Compute subspace (sh)apes  
A Marry first indexes and shapes

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  l<-ιΓ/f

  a<-fιl
  z<-1+(≠f)-(φf)ιl
  → a z<-(ρω)◦{↓Φ1+αΤω-1}◦a z
  sh<-1+z-a
  ↑ a,◦sh

}

```

A Space's (r)ank  
A Space (f)lattened  
A Subspace (l)abels

A Find first occurrences  
A Find last occurrences  
A Convert first/last to ω-index space

A Compute subspace (sh)apes  
A Marry first indexes and shapes

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  l<-ιΓ/f

  a<-fιl
  z<-1+(#f)-(φf)ιl
  a z<-(ρω)◦{↓Φ1+ατω-1}◦a z

  → sh<-1+z-a
    ↑a,◦sh
}

  A Space's (r)ank
  A Space (f)lattened
  A Subspace (l)abels

  A Find first occurrences
  A Find last occurrences
  A Convert first/last to ω-index space

  A Compute subspace (sh)apes
  A Marry first indexes and shapes

```

# subspaces $\omega$

```

subspaces<-{
  r<-ρρω
  f<-,ω
  l<-ιΓ/f

  a<-fιl
  z<-1+(#f)-(φf)ιl
  a z<-(ρω)◦{↓Φ1+ατω-1}◦a z

  sh<-1+z-a
  ↑a,◦sh
}

  A Space's (r)ank
  A Space (f)lattened
  A Subspace (l)abels

  A Find first occurrences
  A Find last occurrences
  A Convert first/last to ω-index space

  A Compute subspace (sh)apes
  A Marry first indexes and shapes

```

2022

**January**

Su	2	9	16	23	30
Mo	3	10	17	24	31
Tu	4	11	18	25	
We	5	12	19	26	
Th	6	13	20	27	
Fr	7	14	21	28	
Sa	1	8	15	22	

**February**

	6	13	20	27
	7	14	21	28
	1	8	15	22
	2	9	16	23
	3	10	17	24
	4	11	18	25

**March**

	6	13	20	27
	7	14	21	28
	1	8	15	22
	2	9	16	23
	3	10	17	24
	4	11	18	25

**April**

	3	10	17	24
	4	11	18	25
	5	12	19	26
	6	13	20	27
	7	14	21	28
	1	8	15	22
	9	16	23	30

**May**

Su	1	8	15	22
Mo	2	9	16	23
Tu	3	10	17	24
We	4	11	18	25
Th	5	12	19	26
Fr	6	13	20	27
Sa	7	14	21	28

**APL Competition****2.6 It's a Date! (DDN)****August**

	7	14	21	28
	8	15	22	29
	9	16	23	30
	10	17	24	31
	11	18	25	
	12	19	26	
	13	20	27	

**September**

Su	4	11	18	25
Mo	5	12	19	26
Tu	6	13	20	27
We	7	14	21	28
Th	1	8	15	22
Fr	2	9	16	23
Sa	3	10	17	24

**October**

	2	9	16	23	30
	3	10	17	24	31
	4	11	18	25	
	5	12	19	26	
	6	13	20	27	
	7	14	21	28	
	1	8	15	22	29

**November**

	6	13	20	27
	7	14	21	28
	1	8	15	22
	2	9	16	23
	3	10	17	24
	4	11	18	25
	5	12	19	26

**December**

	4	11	18	25
	5	12	19	26
	6	13	20	27
	7	14	21	28
	1	8	15	22
	2	9	16	23
	3	10	17	24
	31			

$\alpha$  DDN  $\omega$

**$\alpha$  DDN  $\omega$**

'Ddd, DD-Mmm-YYYY hh:mm:ss' (1200I) 44608.63203  $\Rightarrow$  'Thu, 17-Feb-2022 15:10:07'

$\alpha$  DDN  $\omega$

'Ddd, DD-Mmm-YYYY hh:mm:ss' (1200I) 44608.63203  $\Rightarrow$  'Thu, 17-Feb-2022 15:10:07'

---

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07'  $\Rightarrow$  44608.63203

$\alpha$  DDN  $\omega$

'Ddd, DD-Mmm-YYYY hh:mm:ss' (1200I) 44608.63203  $\Rightarrow$  'Thu, 17-Feb-2022 15:10:07'

---

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07'  $\Rightarrow$  44608.63203  
'MM/DD/YY tP:mm' DDN '02/17/22 3P:39'  $\Rightarrow$  44608.65215

