Learning Wolfram Language

Exercises for Section 1 | Starting Out: Elementary Arithmetic

1.1 Compute1+2+3.

In[13]:=
```
1 + 2 + 3
```
Out[13]=
```
6
```

1.2 Add the numbers 1,2,3,4,5.

In[15]:=
```
1 + 2 + 3 + 4 + 5
```
Out[15]=
```
15
```

1.3 Multiply the numbers 1, 2, 3, 4, 5.

In[16]:=
```
1 * 2 * 3 * 4 * 5
```
Out[16]=
```
120
```

1.4 Compute 5 squared (i . e . 5*5 or 5 raised to the power 2)

In[17]:=
```
5 ^ 2
```
Out[17]=
```
25
```

1.5 Compute 3 raised to the fourth power .

In[18]:=
```
3 ^ 4
```
Out[18]=
```
81
```

1.6 Compute 10 raised to the power 12 (a trillion) .

In[20]:=
```
10 ^ 12
```
Out[20]=
```
1 000 000 000 000
```

1.7 Compute 3 raised to the power 7 x8 .

In[19]:=
```
3 ^ (7 * 8)
```
Out[19]=
```
523 347 633 027 360 537 213 511 521
```

1.8 Add parentheses to 4 - 2*3 + 4 to make 14.

In[21]:=
```
(4 - 2) * (3 + 4)
```
Out[21]= 14

1.9 Compute twenty - nine thousand mutiplied by seventy - three .

In[22]:=
```
29 000 * 73
```
Out[22]= 2 117 000

+1.1 Add all integers from - 3 to + 3.

In[23]:=
```
-3 + -2 + -1 + 1 + 2 + 3
```
Out[23]= 0

+1.2 Compute 24 divided by 3.

In[24]:=
```
24 / 3
```
Out[24]= 8

+1.3 Compute 5 raised to the power 100.

In[25]:=
```
5 ^ 100
```
Out[25]= 7 888 609 052 210 118 054 117 285 652 827 862 296 732 064 351 090 230 047 702 789 306 640 625

+1.4 Subtract 5 squared from 100

In[26]:=
```
100 - (5 ^ 2)
```
Out[26]= 75

+1.5 Multiply 6 by 5 squared, and add 7

In[27]:=
```
(6 * (5 ^ 2)) + 7
```
Out[27]= 157

+1.6 Compute 3 squared minus 2 cubed .

In[28]:=
```
(3 ^ 2) - (2 ^ 3)
```
Out[28]= 1

+1.7 Compute 2 cubed times 3 squared

In[29]:=
```
(2 ^ 3) * (3 ^ 2)
```
Out[29]= 72

+1.8 Compute "double the sum of eight and negative eleven"

In[30]:=
```
(8 - 11) * 2
```
Out[30]= −6

Exercises for Section 2 | Introducing Functions

2.1 Compute 7 + 6 + 5 using the function Plus

In[31]:=
```
Plus[7, 6, 5]
```
Out[31]= 18

2.2 Compute 2 x (3 + 4) using Times and Plus

In[32]:=
```
Times[2, Plus[3, 4]]
```
Out[32]= 14

2.3 Use Max to find the larger of 6x8 and 5x9

In[33]:=
```
Max[Times[6, 8], Times[5, 9]]
```
Out[33]= 48

2.4 Use RandomInteger to generate a random number between 0 and 1000.

In[34]:=
```
RandomInteger[1000]
```
Out[34]= 443

2.5 Use Plus and RandomInteger to generate a number between 10 and 20.

In[35]:=
```
Plus[10, RandomInteger[10]]
```
Out[35]= 12

+2.1 Compute 5 x4x3x2 using Times .

In[36]:=
```
Times[5, 4, 3, 2]
```
Out[36]= 120

+2.2 Compute 2 - 3 using Subtract

In[37]:=
```
Subtract[2, 3]
```
Out[37]= −1

+2.3 Compute (8 + 7) + (9 + 2) using Times and Plus

In[38]:=
```
Times[Plus[8, 7], Plus[9, 2]]
```
Out[38]=
```
165
```

+2.4 Compute (26 - 89)/9 using Subtract and Divide

In[39]:=
```
Divide[Subtract[26, 89], 9]
```
Out[39]=
```
-7
```

+2.5 Compute 100 - 5^2 using Subtract and Power

In[40]:=
```
Subtract[100, Power[5, 2]]
```
Out[40]=
```
75
```

+2.6 Find the larger of 3^5 and 5^3

In[41]:=
```
Max[Power[3, 5], Power[5, 3]]
```
Out[41]=
```
243
```

+2.7 Multiply 3 and the larger of 4^3 and 3^4

In[42]:=
```
Times[3, Max[Power[4, 3], Power[3, 4]]]
```
Out[42]=
```
243
```

+2.8 Add two random numbers each between 0 and 1000.

