(*3x+1 function *)
f[x_] := If[Mod[x, 2] == 0, x/2, 3x + 1];
g[x_] := Module[{},
  (* input is an odd number *)
  temp = 3x + 1;
  While[Mod[temp, 2] == 0, temp = temp/2];
  Return[temp];
];

iteratef[start_, print_] := Module[{},
  count = 0;
  current = start;
  Print["We are starting at ", current, "."]; 
  While[current > 0, 
    current = f[current];
    count = count + 1;
    If[print == 1, Print[current]]; 
  ]; (* end of while loop *)
];

iteratefrange[numdo_, startpower_, function_] := Module[{},
  results = {};
  h[y_] := If[function == 1, f[y], g[y]];
  For[n = 1, n <= numdo, n++,
    {count = 0;
     current = RandomInteger[10^startpower];
     While[current > 0, 
      {current = h[current];
       count = count + 1;
      }]; (* end of while loop *)
     results = AppendTo[results, count];
    }]; (* end of n loop *)
  Print["Doing ", numdo, " runs starting at 10^", startpower];
  Print["Average is ", 1.0 Mean[results]]; 
  Print["StDev is ", 1.0 StandardDeviation[results]]; 
  Print[Histogram[results, Automatic, "Probability"]];
 ];

Timing[iteratefrange[100000, 1000, 2]]
Doing 100000 runs starting at 10^1000
Average is 8003.02
StDev is 304.15

\[
\begin{array}{c}
\text{In[5]}: \quad \text{Timing[iteratefrange[1000, 400, 2]]} \\
\text{Out[5]}: \quad \{6545.02, \text{Null}\}
\end{array}
\]

Doing 1000 runs starting at 10^400
Average is 3203.2
StDev is 196.651

\[
\begin{array}{c}
\text{In[5]}: \quad \text{Timing[iteratefrange[1000, 400, 2]]} \\
\text{Out[5]}: \quad \{25.1942, \text{Null}\}
\end{array}
\]
iteratefrangeanalyze[numdo_, startpower_, numpowers_, function_] := Module[{},
    results = {};
    powerresults = {};
    semilogpowerresults = {};
    loglogpowerresults = {};
    h[y_] := If[function == 1, f[y], g[y]];
    For[p = 1, p ≤ numpowers, p++,
        exponent = startpower + 10*p;
        count = 0;
        If[Mod[p, numpowers/10] == 0, Print["We have done ", 100 * p / numpowers, ", %."]];
        For[n = 1, n ≤ numdo, n++,
            current = RandomInteger[10^exponent];
            While[current > 1,
                current = h[current];
                count = count + 1;
            ]]; (* end of while loop *)
        results = AppendTo[results, count];
    ]; (* end of n loop *)
    loglogpowerresults = AppendTo[loglogpowerresults,
        {Log[10., 10.^exponent], Log[10., 1.0 count / numdo]}];
    semilogpowerresults = AppendTo[semilogpowerresults,
        {Log[10.^exponent], 1.0 count / numdo}];
    ]; (* end of p loop *)
    Print["Log-Log Plot, Base 10, Pull out all powers of 2"];
    Print[
      ListPlot[loglogpowerresults, AxesLabel → {"Log_10(seed)", "Log_10(steps)"}]];
    Print["SemiLog Plot, Base 10, Pull out all powers of 2"];
    Print[ListPlot[semilogpowerresults, AxesLabel → {"Log_10(seed)", "steps"}]];
];

Timing[iteratefrangeanalyze[100, 10, 200, 2]]
We have done 10%.
We have done 20%.
We have done 30%.
We have done 40%.
We have done 50%.
We have done 60%.
We have done 70%.
We have done 80%.
We have done 90%.
We have done 100%.

Log-Log Plot, Base 10, Pull out all powers of 2

Semilog Plot, Base 10, Pull out all powers of 2

Out[13]= {1316.46, Null}