Hexi—PS18—2025 - 04 - 15

8/8

Due to getting a little behind in the final two weeks of the semester, I only checked for completeness on PS 18-21.
~Brian

Exercises from EIWL3 Section 41

```
In[•]:= Cases[IntegerDigits[#^2 & /@ Range[100]], {___, x__, x__, ___}]
```

```
Out[•]=
{{1, 0, 0}, {1, 4, 4}, {2, 2, 5}, {4, 0, 0}, {4, 4, 1}, {9, 0, 0}, {1, 1, 5, 6},
 {1, 2, 2, 5}, {1, 4, 4, 4}, {1, 6, 0, 0}, {2, 1, 1, 6}, {2, 2, 0, 9},
 {2, 5, 0, 0}, {3, 3, 6, 4}, {3, 6, 0, 0}, {3, 8, 4, 4}, {4, 2, 2, 5},
 {4, 4, 8, 9}, {4, 9, 0, 0}, {5, 7, 7, 6}, {6, 4, 0, 0}, {6, 8, 8, 9},
 {7, 2, 2, 5}, {7, 7, 4, 4}, {8, 1, 0, 0}, {8, 8, 3, 6}, {1, 0, 0, 0, 0}}
```

```
In[•]:= Select[ToString[RomanNumeral[#]] & /@ Range[100],
  StringMatchQ[#, {___ ~~ "L" ~~ ___ ~~ "I" ~~ ___ ~~ "X" ~~ ___}] &]
```

```
Out[•]=
{XLIX, LIX, LXIX, LXXIX, LXXXIX}
```

```
In[•]:= f[List_] := If[List == Reverse[List], T, F]
        f[{1, 2, 3}]
        f[{1, 1, 1}]
```

```
Out[•]=
F
```

```
Out[•]=
T
```

```
In[•]:= Cases[Partition[TextWords[WikipediaData["alliteration"]], 2, 1],
  {x_, y_} /; StringTake[x, 1] == StringTake[y, 1]]
```

```
Out[•]=
{{or, of}, {as, a}, {Peter, Piper}, {pickled, peppers}, {Irish, It},
 {as, an}, {ideas, in}, {Icelandic, It}, {cartoon, characters}, {the, term},
 {identical, initial}, {several, special}, {as, alliteration}, {stressed, syllables},
 {as, an}, {lazy, languid}, {languid, line}, {as, alliteration}, {be, because},
 {such, syllables}, {syllables, start}, {consonant, clusters}, {sp, st},
 {consonant, clusters}, {s, sound}, {consonant, cluster}, {cluster, can},
```

{with, words}, {consonant, cluster}, {s, such}, {sp, st}, {Walt, Whitman},
{Splendid, Silent}, {Silent, Sun}, {consonant, clusters}, {sp, st},
{spit, sting}, {stick, skin}, {consonant, clusters}, {s, seems}, {same, source},
{consonant, clusters}, {to, the}, {the, two}, {identical, in}, {at, any},
{home, hot}, {as, a}, {stressed, syllable}, {humble, house}, {potential, power},
{power, play}, {play, picture}, {picture, perfect}, {money, matters}, {rocky, road},
{quick, question}, {Peter, Piper}, {pickled, peppers}, {of, outside}, {same, sound},
{of, outside}, {to, the}, {brown, blazers}, {in, its}, {Poetry, Poets}, {can, call},
{splendid, silent}, {silent, sun}, {Walt, Whitman}, {Splendid, Silent},
{Silent, Sun}, {wondered, what}, {his, horse}, {also, add}, {to, the},
{harsh, hard}, {they, than}, {slippered, sleep}, {lean, lithe}, {fleet, flown},
{E., E.}, {heaped, heartbreak}, {fire, forthrightly}, {Chappell, Chestnuts},
{finally, finding}, {Finch, Fresh-firecoal}, {plotted, pieced}, {fold, fallow},
{height, hangs}, {hangs, his}, {who, wanders}, {barred, by}, {Who, Wanders},
{I, In}, {sat, silent}, {We, Were}, {swart, ship}, {with, weeping}, {out, onward},
{out, of}, {to, the}, {sun, sword}, {axe, angles}, {hell's, handiwork},
{silken, sad}, {breeze, blew}, {foam, flew}, {furrow, followed}, {followed, free},
{stood, still}, {churlish, chiding}, {winter's, wind}, {brown, below},
{harvests, hang}, {heavy, head}, {Brent, Bernard}, {who, watch}, {watch, with},
{with, wild}, {wild, wonder}, {wide, window}, {beautiful, birds}, {birds, begin},
{bountiful, birdseed}, {Thurston, Three}, {grey, geese}, {Grey, Geese},
{Betty, Botter}, {butter, but}, {she, said}, {butter's, bitter}, {it, in},
{make, my}, {batter, bitter}, {bitter, but}, {better, butter}, {make, my},
{bitter, batter}, {batter, better}, {the, tongue-twister}, {Betty, Botter},
{Peter, Piper}, {pickled, peppers}, {Peter, Piper}, {pickled, peppers},
{pickled, peppers}, {Peter, Piper}, {Helplessly, Hoping}, {throughout, the},
{stand, still}, {stood, still}, {Fairyland, Fanfare}, {legend, live},
{live, life}, {all, alone}, {to, the}, {lunar, lure}, {lacking, lustre},
{late, last}, {as, an}, {an, artistic}, {emotional, effect}, {any, attitude},
{is, in}, {as, an}, {which, we}, {our, only}, {of, our}, {our, own}, {but, by},
{today, that}, {that, the}, {truths, that}, {is, inextricably}, {to, the},
{itself, is}, {testimony, to}, {to, the}, {have, had}, {because, brave},
{freedom's, front}, {Ronald, Reagan}, {Vietnam, Veterans}, {new, nation}, {to, the},
{portae, proficiscere}, {blonde, bad-built}, {bad-built, butch}, {butch, body},
{and, adds}, {adds, an}, {an, alliteration}, {Μάρθα, Μάρθα}, {Martha, Martha},
{Martha, Martha}, {House, Handbook}, {Modern, Memory}, {to, the}, {Some, Suggestive},
{4, 438}, {438, 45}, {E, E}, {55, 5}, {388, 390}, {Indolence, ISBN},
{R, R}, {alliteration, and}, {and, alliterative}, {alliterations, and}}

