Rania —PS 9 (2.20.2025)

EIWL3 Sections 23, 24, and 25

Section 23

In[69]:=
```
(*23.1 Find sqrt 2 to 500-digit precision.*)
N[Sqrt[2], 500]
```

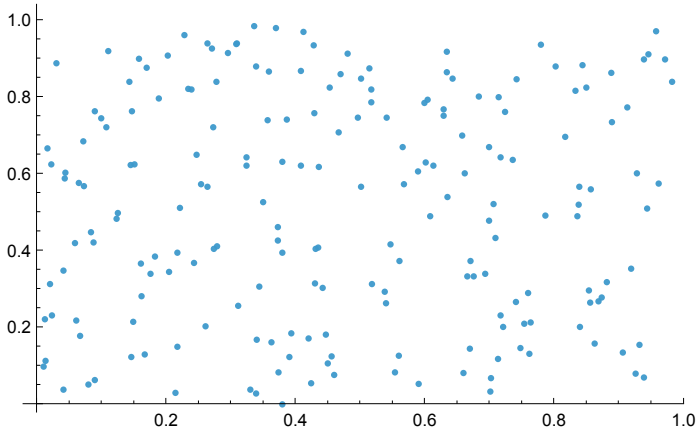
Out[69]=
```
1.41421356237309504880168872420969807856967187537694807317667973799073247846210703885038753432764157273501384623091229702492483605585073721264412149709993583141322266592750559275579995050115278206057147010955997160597027453459686201472851741864088919860955232923048430871432145083976260362799525140798968725339654633180882964062061525835239505474575028775996172983557522033753185701135437460340849884716038689997069900481503054402779031645424782306849293691862158057846311159666871301301561856898723720
```

In[70]:=
```
(*23.2 Generate 10 random real numbers between 0 and 1. *)
RandomReal[1, 10]
```

Out[70]=
```
{0.478985, 0.565053, 0.474835, 0.777362,
 0.164697, 0.662163, 0.19913, 0.267706, 0.279953, 0.141348}
```

In[71]:=
```
(*23.3 A plot of 200 points with random
 real x and y coordinates between 0 and 1.*)
ListPlot[Table[{RandomReal[1], RandomReal[1]}, 200]]
```

Out[71]=



In[72]:=
```
(*23.4 A random walk using AnglePath
 and 1000 random real numbers between 0 and 2π *)
Graphics[Line[AnglePath[Table[RandomReal[2 Pi], 1000]]]]
```

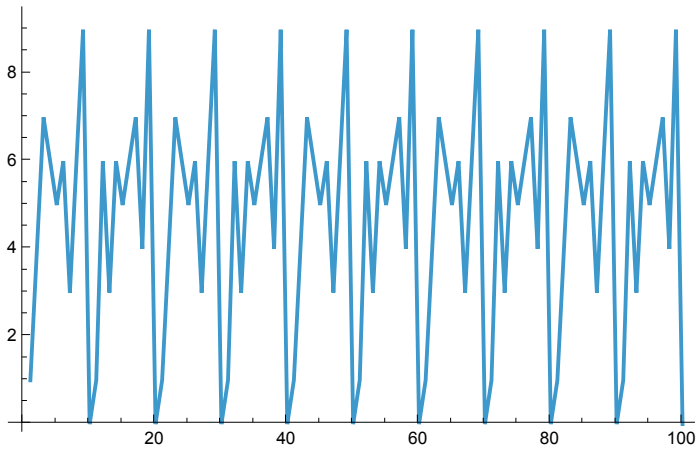
Out[72]=

In[73]:=
```
(*23.5 Table of Mod[n^2,10]for n from 0 to 30*)
Table[Mod[n^2, 10], {n, 0, 30}]
```

Out[73]=
```
{0, 1, 4, 9, 6, 5, 6, 9, 4, 1, 0, 1, 4, 9, 6, 5, 6, 9, 4, 1, 0, 1, 4, 9, 6, 5, 6, 9, 4, 1, 0}
```

In[74]:=
```
(*23.6 Line plot of Mod[n^n,10] for n from 1 to 100.*)
ListLinePlot[Table[Mod[n^n, 10], {n, 1, 100}]]
```

Out[74]=

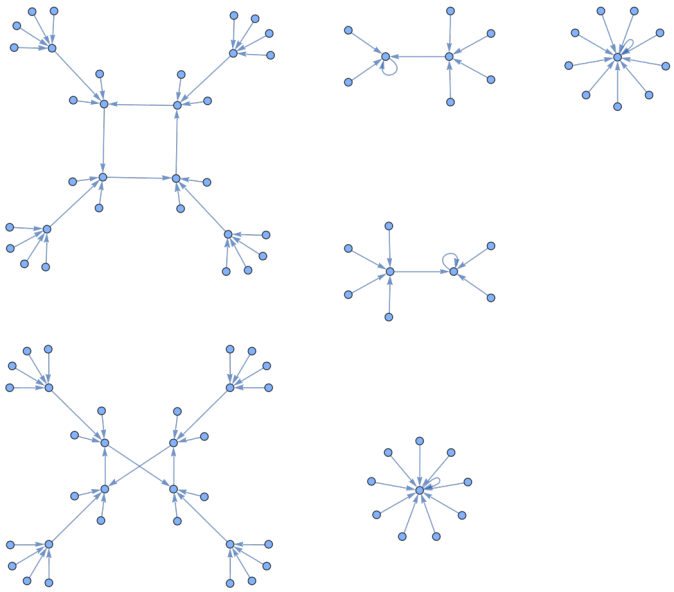


In[75]:=
```
(*23.7 Table of the first 10 powers of pi, rounded to integers*)
Table[Round[π^n], {n, 1, 10}]
```

