grace li

```
1. void f1(int n){
    int i=2;
      while(i<n){
        /* dosmthing   O(1)
          i = i*i;
        }
      }
```

$$\sum_{1}^{\log\log n} O(1)$$

k	i
1	2
2	4
3	16
4	256

2^{2^k}

$$\boxed{k = \log_2 \log_2 n}$$

```
b. void f2(int n){
    for(int i=1; i<=n; i++){
      if(i% (int)sqrt(n)) ==0){
        for(int k=0; k<pow(i,3); k++){
          /* do smth O(1)
```

$\longleftarrow \sqrt{n}$

16

4 8 12 16

$\downarrow \; \downarrow \; \downarrow \; \downarrow$

$4^3 \; 8^3 \; 12^3 \; 16^3$

runtime $4^3 + 8^3 + 12^3 + 16^3 =$

$(1\sqrt{n})^3 + (2\sqrt{n})^3 + (3\sqrt{n})^3 + (\sqrt{n}\sqrt{n})^3 \quad \sum_{i=1}^{\sqrt{n}} (\sqrt{n})^3$

$\sqrt{n}^3 \sum_{i=1}^{\sqrt{n}} i^3 \quad \frac{\sqrt{n}^2(\sqrt{n}+1)^2}{4} \quad \frac{n(\sqrt{n}+1)^2}{4} =$

$\sqrt{n}^3 (n^2 = n^{7/2}$

$3/2 + 4/2$

$O(n^{7/2})$

[the if statement is called every time i is a multiple of $\sqrt{n}$ (happens $\sqrt{n}$ times)

$\sqrt{n}^3 \sum_{i=1}^{\sqrt{n}} i^3 = \frac{n(\sqrt{n}+1)^2}{4} = O(n^{7/2})$]

```
c. for(int i=1; i<=n; i++){
     for(int k=1;k<=n; k++){
       if(A[k]== i {
         for (int m=1;  m<n; m =m+m
```

$$\sum_{i}^{n}\left(\sum_{k=1}^{n}\left(O(1) + O(\log n)\right)\right)$$

$$= \sum_{n=1}^{n} O(n-1) + O(\log n)$$

$$= n\,[O(n) + O(\log n)]$$

$$= n^2 \longrightarrow \boxed{O(n^2)}$$

d.

size<n $= \frac{3}{2}$ size

4=size $\quad i = (\frac{3}{2})^2$ size

+size + $\frac{3}{2}$size

$(\frac{3}{2})^0 + \frac{3}{2}\text{size} + (\frac{3}{2})^2\text{size} + \ldots$

$\frac{(1-\frac{3}{2})^{i+1}}{1-\frac{3}{2}} \quad 2[(\frac{3}{2})^{i+1} - 1]$

worstcase $(\frac{3}{2})^i$ size $<n$

$(\frac{3}{2})^i = \frac{n}{\text{size}}$

$\downarrow$

$\frac{1-(\frac{3}{2})^{i+1}}{1-\frac{3}{2}} = 2(\frac{3}{2}\frac{n}{\text{size}} - 1)$

$$O(T) = O\left(10 \sum_{i=1}^{\log(\frac{3}{2}n)} 3/2)^i = O\left(10\,\frac{1-\frac{3}{2}^{\log_{3/2} n}}{1-3/2} = 10\,\frac{1-n}{-\frac{1}{2}}\right) = O(n)$$

(every time size is reached loop of size is run and then multipled by 3/2. $10(\frac{3}{2})^k = n = 10\left(\frac{1-\frac{3}{2}^{\log\frac{3}{2}n}}{1-3/2}\right) = O(n)$)

$$O(n) + O(n) = O(n)$$

a

in1	in2	list
1→2→3→4	5→6	
5→6	2→3→4	1→
2→3→4	6	1→5
6	3→4	1→5→2
3→4		1→5→2→6

OUTPUT: 1→5→2→6→3→4

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b

in1	in2
null	2→null

n1 is null so it returns in2's first node

OUTPUT: 2