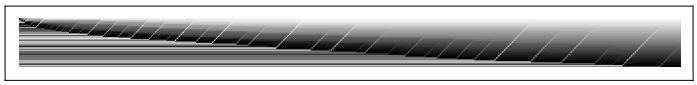
In[•]:=
```
FixedPointList[
  (# /. {x___, b_, a_, y___} /; b > a → {x, a, b, y}) &, {4, 5, 1, 3, 2}] // Grid
```

Out[•]=

```
4 5 1 3 2
4 1 5 3 2
1 4 5 3 2
1 4 3 5 2
1 3 4 5 2
1 3 4 2 5
1 3 2 4 5
1 2 3 4 5
1 2 3 4 5
```

In[•]:=
```
ArrayPlot[Transpose[FixedPointList[
    (# /. {x___, b_, a_, y___} /; b > a → {x, a, b, y} &), RandomSample[Range[50]]]]]
```

Out[•]=



In[•]:=
```
FixedPointList[(# + 2 / #) / 2 &, 1.0]
```

Out[•]=
```
{1., 1.5, 1.41667, 1.41422, 1.41421, 1.41421, 1.41421}
```

In[•]:=
```
algorithm[{a_, b_}] := {b, Mod[a, b]};
NestList[algorithm, {12 345, 54 321}, 6]
```

Out[•]=
```
{{12 345, 54 321}, {54 321, 12 345},
 {12 345, 4941}, {4941, 2463}, {2463, 15}, {15, 3}, {3, 0}}
```

In[•]:=
```
FixedPointList[
 # /. {s[x_][y_][z_] → x[z][y[z]], k[x_][y_] → x} &, s[s][k][s[s[s]][s]][s]]
```