**α DDN ω**

'Ddd, DD-Mmm-YYYY hh:mm:ss' (1200I) 44608.63203 → 'Thu, 17-Feb-2022 15:10:07'

---

'Ddd, DD-Mmm-YYYY hh:mm:ss'	DDN	'Thu, 17-Feb-2022 15:10:07'	→	44608.63203
'MM/DD/YY tP:mm'	DDN	'02/17/22 3P:39'	→	44608.65215
'Dddd'	DDN	'Thursday'	→	43208

**α DDN ω**

'Ddd, DD-Mmm-YYYY hh:mm:ss' (1200I) 44608.63203 → 'Thu, 17-Feb-2022 15:10:07'

---

'Ddd, DD-Mmm-YYYY hh:mm:ss'	DDN	'Thu, 17-Feb-2022 15:10:07'	→	44608.63203
'MM/DD/YY tP:mm'	DDN	'02/17/22 3P:39'	→	44608.65215
'Dddd'	DDN	'Thursday'	→	43208
'MMDDYYYYhhmmss'	DDN	'02172022151007'	→	44608.63203

A	Pattern	Cat	Len	Num	Variations	
A	m←q;	'YY'	'1'	2	1	θ
A	m←m;	'YYYY'	'Y'	4	1	θ
A	m←m;	'M'	'M'	0	1	θ
A	m←m;	'MM'	'M'	2	1	(ε' _M')
A	m←m;	'MMM'	'M'	3	0	('Mmm' 'mmm' '_mm')
A	m←m;	'MMMM'	'M'	0	0	('Mmmm' 'mmmm' '_mmm')
A	m←m;	'D'	'D'	0	1	θ
A	m←m;	'DD'	'D'	2	1	(ε' _D')
A	m←m;	'h'	'h'	0	1	θ
A	m←m;	'hh'	'h'	2	1	(ε' _h')
A	m←m;	'm'	'm'	0	1	θ
A	m←m;	'mm'	'm'	2	1	(ε' _m')
A	m←m;	's'	's'	0	1	θ
A	m←m;	'ss'	's'	2	1	(ε' _s')
A	m←m;	'd'	'd'	1	1	θ
A	m←m;	'ddd'	'd'	3	0	('DDD' 'Ddd' '_dd')
A	m←m;	'dddd'	'd'	0	0	('DDDD' 'Dddd' '_ddd')
A	m←m;	'w'	'w'	0	1	θ
A	m←m;	'ww'	'w'	2	1	(ε' _w')
A	m←m;	'WW'	'W'	2	2	θ
A	m←m;	'WWWW'	'W'	4	1	θ
A	m←m;	'y'	'y'	0	1	θ
A	m←m;	'yy'	'y'	3	1	(ε' _y')
A	m←m;	'o'	'o'	1	0	(ε' _o')
A	m←m;	'OO'	'O'	2	0	('Oo' 'oo')
A	m←m;	't'	't'	0	1	θ
A	m←m;	'tt'	't'	2	1	(ε' _t')
A	m←m;	'p'	'P'	1	0	(ε' _p')
A	m←m;	'PP'	'P'	2	0	(ε' pp')

→ 'Thu, 17-Feb-2022 15:10:07'

---

15:10:07' → 44608.63203  
 → 44608.65215  
 → 43208  
 → 44608.63203

A	A	Pattern	Cat	Len	Num	Variations
A	m←q,	'YY'	'1'	2	1	θ
A	m←m,	'YYYY'	'Y'	4	1	θ
A	m←m,	'M'	'M'	0	1	θ
A	m←m,	'MM'	'M'	2	1	(ε' _M')
A	m←m,	'MMM'	'M'	3	0	('Mmm' 'mmm' '_mm')
A	m←m,	'MMMM'	'M'	0	0	('Mmmm' 'mmmm' '_mmm')
A	m←m,	'D'	'D'	0	1	θ
A	m←m,	'DD'	'D'	2	1	(ε' _D')
A	m←m,	'h'	'h'	0	1	θ
A	m←m,	'hh'	'h'	2	1	(ε' _h')
A	m←m,	'm'	'm'	0	1	θ
A	m←m,	'mm'	'm'	2	1	(ε' _m')
A	m←m,	's'	's'	0	1	θ
A	m←m,	'ss'	's'	2	1	(ε' _s')
A	m←m,	'd'	'd'	1	1	θ
A	m←m,	'ddd'	'd'	3	0	('DDD' 'Ddd' '_dd')
A	m←m,	'dddd'	'd'	0	0	('DDDD' 'Dddd' '_ddd')
A	m←m,	'w'	'w'	0	1	θ
A	m←m,	'ww'	'w'	2	1	(ε' _w')
A	m←m,	'WW'	'2'	2	1	θ
A	m←m,	'WWWW'	'W'	4	1	θ
A	m←m,	'y'	'y'	0	1	θ
A	m←m,	'yy'	'y'	3	1	(ε' _y')
A	m←m,	'o'	'o'	1	0	(ε' o')
A	m←m,	'OO'	'O'	2	0	('Oo' 'oo')
A	m←m,	't'	't'	0	1	θ
A	m←m,	'tt'	't'	2	1	(ε' _t')
A	m←m,	'p'	'P'	1	0	(ε' p')
A	m←m,	'PP'	'P'	2	0	(ε' pp')