Out[75]=
```
{3, 10, 31, 97, 306, 961, 3020, 9489, 29 809, 93 648}
```

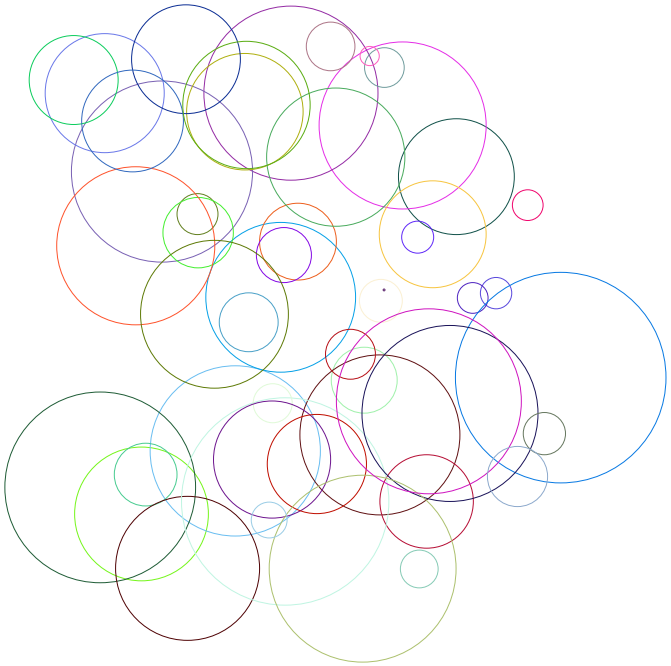
In[76]:=
```
(*23.8 A graph by connecting n with Mod[n^2,100] for n from 0 to 99*)
Graph[Table[n → Mod[n^2, 100], {n, 0, 99}]]
```

Out[76]=



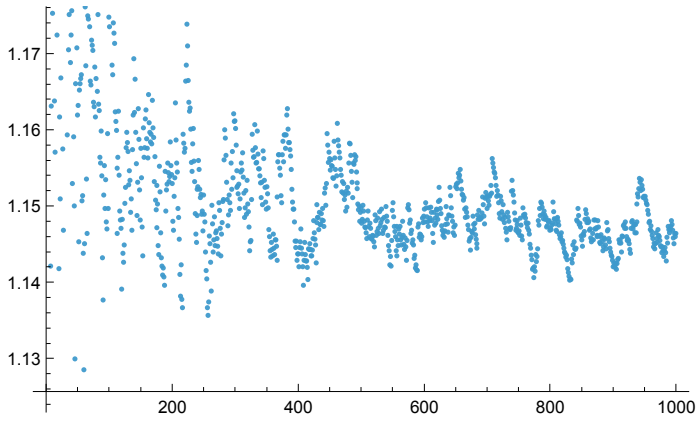
In[77]:=
```
(*23.9 Graphics of 50 circles with random real coordinates 0 to 10,
random real radii from 0 to 2,and random colors.*)
Graphics[Table[Style[
   Circle[{RandomReal[10], RandomReal[10]}, RandomReal[2]], RandomColor[]], 50]]
```

Out[77]=



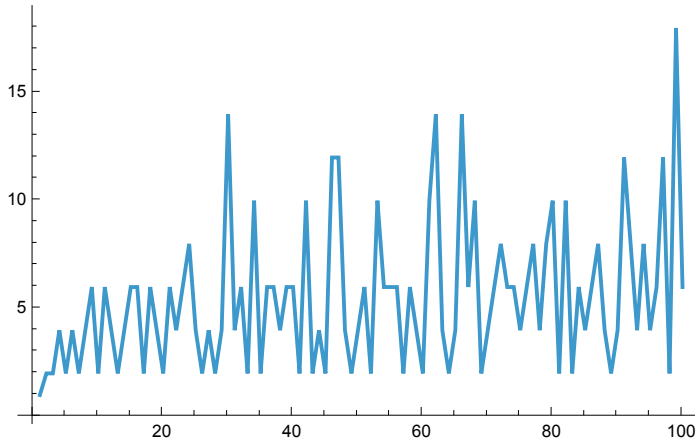
In[78]:=
```
(*23.10 A plot of the nth prime divided by n*log(n),for n from 2 to 1000*)
ListPlot[Table[Prime[n]/(n * Log[n]), {n, 2, 1000}]]
```

Out[78]=



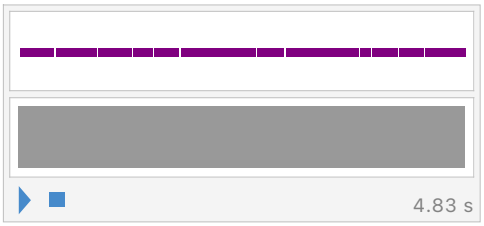
In[79]:=
```
(*23.11 Line plot of the diffrences between sucessive primes up to 100*)
ListLinePlot[Table[Prime[n + 1] - Prime[n], {n, 1, 100}]]
```