In[43]:=
```
Plus[RandomInteger[1000], RandomInteger[1000]]
```
Out[43]=
```
698
```

Exercises for Section 3 | First Look at Lists

3.1 Use Range to create the list {1, 2, 3, 4}

In[44]:=
```
Range[4]
```
Out[44]=
```
{1, 2, 3, 4}
```

3.2 Make a list of numbers up to 100

In[45]:=
```
Range[100]
```
Out[45]=
```
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23,
 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43,
 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62,
 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81,
 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100}
```

3.3 Use Range and Reverse to create {4, 3, 2, 1}

In[46]:=
```
Reverse[Range[4]]
```

Out[46]=
```
{4, 3, 2, 1}
```

3.4 Make a list of numbers from 1 to 50 in reverse order .

In[47]:=
```
Reverse[Range[50]]
```

Out[47]=
```
{50, 49, 48, 47, 46, 45, 44, 43, 42, 41, 40, 39, 38, 37,
 36, 35, 34, 33, 32, 31, 30, 29, 28, 27, 26, 25, 24, 23, 22, 21, 20,
 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1}
```

3.5 Use Range, Reverse and Join to create {1, 2, 3, 4, 4, 3, 2, 1}

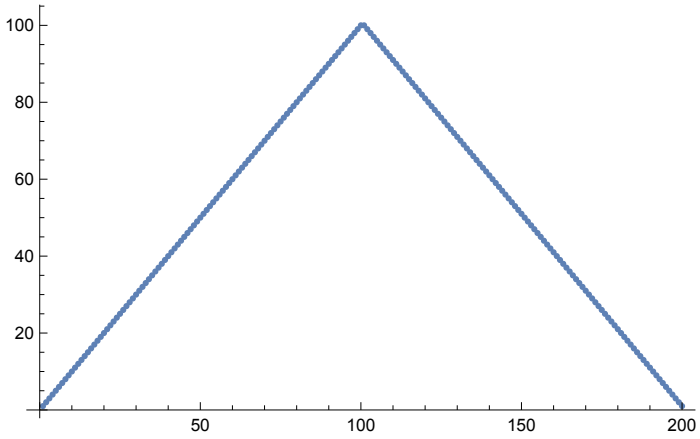
In[48]:=
```
Join[Range[4], Reverse[Range[4]]]
```

Out[48]=
```
{1, 2, 3, 4, 4, 3, 2, 1}
```

3.6 Plot a list that counts up from 1 to 100, then down to 1.

In[49]:=
```
ListPlot[Join[Range[100], Reverse[Range[100]]]]
```

Out[49]=



3.7 Use Range and RandomInteger to make a list with a random lenght up to 10.

In[51]:=
```
Range[RandomInteger[10]]
```

Out[51]=
```
{1, 2, 3}
```

3.8 Find a simpler form for Reverse[Reverse[Range[10]]]

In[52]:=
```
Range[10]
```

Out[52]=
```
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
```

3.9 Find a simpler form to Join[{1, 2}, Join[{3, 4}, {5}]]

In[53]:=
```
Range[5]
```

Out[53]=
```
{1, 2, 3, 4, 5}
```

3.10 Find a simpler form for Join[Range[10], Join[Range[10], Range[5]]]

In[54]:=
```
Join[Range[10], Range[10], Range[5]]
```

Out[54]=
```
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 1, 2, 3, 4, 5}
```

3.11 Find a simpler form for Reverse[Join[Range[20], Reverse[Range[20]]]]

In[55]:=
```
Join[Range[20], Reverse[Range[20]]]
```

Out[55]=
```
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,
 20, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1}
```

+3.1 Compute the reverse of the reverse of {1, 2, 3, 4}

In[57]:=
```
Reverse[Reverse[Range[4]]]
```

Out[57]=
```
{1, 2, 3, 4}
```

+3.2 Use Range, Reverse and Join to create the list {1, 2, 3, 4, 5, 4, 3, 2, 1} .

In[58]:=
```
Join[Range[4], Reverse[Range[4]]]
```

Out[58]=
```
{1, 2, 3, 4, 4, 3, 2, 1}
```

+3.3 Use Range, Reverse and Join to create {3, 2, 1, 4, 3, 2, 1, 5, 4, 3, 2, 1}

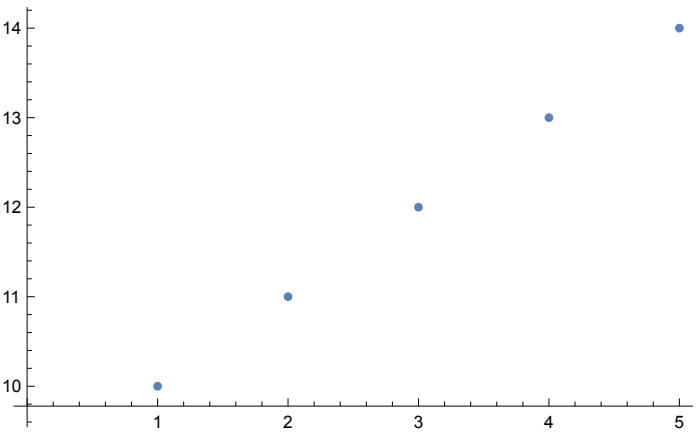
In[59]:=
```
Join[Reverse[Range[3]], Reverse[Range[4]], Reverse[Range[5]]]
```