→ 'Thu, 17-Feb-2022 15:10:07'

---

15:10:07' → 44608.63203

→ 44608.65215

→ 43208

→ 44608.63203

A	Pattern	Cat	Len	Num	Variations
m←q;	'YY'	'1'	2	1	θ
m←m;	'YYYY'	'Y'	4	1	θ
m←m;	'M'	'M'	0	1	θ
m←m;	'MM'	'M'	2	1	(ε '_M')
m←m;	'MMM'	'M'	3	0	('Mmm' 'mmm' '_mm')
m←m;	'MMMM'	'M'	0	0	('Mmmm' 'mmmm' '_mmm')
m←m;	'D'	'D'	0	1	θ
m←m;	'DD'	'D'	2	1	(ε '_D')
m←m;	'h'	'h'	0	1	θ
m←m;	'hh'	'h'	2	1	(ε '_h')
m←m;	'm'	'm'	0	1	θ
m←m;	'mm'	'm'	2	1	(ε '_m')
m←m;	's'	's'	0	1	θ
m←m;	'ss'	's'	2	1	(ε '_s')
m←m;	'd'	'd'	1	1	θ
m←m;	'ddd'	'd'	3	0	('DDD' 'Ddd' '_dd')
m←m;	'dddd'	'd'	0	0	('DDDD' 'Dddd' '_ddd')
m←m;	'w'	'w'	0	1	θ
m←m;	'ww'	'w'	2	1	(ε '_w')
m←m;	'WW'	'2'	2	1	θ
m←m;	'WWWW'	'W'	4	1	θ
m←m;	'y'	'y'	0	1	θ
m←m;	'yy'	'y'	3	1	(ε '_y')
m←m;	'o'	'o'	1	0	(ε 'o')
m←m;	'OO'	'O'	2	0	('Oo' 'oo')
m←m;	't'	't'	0	1	θ
m←m;	'tt'	't'	2	1	(ε '_t')
m←m;	'p'	'p'	1	0	(ε 'p')
m←m;	'PP'	'P'	2	0	(ε 'pp')

→ 'Thu, 17-Feb-2022 15:10:07'

---

15:10:07' → 44608.63203

→ 44608.65215

→ 43208

→ 44608.63203

A	Pattern	Cat	Len	Num	Variations
A					
m←q;	'YY'	'1'	2	1	θ
m←m;	'YYYY'	'Y'	4	1	θ
m←m;	'M'	'M'	0	1	θ
m←m;	'MM'	'M'	2	1	(< '_M' )
m←m;	'MMM'	'M'	3	0	('Mmm' 'mmm' '_mm')
m←m;	'MMMM'	'M'	0	0	('Mmmmm' 'mmmm' '_mmmm')
m←m;	'D'	'D'	0	1	θ
m←m;	'DD'	'D'	2	1	(< '_D' )
m←m;	'h'	'h'	0	1	θ
m←m;	'hh'	'h'	2	1	(< '_h' )

→ 'Thu, 17-Feb-2022 15:10:07'

```
m parse<{
m     m[α;3]:      =>ΦVFΙω          A Parse number
m     m[α;1]='d': 1+dowsi<3↑lc ω   A Look up day of week
m     m[α;1]='M': 1+monsi<3↑lc ω   A Look up month
m     m[α;1]='O': '_snrt'i=lc ω    A Look up day of month ordinal indicator
m     m[α;1]='P': 12×'P'=⇒ω        A Look up AM/PM adjustment
m
m     ΦSIGNAL 11                  A Domain error
m }
```