Out[•]=
```
{s[s][k][s[s[s]][s]][s], s[s[s[s]][s]][k[s[s[s]][s]]][s],
 s[s[s]][s][s][k[s[s[s]][s]][s]], s[s][s][s[s]][s[s[s]][s]],
 s[s[s]][s[s[s]]][s[s[s]][s]], s[s][s[s[s]][s]][s[s[s]][s[s[s]][s]]],
 s[s[s[s]][s[s[s]][s]]][s[s[s]][s][s[s[s]][s[s[s]][s]]]],
 s[s[s[s]][s[s[s]][s]]][s[s][s[s[s]][s[s[s]][s]]][s[s[s[s]][s[s[s]][s]]]]],
 s[s[s[s]][s[s[s]][s]]][
  s[s[s[s[s]][s[s[s]][s]]]][s[s[s]][s[s[s]][s]][s[s[s[s]][s[s[s]][s]]]]],
 s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]][s[s][s[s[s[s]][s[s[s]][s]]]][
    s[s[s]][s][s[s[s[s]][s[s[s]][s]]]]], s[s[s[s]][s[s[s]][s]]][
  s[s[s[s[s]][s[s[s]][s]]]][s[s[s[s]][s][s[s[s[s]][s[s[s]][s]]]]][
    s[s[s[s]][s[s[s]][s]]][s[s[s]][s][s[s[s[s]][s[s[s]][s]]]]]]]],
 s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]][
   s[s[s][s[s[s[s]][s[s[s]][s]]]][s[s[s[s[s]][s[s[s]][s]]]]][s[s[s[s]][
       s[s[s]][s]]][s[s][s[s[s[s]][s[s[s]][s]]]][s[s[s[s[s]][s[s[s]][s]]]]]]]]],
 s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]][s[s[s[s[s]][s[s[s]][s]]]]][
      s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]]][
    s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]]][
      s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]]]]]],
 s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]][s[s[s[s[s[s[s]][s[s[s]][s]]]]]][
      s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]]][
    s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]]][
      s[s[s[s]][s[s[s]][s]]][s[s[s[s[s]][s[s[s]][s]]]]]]]]}
```

In[•]:=
```
IntegerDigits[100!] /. {x__, 0 ..} → {x}
```

Out[•]=
```
{9, 3, 3, 2, 6, 2, 1, 5, 4, 4, 3, 9, 4, 4, 1, 5, 2, 6, 8, 1, 6, 9, 9, 2, 3, 8,
 8, 5, 6, 2, 6, 6, 7, 0, 0, 4, 9, 0, 7, 1, 5, 9, 6, 8, 2, 6, 4, 3, 8, 1, 6, 2, 1,
 4, 6, 8, 5, 9, 2, 9, 6, 3, 8, 9, 5, 2, 1, 7, 5, 9, 9, 9, 9, 3, 2, 2, 9, 9, 1, 5,
 6, 0, 8, 9, 4, 1, 4, 6, 3, 9, 7, 6, 1, 5, 6, 5, 1, 8, 2, 8, 6, 2, 5, 3, 6, 9, 7,
 9, 2, 0, 8, 2, 7, 2, 2, 3, 7, 5, 8, 2, 5, 1, 1, 8, 5, 2, 1, 0, 9, 1, 6, 8, 6, 4}
```

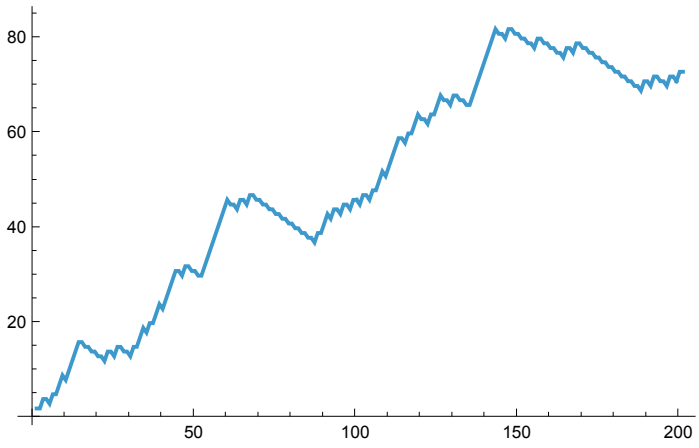
In[•]:=
```
newList[{x_, y_, everythingelse___}] :=
  Switch[x, 0, Join[{everythingelse}, {1, 0, 0}], 1, Join[{everythingelse}, {0, 1}]];
Length /@ NestList[newList, {1, 0}, 200]
```

