

PS 12 — Rania 3.22.2025

Section 31

In[63]:= (*31.1 Find the last 5 digits in 2^{1000} .*)

Take[IntegerDigits[2^{1000}], -5]

Out[63]=

{6, 9, 3, 7, 6}

In[64]:= (*31.2 Pick out letters 10 through 20 in the alphabet.*)

Alphabet[][[10 ;; 20]]

Out[64]=

{j, k, l, m, n, o, p, q, r, s, t}

In[65]:= (*31.3 Make a list of the letters at even-numbered positions in the alphabet.*)

Alphabet[][[Select[Range[26], EvenQ[#] &]]]

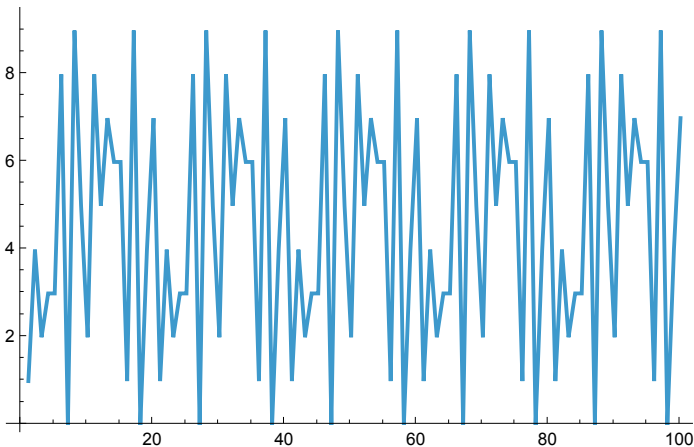
Out[65]=

{b, d, f, h, j, l, n, p, r, t, v, x, z}

In[66]:= (*31. 4 Make a line plot of the second
to last digit in the first 100 powers of 12*)

ListLinePlot[IntegerDigits[$12^{\text{Range}[100]}$][[All, -2]]]

Out[66]=



In[67]:= (*31.5 Join lists of the first 20 squares and cubes,
and get the 10 smallest elements of the combined list*)

TakeSmallest[Join[Power[Range[20], 2], Power[Range[20], 3]], 10]

Out[67]=

{1, 1, 4, 8, 9, 16, 25, 27, 36, 49}

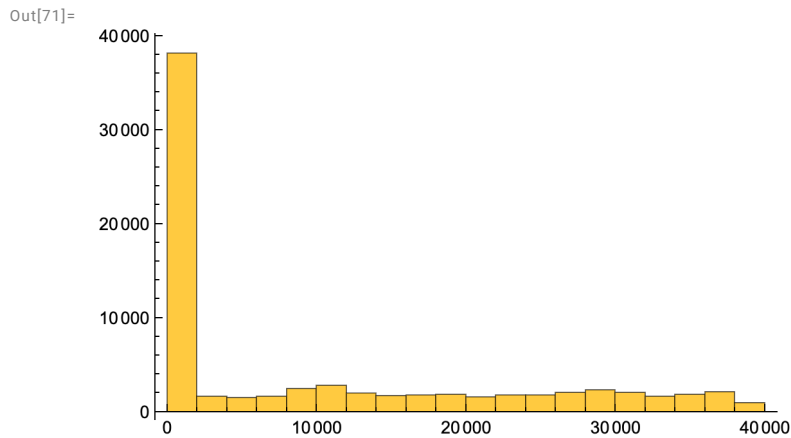
```
In[68]:= (*31.6 Find the positions of the word
          "software" in the Wikipedia entry for "computers"*)
```

```
In[69]:= Flatten[Position[TextWords[WikipediaData["computers"]], "software"]]
```

```
Out[69]= {62, 6124, 6218, 6240, 6980, 7002, 7005, 7009, 7023, 8226, 8327, 8334, 8342, 8364}
```

```
In[70]:= (*31.7 Make a histogram of where the
          letter "e" occurs in the words in WordList[].*)
```

```
In[71]:= Histogram[Flatten[Position[Characters[WordList[]], "e"]]]
```



```
In[72]:= (*31.8 Make a list of the first 100 cubes,
          with every one whose position is a square replaced by Red*)
          ReplacePart[Range[100]^3, Thread[Table[x^2, {x, 10}] → Red]]
```

```
Out[72]= {
  1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, 1331, 1728, 2197, 2744, 3375, 4096, 4913, 5832,
  6859, 8000, 9261, 10648, 12167, 13824, 17576, 19683, 21952, 24389, 27000,
  29791, 32768, 35937, 39304, 42875, 50653, 54872, 59319, 64000, 68921,
  74088, 79507, 85184, 91125, 97336, 103823, 110592, 125000, 132651, 140608,
  148877, 157464, 166375, 175616, 185193, 195112, 205379, 216000, 226981,
  238328, 250047, 274625, 287496, 300763, 314432, 328509, 343000, 357911,
  373248, 389017, 405224, 421875, 438976, 456533, 474552, 493039, 512000, 551368,
  571787, 592704, 614125, 636056, 658503, 681472, 704969, 729000,
  753571, 778688, 804357, 830584, 857375, 884736, 912673, 941192, 970299, 1000000}
```

```
In[73]:= (*31.9 Make a list of the first 100 primes,
          dropping ones whose first digit is less than 5*)
```

```
In[74]:= If[First[IntegerDigits[#]] > 5, #, Nothing] & /@ Array[Prime, 100]
```

```
Out[74]= {7, 61, 67, 71, 73, 79, 83, 89, 97}
```

```

In[75]:= (*31.10 Make a grid starting with Range[10],
then at each of 9 steps randomly removing another element.*)
NestList[
  ReplacePart[#, RandomInteger[{1, Length[#]}] → Nothing] &, Range[10], 9] // Grid
Out[75]=
1 2 3 4 5 6 7 8 9 10
1 2 4 5 6 7 8 9 10
1 2 4 5 6 7 8 9
1 2 4 5 6 8 9
1 2 4 6 8 9
2 4 6 8 9
4 6 8 9
4 8 9
4 9
9

In[76]:= (*31.11 Find the longest 10 words in WordList[]*)
TakeLargestBy[WordList[], StringLength, 10]
Out[76]=
{electroencephalographic, electroencephalograph,
 buckminsterfullerene, compartmentalization,
 counterrevolutionary, electroencephalogram, internationalization,
 magnetohydrodynamics, uncharacteristically, counterintelligence}

In[77]:= (*31.12 Find the 5 longest integer names for integers up to 100 *)
In[78]:= TakeLargestBy[IntegerName /@ Range[100], StringLength, 5]
Out[78]=
{seventy-three, seventy-seven, seventy-eight, twenty-three, twenty-seven}

In[79]:= (*31.13 Find the 5 integer names for numbers up to 100 with the most "e"s*)
TakeLargestBy[IntegerName /@ Range[100], StringCount[#, "e"] &, 5]
Out[79]=
{seventeen, seventy-three, seventy-seven, eleven, eighteen}

