Rania —PS 10 (2.25.2025)

EIWL3 Sections 26, 27, and 28

Section 26

```
Some notes because Wolfram didn't really:
      /@: apply the previous thing to all elements in list following it
      &: indicates the previous is a pure function
      #: "slot" in which element is put (if it's followed /@ it will each element into the list)
      EXAMPLE:
      Rotate[#, 90 degree] &/@{"one", "two", "three"] -> Rotate[one, 90 degree], Rotate[two, 90 degree]...
      Rotate["hello", #] &/@[30 deg, 90 deg, 80 deg] -> Rotate["hello", 30 degree], Rotate["hello", 90 degree]...
      #: can also be used to pair
      {#, ColorNegate[#]}&/@{Red, Blue, Green}
In[146]:=
       (*26.1 Use Range and a pure function to create a list of the first 20 squares.*)
      Power[#, 2] & /@ Range[20]
Out[146]=
       \{1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400\}
In[147]:=
       (*26.2 A list of the result of blending yellow, green and blue with red*)
      Blend[{#, Red}] & /@ {Yellow, Green, Blue}
Out[147]=
       {■, ■, ■}
In[148]:=
       (*26.3 Generate a list of framed columns containing the
       uppercase and lowercase versions of each letter of the alphabet.*)
      Framed[Column[{ToUpperCase[#], #}]] & /@ Alphabet[]
Out[148]=
```

Out[150]=

```
In[149]:=
      (*26.4 A list of letters of the alphabet, in random colors,
     with frames having random background colors.*)
     Framed[Style[#, RandomColor[]], Background → RandomColor[]] & /@ Alphabet[]
Out[149]=
In[150]:=
      (*26.5 A table of G5 countries, together with their flags,
     and arrange the result in a fully framed grid.*)
     Frame → Automatic
      (*Framed[Grid[Table[{#,CountryData[#,"Flag"]},1]]]&/@
        EntityList Group of 5 COUNTRIES ) *
```

France Germany Japan United Kingdom

United States

In[151]:= (**) WordCloud[WikipediaData[#]] & /@ {"apple", "peach", "pear"}

Out[151]=

color_England high cidernameaphid nuts America generally, diseasesgoddess cooking time Foodseeds including loneycrisp Davidson modern United varieties University USE dAphrodite for freshgroup genome mythology cultivated North include trees production domestica rawdisease rootstocks fruit Malus grafting Old Europe Cultivate UNIVATS domesticates use Chinastorage Cultivate Towns and the control of the control o Chinastorage Cultivars domesticated M. Fasttree % led Company Species ISBN cultivar → found fruits calledproduced Century ultivation is cookedflowering commonly controlled breeding Pests juicewild brown different grown eating ethyle arly grown eating ethyle architecture.

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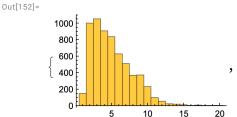
ncommon!
United clingstoneGeorgiacultivatedaddition
State European grown modern/called eastern centralchillingstone
fleshwhiteyears_cherry place

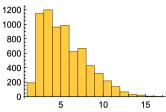
Book Latin According Calleryanalea wese dible flowers forms ubsp. Chinaussuriens is variety apples cider food produce Chinaussuriens is variety apples cider food produce Chinaussuriens is variety apples cider blocks Africa, temperate Cultivated Consumer blocks africa, and the consumer blocks africant and the cultivated Consumer blocks and the cultivated Consumer blocks africant and the cultivated Consumer blocks and the cultivated Consumer blocks and the cultivated Consumer blocks are consumer blocks and the cultivated Consumer blocks and the cultiva +1 Western -1 Western 1 × Cultivarstall 2 cultivation S D C C Cultivarstall active sinkiangensis C - C manufacture Asian manufacture Asian native sinkiangensis fruitsproduction fruit PfurnitureBureau found pyrifoliabretschneideriknown World regions ripening rootstocksagricultureCooking Like History whitewordaccounts Bradfordtable Award