Out[79]=



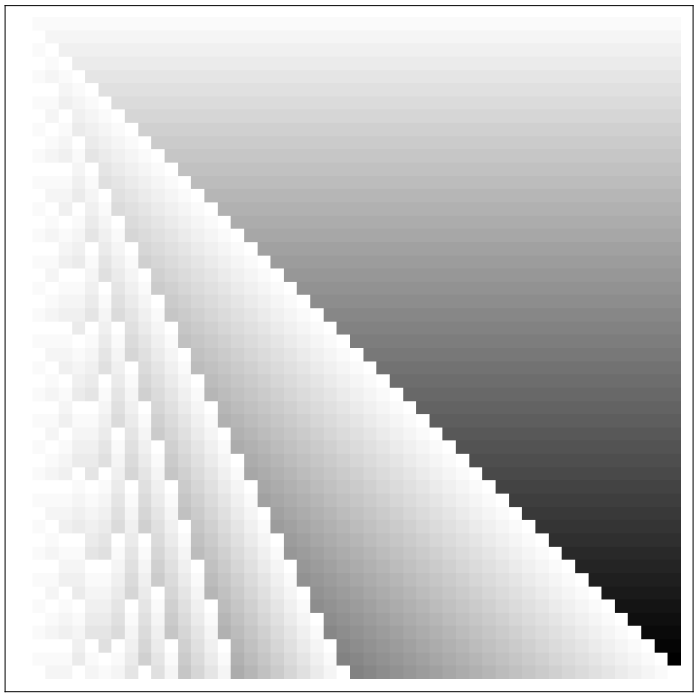
In[80]:=
```
(*23.12 A squence of 20 middle C notes
 with random durations between 0 to 0.5 seconds*)
Sound[Table[SoundNote["C", RandomReal[.5]], 20]]
```

Out[80]=



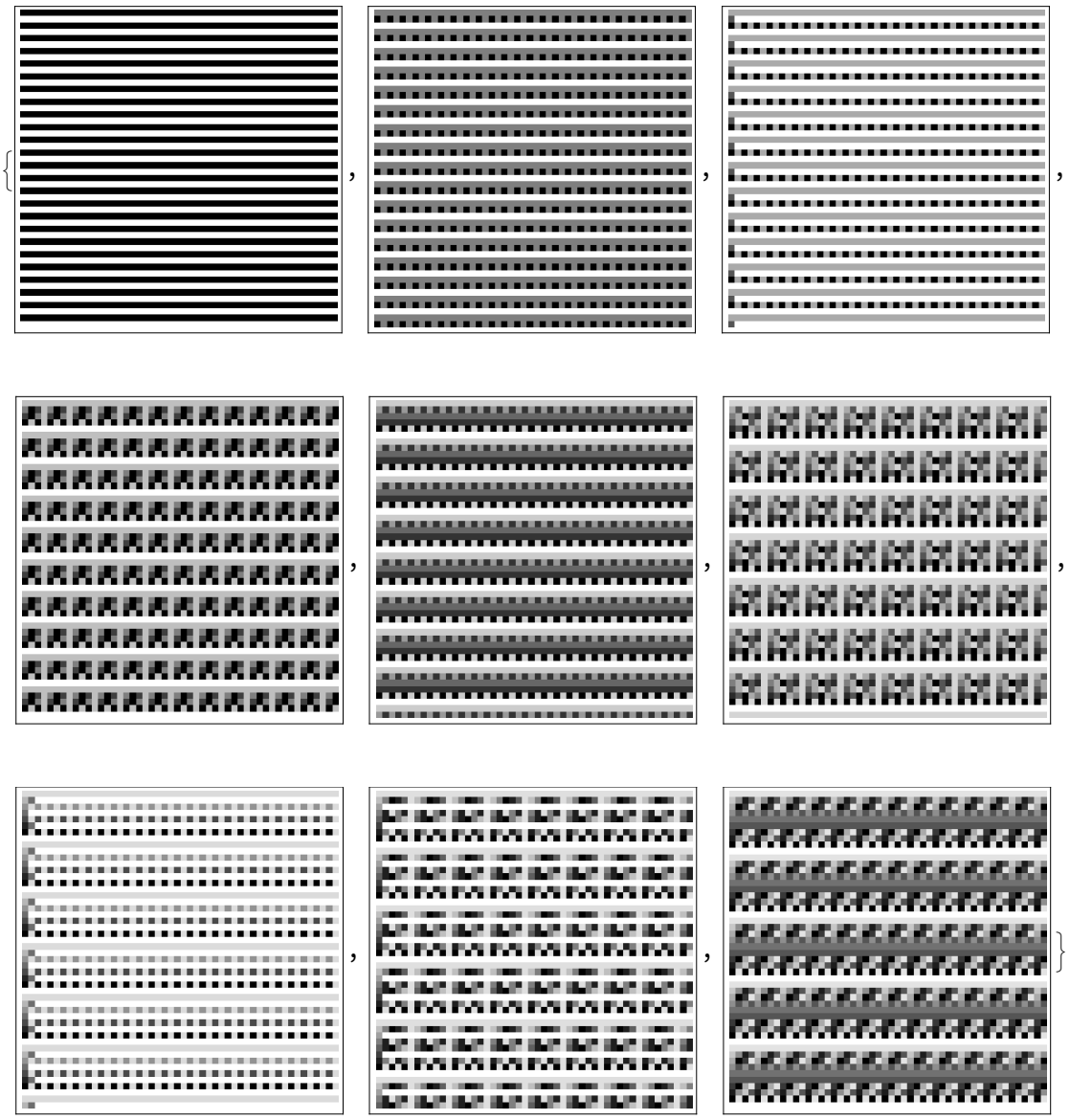
In[81]:=
```
(*23.13 An array plot of Mod[i,j] for i and j up to 50 *)
ArrayPlot[Table[Mod[i, j], {i, 1, 50}, {j, 1, 50}]]
```

Out[81]=



In[82]:=
```
(*23.14 A list for n from 2 to 10 of
 array plots of x and y up to 50 of x^y mod n*)
Table[ArrayPlot[Table[Mod[x^y, n], {x, 1, 50}, {y, 1, 50}]], {n, 2, 10}]
```

