Solution to Assignment I

Finding Unknown U

- Find the range of U : Low and High, from two consecutive power terms from k^1, k^2, k^3, ...k^n; k can be 2, 3,...any 10; complexity of finding range will be ceil($\log_k U$); in order notation $\log_2 U$, $\log_k U$ and $\log_{10} U$ have same order
- After finding rage do a binary search for the number; ceil($\log_2 U$) time

Square Root

- Finding root of X^2-N=0 uisng newton rapson method : $X_{k+1}=X_k-f(X_k)/f'(X_k)$

  $=X_k- (X_k^2-N)/2X_k= (X_k+N/X_k)/2$
  - do $X_{k+1}=(X_k+N/X_k)/2$ until abs($X_{k+1}-X_k$)>accuracy
- Take initial guess between 0 to N/2; suppose y;
  - Root will be between 0 to y if N/y < y ;
  - Root will be between y to N if N/y > y ;
  - Approximte using Bisection method :

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y'=any number between 0 to N/2;
Repeat {
        y=y';
        y' = (y+N/y)/2
} untill abs(y-y')<accuracy;
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- which turn out to be same as newton rapson method.

Finding your friend

- Searching all the directions one after another sequencially inorder upto limit distance L=1
  - Searching Cirularly : After finishing all the directions
    - Incrementing the limit L by L=L+1 ;
      - Result in worst cover distance which is $8(1+2+3+..+D)=8*D*(D+1)/2=4(D^2+D)=O(D^2)$
    - Incrementing the limit L by L=2*L;
      - Total cover distance will be 8*(1+2+4+8+..+D+2D)=32*D = O(D);
      - Good solution
  - Searching Spirally: After finising a direction increment L=L*2;
    - Distance will be 2(1+2+4+8+...+D+2D+4D+8D)=32D;
    - Worst case scnario chances is bellow average.