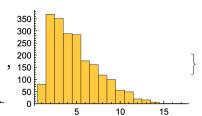
In[152]:=

(* 26.7 List of histograms of the word lengths in Wikipedia articles on apple, peach and pear.*)

Histogram[StringLength[TextWords[WikipediaData[#]]]] & /@ {"apple", "peach", "pear"}







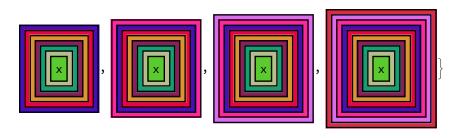
(*26.8 A list of maps of Central America, highlighting each country in turn*) GeoListPlot [#, GeoRange → | Central America COUNTRIES] & /@ EntityList [::: Central America COUNTRIES ...] Out[153]=

Section 27

In[154]:= (*27.1 Make a list of the results of nesting Blur up to 10 times, starting with a rasterized size-30 "X"*) NestList[Blur, Rasterize[Style["A", 20]], 10] Out[154]=

 $\{A, A, A, A, A, A, A, A, A, A, A\}$

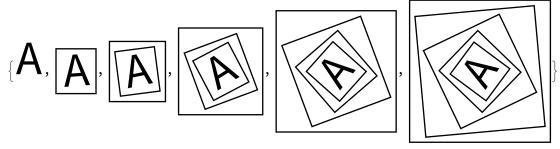
In[155]:= ($\star 27.2$ Start with x,then make a list by nestedly applying Framed up to 10 times, using a random background color each time*) NestList[Framed[#, Background → RandomColor[]] &, x, 10] (*sorta confused of using # without /@*) Out[155]=



In[156]:= (*27.3 Start with a size-50 "A", then make a list of nestedly applying a frame and a random rotation 5 times*)

NestList[Framed[Rotate[#, RandomReal[]]] &, Style["A", 50], 5]

Out[156]=



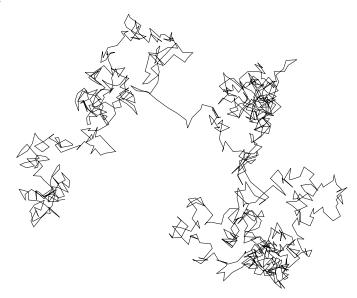
In[157]:=

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(\star27.4 Make a line plot of 100 iterations of the logistic map iteration 4 #(1-#)&,
      starting from 0.2*)
      ListLinePlot[NestList[4 # (1 - #) &, 0.2, 100]]
Out[157]=
      1.0
                                     60
In[158]:=
       (\star27. 5 Find the numerical value of the result from 30 iterations of 1+1/#&
        starting from 1.*)
      N[Nest[1+1/# &, 1, 30]]
Out[158]=
       1.61803
In[159]:=
       (*27. 6 Create a list of the first 10 powers
       of 3 (starting at 0) by nested multiplication.*)
      NestList[3#&, 1, 10]
Out[159]=
       {1, 3, 9, 27, 81, 243, 729, 2187, 6561, 19683, 59049}
In[160]:=
       (* 27.7 Make a list of the result of nesting the (Newton's method)
          function (#+2/#)/2\& up to 5 times starting from 1.0,
      and then subtract sqrt 2 from all the results *)
      NestList[(#+2/#)/2 \&, 1.0, 5] - Sqrt[2]
Out[160]=
       \{-0.414214, 0.0857864, 0.0024531, 2.1239 \times 10^{-6}, 1.59472 \times 10^{-12}, -2.22045 \times 10^{-16}\}
```

In[161]:=

(*27. 8 Make graphics of a 1000-step 2D random walk which starts at $\{0,0\}$, and in which at each step a pair of random numbers between-1 and+1 are added to the coordinates.*) Graphics[Line[Accumulate[RandomReal[{-1, 1}, {1000, 2}]]]]

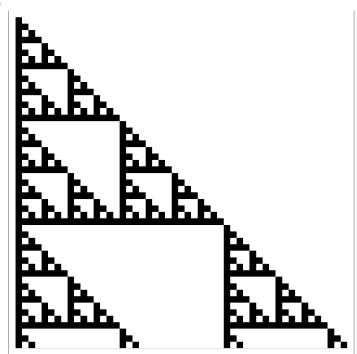
Out[161]=



In[162]:=

($\star 27.9$ Make an array plot of 50 steps of Pascal's triangle modulo 2 by starting from {1} and nestedly joining {0} at the beginning and at the end, and adding these results together modulo 2 *) ArrayPlot[NestList[Mod[Join[{0}, #] + Join[#, {0}], 2] &, {1}, 50]]

Out[162]=



In[163]:= (*27.10 Generate a graph by starting from 0, then nestedly 10 times connecting each node with value n to ones with values n+1 and 2n.*) NestGraph[{#+1, 2#} &, 0, 10]

Out[163]=

In[164]:= (* 27.11 Generate a graph obtained by nestedly finding bordering countries starting from the United States, and going 4 iterations.*) NestGraph [#["BorderingCountries"] &, United States COUNTRY, 4, VertexLabels → All]



In[165]:= Belize Mexico Honduras United State Canada El Salvador



Section 28

