

Brian — PS 11 — 2025-03-18 — Solution

EIWL3 Sections 29 and 30

!! HELP — I HAD TROUBLE WITH 30.7 and 30.10 !!

Exercises from *EIWL3* Section 29

In[343]:=

```
(* 29.1 *) Array[Prime, 100]
```

Out[343]=

```
{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[344]:=

```
(* 29.2 *) Array[Prime[#] - Prime[# - 1] &, 99, 2]
```

Out[344]=

```
{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}
```

In[345]:=

```
(* 29.3*) Array[Plus, {10, 10}] // Grid
```

Out[345]=

```
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[346]:=

```
(* 29.4 *) FoldList[Times, Range[10]]
```

Out[346]=

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

In[347]:=

```
(* 29.5 *) FoldList[Times, Array[Prime, 10]]
```

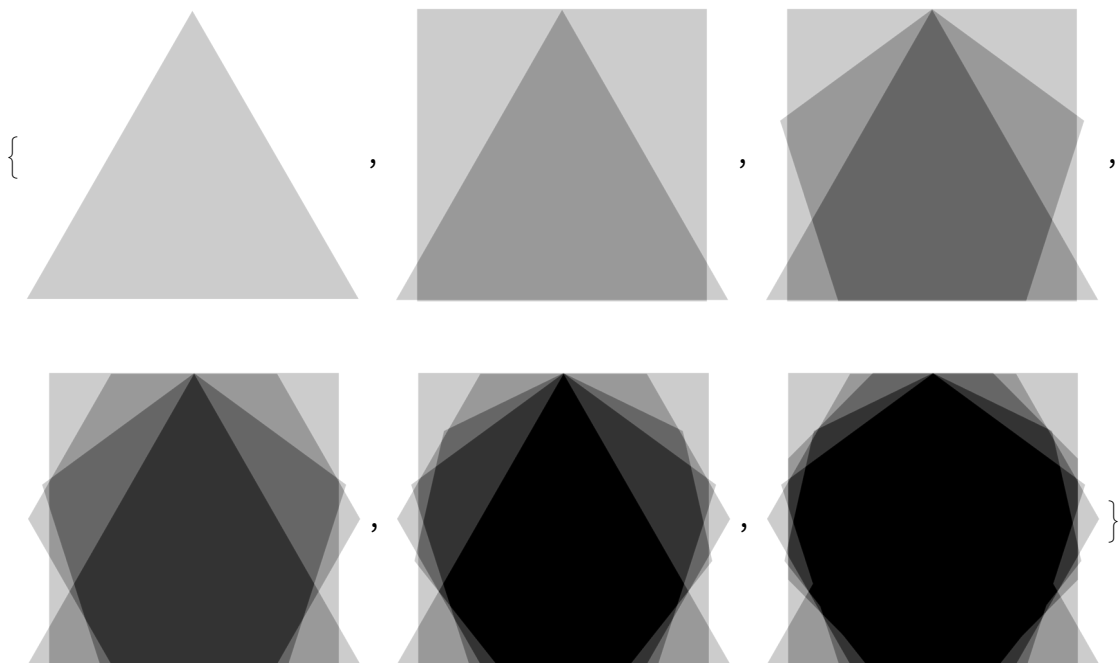
Out[347]=

```
{2, 6, 30, 210, 2310, 30 030, 510 510, 9 699 690, 223 092 870, 6 469 693 230}
```

In[348]:=

```
(* 29.6 *) FoldList[ImageAdd,  
Graphics /@ Array[{Opacity[0.2], RegularPolygon[#]} &, 6, 3]]
```

Out[348]=



Exercises from *EIWL3* Section 30

In[349]:=

```
(* 30.1 *) Thread[Alphabet[] → LetterNumber /@ Alphabet[]]
```

Out[349]=

```
{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[350]:=

```
(* 30.2 *) Partition[Alphabet[], 6] // Grid
```

Out[350]=

```
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[351]:=
```

```
(* 30.3 *) Partition[IntegerDigits[21000], 50] // Grid[#, Frame → All] &
```

Out[351]=

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[352]:=
```

(* 30.4 *)

```
Partition[Characters[StringTake[WikipediaData["computers"], 400]], 20] //  
Grid[#, Frame -> All] &
```

