Eli — PS 11 — 2025-03-18

EIWL3 Sections 29 and 30

In[538]:=
```
Array[Prime, 100]
```
Out[538]=
```
{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[539]:=
```
Array[Prime[# + 1] - Prime[#] &, 100]
```
Out[539]=
```
{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}
```

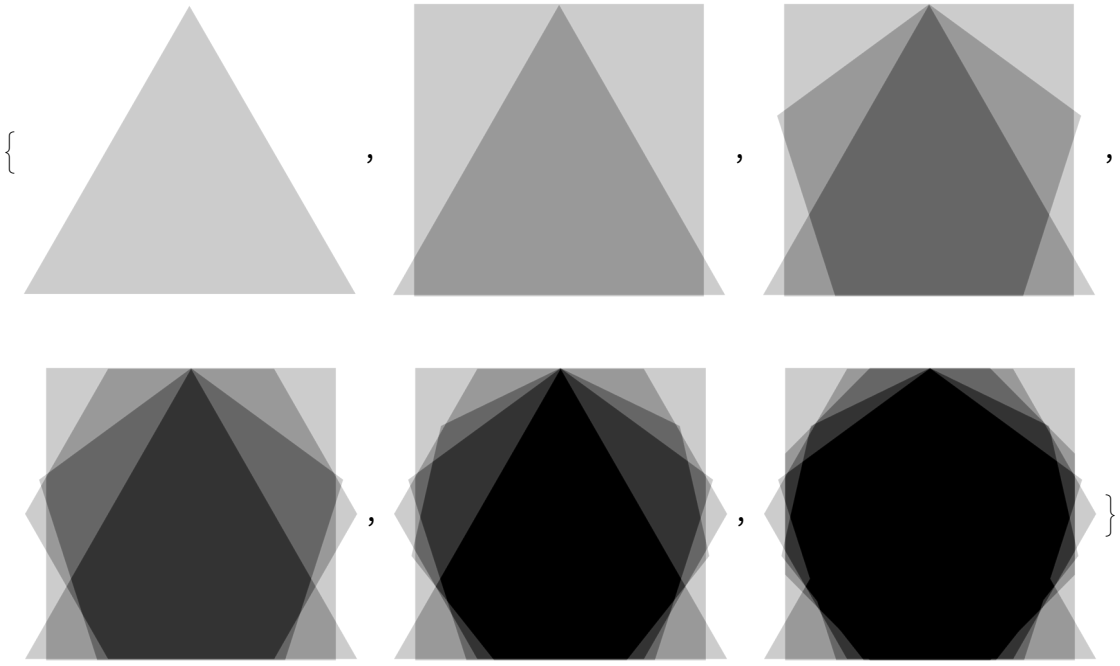
In[540]:=
```
Grid[Array[Plus, {9, 9}]]
```
Out[540]=
```
 2  3  4  5  6  7  8  9 10
 3  4  5  6  7  8  9 10 11
 4  5  6  7  8  9 10 11 12
 5  6  7  8  9 10 11 12 13
 6  7  8  9 10 11 12 13 14
 7  8  9 10 11 12 13 14 15
 8  9 10 11 12 13 14 15 16
 9 10 11 12 13 14 15 16 17
10 11 12 13 14 15 16 17 18
```

In[541]:=
```
FoldList[Times, 1, Range[10]]
```
Out[541]=
```
{1, 1, 2, 6, 24, 120, 720, 5040, 40 320, 362 880, 3 628 800}
```

In[542]:=
```
FoldList[Times, 1, Array[Prime, 10]]
```
Out[542]=
```
{1, 2, 6, 30, 210, 2310, 30 030, 510 510, 9 699 690, 223 092 870, 6 469 693 230}
```

In[543]:=
```
FoldList[ImageAdd, Graphics[Style[RegularPolygon[#], Opacity[0.2]]] & /@ Range[3, 8]]
```

Out[543]=



Chapter 30

In[544]:=
```
Thread[Alphabet[] → LetterNumber[Alphabet[]]]
```

Out[544]=
```
{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[545]:=
```
Grid[Partition[FromLetterNumber[Range[24]], 4]]
```