```
== conditional (True/false)
       && represents "and"
      || represents "or"
      ! represents "not"
In[166]:=
       (*28. 1 Test whether 123^321 is greater than 456^123*)
       123 ^ 321 > 456 ^ 123
Out[166]=
      True
In[167]:=
       (*28.2 Get a list of numbers up to 100 whose digits add up to less than 5.*)
      Select[Range[100], DigitSum[#] ≤ 5 &]
Out[167]=
       \{1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 20, 21, 22, 23, 30, 31, 32, 40, 41, 50, 100\}
In[168]:=
       (*28.3 Make a list of the first 20 integers, with prime numbers styled red.*)
      If[PrimeQ[#], Style[#, Red], #] & /@ Range[20]
Out[168]=
       \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}
In[169]:=
       (*28.4 Find words in WordList[] that both begin and end with the letter "p".*)
       Select[WordList[], StringTake[#, 1] == StringTake[StringReverse[#], 1] == "p" &]
Out[169]=
       {pap, paperclip, parsnip, partisanship, partnership, pawnshop, peep, penmanship,
        pep, pickup, pileup, pip, plop, plump, polyp, pomp, pop, premiership,
        prep, primp, professorship, prop, proprietorship, pulp, pump, pup}
In[170]:=
       (*28.5 Make a list of the first 100 primes,
       keeping only ones whose last digit is less than 3.*)
       Select[Prime[Range[100]], Last[IntegerDigits[#]] < 3 &]</pre>
Out[170]=
       {2, 11, 31, 41, 61, 71, 101, 131, 151, 181, 191, 211,
        241, 251, 271, 281, 311, 331, 401, 421, 431, 461, 491, 521, 541}
In[171]:=
       (*28. 6 Find Roman numerals up to 100 that do not contain "I"*)
      Select[RomanNumeral[Range[100]], ! MemberQ[Characters[#], "I"] &]
Out[171]=
       {V, X, XV, XX, XXV, XXX, XXXV, XL, XLV,
        L, LV, LX, LXV, LXX, LXXV, LXXX, LXXXV, XC, XCV, C}
```