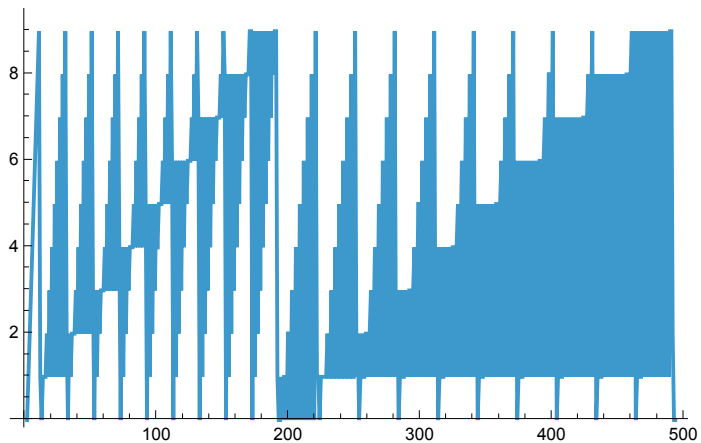
Out[352]=

[illegible]

In[353]:=

```
(* 30.5 *)ListLinePlot[Flatten[ IntegerDigits /@ Range[0, 200]]]
```

Out[353]=

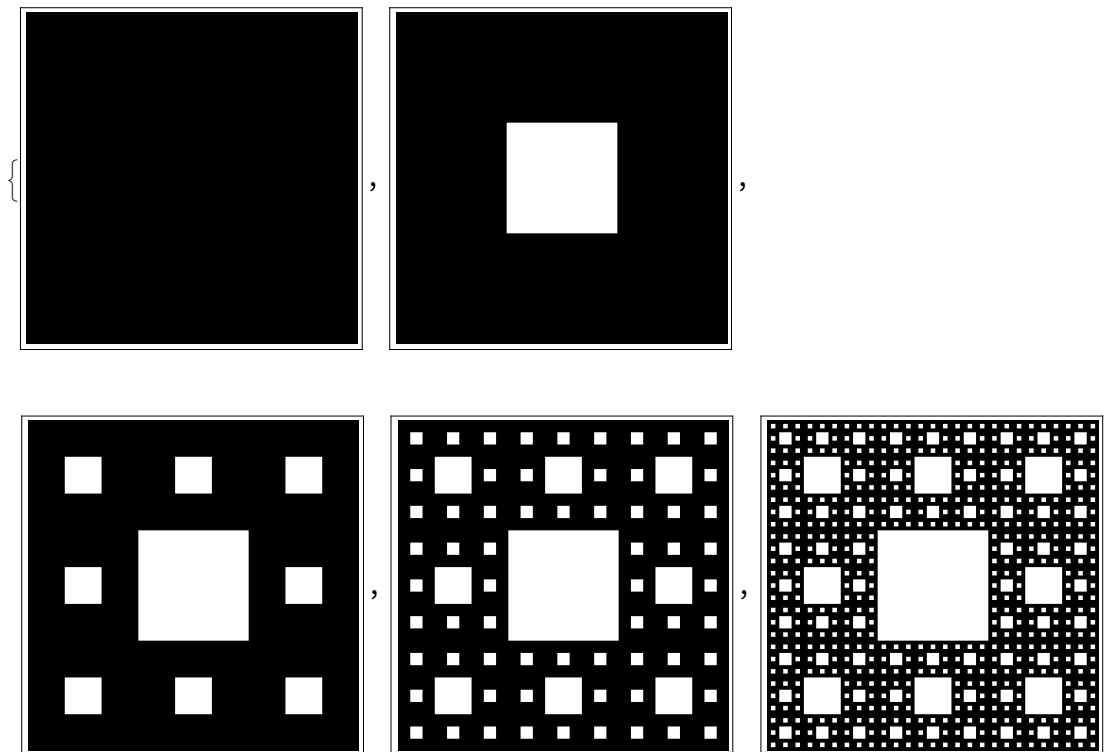


In[354]:=

```
(* 30.6 *)
```

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

Out[354]=



In[355]:=

```
(* 30.7 *) myList = Array[{#1, #2, Sqrt[#1^2 + #2^2]} &, {5, 5}]
```

Out[355]=

```
{{{1, 1, Sqrt[2]}, {1, 2, Sqrt[5]}, {1, 3, Sqrt[10]}, {1, 4, Sqrt[17]}, {1, 5, Sqrt[26]}},
 {{2, 1, Sqrt[5]}, {2, 2, 2 Sqrt[2]}, {2, 3, Sqrt[13]}, {2, 4, 2 Sqrt[5]}, {2, 5, Sqrt[29]}},
 {{3, 1, Sqrt[10]}, {3, 2, Sqrt[13]}, {3, 3, 3 Sqrt[2]}, {3, 4, 5}, {3, 5, Sqrt[34]}},
 {{4, 1, Sqrt[17]}, {4, 2, 2 Sqrt[5]}, {4, 3, 5}, {4, 4, 4 Sqrt[2]}, {4, 5, Sqrt[41]}},
 {{5, 1, Sqrt[26]}, {5, 2, Sqrt[29]}, {5, 3, Sqrt[34]}, {5, 4, Sqrt[41]}, {5, 5, 5 Sqrt[2]}}}
```