```

Section 32

```

In[80]:= (*32. 1*)
In[81]:= Cases[IntegerDigits[Range[1000]], {1, _, 9}]
Out[81]=
{{1, 0, 9}, {1, 1, 9}, {1, 2, 9}, {1, 3, 9},
 {1, 4, 9}, {1, 5, 9}, {1, 6, 9}, {1, 7, 9}, {1, 8, 9}, {1, 9, 9}}

```

In[82]:= (*32.2*)

Cases[IntegerDigits[Range[1000]], {x_, x_, x_}]

Out[82]=

```
{ {1, 1, 1}, {2, 2, 2}, {3, 3, 3}, {4, 4, 4},
  {5, 5, 5}, {6, 6, 6}, {7, 7, 7}, {8, 8, 8}, {9, 9, 9} }
```

In[83]:= (*32.3*)

Cases[IntegerDigits[(Range[1000])^2], {9, ___, 0 | 1}]

Out[83]=

```
{ {9, 0, 0}, {9, 6, 1}, {9, 8, 0, 1}, {9, 0, 0, 0, 0},
  {9, 0, 6, 0, 1}, {9, 5, 4, 8, 1}, {9, 6, 1, 0, 0}, {9, 6, 7, 2, 1},
  {9, 0, 0, 6, 0, 1}, {9, 0, 2, 5, 0, 0}, {9, 0, 4, 4, 0, 1}, {9, 1, 9, 6, 8, 1},
  {9, 2, 1, 6, 0, 0}, {9, 2, 3, 5, 2, 1}, {9, 3, 8, 9, 6, 1}, {9, 4, 0, 9, 0, 0},
  {9, 4, 2, 8, 4, 1}, {9, 5, 8, 4, 4, 1}, {9, 6, 0, 4, 0, 0}, {9, 6, 2, 3, 6, 1},
  {9, 7, 8, 1, 2, 1}, {9, 8, 0, 1, 0, 0}, {9, 8, 2, 0, 8, 1}, {9, 9, 8, 0, 0, 1} }
```

In[84]:= (*32.4*)

IntegerDigits[Range[100]] /. Thread[{0 → Gray, 9 → Orange}]

Out[84]=

```
{ {1}, {2}, {3}, {4}, {5}, {6}, {7}, {8}, {9}, {1, 9}, {1, 1}, {1, 2}, {1, 3},
  {1, 4}, {1, 5}, {1, 6}, {1, 7}, {1, 8}, {1, 9}, {2, 9}, {2, 1}, {2, 2},
  {2, 3}, {2, 4}, {2, 5}, {2, 6}, {2, 7}, {2, 8}, {2, 9}, {3, 9}, {3, 1}, {3, 2},
  {3, 3}, {3, 4}, {3, 5}, {3, 6}, {3, 7}, {3, 8}, {3, 9}, {4, 9}, {4, 1}, {4, 2},
  {4, 3}, {4, 4}, {4, 5}, {4, 6}, {4, 7}, {4, 8}, {4, 9}, {5, 9}, {5, 1}, {5, 2},
  {5, 3}, {5, 4}, {5, 5}, {5, 6}, {5, 7}, {5, 8}, {5, 9}, {6, 9}, {6, 1}, {6, 2},
  {6, 3}, {6, 4}, {6, 5}, {6, 6}, {6, 7}, {6, 8}, {6, 9}, {7, 9}, {7, 1}, {7, 2},
  {7, 3}, {7, 4}, {7, 5}, {7, 6}, {7, 7}, {7, 8}, {7, 9}, {8, 9}, {8, 1}, {8, 2},
  {8, 3}, {8, 4}, {8, 5}, {8, 6}, {8, 7}, {8, 8}, {8, 9}, {9, 9}, {9, 1},
  {9, 2}, {9, 3}, {9, 4}, {9, 5}, {9, 6}, {9, 7}, {9, 8}, {9, 9}, {1, 9, 9} }
```

