Brian — PS 18 — 2025-04-15 — Solution

EIWL3 Sections 41 and 42

My solutions to 41.9 and 41.10 are broken.

Exercises from *EIWL3* Section 41

In[1]:=
```
(* 41.1 *) Cases[IntegerDigits[Array[#^2 &, 100]], {___, x_, y_, ___} /; x == y]
```

Out[1]=
```
{{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[2]:=
```
(* 41.2 *) StringJoin /@
 Cases[Array[Characters[RomanNumeral[#]] &, 100], {___, "L", ___, "I", ___, "X", ___}]
```

Out[2]=
```
{XLIX, LIX, LXIX, LXXIX, LXXXIX}
```

In[3]:=
```
(* 41.3 *) f[list_] := Equal[list, Reverse[list]]
```

In[4]:=
```
(* 41.4 *) (* So as not to fill up my document, I just took the first 20: *)
Take[Cases[Partition[TextWords[WikipediaData["alliteration"]], 2, 1],
  {x_, y_} /; Characters[x][[1]] == Characters[y][[1]], 20]
```

Out[4]=
```
{{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}}
```

In[5]:=
```
{{"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"}}
(* Notice that this solution is case-sensitive. One could also convert the *)
(* characters to lower-case and then test to get a case-insensitive test. *)
```

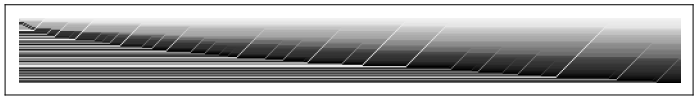
Out[5]=
```
{{or, of}, {as, a}, {Peter, Piper}, {pickled, peppers}, {Irish, It},
 {as, an}, {ideas, in}, {Icelandic, It}, {cartoon, characters},
 {the, term}, {identical, initial}, {several, special},
 {as, alliteration}, {stressed, syllables}, {as, an}, {lazy, languid},
 {languid, line}, {as, alliteration}, {be, because}, {such, syllables}}
```

In[8]:=
```
(* 41.5 *) Clear[x, y];
(* I was getting gibberish due to having defined x and y elsewhere. *)
FixedPointList[
  (# /. {x___, b_, a_, y___} /; b > a → {x, a, b, y}) &, {4, 5, 1, 3, 2}] // Grid
```

Out[9]=
```
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[10]:=
```
(* 41.6 *) Clear[x, y];
Transpose[FixedPointList[# /. {x___, b_, a_, y___} /; b > a → {x, a, b, y} &,
   RandomInteger[100, 50]]] // ArrayPlot
```

Out[11]=



In[12]:=
```
(* 41.7 *) FixedPoint[(# + 2 / #) / 2 &, 1.0]
(* This is a crafty way of computing Sqrt[2]. *)
```

Out[12]=
```
1.41421
```

In[13]:=
```
(* 41.8 *) FixedPointList[
 # /. {a_Integer, b_Integer} /; b ≠ 0 → {b, Mod[a, b]} &, {12 345, 54 321}]
```

Out[13]=
```
{{12 345, 54 321}, {54 321, 12 345}, {12 345, 4941},
 {4941, 2463}, {2463, 15}, {15, 3}, {3, 0}, {3, 0}}
```

In[14]:=
```
(* 41.9 *) Clear[x, y, z];
FixedPointList[
 # /. {{s[x_][y_][z_] → x[z][y[z]]}, {k[x_][y_] → x}} &, s[s][k][s[s[s]][s]][s]]
```

Out[15]=
```
$Aborted
```

```
(* 41.10 *)IntegerDigits[Factorial[100]] /.
 {leading_.., remainder_} /; leading > 0 → leading
```

Out[25]=
```
{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, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}
```

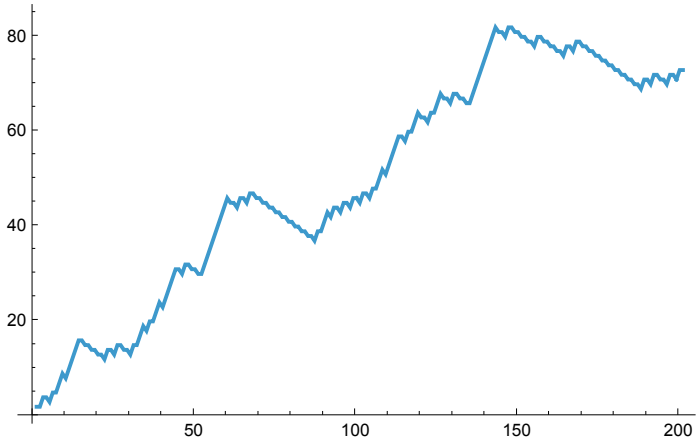
In[37]:=
```
(* 41.11 *)Length /@ NestList[
  If[#[[1]] == 1, Join[Drop[#, 2], {0, 1}], Join[Drop[#, 2], {1, 0, 0}]] &, {1, 0}, 200]
```

Out[37]=
```
{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}
```

In[51]:=
```
(* 41.12 *)switch[foo_] :=
 Module[{fooDropped = Drop[foo, 2]}, Switch[foo[[1]], 0, Join[fooDropped, {2, 1}],
   1, Append[fooDropped, 0], 2, Join[fooDropped, {0, 2, 1
     , 2}]]]
```

In[54]:=
```
ListLinePlot[Length /@ NestList[switch, {0, 0}, 200]]
```

Out[54]=



Exercises from *EIWL3* Section 42

In[ ]:=
```
(* 42.1 *) StringReplace["1 2 3 4", " " → "---"]
```

Out[ ]=
```
1---2---3---4
```

```
(* 42.2 *)
```

```
(* 42.3 *)
```

```
(* 42.4 *)
```

```
(* 42.5 *)
```

```
(* 42.6 *)
```

```
(* 42.7 *)
```

```
(* 42.8 *)
```