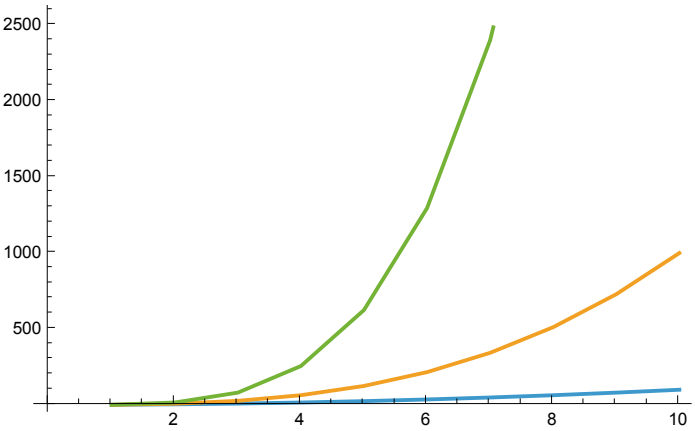
Out[82]=



Section 24

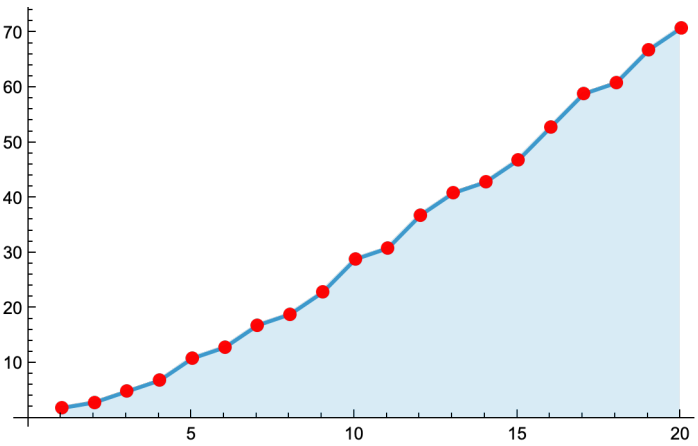
In[83]:=
```
(*24.1 Plot with lines joining the squares,
the cubes and the 4th powers of integers up to 10.*)
ListLinePlot[
 {Table[x^2, {x, 1, 10}], Table[x^3, {x, 1, 10}], Table[x^4, {x, 1, 10}]}]
```

Out[83]=



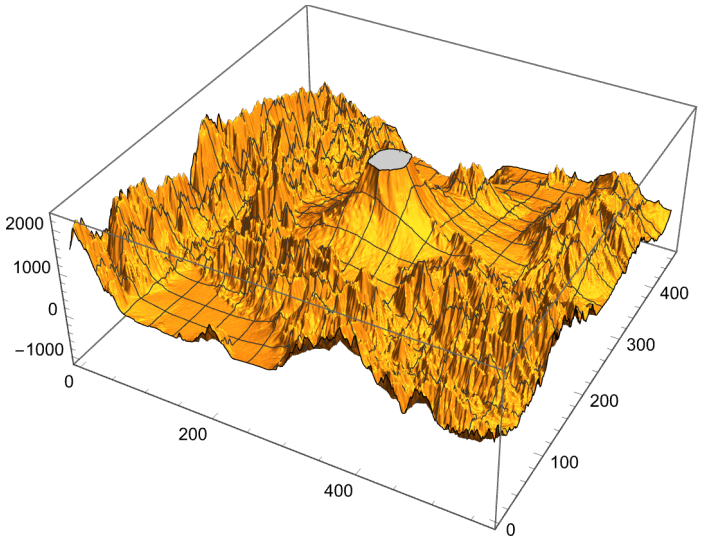
In[84]:=
```
(*24.2 Plot the first 20 primes, joined by a lin,
filled to the axis and with a red dot at each prime*)
ListLinePlot[Table[Prime[n], {n, 1, 20}],
 Filling → Axis, Mesh → All, MeshStyle → Red]
```

Out[84]=



In[85]:=
```
(*24.3 3D plot of the topography for 20 miles around Mount Fuji*)
ListPlot3D[GeoElevationData[GeoDisk[ Mount Fuji MOUNTAIN , 20 mi ]]]
```