Out[59]=
```
{3, 2, 1, 4, 3, 2, 1, 5, 4, 3, 2, 1}
```

+3.4 Plot the list numbers {10, 11, 12, 13, 14}

In[60]:=
```
ListPlot[Range[10, 14]]
```

Out[60]=

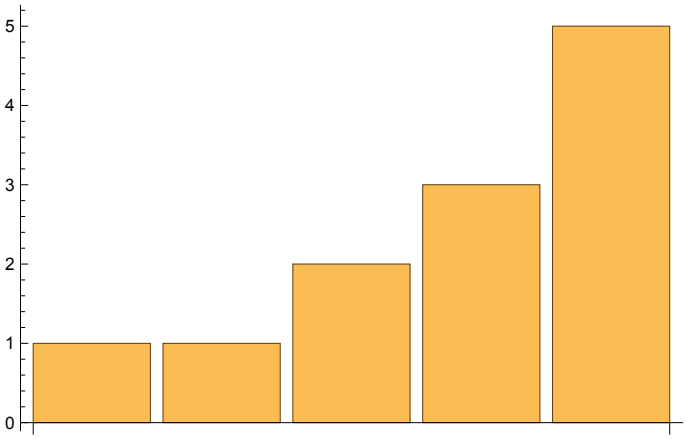


Exercises for Section 4 | Displaying Lists

4.1 Make a bar chart of {1, 1, 2, 3, 5}

In[61]:=
```
BarChart[{1, 1, 2, 3, 5}]
```

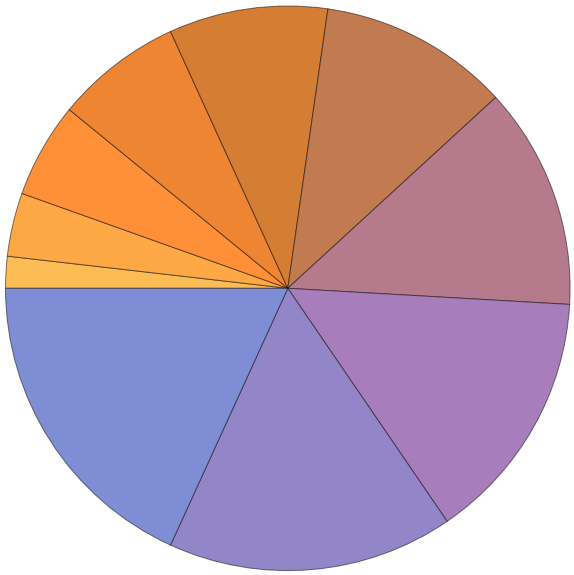
Out[61]=



4.2 Make a pie chart of numbers from 1 to 10.

In[62]:=
```
PieChart[Range[10]]
```

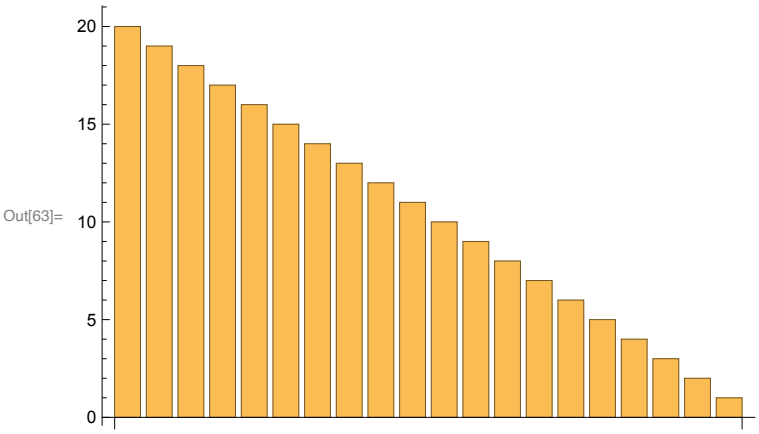
Out[62]=



4.3 Make a bar chart of numbers counting down from 20 to 1.

In[63]:=
```
BarChart[Reverse[Range[20]]]
```

Out[63]=



4.4 Display numbers from 1 to 5 in a column .

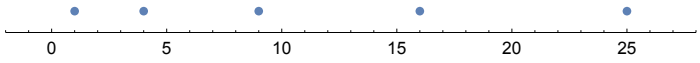
In[64]:=
```
Column[Range[5]]
```

Out[64]=
```
1
2
3
4
5
```

4.5 Make a number line plot of the squares {1, 4, 9, 16, 25} .

In[65]:=
```
NumberLinePlot[Range[5]^2]
```

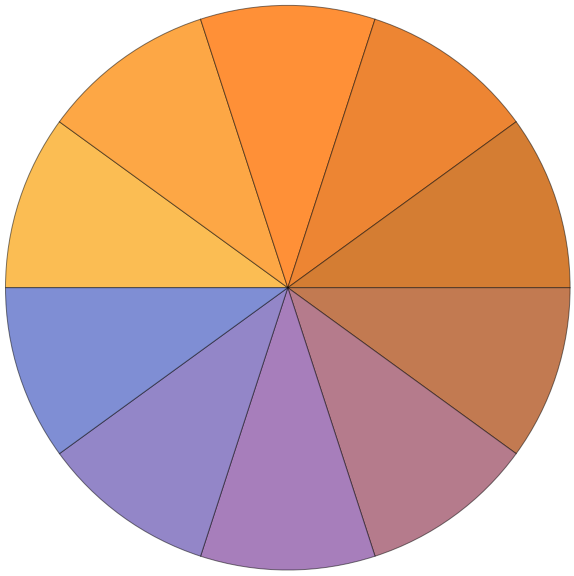
Out[65]=



4.6 Make a pie chart with 10 identical segments, each of size 1.

In[66]:=
```
PieChart[ConstantArray[1, 10]]
```

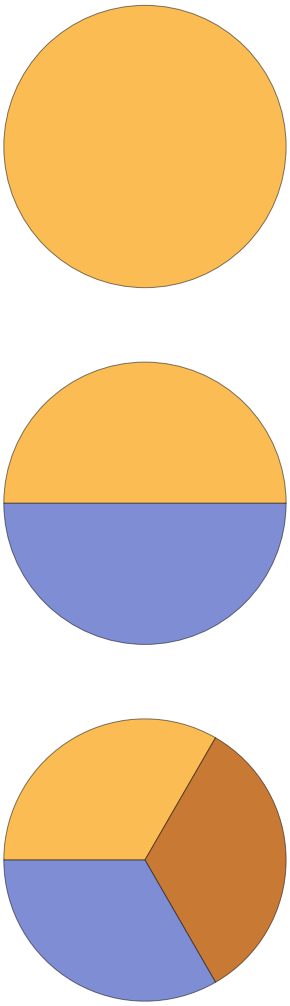
Out[66]=



4.7 Make a column of pie charts with 1, 2 and 3 identical segments.

In[67]:=
```
Column[{PieChart[{1}], PieChart[{1, 1}], PieChart[{1, 1, 1}]}, 3]
```

