

# Jeremy — PS 11 — 2025-03-18

## EIWL3 Sections 29 and 30

In[371]:=

**Array[Prime, 100]**

Out[371]=

{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[372]:=

**Array[Prime[# + 1] - Prime[#] &, 100]**

Out[372]=

{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[373]:=

**Array[#1 + #2 &, {10, 10}] // Grid**

Out[373]=

```
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[374]:=

**FoldList[#1 \* #2 &, 1, Range[10]]**

Out[374]=

{1, 1, 2, 6, 24, 120, 720, 5040, 40320, 362880, 3628800}

In[375]:=

**FoldList[#1 \* #2 &, 1, Array[Prime, 10]]**

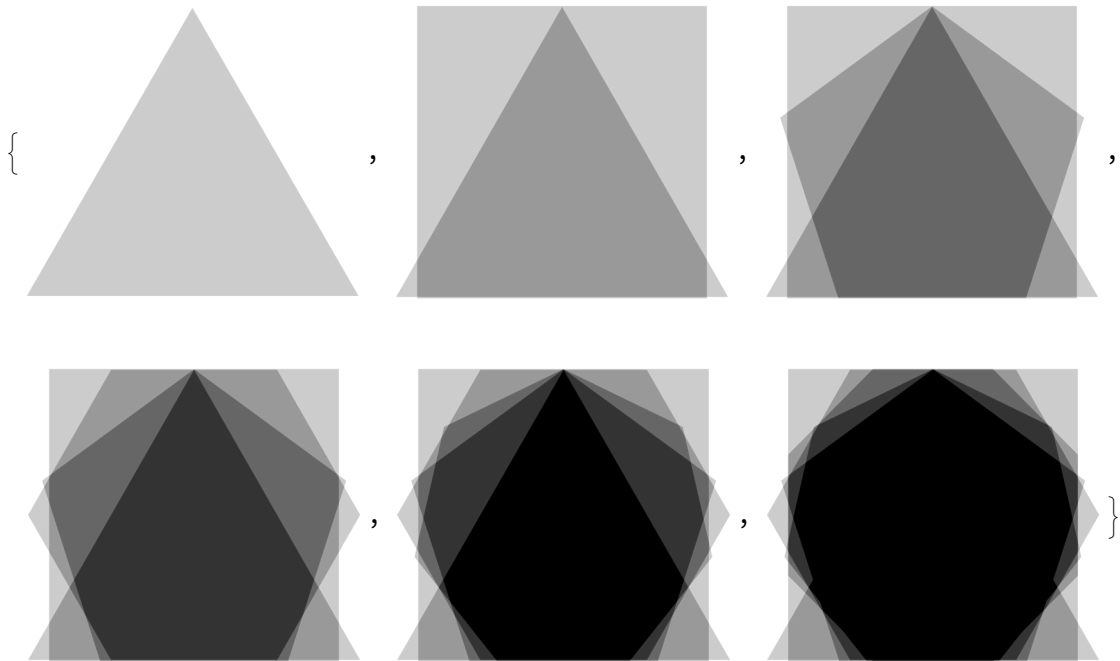
Out[375]=

{1, 2, 6, 30, 210, 2310, 30030, 510510, 9699690, 223092870, 6469693230}

In[376]:=

```
FoldList[ImageAdd,
  Table[Graphics[Style[RegularPolygon[n], Opacity[0.2]]], {n, 3, 8}]]
```

Out[376]=



In[377]:=

```
Thread[Alphabet[] → Range[26]]
```

Out[377]=

```
{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[378]:=

```
Grid[Partition[Take[Alphabet[], 24], 6]]
```