In[85]:= (*32.5*)

IntegerDigits[2^1000] /. Thread[{0 → Red}]

Out[85]=

```
{ 1, 7, 1, 5, 8, 6, 7, 1, 8, 6, 2, 6, 7, 3, 2, 9, 4, 8, 4, 2, 5, 4, 9,
  6, 6, 1, 8, 1, 5, 6, 1, 4, 4, 8, 1, 1, 7, 5, 5, 3, 3, 6,
  7, 4, 4, 3, 7, 5, 3, 8, 8, 3, 7, 3, 5, 1, 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, 8, 5, 8, 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,
  4, 3, 5, 9, 8, 4, 5, 7, 7, 5, 7, 4, 6, 9, 8, 5, 7, 4, 8, 3, 9, 3, 4, 5, 6, 7, 7,
  7, 4, 8, 2, 4, 2, 3, 9, 8, 5, 4, 2, 1, 7, 4, 6, 5, 6, 2, 3, 7, 1, 1,
  4, 1, 8, 7, 7, 9, 5, 4, 1, 8, 2, 1, 5, 3, 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, 7, 7, 6,
  2, 9, 1, 4, 5, 7, 1, 1, 9, 6, 4, 7, 7, 6, 8, 6, 5, 4, 2, 1, 6, 7, 6, 6, 4, 2, 9,
  8, 3, 1, 6, 5, 2, 6, 2, 4, 3, 8, 6, 8, 3, 7, 2, 5, 6, 6, 8, 6, 9, 3, 7, 6 }
```

In[86]:= (***32.6***)

Characters["The Wolfram Language"] /. {"a" | "e" | "i" | "o" | "u" → Nothing}

Out[86]=

{T, h, , W, l, f, r, m, , L, n, g, g}

In[87]:= (***32.7***)

Cases[IntegerDigits[2^1000], 0 | 1]

Out[87]=

{1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0}

In[88]:= (***32.8***)

Cases[IntegerDigits[Range[100, 999]], {x_, y_, x_}]

Out[88]=

{{1, 0, 1}, {1, 1, 1}, {1, 2, 1}, {1, 3, 1}, {1, 4, 1}, {1, 5, 1}, {1, 6, 1}, {1, 7, 1},
 {1, 8, 1}, {1, 9, 1}, {2, 0, 2}, {2, 1, 2}, {2, 2, 2}, {2, 3, 2}, {2, 4, 2}, {2, 5, 2},
 {2, 6, 2}, {2, 7, 2}, {2, 8, 2}, {2, 9, 2}, {3, 0, 3}, {3, 1, 3}, {3, 2, 3}, {3, 3, 3},
 {3, 4, 3}, {3, 5, 3}, {3, 6, 3}, {3, 7, 3}, {3, 8, 3}, {3, 9, 3}, {4, 0, 4}, {4, 1, 4},
 {4, 2, 4}, {4, 3, 4}, {4, 4, 4}, {4, 5, 4}, {4, 6, 4}, {4, 7, 4}, {4, 8, 4}, {4, 9, 4},
 {5, 0, 5}, {5, 1, 5}, {5, 2, 5}, {5, 3, 5}, {5, 4, 5}, {5, 5, 5}, {5, 6, 5}, {5, 7, 5},
 {5, 8, 5}, {5, 9, 5}, {6, 0, 6}, {6, 1, 6}, {6, 2, 6}, {6, 3, 6}, {6, 4, 6},
 {6, 5, 6}, {6, 6, 6}, {6, 7, 6}, {6, 8, 6}, {6, 9, 6}, {7, 0, 7}, {7, 1, 7},
 {7, 2, 7}, {7, 3, 7}, {7, 4, 7}, {7, 5, 7}, {7, 6, 7}, {7, 7, 7}, {7, 8, 7},
 {7, 9, 7}, {8, 0, 8}, {8, 1, 8}, {8, 2, 8}, {8, 3, 8}, {8, 4, 8}, {8, 5, 8},
 {8, 6, 8}, {8, 7, 8}, {8, 8, 8}, {8, 9, 8}, {9, 0, 9}, {9, 1, 9}, {9, 2, 9},
 {9, 3, 9}, {9, 4, 9}, {9, 5, 9}, {9, 6, 9}, {9, 7, 9}, {9, 8, 9}, {9, 9, 9}}