1. ~~Outer:~~

fixed. so worst=best.

outer: $i = 0, \cdots, n-(t-1)\cdot t$.

$\therefore$ last $i=k$ $\quad k \le n-(k-1)t$

$\therefore k(t+1) \le n+t \leftarrow \sqrt{n}$

$\therefore k \le \left(\frac{n+\sqrt{n}}{\sqrt{n}+1} = \frac{\sqrt{n}(\sqrt{n}+1)}{(\sqrt{n}+1)}\right)$

$\therefore$ last $i = k = \sqrt{n}$.

Inner: when $i = m$ $\quad n-(m-1)\cdot t$ ($=\sqrt{n}$) times innerloop runs.

$\therefore$ total loop.

$$\sum_{m=1}^{\sqrt{n}} (n-(m-1)\cdot\sqrt{n}) = (\text{number of series}) \times \frac{(\text{first}+\text{last})}{2}$$

$$= \sqrt{n}\left(\frac{n + n-(\sqrt{n}-1)\sqrt{n}}{2}\right) = \sqrt{n}\,\frac{(n+\sqrt{n})}{2}$$

first, last

$$\le O(n\sqrt{n})$$

2. outer 1: n

outer 2: n

worstcase inner loop for only n times, 1

total runs $=$ ~~$n^2 * (1*(n^2-n)+$~~

$= 1*(n^2-n) + n*(\text{innerloop})$

$m = 1, 2, 4 \cdots 2^k$.

$2^k \le n$

$\therefore k \le \log_2 n$.

Worst

total runs $= (n^2-n) + n\log n \le O(n^2)$

best. no innerloop.

total runs $= n^2 \ge \Omega(n^2)$

3. $\boxed{\text{Worst}}$

the first for loop : $n * (\underbrace{\text{runtime of insert}}_{=\log n})$

$= n\log n$

the second.

$n * (\text{find runtime} + \log n)$ while $\frac{k}{2^{m-1}} < n$

$\therefore m \le \log n$.

- find runtime $\propto$ size of t_i.

size of $t_i = n$ from the first loop

and $k \le n$ so. t_i size doesn't change

$\therefore$ find runtime $= \log n$

$\therefore$ total $= n\log n + 2n\log n \le O(n\log n)$

$\boxed{\text{Best}}$

$n\log n + n*(\text{find only})$, find only $= \log n$

$= 2n\log n \ge \Omega(n\log n)$

4. outer n / 1

Best $n \le 10$ just n $\Omega(n)$

inner loop for every $i == \text{size}$.

size $= 10,\ 10\cdot(1.5),\ 10\cdot(1.5)^2, \cdots$

K assume all number of size.

the last $10\cdot(1.5)^{k-1} \le n$

$\therefore k = \log_{1.5}\left(\frac{n}{10}\right)+1$

$\therefore$ for k times innerloop run

$\underline{m\text{'th size loop runtime}} = \underline{10\cdot(1.5)^{m-1}}$ ($=$ m'th size.)

$\therefore$ total run

$$1\cdot(n-k) + \sum_{m=1}^{k} 10\cdot(1.5)^{m-1}$$

$$10\cdot\frac{(1.5)^k-1}{1.5-1} = C_0\cdot(1.5)^{\log_{1.5}\left(\frac{n}{10}\right)+1} + C_1$$

$$= C_0'\cdot n + C_1$$

$$\therefore (n-k) + C_0'n + C_1 \le O(n)$$