Out[378]=

```
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[379]:=

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

Out[379]=

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	6

In[380]:=

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

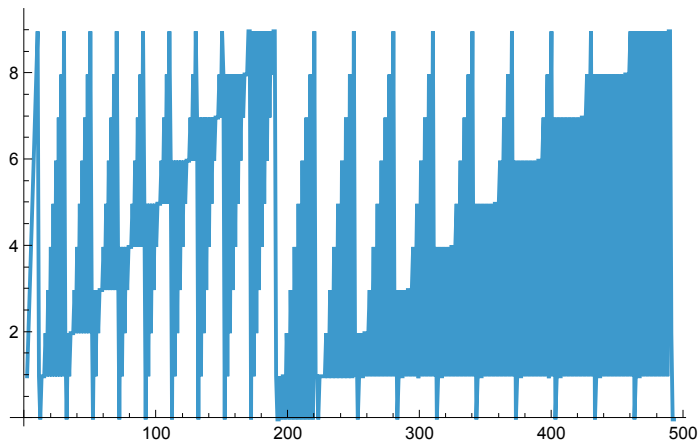
Out[380]=

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
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
	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	.
	T	h	e	s	e		c	o	m	p	u	t	e	r	s		t	o
	t	o		p	e	r	f	o	r	m		a		w	i	d	e	r
	r	a	n	g	e		o	f		t	a	s	k	s	.		T	h
	e	t		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[381]:=

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

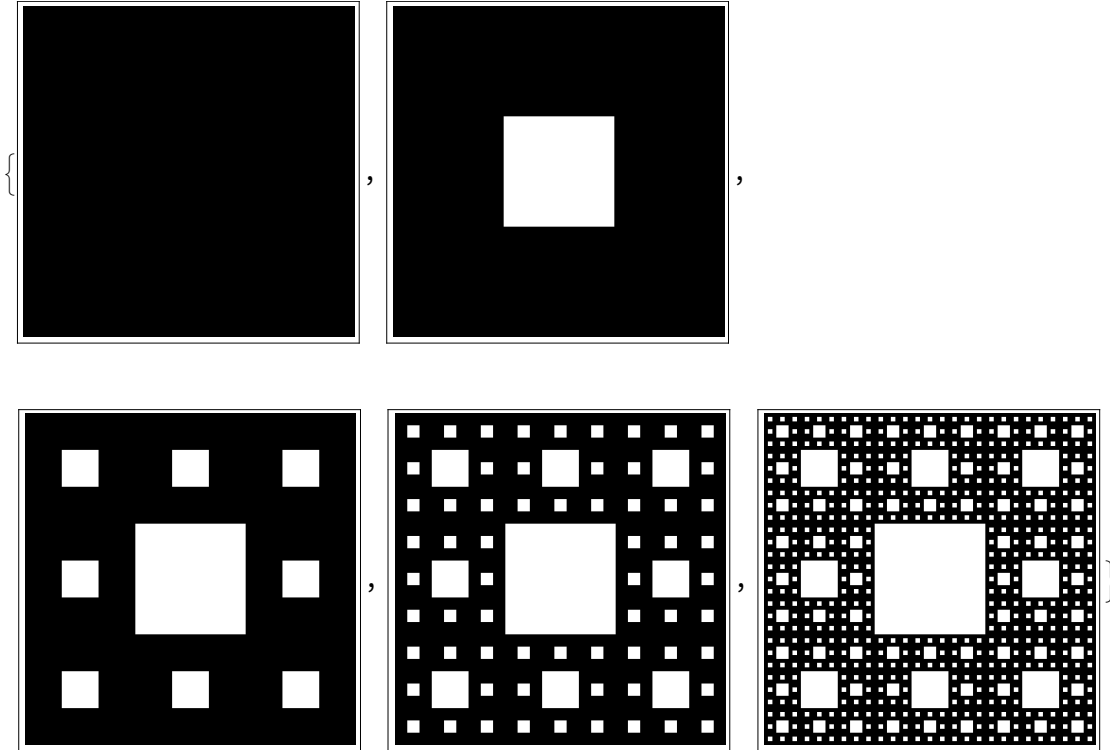
Out[381]=



In[382]:=

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

Out[382]=



In[383]:=

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

Out[383]=

```
{{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[384]:=

```
Table[Length[Last[SortBy[Split[IntegerDigits[2^n]], Length]]], {n, 100}]
```

