Tahm — PS 11 — 2025-03-18

EIWL3 Sections 29 and 30

Chapter 29

In[425]:=
```
Array[Prime[#] &, 100]
```
Out[425]=
```
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79,
 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163,
 167, 173, 179, 181, 191, 193, 197, 199, 211, 223, 227, 229, 233, 239, 241, 251,
 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317, 331, 337, 347, 349,
 353, 359, 367, 373, 379, 383, 389, 397, 401, 409, 419, 421, 431, 433, 439,
 443, 449, 457, 461, 463, 467, 479, 487, 491, 499, 503, 509, 521, 523, 541}
```

In[426]:=
```
Array[Prime[# + 1] - Prime[#] &, 100]
```
Out[426]=
```
{1, 2, 2, 4, 2, 4, 2, 4, 6, 2, 6, 4, 2, 4, 6, 6, 2, 6, 4, 2, 6, 4, 6, 8, 4, 2,
 4, 2, 4, 14, 4, 6, 2, 10, 2, 6, 6, 4, 6, 6, 2, 10, 2, 4, 2, 12, 12, 4, 2, 4,
 6, 2, 10, 6, 6, 6, 2, 6, 4, 2, 10, 14, 4, 2, 4, 14, 6, 10, 2, 4, 6, 8, 6, 6, 4,
 6, 8, 4, 8, 10, 2, 10, 2, 6, 4, 6, 8, 4, 2, 4, 12, 8, 4, 8, 4, 6, 12, 2, 18, 6}
```

In[427]:=
```
Array[#1 + #2 &, {10, 10}] // Grid
```
Out[427]=

2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18
10	11	12	13	14	15	16	17	18	19
11	12	13	14	15	16	17	18	19	20

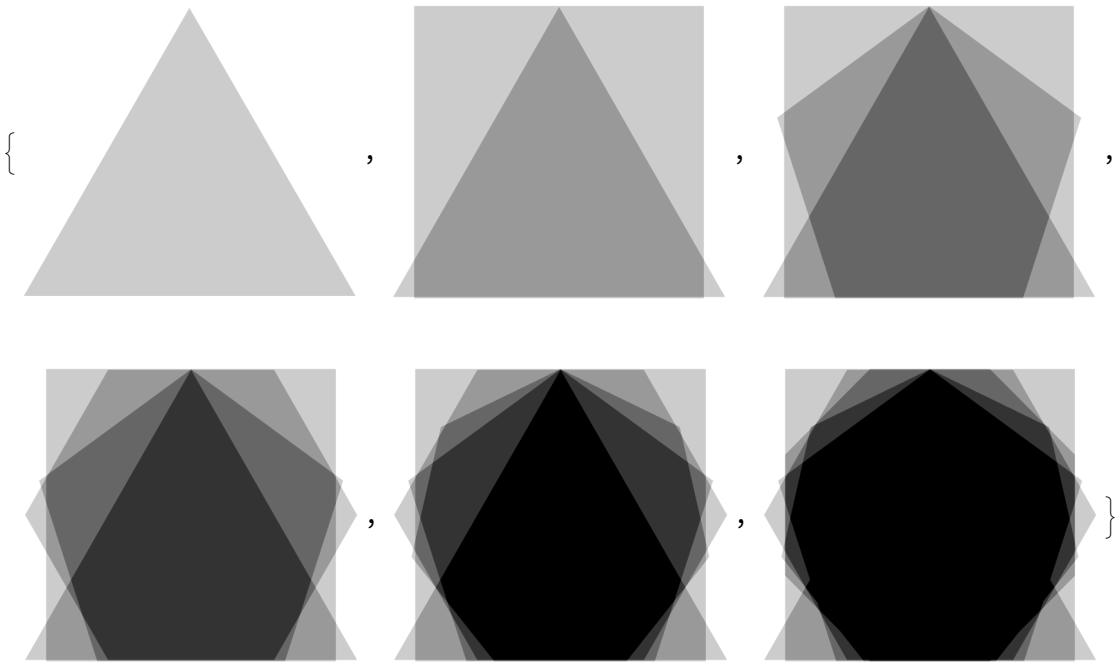
In[428]:=
```
FoldList[Times, 1, Range[10]]
```
Out[428]=
```
{1, 1, 2, 6, 24, 120, 720, 5040, 40 320, 362 880, 3 628 800}
```