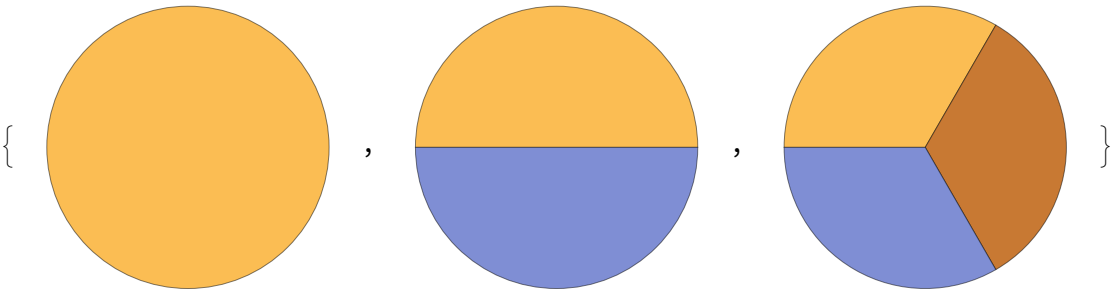
Out[67]=



+4.1 Make a list of pie charts with 1, 2 and 3 identical segments .

In[68]:=
```
{PieChart[{1}], PieChart[{1, 1}], PieChart[{1, 1, 1}]}
```

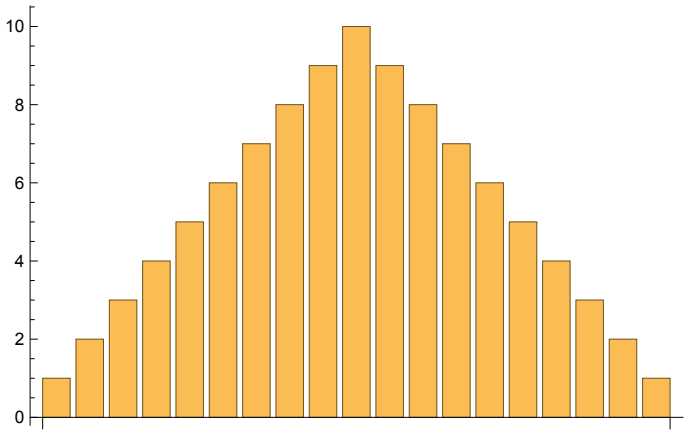
Out[68]=



+4.2 Make a bar chart of the sequence 1, 2, 3, ..., 9, 10, 9, 8, 7, ..., 1.

In[69]:=
```
BarChart[Join[Range[10], Reverse[Range[9]]]]
```

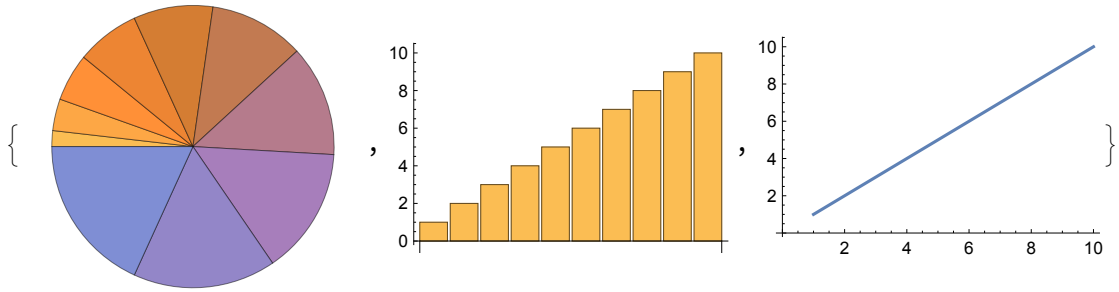
Out[69]=



+4.3 Make a list of pie chart, bar chart and line plot of the numbers from 1 to 10.

In[70]:=
```
{PieChart[Range[10]], BarChart[Range[10]], ListLinePlot[Range[10]]}
```

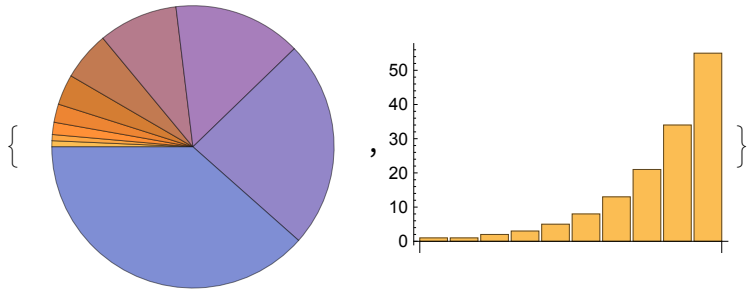
Out[70]=



+4.4 Make a list of a pie chart and a bar chart of {1, 1, 2, 3, 5, 8, 13, 21, 34, 55}

In[71]:=
```
{PieChart[Fibonacci[Range[10]]], BarChart[Fibonacci[Range[10]]]}
```

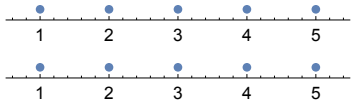
Out[71]=



+4.5 Make a column of two number line plot of {1, 2, 3, 4, 5}

In[72]:=
```
Column[{NumberLinePlot[Range[5]], NumberLinePlot[Range[5]]}]
```

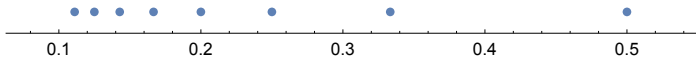
Out[72]=



+4.6 Mae a number line of fractions 1/2, 1/3, ... through 1/9.

