Brian — PS 21 — 2025-04-25 — Solution

EIWL3 Sections 47 and 48

We are getting to the end of our wide-ranging introduction to Mathematica. Some sections have been about things that are core, and necessary for almost any Mathematica notebook. Some sections have been about features that you may never use, but you know they are there, and that adds to your toolkit. These last two things are about writing good code and about debugging strategies. The recommendations Wolfram makes are generally applicable to code written in any computer language, even though their immediate application is to the Wolfram language.

Exercises from *EIWL3* Section 47

```
In[ ]:= (* 47.1 *) Total[Array[# (# + 1) &, 1000]]
```

```
Out[ ]=
        334 334 000
```

```
In[ ]:= (* 47.2 *) Nest[ 1/(1 + #) &, x, 10]
```
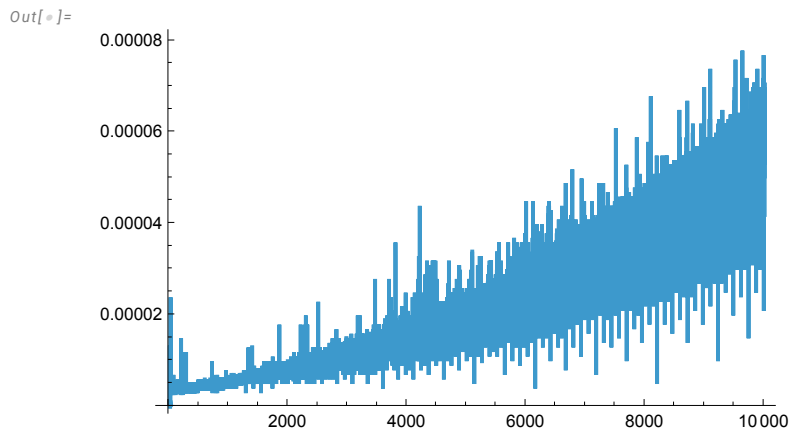
$$
Out[ ]= \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + x}}}}}}}}}}
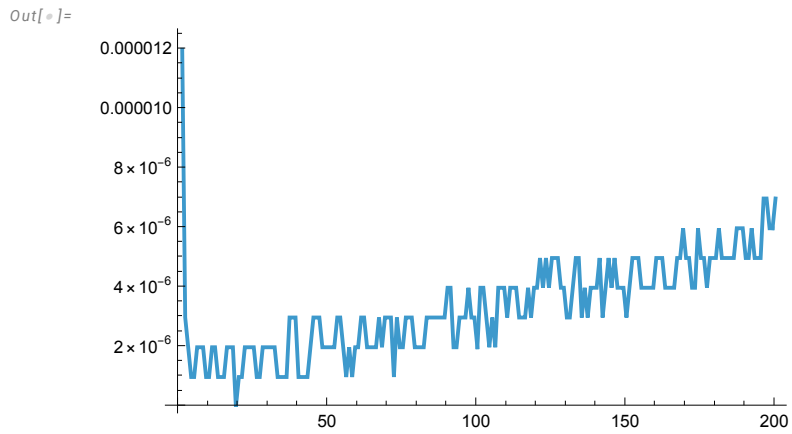$$

```
In[ ]:= (* 47.3 *) Flatten[Array[{#1, #2} &, {10, 10}]]
```

```
Out[ ]=
        {1, 1, 1, 2, 1, 3, 1, 4, 1, 5, 1, 6, 1, 7, 1, 8, 1, 9, 1, 10, 2, 1, 2, 2, 2, 3, 2, 4, 2, 5, 2,
         6, 2, 7, 2, 8, 2, 9, 2, 10, 3, 1, 3, 2, 3, 3, 3, 4, 3, 5, 3, 6, 3, 7, 3, 8, 3, 9, 3, 10,
         4, 1, 4, 2, 4, 3, 4, 4, 4, 5, 4, 6, 4, 7, 4, 8, 4, 9, 4, 10, 5, 1, 5, 2, 5, 3, 5, 4, 5,
         5, 5, 6, 5, 7, 5, 8, 5, 9, 5, 10, 6, 1, 6, 2, 6, 3, 6, 4, 6, 5, 6, 6, 6, 7, 6, 8, 6, 9,
         6, 10, 7, 1, 7, 2, 7, 3, 7, 4, 7, 5, 7, 6, 7, 7, 7, 8, 7, 9, 7, 10, 8, 1, 8, 2, 8, 3,
         8, 4, 8, 5, 8, 6, 8, 7, 8, 8, 8, 9, 8, 10, 9, 1, 9, 2, 9, 3, 9, 4, 9, 5, 9, 6, 9, 7, 9,
         8, 9, 9, 9, 10, 10, 1, 10, 2, 10, 3, 10, 4, 10, 5, 10, 6, 10, 7, 10, 8, 10, 9, 10, 10}
```

In[ ]:= `(* 47.4 *) ListLinePlot[Array[{#, Timing[#^#][[1]]} &, 10 000]]`

Out[ ]=

In[ ]:= `(* 47.5 *)`

`ListLinePlot[Array[{#, Timing[Sort[RandomSample[Range[#], #]]][[1]]} &, 200]]`

Out[ ]=

In[ ]:=

Exercises from *EIWL3* Section 48

```
(* 48.1 *) (* Correct this code: *)
(* Counts[StringTake[#,2]&/@WordList[]]*)
(* Counts[StringTake[#,Min[2,StringLength[#]]]&/@WordList[]] *)
(* or, if you aren't interested in the one-letter cases, *)
Counts[StringTake[#, 2] & /@ Select[WordList[], StringLength[#] ≥ 2 &]]
```