In[429]:=
```
FoldList[Times, 1, Array[Prime, 10]]
```

Out[429]=
```
{1, 2, 6, 30, 210, 2310, 30 030, 510 510, 9 699 690, 223 092 870, 6 469 693 230}
```

In[430]:=
```
FoldList[ImageAdd,
 Table[Graphics[Style[RegularPolygon[x], Opacity[0.2]]], {x, 3, 8}]]
```

Out[430]=



Chapter 30

In[431]:=
```
Thread [Alphabet[] → LetterNumber[Alphabet[]]]
```

Out[431]=
```
{a → 1, b → 2, c → 3, d → 4, e → 5, f → 6, g → 7, h → 8,
 i → 9, j → 10, k → 11, l → 12, m → 13, n → 14, o → 15, p → 16, q → 17,
 r → 18, s → 19, t → 20, u → 21, v → 22, w → 23, x → 24, y → 25, z → 26}
```

In[432]:=
```
Grid[Partition[Alphabet[], 6]]
```

Out[432]=
```
a b c d e f
g h i j k l
m n o p q r
s t u v w x
```

In[433]:=

```
Grid[Partition[IntegerDigits[2^1000], 50], Frame → All]
```

Out[433]=

1	0	7	1	5	0	8	6	0	7	1	8	6	2	6	7	3	2	0	9	4	8	4	2	5	0	4	9	0	6	0	0	0	1	8	1	0	5	6	1	4	0	4	8	1	1	7
3	3	6	0	7	4	4	3	7	5	0	3	8	8	3	7	0	3	5	1	0	5	1	1	2	4	9	3	6	1	2	2	4	9	3	1	9	8	3	7	8	8	1	5	6	9	5
1	2	7	5	9	4	6	7	2	9	1	7	5	5	3	1	4	6	8	2	5	1	8	7	1	4	5	2	8	5	6	9	2	3	1	4	0	4	3	5	9	8	4	5	7	7	5
9	8	5	7	4	8	0	3	9	3	4	5	6	7	7	7	4	8	2	4	2	3	0	9	8	5	4	2	1	0	7	4	6	0	5	0	6	2	3	7	1	1	4	1	8	7	7
1	8	2	1	5	3	0	4	6	4	7	4	9	8	3	5	8	1	9	4	1	2	6	7	3	9	8	7	6	7	5	5	9	1	6	5	5	4	3	9	4	6	0	7	7	0	6
4	5	7	1	1	9	6	4	7	7	6	8	6	5	4	2	1	6	7	6	6	0	4	2	9	8	3	1	6	5	2	6	2	4	3	8	6	8	3	7	2	0	5	6	6	8	0

In[434]:=

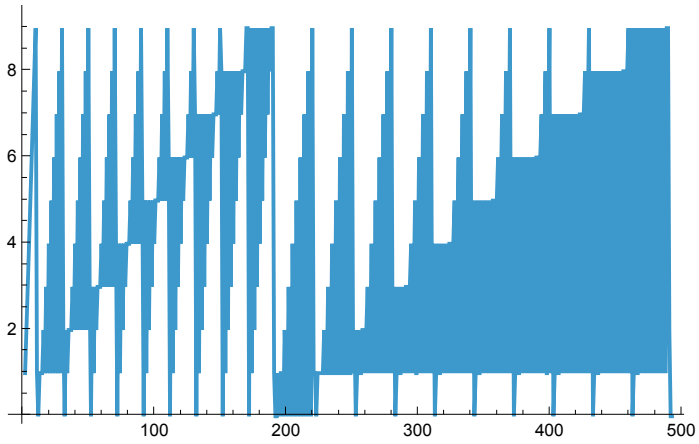
```
Grid[Partition[Characters[StringTake[WikipediaData["computers"], 400]], 20],
 Frame → All]
```

