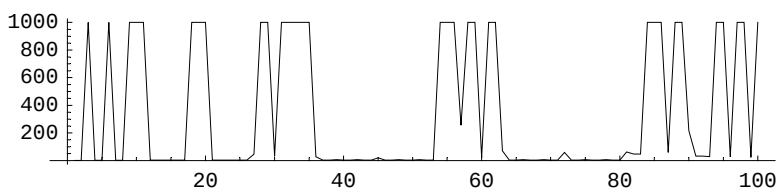
```
Q3Series[α_Integer, n_Integer, cut_Integer] :=
 Module[{NotUsedQ, t},
  NotUsedQ[_] = True;
  NotUsedQ[0] = False;
  Most@NestWhileList[
    If[Mod[#, 3] == 0, α # / 3, Quotient[#, 3]] &,
    n,
    (t = NotUsedQ[#]; NotUsedQ[#] = False; t) &,
    1,
    cut
   ]
 ]
```

```
Q3Series[28, 5, 10]
```

```
{5, 1}
```

```
res28 = Table[Q3Series[28, i, 1000], {i, 100}];
```

```
ListPlot[Length /@ res28, PlotJoined → True, AspectRatio → 1 / 5]
```



- Graphics -

```
Position[Length /@ res28, 1000]
```

```
{{3}, {6}, {9}, {10}, {11}, {18}, {19}, {20}, {28}, {29},
 {31}, {32}, {33}, {34}, {35}, {54}, {55}, {56}, {58}, {59}, {61},
 {62}, {84}, {85}, {86}, {88}, {89}, {94}, {95}, {97}, {98}, {100}}
```

```
try3 = Q3Series[28, 3, 10000];
```

```
Max[try3]
```

```
322429455529482627547389110363494692241704601889357697694334647094847403034876639648 0
 3545585838379652790065521083772080469218543353117441619298207281722659 2
```

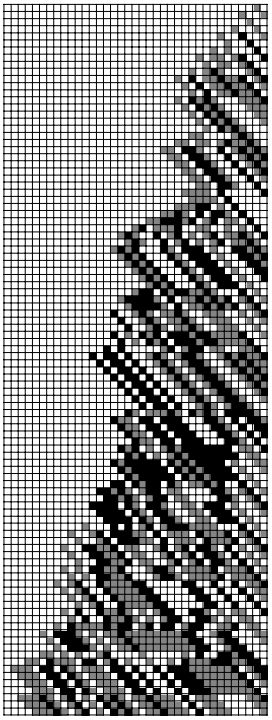
```
Max[Take[try3, 100]]
```

```
73969548168207104
```

```
Log[3., %]
```

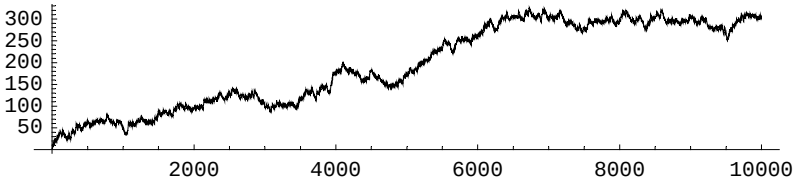
```
35.3559
```

```
ListDensityPlot[3 - Reverse@IntegerDigits[Take[try3, 100], 3, 37],
 AspectRatio → Automatic, Frame → False]
```



- DensityGraphics -

```
ListPlot[1 + Floor[Log[3., try3]], PlotJoined → True, AspectRatio → 1 / 5]
```

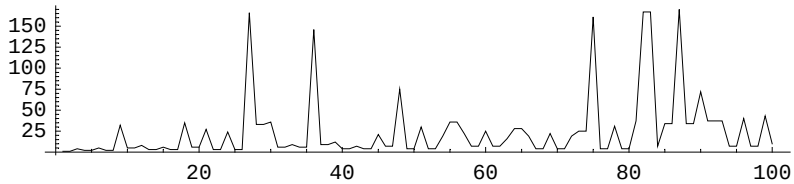


- Graphics -

α==26

```
res26 = Table[Q3Series[26, i, 1000], {i, 100}];
```

```
ListPlot[Length /@ res26, PlotJoined → True, AspectRatio → 1 / 5, PlotRange → All]
```