Out[545]=
```
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[546]:=

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

Out[546]=

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[547]:=

```
Grid[Partition[Characters[WikipediaData["computers"]][[1 ;; 400]], 20], Frame → All]
```

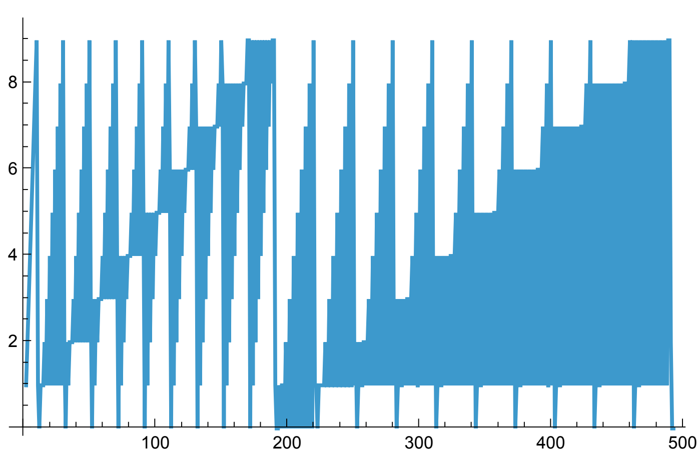
Out[547]=

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[548]:=

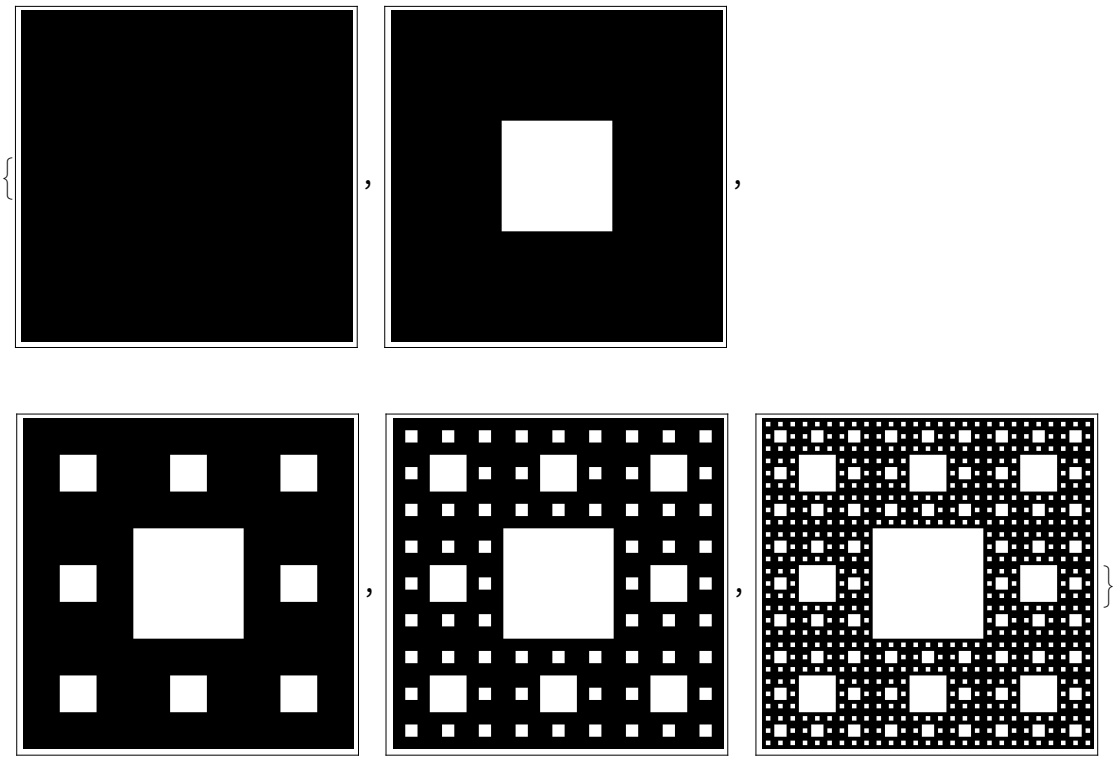
```
ListLinePlot[Flatten[IntegerDigits[ Range[200]]]]
```

Out[548]=



In[549]:=
```
ArrayPlot /@
 NestList[ArrayFlatten[{{#, #, #}, {#, 0, #}, {#, #, #}}] &, {{1}}, 4]
```

Out[549]=



In[550]:=
```
Select[Flatten[Table[{x, y, Sqrt[x^2 + y^2]}, {x, 20}, {y, 20}], 1],
 IntegerQ[Last[#]] &]
```

Out[550]=
```
{{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[551]:=
```
SortBy[WordList[][[1 ;; 50]], StringTake[StringReverse[#], 1] &]
```