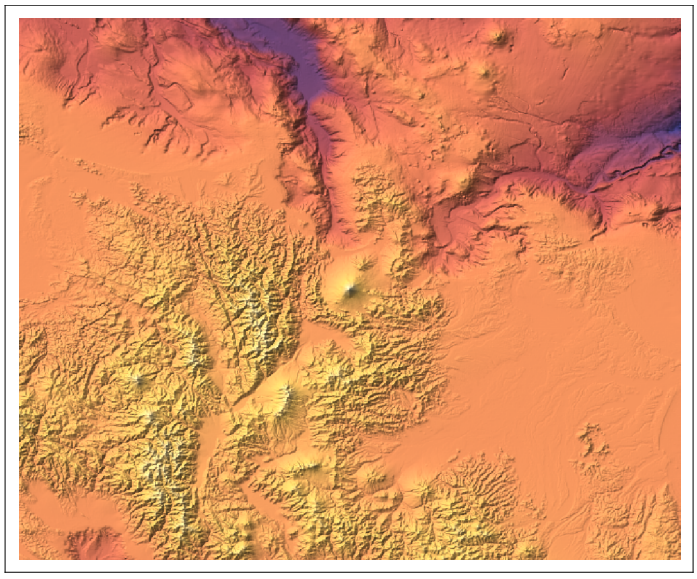
Out[85]=



In[86]:=

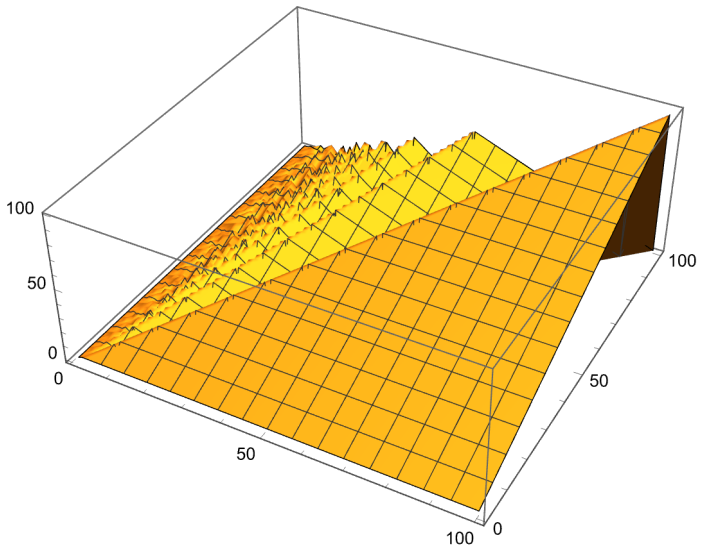
In[87]:=
```
(*24.4 A relief plot of the topography for 100 miles around Mount Fuji.*)
ReliefPlot[GeoElevationData[GeoDisk[ Mount Fuji MOUNTAIN , 100 mi ]]]
```

Out[87]=



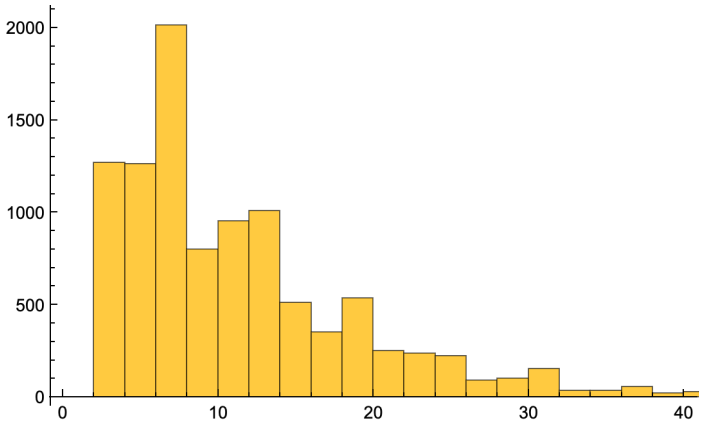
In[88]:=
```
(*24.5 A 3D plot of heights generated
 from Mod[i,j] with i and j going up to 100.*)
ListPlot3D[Table[Mod[i, j], {i, 1, 100}, {j, 1, 100}]]
```

Out[88]=



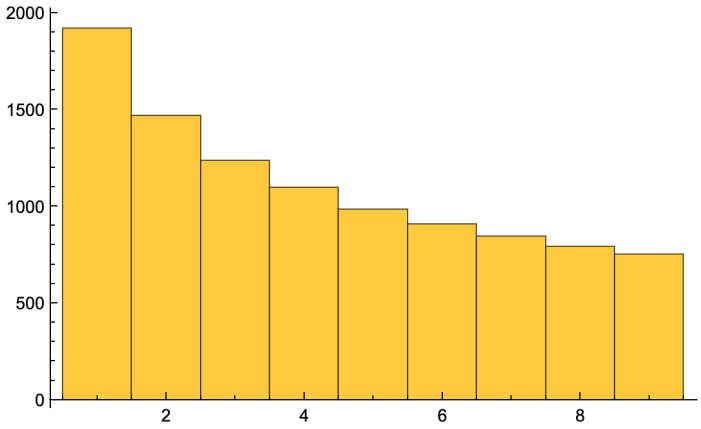
In[89]:=
```
(*24.6 Histogram of the differences between
 successive primes for the first 10000 primes*)
Histogram[Table[Prime[n + 1] - Prime[n], {n, 1, 10 000}]]
```

Out[89]=



In[90]:=
```
(*24.7 A histogram of the first digits of squares
     of integers up to 10000 (illustrating Benford's law).*)
Histogram[Flatten[Table[Take[IntegerDigits[x^2], 1], {x, 1, 10 000}]]]
```

Out[90]=

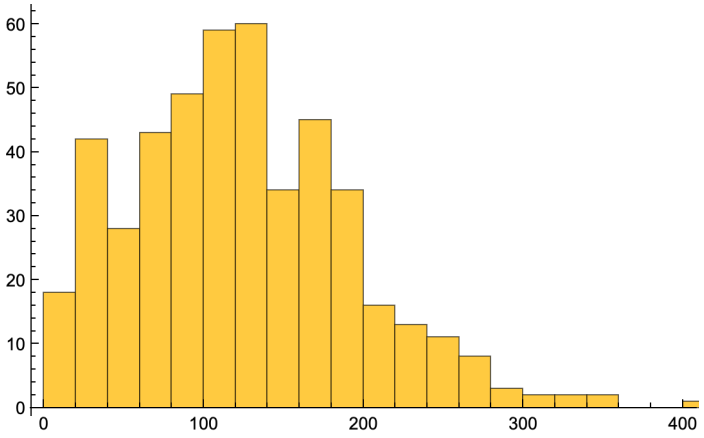


In[91]:=
```
(*24.8 A histogram of the length of Roman numerals up to 1000.*)
Histogram[Table[StringLength[RomanNumeral[n]], {n, 1, 1000}]]
```