In[356]:=

```
Select[myList, IntegerQ[Last[#]] &]
```

Out[356]=

```
{}
```

In[357]:=

```
(* 30.8 *) Array[Length[Last[Sort[Split[IntegerDigits[2#]]]]] &, 100]
```

Out[357]=

```
{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[358]:=

```
(* 30.9 *) Gather[Array[IntegerName, 100],
 First[Characters[#1]] == First[Characters[#2]] &]
```

Out[358]=

```
{{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[359]:=

```
(* 30.10 *) Sort[Take[WordList[], 50], Last[Characters[#1]] < Last[Characters[#2]] &]
```

Out[359]=

```
{a, aah, aardvark, aback, abacus, abaft, abalone, abandon, abandoned, abandonment,
abase, abasement, abash, abashed, abashment, abate, abatement, abattoir,
abbe, abbess, abbey, abbot, abbreviate, abbreviated, abbreviation, abdicate,
abdication, abdomen, abdominal, abduct, abducting, abduction, abductor,
abeam, abed, aberrant, aberration, abet, abettor, abeyance, abhor, abhorrence,
abhorrent, abidance, abide, abiding, ability, abject, abjection, abjectly}
```

In[360]:=

```
(* 30.11 *)
Sort[Array[#^2 &, 20], First[IntegerDigits[#1]] < First[IntegerDigits[#2]] &]
```

Out[360]=

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

In[361]:=

```
(* 30.12 *) Sort[Array[IntegerName, 20], StringLength[#1] < StringLength[#2] &]
```

Out[361]=

```
{ten, six, two, one, nine, five, four, eight, seven, three, twenty, twelve,
eleven, sixteen, fifteen, nineteen, eighteen, fourteen, thirteen, seventeen}
```

In[362]:=

```
(* 30.13 *)
Gather[RandomChoice[WordList[], 20], StringLength[#1] == StringLength[#2] &]
```

Out[362]=

```
{{shine}, {swelled, stumble, descant}, {assemble, methanol, loveless, strainer},
{niggle, gossip, untidy, carpel}, {eyeglasses, underskirt},
{opalescence, propinquity}, {vent}, {simultaneity}, {UFO}, {corollary}}
```

In[363]:=

```
(* 30.14 *) Complement[Alphabet["Russian"], Alphabet["Ukrainian"]]
```

Out[363]=

```
{б, ъ, э, ё}
```

In[364]:=

```
(* 30.15 *) Intersection[Array[#^2 &, 100], Array[#^3 &, 100]]
```


Out[364]=

```
{1, 64, 729, 4096}
```

In[365]:=

```
(* 30.16 *) Intersection[EntityList[ Group of 8 COUNTRIES],
EntityList[ North Atlantic Treaty Organization COUNTRIES]]
```

Out[365]=

```
{, , , , , 
```

In[366]:=

(* 30.17 *) Transpose[Permutations[Range[4]]] // Grid

Out[366]=

```

1 1 1 1 1 1 2 2 2 2 2 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[367]:=

(* 30.18 *) Permutations[Characters["hello"]]

Out[367]=

```

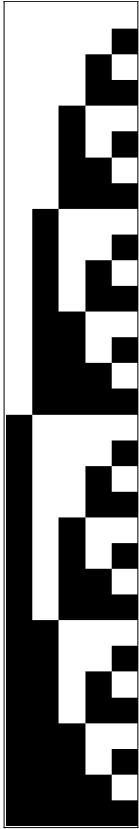
{{h, e, l, l, o}, {h, e, l, o, l}, {h, e, o, l, l}, {h, l, e, l, o}, {h, l, e, o, l},
 {h, l, l, e, o}, {h, l, l, o, e}, {h, l, o, e, l}, {h, l, o, l, e}, {h, o, e, l, l},
 {h, o, l, e, l}, {h, o, l, l, e}, {e, h, l, l, o}, {e, h, l, o, l}, {e, h, o, l, l},
 {e, l, h, l, o}, {e, l, h, o, l}, {e, l, l, 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[368]:=

(* 30.19 *) ArrayPlot[Tuples[{0, 1}, 5]]

Out[368]=



In[369]:=

(* 30.20 *) Table[RandomChoice[Alphabet[], 5], 5]

Out[369]=

{ {q, z, r, m, s}, {e, p, e, y, r}, {t, t, e, t, f}, {a, t, x, q, c}, {b, b, g, s, z} }

In[370]:=

(* 30.21 *) Flatten[Array[{#1, #2, #3} &, {2, 2, 2}], 2]

Out[370]=

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