```
In[172]:=
       (*28.7 Get a list of Roman numerals up to 1000 that are palindromes.*)
      Select[RomanNumeral[Range[1000]], StringReverse[#] == # &]
Out[172]=
       {I, II, III, V, X, XIX, XX, XXX, L, C, CXC, CC, CCC, D, M}
In[173]:=
       (*28.8Find names of integers up to
       100 that begin and end with the same letter.*)
      Select[IntegerName[Range[100]], StringTake[#, 1] == Last[Characters[#]] &]
Out[173]=
       {nineteen, twenty-eight, thirty-eight, eighty-one,
       eighty-three, eighty-five, eighty-nine, ninety-seven}
In[174]:=
       (*28.9 Get a list of words longer than 15
        characters from the Wikipedia article on words.*)
      Select[TextWords[WikipediaData["Words"]], StringLength[#] > 15 &]
Out[174]=
       {yibi-jarran-gabun, yibi-gabun-jarran, orthographically,
       multiple-morpheme, Proto-Indo-European, 978-0-08-044854-1}
In[175]:=
       (*28.10 Starting from 1000, divide by 2 if the number is even,
      and compute 3#+1% if the number is odd;
      do this repeatedly 200 times (Collatz problem)*)
      NestList[If[EvenQ[#], #/2, 3 # + 1] &, 1000, 200]
Out[175]=
       {1000, 500, 250, 125, 376, 188, 94, 47, 142, 71, 214, 107, 322, 161, 484, 242, 121, 364,
       182, 91, 274, 137, 412, 206, 103, 310, 155, 466, 233, 700, 350, 175, 526, 263,
       790, 395, 1186, 593, 1780, 890, 445, 1336, 668, 334, 167, 502, 251, 754, 377,
       1132, 566, 283, 850, 425, 1276, 638, 319, 958, 479, 1438, 719, 2158, 1079, 3238,
       1619, 4858, 2429, 7288, 3644, 1822, 911, 2734, 1367, 4102, 2051, 6154, 3077,
       9232, 4616, 2308, 1154, 577, 1732, 866, 433, 1300, 650, 325, 976, 488, 244, 122,
       61, 184, 92, 46, 23, 70, 35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1, 4, 2,
       1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4,
       2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1,
       4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2, 1, 4, 2}
```

```
In[176]:=
       (*28.11 Make a word cloud of 5-
       letter words in the Wikipedia article on computers*)
      WordCloud[Select[TextWords[WikipediaData["computers"]], StringLength[#] == 5 &]]
Out[176]=
          break chips
                       doingabove drove
          casesbased Mouse undercards found gates Along
           began I
       ahead W
       meant
       still
                                event
                                                  order
        <sup>1970s</sup>large
      bytes<sub>1950s</sub>
                      afterpaperabout cause until 1,500
         carry equalallow
                             shortusageBerry
In[177]:=
       (*28.12Find words in WordList[] whose first
        3 letters are the same as their last 3 read backward,
      but where the whole string is not a palindrome.*)
      Select[WordList[], StringLength[#] ≥ 3 && # ≠ StringReverse[#] &&
          StringTake[#, 3] == StringTake[StringReverse[#], 3] &]
Out[177]=
      {despised, detected, detested, drainboard,
        foolproof, lackadaisical, marjoram, revolver}
```

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In[178]:=
```

(*8.13Find all 10letter words in WordList[] for which the total of LetterNumber values is 100.*) Select[Select[WordList[], StringLength[#] == 10 &], Total[LetterNumber /@ Characters[#]] == 100 &]

Out[178]=

```
{accumulate, alienation, answerable, apoplectic, aquamarine, bewitching, censurable,
ceramicist, chastening, chimpanzee, clinically, collecting, condensate,
congenital, conjugated, connivance, declension, deliquesce, demobilize,
demodulate, denominate, diagonally, discipline, discommode, egoistical,
emasculate, embodiment, emendation, empathetic, fatalistic, fatherhood,
geographer, hemoglobin, inadequacy, interbreed, leveraging, liberalism,
likelihood, martingale, mercantile, meridional, neoclassic, paramecium,
plebiscite, potbellied, quadrangle, reciprocal, regimented, reschedule,
researcher, scoreboard, septicemia, shibboleth, sleepyhead, stagecraft,
stalemated, temperance, thickening, threatened, uncombined, unmodified}
```