Out[91]=

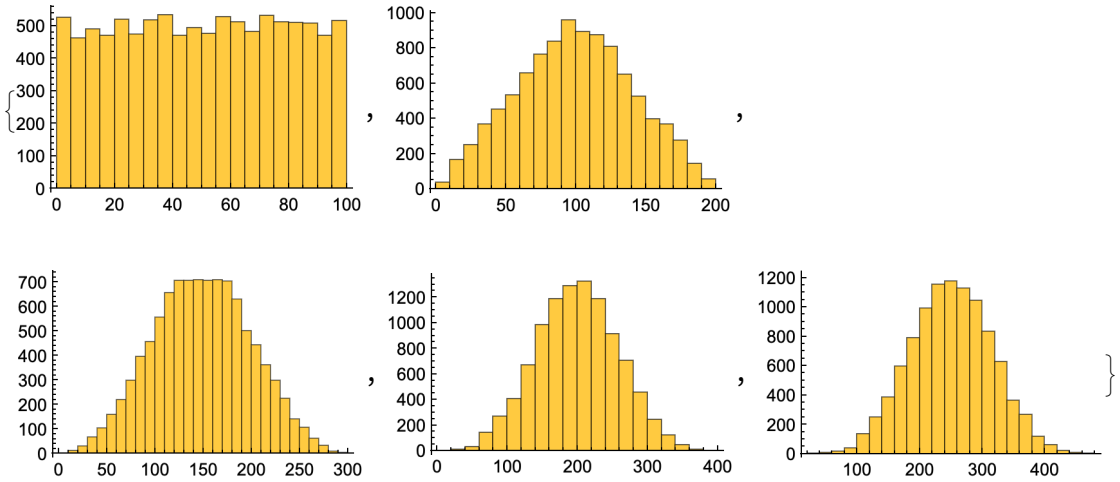
In[92]:=
```
(*24.9 A histogram of sentence lengths in the Wikipedia article on computers.*)
Histogram[StringLength[TextSentences[WikipediaData["computers"]]]]
```

Out[92]=



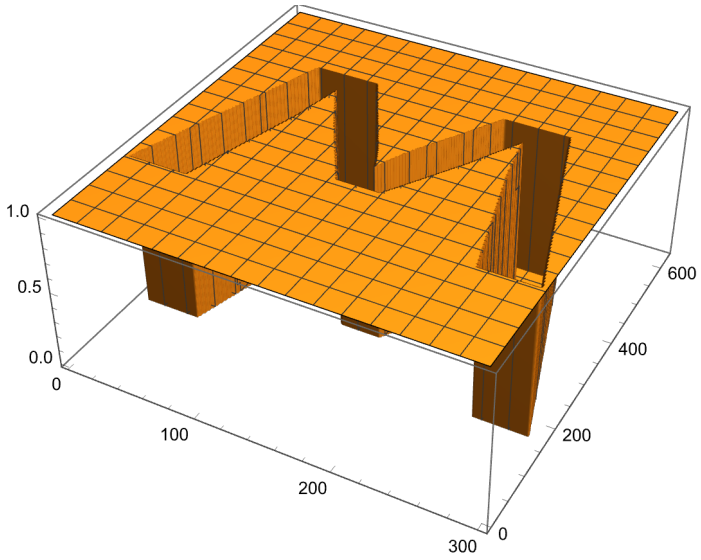
In[93]:=
```
(*24.10 A list of histograms of 10000
 instances of totals of n random reals up to 100,
with n going from 1 to 5 (illustrating the central limit theorem*)
Table[Histogram[Table[Total[RandomReal[100, n] ], 10 000]] , {n, 1, 5}]
```

Out[93]=



In[94]:=
```
(*24.11 Generate a 3D list plot using the image data from a binarized size-
 200 letter “W” as heights*)
ListPlot3D[ImageData[Binarize[Rasterize[Style["W", 200]]]]]
```

Out[94]=



Section 25

In[95]:=
```
(*Check your answers in the Wolfram Cloud
25.1Use/@and Range to reproduce the result of Table[f[n],{n,5}].»
25.2Use/@twice to generate Table[f[g[n]],{n,10}].»
25.3Use//to create a[b[c[d[x]]]].»
25.4Make a list of letters of the alphabet,with a frame around each one.»
25.5Color negate an image of each planet,giving a list of the results.»
25.6Use/@to draw separate maps of each country in the G5.»
25.7Binarize each flag in Europe,and make an image collage of the result.»
25.8Find a list of the dominant colors in images of the planets,
putting the results for each planet in a column.»
25.9Find the total of the letter numbers given
 by LetterNumber for the letters in the word “wolfram”.*)
```

In[96]:=
```
(*25.1 *)
f /@ Range[5]
```

Out[96]=
```
{f[1], f[2], f[3], f[4], f[5]}
```

In[97]:=
```
(*25.2*)
f /@ g /@ Range[10]
```

Out[97]=
```
{f[g[1]], f[g[2]], f[g[3]], f[g[4]],
 f[g[5]], f[g[6]], f[g[7]], f[g[8]], f[g[9]], f[g[10]]}
```