Out[434]=

A		c	o	m	p	u	t	e	r		i	s		a		m	a	c	h
i	n	e		t	h	a	t		c	a	n		b	e		p	r	o	g
r	a	m	m	e	d		t	o		a	u	t	o	m	a	t	i	c	a
l	l	y		c	a	r	r	y		o	u	t		s	e	q	u	e	n
c	e	s		o	f		a	r	i	t	h	m	e	t	i	c		o	r
	l	o	g	i	c	a	l		o	p	e	r	a	t	i	o	n	s	
(	c	o	m	p	u	t	a	t	i	o	n	)	.		M	o	d	e	r
n		d	i	g	i	t	a	l		e	l	e	c	t	r	o	n	i	c
	c	o	m	p	u	t	e	r	s		c	a	n		p	e	r	f	o
r	m		g	e	n	e	r	i	c		s	e	t	s		o	f		o
p	e	r	a	t	i	o	n	s		k	n	o	w	n		a	s		p
r	o	g	r	a	m	s	.		T	h	e	s	e		p	r	o	g	r
a	m	s		e	n	a	b	l	e		c	o	m	p	u	t	e	r	s
	t	o		p	e	r	f	o	r	m		a		w	i	d	e		r
a	n	g	e		o	f		t	a	s	k	s	.		T	h	e		t
e	r	m		c	o	m	p	u	t	e	r		s	y	s	t	e	m	
m	a	y		r	e	f	e	r		t	o		a		n	o	m	i	n
a	l	l	y		c	o	m	p	l	e	t	e		c	o	m	p	u	t
e	r		t	h	a	t		i	n	c	l	u	d	e	s		t	h	e
	h	a	r	d	w	a	r	e	,		o	p	e	r	a	t	i	n	g

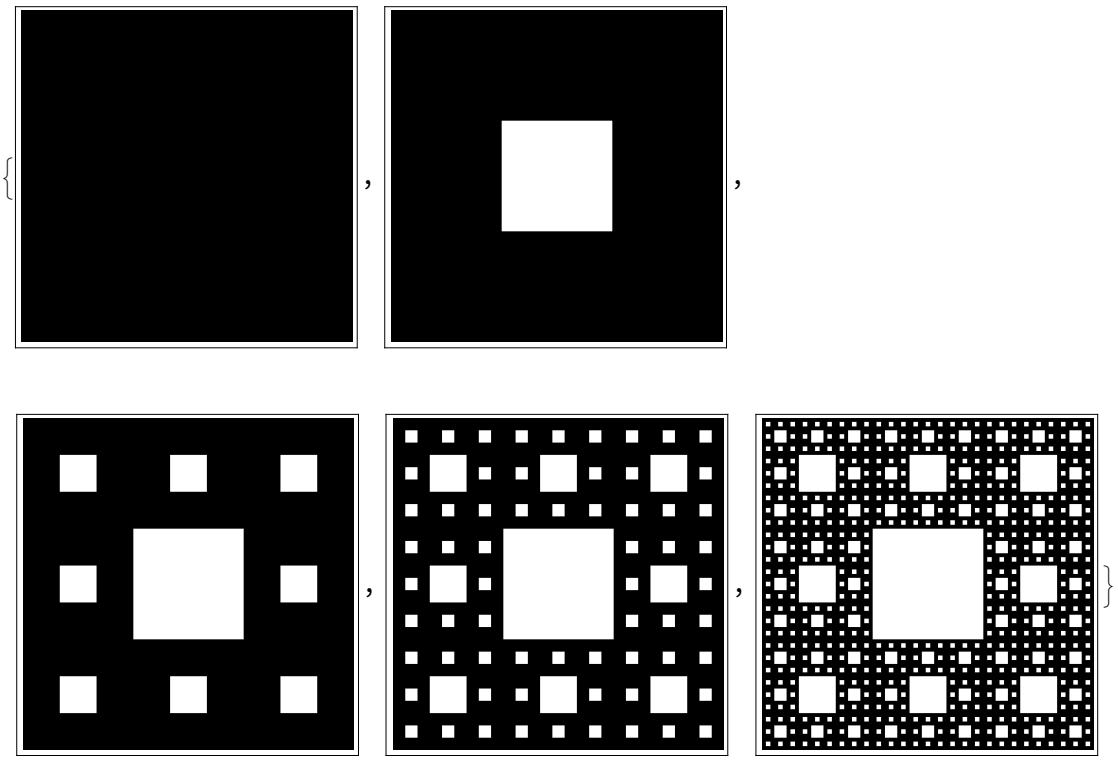
In[435]:=
```
ListLinePlot[Flatten[IntegerDigits[Range[200]]]]
```