Out[551]=
```
{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[552]:=
```
Table[Max[Length[Gather[IntegerDigits[2^n]]]], {n, 100}]
```
Out[552]=
```
{1, 1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 3, 5, 4, 4, 7, 6, 5, 4, 4, 4, 6,
 6, 6, 9, 7, 7, 5, 6, 6, 7, 7, 8, 7, 7, 7, 6, 8, 7, 9, 8, 7, 8, 9, 7, 8, 9, 8,
 7, 7, 8, 8, 7, 9, 8, 9, 9, 9, 9, 9, 9, 8, 9, 10, 9, 10, 7, 9, 8, 9, 9, 9, 8, 9,
 10, 9, 9, 10, 9, 10, 9, 9, 10, 10, 10, 9, 8, 9, 9, 10, 10, 10, 10, 10, 9, 10}
```

In[553]:=
```
SortBy[IntegerDigits[Table[x^2, {x, 20}]], First]
```
Out[553]=
```
{{1}, {1, 6}, {1, 0, 0}, {1, 2, 1}, {1, 4, 4}, {1, 6, 9},
 {1, 9, 6}, {2, 5}, {2, 2, 5}, {2, 5, 6}, {2, 8, 9}, {3, 6},
 {3, 2, 4}, {3, 6, 1}, {4}, {4, 9}, {4, 0, 0}, {6, 4}, {8, 1}, {9}}
```

In[554]:=
```
GatherBy[IntegerName[Range[100]], StringTake[#, 1] &]
```
Out[554]=
```
{{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[555]:=
```
SortBy[IntegerName[Range[20]], StringLength]
```
Out[555]=
```
{one, six, ten, two, five, four, nine, eight, seven, three, eleven, twelve,
 twenty, fifteen, sixteen, eighteen, fourteen, nineteen, thirteen, seventeen}
```

In[556]:=
```
GatherBy[RandomSample[WordList[], 20], StringLength]
```
Out[556]=
```
{{laureate, bearskin, publicly, rubidium}, {talkie, zapper, spurge, anthem},
 {hard, pink}, {sheep, stiff, plait}, {crystallography}, {technophobia},
 {thimble, reveler, caliber}, {stabilization}, {raspberry}}
```

In[557]:=
```
Complement[Alphabet["Ukrainian"], Alphabet["Russian"]]
```
Out[557]=
```
{є, і, ї, ґ}
```

In[558]:=
```
Intersection[Table[x^2, {x, 100}], Table[x^3, {x, 100}]]
```
Out[558]=
```
{1, 64, 729, 4096}
```

In[559]:=
```
Intersection[EntityList[North Atlantic Treaty Organization COUNTRIES], EntityList[Group of 8 COUNTRIES]]
```
Out[559]=
```
{Canada, France, Germany, Italy, United Kingdom, United States}
```