$m \leftarrow m;$	't'	't'	0	1	$\theta$
$m \leftarrow m;$	'tt'	't'	2	1	$(\leftarrow '_- t')$
$m \leftarrow m;$	'P'	'P'	1	0	$(\leftarrow 'p')$
$m \leftarrow m;$	'PP'	'P'	2	0	$(\leftarrow 'pp')$

```
A  
A Pattern Cat Len Num Variations
```

```
A  
m<-q; 'YY'      '1' 2   1   θ  
m<-m; 'YYYY'    'Y' 4   1   θ  
m<-m; 'M'       'M' 0   1   θ  
m<-m; 'MM'      'M' 2   1   (_M')  
m<-m; 'MMM'     'M' 3   0   ('Mmm' 'mmm' '_mm')  
m<-m; 'MMMM'    'M' 0   0   ('Mmmm' 'mmmm' '_mmm')  
m<-m; 'D'       'D' 0   1   θ  
m<-m; 'DD'      'D' 2   1   (_D')  
m<-m; 'h'       'h' 0   1   θ  
m<-m; 'hh'      'h' 2   1   (_h')
```

→ 'Thu, 17-Feb-2022 15:10:07'

```
m parse<{-  
m   m[α;3]:    =>Φ□VFIω      A Parse number  
m   m[α;1]='d': 1+dowsι<3↑lc ω  A Look up day of week  
m   m[α;1]='M': 1+monsι<3↑lc ω  A Look up month  
m   m[α;1]='O': '_snrt'ι=>lc ω  A Look up day of month ordinal indicator  
m   m[α;1]='P': 12×'P'=>ω      A Look up AM/PM adjustment
```

```
m □SIGNAL 11          A Domain error  
m }
```

```
m<-m; 't'       't' 0   1   θ  
m<-m; 'tt'      't' 2   1   (_t')  
m<-m; 'P'       'P' 1   0   ('p')  
m<-m; 'PP'      'P' 2   0   ('pp')
```

A	Pattern	Cat	Len	Num	Variations	
A	m←q;	'YY'	'1'	2	1	θ
A	m←m;	'YYYY'	'Y'	4	1	θ
A	m←m;	'M'	'M'	0	1	θ
A	m←m;	'MM'	'M'	2	1	(ε' _M')
A	m←m;	'MMM'	'M'	3	0	('Mmm' 'mmm' '_mm')
A	m←m;	'MMMM'	'M'	0	0	('Mmmm' 'mmmm' '_mmm')
A	m←m;	'D'	'D'	0	1	θ
A	m←m;	'DD'	'D'	2	1	(ε' _D')
A	m←m;	'h'	'h'	0	1	θ
A	m←m;	'hh'	'h'	2	1	(ε' _h')
A	m←m;	'm'	'm'	0	1	θ
A	m←m;	'mm'	'm'	2	1	(ε' _m')
A	m←m;	's'	's'	0	1	θ
A	m←m;	'ss'	's'	2	1	(ε' _s')
A	m←m;	'd'	'd'	1	1	θ
A	m←m;	'ddd'	'd'	3	0	('DDD' 'Ddd' '_dd')
A	m←m;	'dddd'	'd'	0	0	('DDDD' 'Dddd' '_ddd')
A	m←m;	'w'	'w'	0	1	θ
A	m←m;	'ww'	'w'	2	1	(ε' _w')
A	m←m;	'WW'	'W'	2	2	θ
A	m←m;	'WWWW'	'W'	4	1	θ
A	m←m;	'y'	'y'	0	1	θ
A	m←m;	'yy'	'y'	3	1	(ε' _y')
A	m←m;	'o'	'o'	1	0	(ε' _o')
A	m←m;	'OO'	'O'	2	0	('Oo' 'oo')
A	m←m;	't'	't'	0	1	θ
A	m←m;	'tt'	't'	2	1	(ε' _t')
A	m←m;	'p'	'P'	1	0	(ε' _p')
A	m←m;	'PP'	'P'	2	0	(ε' pp')

→ 'Thu, 17-Feb-2022 15:10:07'

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15:10:07' → 44608.63203  
 → 44608.65215  
 → 43208  
 → 44608.63203

**α DDN ω**

'Ddd, DD-Mmm-YYYY hh:mm:ss' (1200I) 44608.63203 → 'Thu, 17-Feb-2022 15:10:07'