Out[435]=



In[436]:=
```
ArrayPlot /@ NestList[ArrayFlatten[{{#, #, #}, {#, 0, #}, {#, #, #}}] &, {{1}}, 4]
```

Out[436]=



In[437]:=
```
Select[Flatten[Table[{x, y, Sqrt[x^2 + y^2]}, {x, 20}, {y, 20}], 1],
 IntegerQ[Last[#]] &]
```

Out[437]=
```
{{3, 4, 5}, {4, 3, 5}, {5, 12, 13}, {6, 8, 10},
 {8, 6, 10}, {8, 15, 17}, {9, 12, 15}, {12, 5, 13}, {12, 9, 15},
 {12, 16, 20}, {15, 8, 17}, {15, 20, 25}, {16, 12, 20}, {20, 15, 25}}
```

In[438]:=
```
Table[Max[Length /@ Split[IntegerDigits[2^n]]], {n, 0, 100, 1}]
```
Out[438]=
```
{1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 2, 2, 1, 1, 1, 2,
 3, 2, 2, 2, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 2, 3, 3, 4, 3, 3, 3, 3, 2, 2, 1,
 2, 3, 2, 2, 2, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 2, 2, 2, 3, 3,
 3, 3, 3, 2, 2, 1, 2, 2, 3, 2, 2, 2, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2}
```

In[439]:=
```
GatherBy[Array[IntegerName, 100], StringTake[#, 1] &]
```
Out[439]=
```
{{one, one hundred}, {two, three, ten, twelve, thirteen, twenty, twenty-one,
   twenty-two, twenty-three, twenty-four, twenty-five, twenty-six, twenty-seven,
   twenty-eight, twenty-nine, thirty, thirty-one, thirty-two, thirty-three,
   thirty-four, thirty-five, thirty-six, thirty-seven, thirty-eight, thirty-nine},
  {four, five, fourteen, fifteen, forty, forty-one, forty-two, forty-three,
   forty-four, forty-five, forty-six, forty-seven, forty-eight,
   forty-nine, fifty, fifty-one, fifty-two, fifty-three, fifty-four,
   fifty-five, fifty-six, fifty-seven, fifty-eight, fifty-nine},
  {six, seven, sixteen, seventeen, sixty, sixty-one, sixty-two, sixty-three,
   sixty-four, sixty-five, sixty-six, sixty-seven, sixty-eight, sixty-nine,
   seventy, seventy-one, seventy-two, seventy-three, seventy-four,
   seventy-five, seventy-six, seventy-seven, seventy-eight, seventy-nine},
  {eight, eleven, eighteen, eighty, eighty-one, eighty-two, eighty-three,
   eighty-four, eighty-five, eighty-six, eighty-seven, eighty-eight, eighty-nine},
  {nine, nineteen, ninety, ninety-one, ninety-two, ninety-three, ninety-four,
   ninety-five, ninety-six, ninety-seven, ninety-eight, ninety-nine}}
```

In[440]:=
```
SortBy[Take[WordList[], 50], StringTake[StringReverse[#], 1] &]
```
Out[440]=
```
{a, abandoned, abashed, abbreviated, abed, abalone, abase, abate, abbe, abbreviate,
 abdicate, abeyance, abhorrence, abidance, abide, abducting, abiding, aah,
 abash, aardvark, aback, abdominal, abeam, abandon, abbreviation, abdication,
 abdomen, abduction, aberration, abjection, abattoir, abductor, abettor,
 abhor, abacus, abbess, abaft, abandonment, abasement, abashment, abatement,
 abbot, abduct, aberrant, abet, abhorrent, abject, abbey, ability, abjectly}
```

In[441]:=
```
SortBy[Table[x^2, {x, 1, 20}], First[IntegerDigits[#]] &]
```
Out[441]=
```
{1, 16, 100, 121, 144, 169, 196, 25, 225, 256, 289, 36, 324, 361, 4, 49, 400, 64, 81, 9}
```