In[98]:=
```
(*25.3*)
x // d // c // b // a
```

Out[98]=
```
a[b[c[d[x]]]]
```

In[99]:=
```
(*25.4*)
Framed /@ Alphabet[]
```

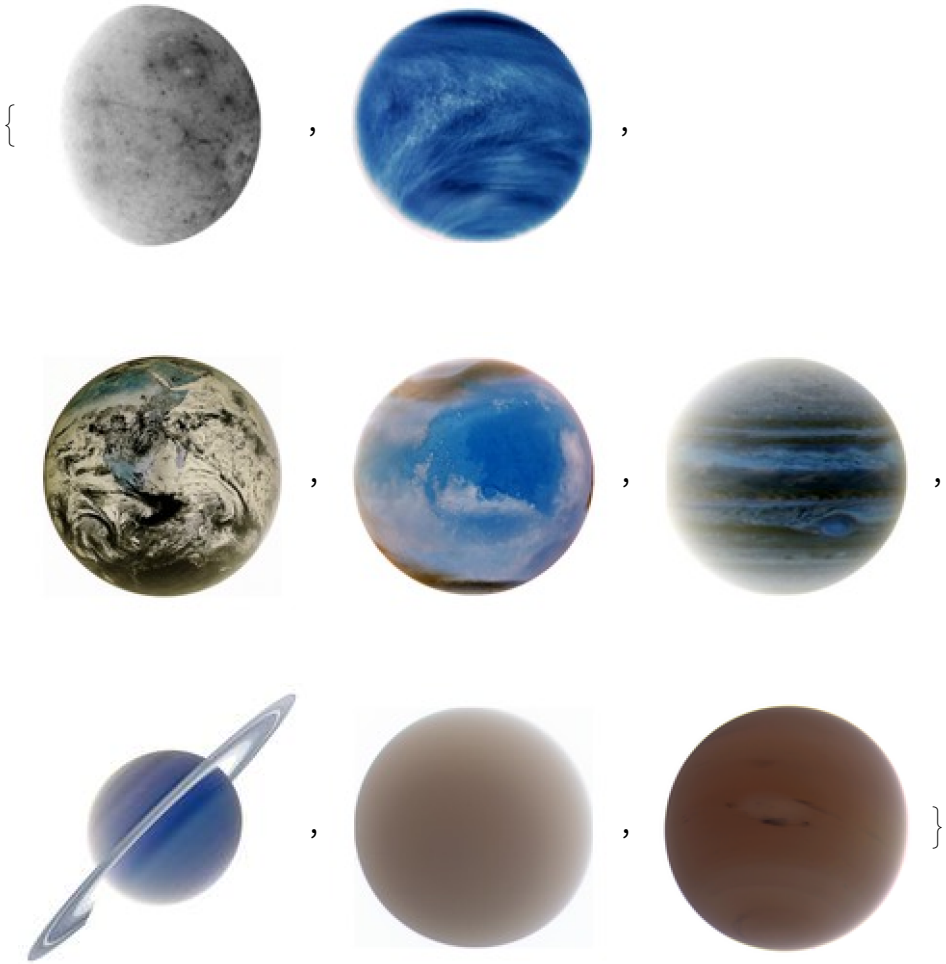
Out[99]=

{[a], [b], [c], [d], [e], [f], [g], [h], [i], [j], [k], [l],
 [m], [n], [o], [p], [q], [r], [s], [t], [u], [v], [w], [x], [y], [z]}

In[100]:=

```
(*25.5*)
ColorNegate /@ planets PLANETS [ image ]
```

Out[100]=

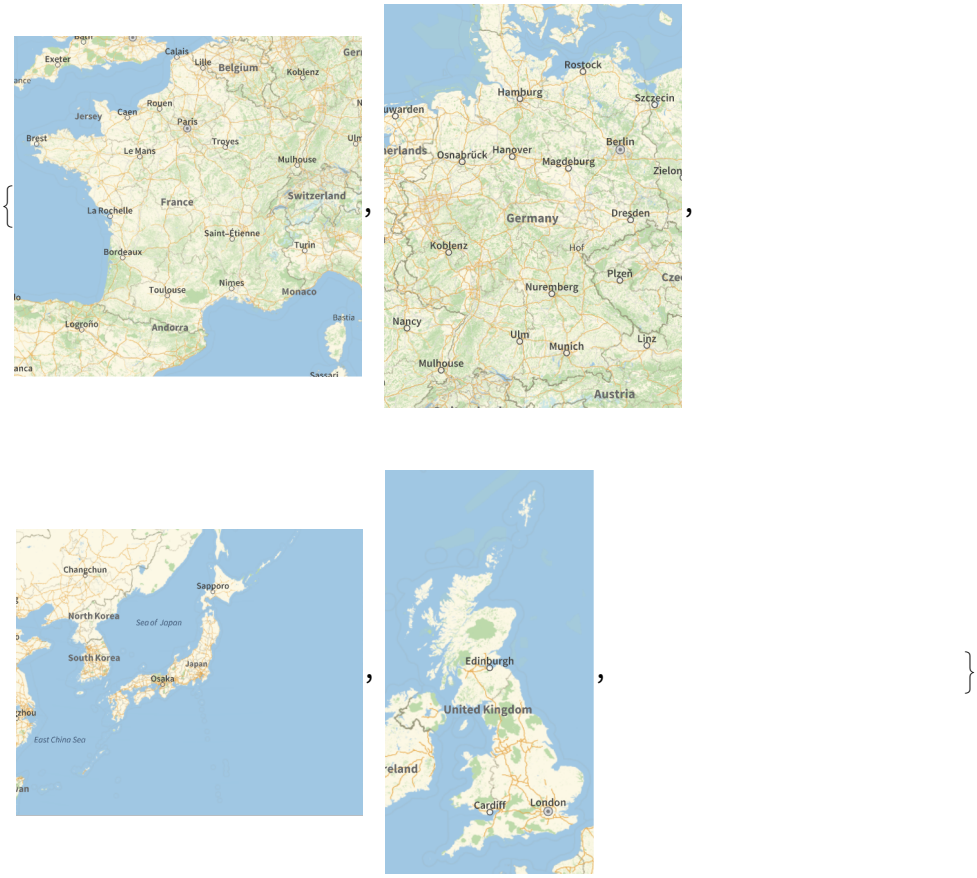


In[101]:=

```
(*25.6*)
GeoGraphics /@ EntityList[EntityClass["Country", "GroupOf5"]]
```

GeoServer: Unable to download one or more vector tiles.