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'Ddd, DD-Mmm-YYYY hh:mm:ss'	DDN	'Thu, 17-Feb-2022 15:10:07'	→	44608.63203
'MM/DD/YY tP:mm'	DDN	'02/17/22 3P:39'	→	44608.65215
'Dddd'	DDN	'Thursday'	→	43208
'MMDDYYYYhhmmss'	DDN	'02172022151007'	→	44608.63203

**$\alpha$  DDN  $\omega$**

at 2022

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'Ddd, DD-Mmm-YYYY hh:mm:ss'	DDN	'Thu, 17-Feb-2022 15:10:07'	→	44608.63203
'MM/DD/YY tP:mm'	DDN	'02/17/22 3P:39'	→	44608.65215
'Dddd'	DDN	'Thursday'	→	43208
'MMDDYYYYhhmmss'	DDN	'02172022151007'	→	44608.63203

α DDN ω

9 2022

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' → 44608.63203

'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' → 44608.65215

'Dddd' DDN 'Thursday' → 43208

'MMDDYYYYhhmmss' DDN '02172022151007' → 44608.63203

α DDN ω

9 2022

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' → 44608.63203

'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' → 44608.65215

'Dddd' DDN 'Thursday' → 43208

'MMDDYYYYhhmmss' DDN '02172022151007' → 44608.63203

α DDN ω

9 2022

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' → 44608.63203  
'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' → 44608.65215  
'Dddd' DDN 'Thursday' → 43208  
'MMDDYYYYhhmmss' DDN '02172022151007' → 44608.63203

α DDN ω

9 2022

...	1	1	1	1	1	1	1	1	1	1	...	2	2	2	2	2	2	2	2	2	2	2	...	2	2	3	3	3	...
...	15	16	17	18	19	20	21	22	...	10	11	12	13	14	15	16	17	18	19	20	...	27	28	1	2	3	...		
...	6	7	1	2	3	4	5	6	...	4	5	6	7	1	2	3	4	5	6	7	...	7	1	2	3	4	...		

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' ➡ 44608.63203  
'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' ➡ 44608.65215  
'Dddd' DDN 'Thursday' ➡ 43208  
'MMDDYYYYhhmmss' DDN '02172022151007' ➡ 44608.63203

$\alpha$  DDN  $\omega$

8 2022

... 1 1 1 1 1 1 1 1 1 ... 2 2 2 2 2 2 2 2 2 ... 2 2 3 3 3 ...  
 ... 15 16 17 18 19 20 21 22 ... 10 11 12 13 14 15 16 17 18 19 20 ... 27 28 1 2 3 ...  
 ... 0 0 0 0 0 1 0 0 ... 1 0 0 0 0 0 1 0 0 0 ... 0 0 0 0 1 ... A Thurs (= 4)

```
'Ddd, DD-Mmm-YYYY hh:mm:ss'  DDN 'Thu, 17-Feb-2022 15:10:07'      ➔ 44608.63203
      'MM/DD/YY tP:mm'  DDN '02/17/22 3P:39'                      ➔ 44608.65215
      'Dddd'  DDN 'Thursday'                                     ➔ 43208
      'MMDDYYYYhhmmss'  DDN '02172022151007'                    ➔ 44608.63203
```

α DDN ω

8 2022

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' ➡ 44608.63203  
'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' ➡ 44608.65215  
'Dddd' DDN 'Thursday' ➡ 43208  
'MMDDYYYYhhmmss' DDN '02172022151007' ➡ 44608.63203

$\alpha$  DDN  $\omega$

8 2022

```
'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' ➔ 44608.63203
      'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' ➔ 44608.65215
      'Dddd' DDN 'Thursday' ➔ 43208
      'MMDDYYYYhhmmss' DDN '02172022151007' ➔ 44608.63203
```

α DDN ω

8 2022

'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' ➡ 44608.63203  
'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' ➡ 44608.65215  
'Dddd' DDN 'Thursday' ➡ 43208  
'MMDDYYYYhhmmss' DDN '02172022151007' ➡ 44608.63203

$\alpha$  DDN  $\omega$

8 2022

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'Ddd, DD-Mmm-YYYY hh:mm:ss' DDN 'Thu, 17-Feb-2022 15:10:07' ➡ 44608.63203  
'MM/DD/YY tP:mm' DDN '02/17/22 3P:39' ➡ 44608.65215  
'Dddd' DDN 'Thursday' ➡ 43208  
'MMDDYYYYhhmmss' DDN '02172022151007' ➡ 44608.63203

Thank you!