Out[384]=

```
{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}
```

In[385]:=

**GatherBy[Table[IntegerName[n], {n, 100}], First[Characters[#]] &]**

Out[385]=

```
{ {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[386]:=

**SortBy[Take[WordList[], 50], Last[Characters[#]] &]**

Out[386]=

```
{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[387]:=

**SortBy[Array[#^2 &, 20], First[IntegerDigits[#]] &]**

Out[387]=

```
{1, 16, 100, 121, 144, 169, 196, 25, 225, 256, 289, 36, 324, 361, 4, 49, 400, 64, 81, 9}
```

In[388]:=

**SortBy[Range[20], StringLength[IntegerName[#]] &]**

Out[388]=

```
{1, 2, 6, 10, 4, 5, 9, 3, 7, 8, 11, 12, 20, 15, 16, 13, 14, 18, 19, 17}
```

In[389]:=

**GatherBy[RandomSample[WordList[], 20], StringLength[#] &]**

Out[389]=

```
{{sculptor, unbolted},
  {seaworthy, dyspepsia, shipwreck, squinting, predicate, upholster, squalidly},
  {ceding, canvas}, {newspaperwoman}, {schizophrenia, magniloquence},
  {cheddar, mindset, netting}, {squad}, {assertively}, {arrogation}}
```

```
In[390]:= Complement[Alphabet["Ukrainian"], Alphabet["Russian"]]
```

```
Out[390]= {є, і, ї, ґ}
```

```
In[391]:= Intersection[Array[#^2 &, 100], Array[#^3 &, 100]]
```

```
Out[391]= {1, 64, 729, 4096}
```

```
In[392]:= Intersection[EntityList[Group of 8 COUNTRIES ✓],
  EntityList[North Atlantic Treaty Organization COUNTRIES ... ✓]]
```

```
Out[392]= {Canada, France, Germany, Italy, United Kingdom, United States}
```

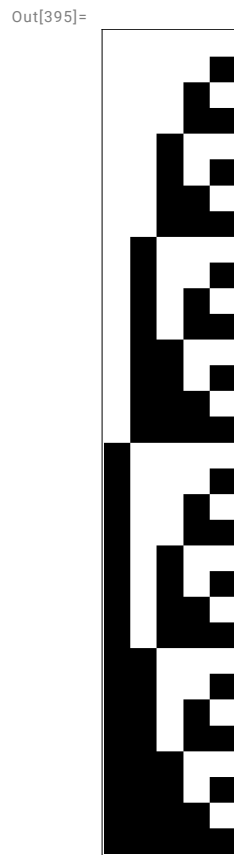
```
In[393]:= Grid[Transpose[Permutations[Range[4]]]]
```

```
Out[393]=
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[394]:= StringJoin /@ Permutations[Characters["hello"]]
```

```
Out[394]= {hello, helol, heoll, hlelo, hleol, hlleo, hlloe, hloel, hlle, hoell, holel, holle,
  ehlllo, ehllol, eholl, elhlo, elhol, ellho, elloh, elohl, elolh, eohll, eolhl, eollh,
  lhelo, lheol, lhleo, lhloe, lhoel, lhle, lehlo, lehol, lelho, leloh, leohl, leolh,
  llheo, llhoe, lleho, lleoh, llohe, lloeh, lohel, lohle, loehl, loelh, lolhe, loleh,
  ohell, ohlel, ohlle, oehll, oelhl, oelhl, olhel, olhle, olehl, olelh, ollhe, olleh}
```

```
In[395]:= ArrayPlot[Tuples[{0, 1}, 5]]
```



```
In[396]:= Table[StringJoin[RandomChoice[Alphabet[], 5]], 10]
```

```
Out[396]= {nocqy, wvlhj, oxrso, bksye, imdxj, ydyjb, oioto, jgphy, kbmtt, yqazk}
```

```
In[397]:= Tuples[{1, 2}, 3]
```

```
Out[397]= {{1, 1, 1}, {1, 1, 2}, {1, 2, 1}, {1, 2, 2}, {2, 1, 1}, {2, 1, 2}, {2, 2, 1}, {2, 2, 2}}
```