In[73]:=
```
NumberLinePlot[{ConstantArray[1, 8] / Range[2, 9]}]
```

Out[73]=



Exercises for Section 5 | Operations on Lists

5.1 Make a list of the first 10 squares, in reverse order .

In[74]:=
```
Reverse[Range[10]^2]
```

Out[74]=
```
{100, 81, 64, 49, 36, 25, 16, 9, 4, 1}
```

5.2 Find the total of the first 10 squares .

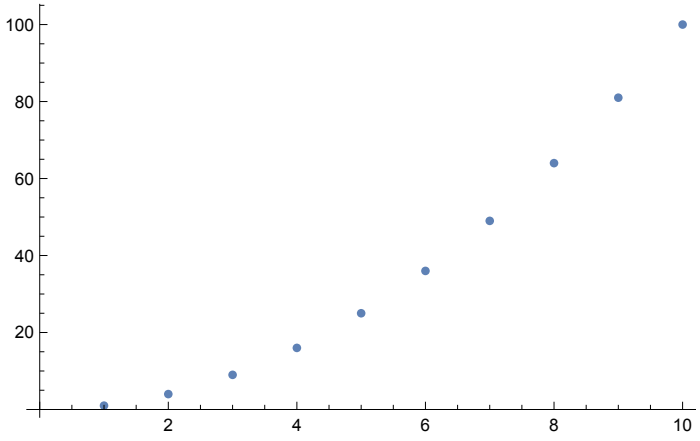
In[75]:=
```
Total[Reverse[Range[10]^2]]
```

Out[75]=
```
385
```

5.3 Make a plot of the first 10 squares, starting at 1.

In[76]:=
```
ListPlot[Range[10]^2]
```

Out[76]=



5.4 Use Sort, Join and Range to create {1, 1, 2, 2, 3, 3, 4, 4}.

In[78]:=
```
Sort[Join[Range[4], Range[4]]]
```

Out[78]=
```
{1, 1, 2, 2, 3, 3, 4, 4}
```

5.5 Use Range and + to make a list of numbers from 10 to 20, inclusive .

In[79]:=
```
Range[0, 10] + 10
```
Out[79]=
```
{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20}
```

5.6 Make a combined list of the first 5 squares and cubes (numbers raised to the power 3), sorted into order .

In[80]:=
```
Sort[Join[Range[5]^2, Range[5]^3]]
```
Out[80]=
```
{1, 1, 4, 8, 9, 16, 25, 27, 64, 125}
```

5.7 Find the number of digits in 2^128.

In[81]:=
```
Length[IntegerDigits[2^128]]
```
Out[81]=
```
39
```

5.8 Find the first digit of 3^32

In[82]:=
```
First[IntegerDigits[2^32]]
```
Out[82]=
```
4
```

5.9 Find the first 10 digits in 2^100.

In[83]:=
```
Take[IntegerDigits[2^100], 10]
```
Out[83]=
```
{1, 2, 6, 7, 6, 5, 0, 6, 0, 0}
```

5.10 Find the largest digit that appears in 2^20.

In[84]:=
```
Max[IntegerDigits[2^20]]
```
Out[84]=
```
8
```

5.11 Find how many zeros appear in the digits of 2^1000.

In[85]:=
```
Count[IntegerDigits[2^1000], 0]
```
Out[85]=
```
28
```

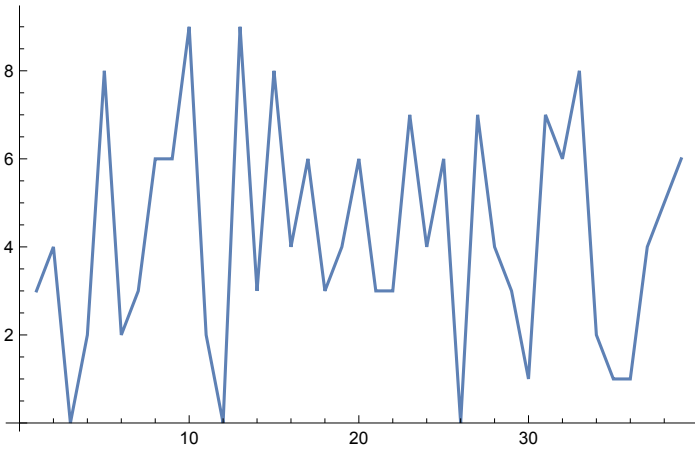
5.12 Use Part, Sort and IntegerDigit to find the second - smallest digit in 2^20.

In[86]:=
```
Part[Sort[IntegerDigits[2^20]], 2]
```
Out[86]=
```
1
```

5.13 Make a line plot of the sequence of digits that appear in 2^128.

In[87]:=
```
ListLinePlot[IntegerDigits[2^128]]
```

Out[87]=



5.14 Use Take and Drop to get the sequence 11 through 20 from Range[100].

In[88]:=
```
Take[Drop[Range[100], 10], 10]
```

Out[88]=
```
{11, 12, 13, 14, 15, 16, 17, 18, 19, 20}
```

+5.1 Make a list of the first 10 multiples of 3.