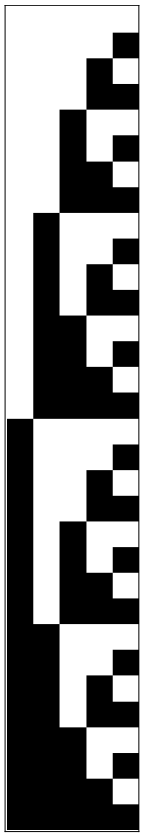
In[560]:=
```
Grid[Transpose[Permutations[Range[4]]]]
```
Out[560]=
```
1 1 1 1 1 1 2 2 2 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4
2 2 3 3 4 4 1 1 3 3 4 4 1 1 2 2 4 4 1 1 2 2 3 3
3 4 2 4 2 3 3 4 1 4 1 3 2 4 1 4 1 2 2 3 1 3 1 2
4 3 4 2 3 2 4 3 4 1 3 1 4 2 4 1 2 1 3 2 3 1 2 1
```

In[561]:=
```
Permutations[Characters["hello"]]
```
Out[561]=
```
{{h, e, l, l, o}, {h, e, l, o, l}, {h, e, o, l, l}, {h, l, e, l, o}, {h, l, e, o, l},
 {h, l, l, e, o}, {h, l, l, o, e}, {h, l, o, e, l}, {h, l, o, l, e}, {h, o, e, l, l},
 {h, o, l, e, l}, {h, o, l, l, e}, {e, h, l, l, o}, {e, h, l, o, l}, {e, h, o, l, l},
 {e, l, h, l, o}, {e, l, h, o, l}, {e, l, l, h, o}, {e, l, l, o, h}, {e, l, o, h, l},
 {e, l, o, l, h}, {e, o, h, l, l}, {e, o, l, h, l}, {e, o, l, l, h}, {l, h, e, l, o},
 {l, h, e, o, l}, {l, h, l, e, o}, {l, h, l, o, e}, {l, h, o, e, l}, {l, h, o, l, e},
 {l, e, h, l, o}, {l, e, h, o, l}, {l, e, l, h, o}, {l, e, l, o, h}, {l, e, o, h, l},
 {l, e, o, l, h}, {l, l, h, e, o}, {l, l, h, o, e}, {l, l, e, h, o}, {l, l, e, o, h},
 {l, l, o, h, e}, {l, l, o, e, h}, {l, o, h, e, l}, {l, o, h, l, e}, {l, o, e, h, l},
 {l, o, e, l, h}, {l, o, l, h, e}, {l, o, l, e, h}, {o, h, e, l, l}, {o, h, l, e, l},
 {o, h, l, l, e}, {o, e, h, l, l}, {o, e, l, h, l}, {o, e, l, l, h}, {o, l, h, e, l},
 {o, l, h, l, e}, {o, l, e, h, l}, {o, l, e, l, h}, {o, l, l, h, e}, {o, l, l, e, h}}
```

In[562]:=

```
ArrayPlot[Tuples[{0, 1}, 5]]
```

Out[562]=



In[563]:=

```
RandomChoice[Alphabet[], {10, 5}]
```

Out[563]=

```
{{j, o, p, d, t}, {n, w, c, d, r}, {a, m, m, q, e}, {j, d, w, j, u}, {l, w, s, t, s},
 {w, c, p, v, z}, {s, c, s, g, z}, {c, p, z, a, m}, {v, b, k, r, a}, {x, m, h, u, i}}
```

In[564]:=

```
RandomChoice[Range[2], {8, 3}]
```

Out[564]=

```
{{2, 2, 1}, {2, 1, 2}, {2, 1, 1}, {2, 2, 1}, {2, 2, 2}, {2, 1, 1}, {1, 1, 2}, {1, 1, 1}}
```