In[442]:=
```
SortBy[Table[x, {x, 1, 20}], StringLength[IntegerName[#]] &]
```
Out[442]=
```
{1, 2, 6, 10, 4, 5, 9, 3, 7, 8, 11, 12, 20, 15, 16, 13, 14, 18, 19, 17}
```

In[443]:=
```
GatherBy[RandomSample[WordList[], 20], StringLength[#] &]
```
Out[443]=
```
{{generous, honeydew, provably, jostling, bookshop, tragical, flirting, ointment},
 {thug, gill, neck, cede, oars}, {frankly}, {snail},
 {peninsula, fecundate}, {escritoire, masquerade}, {crying}}
```

In[444]:=
```
Complement[Alphabet["Ukrainian"], Alphabet["Russian"]]
```
Out[444]=
```
{є, і, ї, ґ}
```

In[445]:=
```
Intersection[Range[100]^2, Range[100]^3]
```
Out[445]=
```
{1, 64, 729, 4096}
```

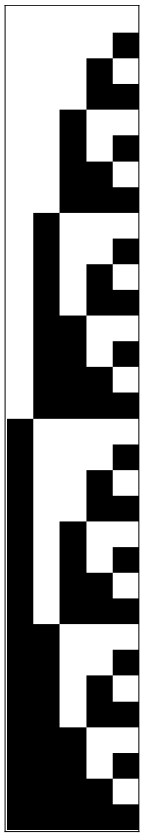
In[446]:=
```
Intersection[EntityList[ North Atlantic Treaty Organization COUNTRIES ],
 EntityList[ Group of 8 COUNTRIES ]]
```
Out[446]=
```
{ Canada , France , Germany , Italy , United Kingdom , United States }
```

In[447]:=
```
Grid[Transpose[Permutations[Range[4]]]]
```
Out[447]=
```
1 1 1 1 1 1 2 2 2 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4
2 2 3 3 4 4 1 1 3 3 4 4 1 1 2 2 4 4 1 1 2 2 3 3
3 4 2 4 2 3 3 4 1 4 1 3 2 4 1 4 1 2 2 3 1 3 1 2
4 3 4 2 3 2 4 3 4 1 3 1 4 2 4 1 2 1 3 2 3 1 2 1
```

In[448]:=
```
StringJoin /@ Permutations[Characters["Hello"]]
```
Out[448]=
```
{Hello, Helol, Heoll, Hlelo, Hleol, Hlleo, Hlloe, Hloel, Hlole, Hoell, Holel, Holle,
 eHllo, eHlol, eHoll, elHlo, elHol, ellHo, elloH, eloHl, elolH, eoHll, eolHl, eollH,
 lHelo, lHeol, lHleo, lHloe, lHoel, lHole, leHlo, leHol, lelHo, leloH, leoHl, leolH,
 llHeo, llHoe, lleHo, lleoH, lloHe, lloeH, loHel, loHle, loeHl, loelH, lolHe, loleH,
 oHell, oHlel, oHlle, oeHll, oelHl, oellH, olHel, olHle, oleHl, olelH, ollHe, olleH}
```

In[449]:=
```
ArrayPlot[Tuples[{0, 1}, 5]]
```

Out[449]=



In[450]:=
```
Table[StringJoin[RandomChoice[Alphabet[], 5]], 10]
```

Out[450]=
```
{umvzp, hkyoi, ywwbg, panyy, ecdjr, zxfxo, cyart, umeii, sflgs, mnack}
```

In[451]:=
```
Tuples[{1, 2}, 3]
```

Out[451]=
```
{{1, 1, 1}, {1, 1, 2}, {1, 2, 1}, {1, 2, 2}, {2, 1, 1}, {2, 1, 2}, {2, 2, 1}, {2, 2, 2}}
```

In[452]:=
```
{{1, 1, 1}, {1, 1, 2}, {1, 2, 1}, {1, 2, 2}, {2, 1, 1}, {2, 1, 2}, {2, 2, 1}, {2, 2, 2}}
```

Out[452]=
```
{{1, 1, 1}, {1, 1, 2}, {1, 2, 1}, {1, 2, 2}, {2, 1, 1}, {2, 1, 2}, {2, 2, 1}, {2, 2, 2}}
```