- Graphics -

```
Q3SeriesTable[α_Integer, n_Integer, cut_Integer] :=
 Module[{NotUsedQ, t},
  NotUsedQ[_] = True;
  NotUsedQ[0] = False;
  Table[Most@NestWhileList[
     If[Mod[#, 3] == 0, α # / 3, Quotient[#, 3]] &,
     i,
     (t = NotUsedQ[#]; NotUsedQ[#] = False; t) &,
     1,
     cut
    ], {i, n}]
 ]
```

```
Q3SeriesTable[26, 10, 10]
```

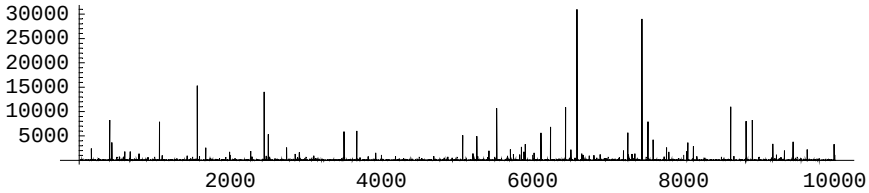
```
{{1}, {2}, {3, 26, 8}, {4}, {5}, {6, 52, 17}, {7},
 {}, {9, 78, 676, 225, 1950, 16900, 5633, 1877, 625, 208}, {10}}
```

```
res26b = Q3SeriesTable[26, 10000, 100000]; // Timing
```

```
General::spell1 :
 Possible spelling error: new symbol name "res26b" is similar to existing symbol "res26". More…
```

```
{21.04 Second, Null}
```

```
ListPlot[Length /@ res26b, PlotJoined → True, AspectRatio → 1 / 5, PlotRange → All]
```



- Graphics -

```
Ordering[Length /@ res26b, -1]
```

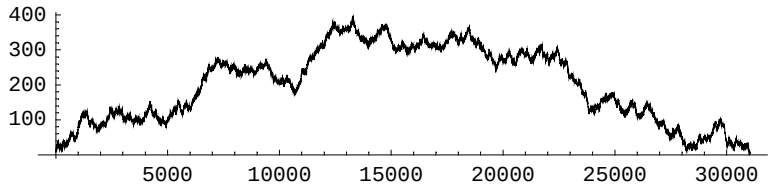
```
{6588}
```

```
try6588 = Q3Series[26, 6588, 100000];
```

```
Last[try6588]
```

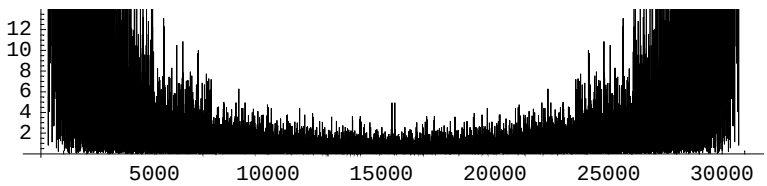
1

```
ListPlot[1 + Floor[Log[3., try6588]], PlotJoined → True, AspectRatio → 1 / 5]
```



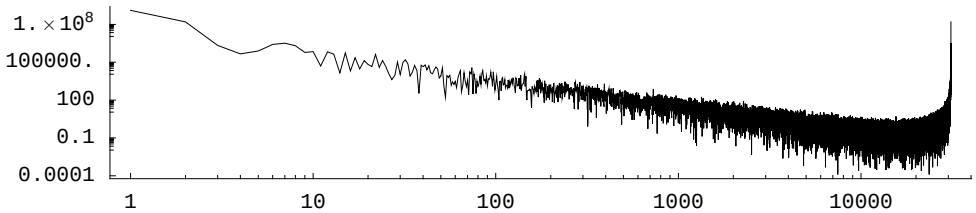
- Graphics -

```
dat = 1 + Floor[Log[3., try6588]];
ps = Abs[Fourier[dat]]^2;
ListPlot[ps, PlotJoined → True, AspectRatio → 1 / 5]
```



- Graphics -

```
LogLogListPlot[ps, PlotJoined → True, AspectRatio → 1 / 5, PlotRange → All]
```



- Graphics -

```
Fit[Transpose[{Log[Range[10000]], Log[Take[ps, 10000]]}], {1, x}, x]
```

16.5725 − 1.91789 x