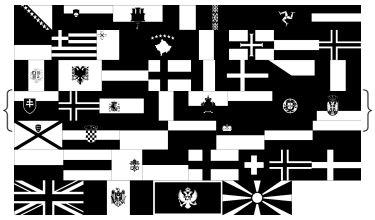
Out[101]=



In[102]:=

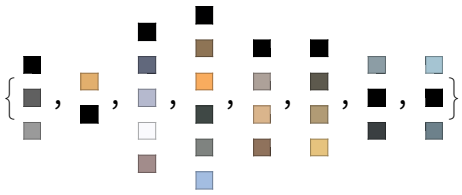
```
(*25.7*)
ImageCollage /@ {Binarize /@ EntityValue[Europe GEOGRAPHIC REGION [countries], flag]}
```

Out[102]=



In[103]:=
```
(*25.8*)
Column /@ DominantColors /@ planets PLANETS [ image ]
```

Out[103]=



In[104]:=
```
(*25.9*)
Total /@ LetterNumber /@ {"wolfram"}
```

Out[104]=
```
{88}
```

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]...
vs.
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[105]:=
```
(*26.1 Use Range and a pure function to create a list of the first 20 squares.*)
Power[#, 2] & /@ Range[20]
```

Out[105]=
```
{1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400}
```

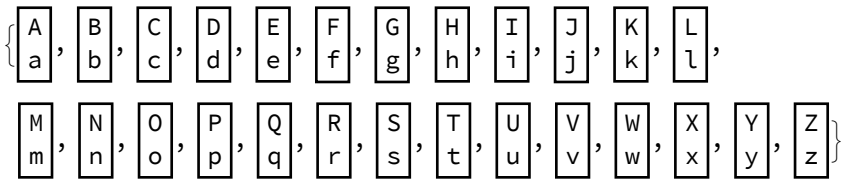
In[106]:=
```
(*26.2 A list of the result of blending yellow,green and blue with red*)
Blend[{#, Red}] & /@ {Yellow, Green, Blue}
```

Out[106]=

In[107]:=

```
(*26.3 Generate a list of framed columns containing the
 uppercase and lowercase versions of each letter of the alphabet.*)
Framed[Column[{ToUpperCase[#], #}]] & /@ Alphabet[]
```

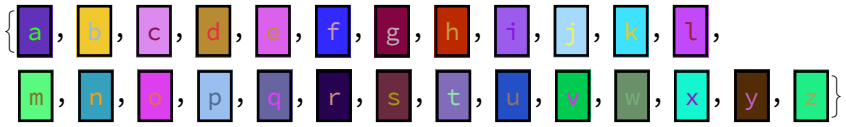
Out[107]=



In[108]:=

```
(*26.4 A list of letters of the alphabet,in random colors,
with frames having random background colors.*)
Framed[Style[#, RandomColor[]], Background → RandomColor[]] & /@ Alphabet[]
```

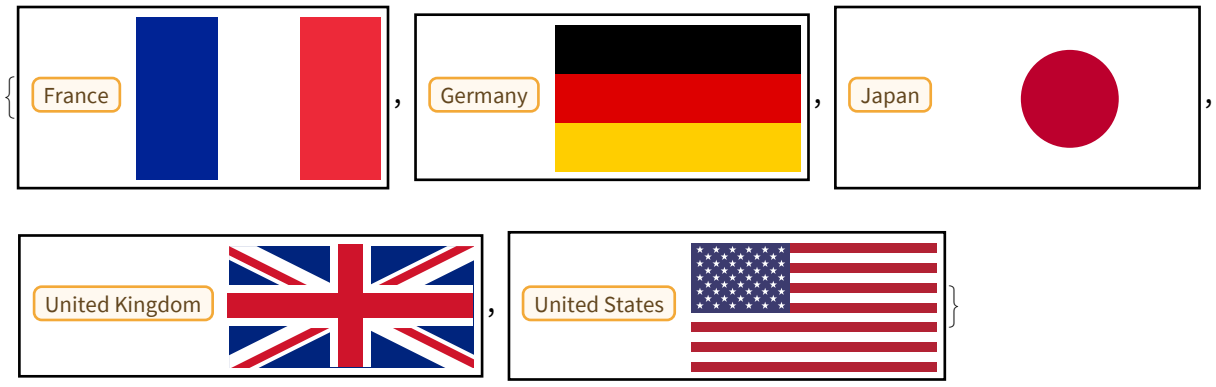
Out[108]=



In[109]:=

```
(*26.5 A table of G5 countries,together with their flags,
and arrange the result in a fully framed grid.*)
Framed[Grid[Table[{#, CountryData[#, "Flag"]}, 1]]] & /@
 EntityList[ Group of 5 COUNTRIES ]
```

Out[109]=



In[110]:=

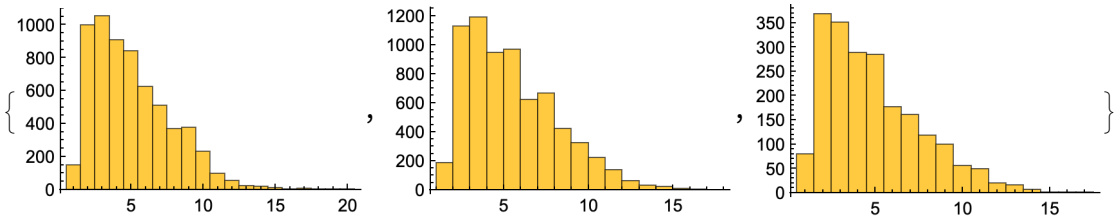
```
(**)
WordCloud[WikipediaData[#]] & /@ {"apple", "peach", "pear"}
```

Out[110]=

In[111]:=

```
(* 26.7 List of histograms of the word lengths in Wikipedia articles on apple,
peach and pear.*)
Histogram[StringLength[TextWords[WikipediaData[#]]]] & /@ {"apple", "peach", "pear"}
```

Out[111]=



In[112]:=

```
(*26.8 A list of maps of Central America,highlighting each country in turn*)
GeoListPlot[#, GeoRange → Central America COUNTRIES] & /@
 EntityList[Central America COUNTRIES]
```

Out[112]=