In[89]:=
```
Range[10] * 3
```

Out[89]=
```
{3, 6, 9, 12, 15, 18, 21, 24, 27, 30}
```

+5.2 Make a list of the first 10 squares using only Range and Times .

In[90]:=
```
Times[Range[10], Range[10]]
```

Out[90]=
```
{1, 4, 9, 16, 25, 36, 49, 64, 81, 100}
```

+5.3 Find the last digit of 2^37.

In[91]:=
```
Last[IntegerDigits[2^37]]
```

Out[91]= 2

+5.4 Find the second-to-last digit of 2^32.

In[92]:=
```
Last[Drop[IntegerDigits[2^32], -1]]
```

Out[92]= 9

+5.5 Find the sum of all the digits of 3^126.

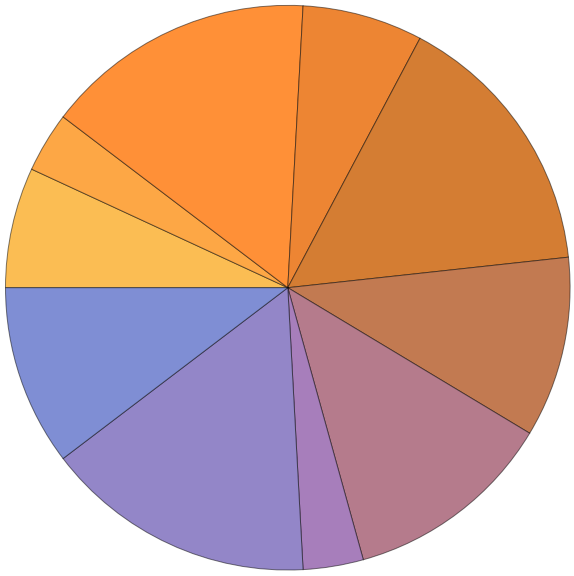
In[93]:=
```
Total[IntegerDigits[3^126]]
```

Out[93]= 234

+5.6 Make a pie chart of the sequence of digits that appear in 2^32.

In[94]:=
```
PieChart[IntegerDigits[2^32]]
```

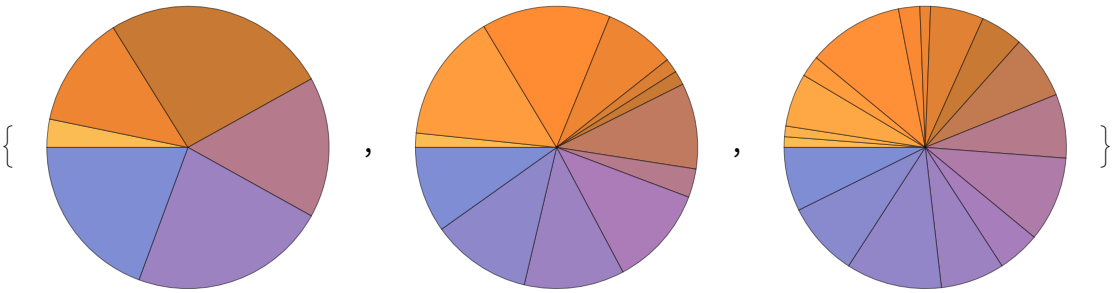
Out[94]=



+5.7 Make a list of pie charts for the sequence of digits in 2^20, 2^40, 2^60.

In[95]:=
```
{PieChart[IntegerDigits[2^20]],
 PieChart[IntegerDigits[2^40]], PieChart[IntegerDigits[2^60]]}
```

Out[95]=



Exercises for Section 6 | Making Tables

6.1 Make a list in which the number 1000 is repeated 5 times .

In[96]:=
```
Table[1000, {5}]
```

Out[96]=
```
{1000, 1000, 1000, 1000, 1000}
```

6.2 Make a table of the value of n^3 for n from 10 to 20.

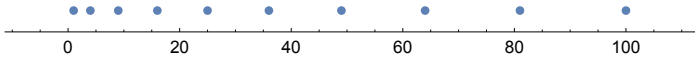
In[97]:=
```
Table[n^3, {n, 10, 20}]
```

Out[97]=
```
{1000, 1331, 1728, 2197, 2744, 3375, 4096, 4913, 5832, 6859, 8000}
```