Out[•]=
```
{2, 2, 3, 3, 4, 4, 5, 6, 6, 7, 8, 9, 9, 10, 11, 11, 12, 12, 13, 13, 14, 14, 15, 16, 16, 17,
 17, 18, 19, 19, 20, 21, 22, 22, 23, 23, 24, 24, 25, 25, 26, 26, 27, 28, 29, 29, 30,
 30, 31, 32, 32, 33, 33, 34, 35, 35, 36, 37, 37, 38, 38, 39, 40, 40, 41, 42, 43, 43,
 44, 44, 45, 45, 46, 46, 47, 47, 48, 48, 49, 50, 50, 51, 52, 53, 53, 54, 55, 55, 56,
 56, 57, 58, 58, 59, 59, 60, 61, 61, 62, 62, 63, 64, 64, 65, 66, 67, 67, 68, 69, 69,
 70, 70, 71, 71, 72, 72, 73, 74, 74, 75, 76, 77, 77, 78, 78, 79, 79, 80, 80, 81, 82,
 82, 83, 84, 85, 85, 86, 87, 87, 88, 88, 89, 89, 90, 90, 91, 92, 92, 93, 93, 94, 95,
 95, 96, 97, 98, 98, 99, 100, 100, 101, 101, 102, 103, 103, 104, 104, 105, 106,
 106, 107, 108, 109, 109, 110, 111, 111, 112, 112, 113, 113, 114, 114, 115, 116,
 116, 117, 117, 118, 119, 119, 120, 121, 122, 122, 123, 123, 124, 124, 125, 125}
```


```
newList[{x_, y_, everythingelse___}] :=
  Switch[x, 0, Join[{everythingelse}, {1, 0, 0}], 1, Join[{everythingelse}, {0, 1}]];
Length /@ NestList[newList, {1, 0}, 200]
```


In[•]:=
```
taglist[{x_, y_, everythingelse___}] := Switch[x, 0, Join[{everythingelse}, {2, 1}],
   1, Join[{everythingelse}, {0}], 2, Join[{everythingelse}, {0, 2, 1, 2}]];
Length /@ NestList[taglist, {0, 0}, 200] // ListLinePlot
```

Out[•]=



Exercises from EIWL3 Section 42

In[•]:=
```
StringRiffle[StringSplit["1 2 3 4"], "---"]
```

Out[•]=
```
1---2---3---4
```

```
In[•]:= Select[StringCases[WikipediaData["computer"], {DigitCharacter ..}],
          StringLength[#] == 4 &] // Sort
```

```
Out[•]=
{1000, 1235, 1357, 1357, 1595, 1613, 1620, 1630, 1640, 1770, 1822, 1831, 1833,
 1835, 1872, 1872, 1876, 1876, 1888, 1890, 1897, 1901, 1901, 1906, 1914, 1920,
 1920, 1925, 1927, 1930, 1934, 1936, 1936, 1937, 1937, 1938, 1939, 1940, 1941,
 1941, 1942, 1943, 1943, 1943, 1943, 1944, 1945, 1945, 1945, 1945, 1945, 1945,
 1947, 1947, 1947, 1948, 1948, 1949, 1950, 1950, 1950, 1950, 1950, 1951,
 1951, 1952, 1953, 1953, 1955, 1955, 1955, 1955, 1957, 1958, 1958, 1959,
 1959, 1960, 1962, 1964, 1967, 1968, 1970, 1970, 1970, 1970, 1990, 1998,
 2000, 2000, 2000, 2016, 2400, 2468, 4000, 4004, 5000, 5100, 6502, 6510}
```

```
In[•]:= StringCases[WikipediaData["computer"], {"===" ~~ Shortest[x__] ~~ "==="}]
```

```
Out[•]=
{=== Pre-20th century ===, === First computer ===,
 === Electromechanical calculating machine ===, === Analog computers ===,
 === Digital computers ===, ==== Electromechanical ===,
 ==== Vacuum tubes and digital electronic circuits ===, === Modern computers ===,
 ==== Concept of modern computer ===, ==== Stored programs ===,
 ==== Transistors ===, ==== Integrated circuits ===, === Mobile computers ===,
 === By architecture ===, === By size, form-factor and purpose ===,
 === History of computing hardware ===, === Other hardware topics ===,
 === Input devices ===, === Output devices ===, === Control unit ===,
 === Central processing unit (CPU) ===, === Arithmetic logic unit (ALU) ===,
 === Memory ===, === Input/output (I/O) ===, === Multitasking ===,
 === Multiprocessing ===, === Languages ===, === Programs ===,
 ==== Stored program architecture ===, ==== Machine code ===,
 ==== Programming language ===, ===== Low-level languages ===,
 ===== High-level languages ===, ==== Program design ===, ==== Bugs ===,
 === Computer architecture paradigms ===, === Artificial intelligence ===}
```

```
In[•]:= Table[StringTemplate["`i`+`j`=`i+j`"][<|"i" → i, "j" → j, "i+j" → i + j|>],
          {i, 1, 9}, {j, 1, 9}] // Grid
```

```
Out[•]=
1+1=2  1+2=3  1+3=4  1+4=5  1+5=6  1+6=7  1+7=8  1+8=9  1+9=10
2+1=3  2+2=4  2+3=5  2+4=6  2+5=7  2+6=8  2+7=9  2+8=10 2+9=11
3+1=4  3+2=5  3+3=6  3+4=7  3+5=8  3+6=9  3+7=10 3+8=11 3+9=12
4+1=5  4+2=6  4+3=7  4+4=8  4+5=9  4+6=10 4+7=11 4+8=12 4+9=13
5+1=6  5+2=7  5+3=8  5+4=9  5+5=10 5+6=11 5+7=12 5+8=13 5+9=14
6+1=7  6+2=8  6+3=9  6+4=10 6+5=11 6+6=12 6+7=13 6+8=14 6+9=15
7+1=8  7+2=9  7+3=10 7+4=11 7+5=12 7+6=13 7+7=14 7+8=15 7+9=16
8+1=9  8+2=10 8+3=11 8+4=12 8+5=13 8+6=14 8+7=15 8+8=16 8+9=17
9+1=10 9+2=11 9+3=12 9+4=13 9+5=14 9+6=15 9+7=16 9+8=17 9+9=18
```