Out[ ]=

⟨|aa → 2, ab → 170, ac → 217, ad → 191, ae → 26, af → 72, ag → 81, ah → 5, ai → 55, AI → 1,
aj → 1, ak → 2, al → 204, am → 139, an → 330, ao → 3, ap → 165, Ap → 1, aq → 14,
ar → 207, as → 198, AS → 1, at → 99, au → 117, Au → 1, av → 46, aw → 30, ax → 12,
ay → 2, az → 4, ba → 448, BA → 1, be → 359, bi → 208, bl → 254, bo → 302, br → 306,
bu → 255, by → 14, ca → 612, ce → 126, ch → 442, ci → 89, cl → 265, cn → 1, co → 1589,
CO → 1, cr → 337, cu → 184, cy → 45, cz → 3, da → 152, dB → 1, de → 884, De → 1, dh → 2,
di → 827, DN → 1, do → 244, DO → 1, dr → 172, du → 113, dw → 9, dy → 29, ea → 72,
eb → 7, ec → 45, ed → 39, ee → 4, e' → 2, ef → 45, eg → 28, eh → 1, ei → 16, ej → 3,
el → 136, em → 144, en → 316, eo → 1, ep → 53, eq → 41, er → 56, es → 63, et → 42,
eu → 25, ev → 76, ew → 2, ex → 416, ey → 21, fa → 276, fe → 174, Fe → 1, fi → 251,
fj → 1, fl → 266, fo → 335, FO → 1, fr → 228, Fr → 1, fu → 138, ga → 193, ge → 153,
gh → 15, gi → 65, gl → 136, gn → 13, go → 124, Go → 1, gr → 347, gu → 120, gy → 19,
ha → 363, he → 321, hi → 127, HI → 1, h' → 1, hm → 1, ho → 340, hu → 134, hy → 116,
ia → 4, ib → 4, ic → 27, id → 55, if → 2, ig → 18, il → 54, im → 324, in → 1244, io → 10,
ip → 1, IQ → 1, ir → 90, is → 36, it → 17, iv → 3, ja → 72, Ja → 1, je → 47, ji → 32,
jo → 76, ju → 86, Ju → 2, ka → 20, kc → 1, ke → 40, kh → 3, kH → 1, ki → 88, kl → 4,
kn → 51, ko → 10, kp → 1, kr → 5, ku → 3, kv → 1, kW → 1, la → 301, le → 224, li → 293,
ll → 2, lo → 226, lu → 102, ly → 20, ma → 589, Ma → 2, me → 363, mi → 409, mn → 2,
mo → 392, Mo → 1, ms → 1, mu → 206, my → 33, na → 129, ne → 208, ni → 87, no → 304,
No → 1, nt → 1, nu → 86, ny → 4, oa → 15, ob → 126, oc → 46, o' → 2, Oc → 1, od → 19,
oe → 2, of → 47, og → 3, oh → 5, oi → 12, ok → 3, ol → 20, om → 19, on → 34, oo → 7,
op → 86, or → 114, os → 28, ot → 7, ou → 125, ov → 215, ow → 11, ox → 19, oy → 1,
oz → 1, pa → 553, pe → 487, pf → 1, pH → 1, ph → 160, pi → 217, pl → 228, pn → 4,
po → 402, pr → 815, ps → 50, pt → 3, pu → 225, py → 22, qu → 194, ra → 307, re → 1228,
rh → 39, ri → 148, ro → 206, ru → 122, ry → 1, sa → 321, Sa → 1, sc → 334, se → 552,
Se → 1, sh → 377, si → 241, sk → 94, sl → 196, sm → 77, sn → 115, so → 300, sp → 400,
sq → 56, st → 697, su → 519, Su → 1, sv → 1, sw → 119, sy → 100, ta → 270, te → 313,
th → 283, Th → 1, ti → 167, TN → 1, to → 253, tr → 476, ts → 3, tu → 119, Tu → 1,
TV → 1, tw → 49, ty → 42, ub → 2, ud → 1, UF → 1, ug → 3, uk → 2, ul → 24, um → 14,
un → 1335, UN → 1, up → 75, ur → 36, us → 25, ut → 18, uv → 2, ux → 1, va → 143,
ve → 170, vi → 214, VI → 1, vo → 84, vu → 15, wa → 252, we → 127, We → 1, wh → 165,
wi → 186, wo → 166, wr → 68, xe → 6, xi → 1, xy → 3, ya → 26, ye → 36, yi → 6, yo → 27,
yt → 2, yu → 7, za → 3, ze → 19, zi → 15, zl → 1, zo → 13, zu → 1, zw → 1, zy → 3|⟩

In[ ]:= `(* 48.2 *) (* Use Sow and Reap to find intermediate *)`
`(* values of #1 in Fold[10#1+#2&,{1,2,3,4,5}] *)`
`Reap[Fold[10 Sow[#1] + #2 &, {1, 2, 3, 4, 5}]] [[2]] [[1]]`

Out[ ]=
`{1, 12, 123, 1234}`

In[ ]:= `(* 48.3 *) Reap[Nest[If[EvenQ[#], (Sow[#]; # / 2), 3 # + 1] &, 1000, 20]] [[2]] [[1]]`

Out[ ]=
`{1000, 500, 250, 376, 188, 94, 142, 214, 322, 484, 242, 364, 182}`