6.3 Make a number line plot of the first 20 squares .

In[99]:=
```
NumberLinePlot[Table[n^2, {n, 10}]]
```

Out[99]=



6.4 Make a list of the even numbers (2, 4, 6, ...) up to 20.

In[98]:=
```
Table[n * 2, {n, 10}]
```

Out[98]=
```
{2, 4, 6, 8, 10, 12, 14, 16, 18, 20}
```

6.5 Use Table to get the same result as Range[10].

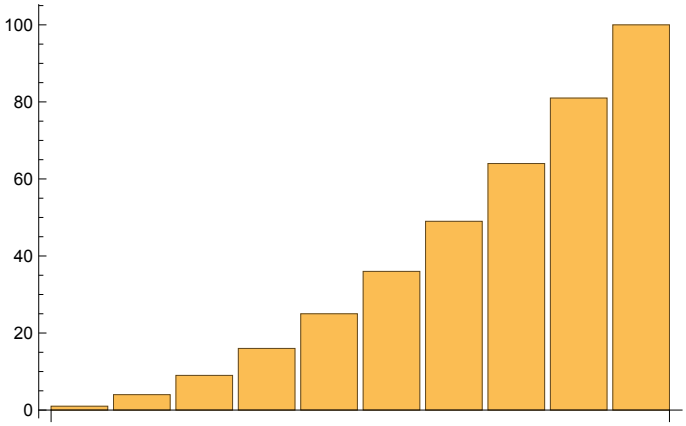
In[100]:=
```
Table[n, {n, 10}]
```

Out[100]=
```
{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
```

6.6 Make a bar chart of the first 10 squares .

In[101]:=
```
BarChart[Table[n^2, {n, 10}]]
```

Out[101]=



6.7 Make a table of lists of digits for the first 10 squares.

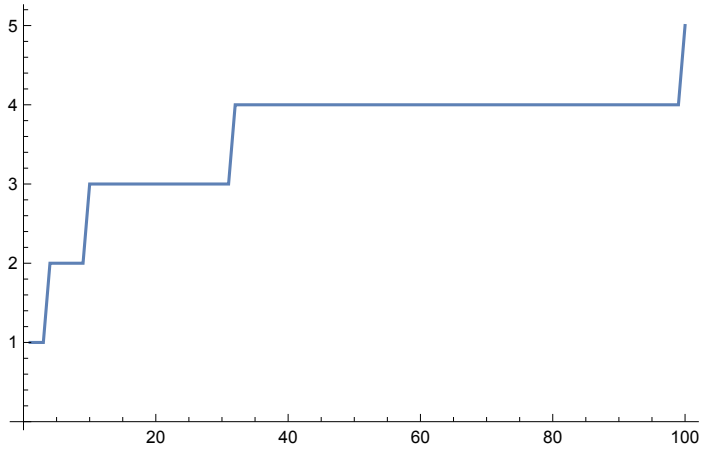
In[102]:=
```
Table[IntegerDigits[n^2], {n, 10}]
```

Out[102]=
```
{{1}, {4}, {9}, {1, 6}, {2, 5}, {3, 6}, {4, 9}, {6, 4}, {8, 1}, {1, 0, 0}}
```

6.8 Make a list line plot of the length of the sequence of digits for each of the first 100 squares.

In[103]:=
```
ListLinePlot[Table[Length[IntegerDigits[n^2]], {n, 100}]]
```

Out[103]=



6.9 Make a table of the first digit of the first 20 squares.

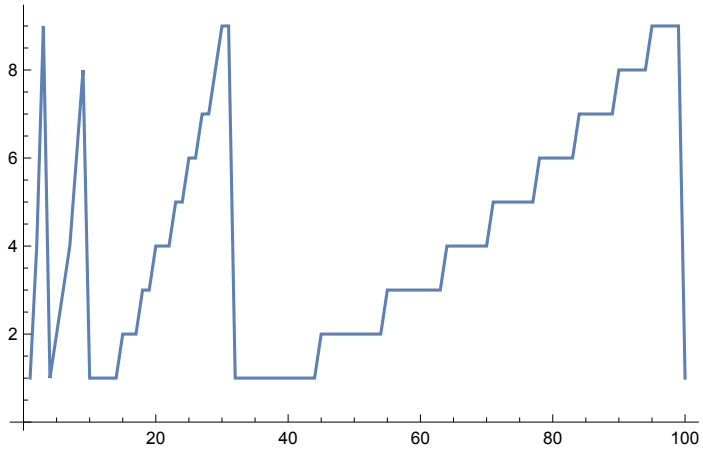
In[104]:=
```
Table[First[IntegerDigits[n^2]], {n, 20}]
```

Out[104]=
```
{1, 4, 9, 1, 2, 3, 4, 6, 8, 1, 1, 1, 1, 1, 2, 2, 2, 3, 3, 4}
```

6.10 Make a list line plot of the first digits of the first 100 squares.

In[105]:=
```
ListLinePlot[Table[First[IntegerDigits[n^2]], {n, 100}]]
```

Out[105]=



+6.1 Make a list of the differences between n^3 and n^2 with n up to 10.

In[106]:=
```
Table[(n^3) - (n^2), {n, 10}]
```

Out[106]=
```
{0, 4, 18, 48, 100, 180, 294, 448, 648, 900}
```

+6.2 Make a list of the odd numbers (1, 3, 5, ...) up to 100.

In[107]:=
```
Table[(n * 2) - 1, {n, 50}]
```

Out[107]=
```
{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31,
 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65,
 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99}
```

+6.3 Make a list of the squares of even numbers up to 100.

In[108]:=
```
Table[(n * 2)^2, {n, 50}]
```

Out[108]=
```
{4, 16, 36, 64, 100, 144, 196, 256, 324, 400, 484, 576, 676, 784, 900,
 1024, 1156, 1296, 1444, 1600, 1764, 1936, 2116, 2304, 2500, 2704, 2916,
 3136, 3364, 3600, 3844, 4096, 4356, 4624, 4900, 5184, 5476, 5776, 6084,
 6400, 6724, 7056, 7396, 7744, 8100, 8464, 8836, 9216, 9604, 10 000}
```

+6.4 Create the list {-3, -2, -1, 0, 1, 2} using Range .

In[109]:=
```
Range[-3, 2]
```

Out[109]=
```
{-3, -2, -1, 0, 1, 2}
```

+6.5 Make a list for the numbers n up to 20 in which each element is a column of the value of n, n^2 and n^3.