In[•]:=
```
Select[StringCases[IntegerName[#] & /@ Range[50],
    {___ ~~ "i" ~~ ___ ~~ "e" ~~ ___}], # =!= {} &] // Flatten
```

Out[•]=
```
{five, nine, thirteen, fifteen, sixteen, eighteen, nineteen,
 twenty-five, twenty-nine, thirty-one, thirty-three, thirty-five,
 thirty-seven, thirty-eight, thirty-nine, forty-five, forty-nine}
```

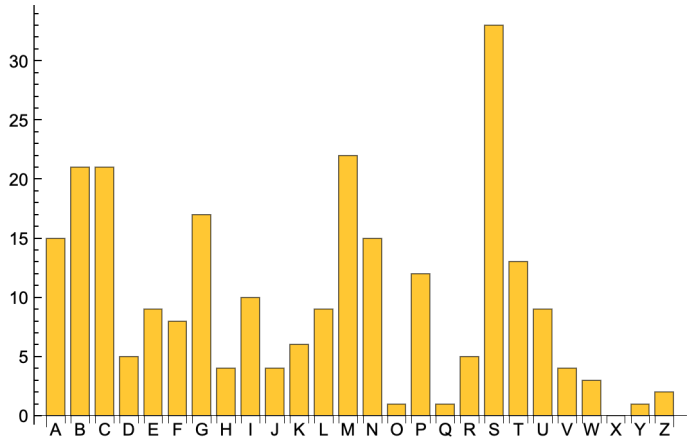
In[•]:=
```
StringReplace[TextSentences[WikipediaData["Computer"]][[1]],
 x : (Whitespace ~~ LetterCharacter ~~ LetterCharacter ~~ Whitespace) :> ToUpperCase[x]]
```

Out[•]=
```
A computer IS a machine that can BE programmed TO automatically
  carry out sequences OF arithmetic OR logical operations (computation).
```

```
TextWords[TextSentences[WikipediaData["Computer"]][[1]]],
```

In[•]:=
```
BarChart[Table[Length[Select[ all countries, dependencies, and territories COUNTRIES ["Name"],
    StringMatchQ[#, ToString[ToUpperCase[FromLetterNumber[n]]] ~~ ___] &]],
  {n, 1, 26}], ChartLabels → ToUpperCase[Alphabet[]]]
```

Out[•]=



In[•]:=
```
Grid[Table[StringJoin[TextString[i], "^",
    TextString[j], "=", TextString[i^j]], {i, 5}, {j, 5}]].»
```

Out[•]=
```
1^1=1  1^2=1   1^3=1   1^4=1    1^5=1
2^1=2  2^2=4   2^3=8   2^4=16   2^5=32
3^1=3  3^2=9   3^3=27  3^4=81   3^5=243 .»
4^1=4 4^2=16  4^3=64  4^4=256 4^5=1024
5^1=5 5^2=25 5^3=125 5^4=625 5^5=3125
```

In[•]:=
```
Table[StringTemplate["`i`^`j`=`i^j`"][<|"i" → i, "j" → j, "i^j" → i^j|>],
  {i, 5}, {j, 5}] // Grid
```

Out[•]=

1^1=1	1^2=1	1^3=1	1^4=1	1^5=1
2^1=2	2^2=4	2^3=8	2^4=16	2^5=32
3^1=3	3^2=9	3^3=27	3^4=81	3^5=243
4^1=4	4^2=16	4^3=64	4^4=256	4^5=1024
5^1=5	5^2=25	5^3=125	5^4=625	5^5=3125