In[110]:=
```
Table[Column[{n, n^2, n^3}], {n, 20}]
```

Out[110]=

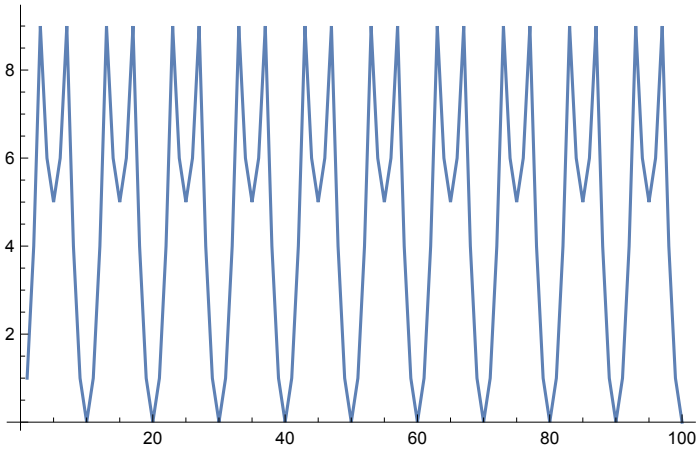
1	2	3	4	5	6	7	8	9	10	11
1	4	9	16	25	36	49	64	81	100	121
1	8	27	64	125	216	343	512	729	1000	1331

12	13	14	15	16	17	18	19	20
144	169	196	225	256	289	324	361	400
1728	2197	2744	3375	4096	4913	5832	6859	8000

+6.6 Make a list line plot of the last digit of the first 100 squares.

In[111]:=
```
ListLinePlot[Table[Last[IntegerDigits[n^2]], {n, 100}]]
```

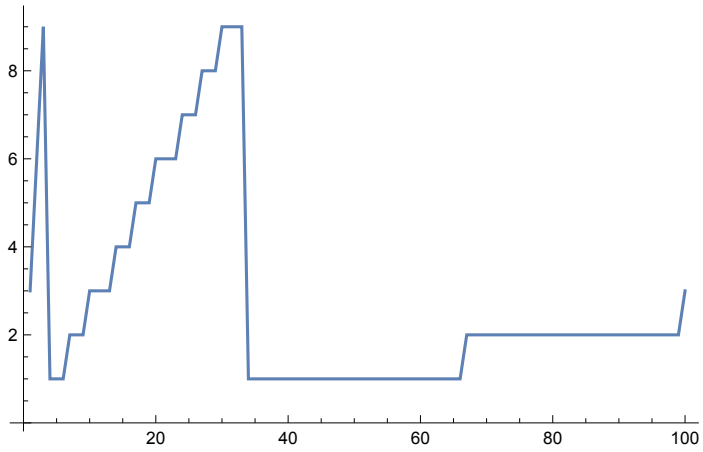
Out[111]=



+6.7 Make a list line plot of the first digit of the first 100 multiplies of 3.

In[112]:=
```
ListLinePlot[Table[First[IntegerDigits[n * 3]], {n, 100}]]
```

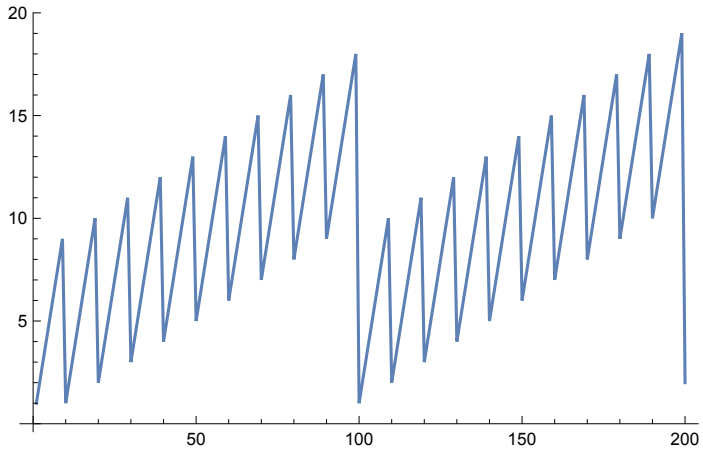
Out[112]=



+6.8 Make a list line plot of the total of the digits for each number up to 200.

In[113]:=
```
ListLinePlot[Table[Total[IntegerDigits[n]], {n, 200}]]
```

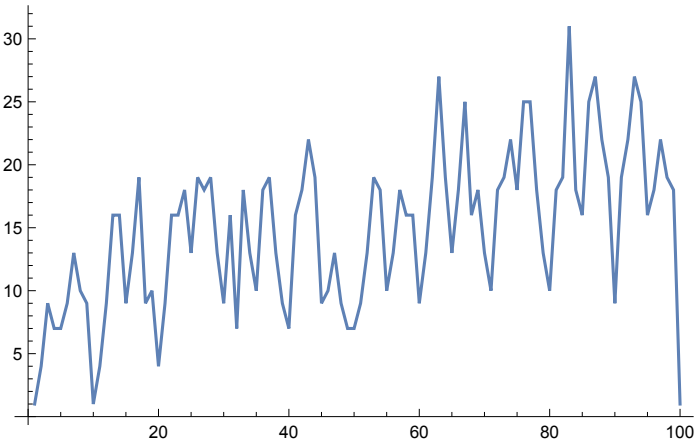
Out[113]=



+6.9 Make a list line plot of the total of the digits for each of the first 100 squares.

In[114]:=
```
ListLinePlot[Table[Total[IntegerDigits[n^2]], {n, 100}]]
```

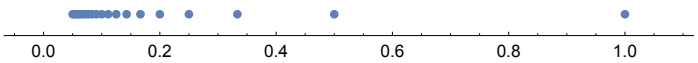
Out[114]=



+6.10 Make a number line plot of the numbers 1/n with n from 1 to 20.

In[115]:=
```
NumberLinePlot[Table[1 / n, {n, 1, 20}]]
```

Out[115]=



+6.11 Make a line plot of a list of 100 random integers where the nth integer is between 0 and n.

In[116]:=
```
ListLinePlot[Table[RandomInteger[n], {n, 100}]]
```

Out[116]=