$n + \frac{n}{2} + \frac{n}{3} = \frac{3n + 2n + n}{6} = \frac{5}{6}n$

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$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$

$$= n + \frac{n}{2} + T\left(\frac{n}{6}\right) + T\left(\frac{n}{4}\right) + \frac{n}{3} + T\left(\frac{n}{6}\right) + T\left(\frac{n}{9}\right)$$

$$= n + \frac{5n}{6} + T\left(\frac{n}{4}\right) + T\left(\frac{n}{9}\right) + 2T\left(\frac{n}{6}\right)$$

$$= n + \frac{5n}{6} + \frac{n}{4} + T\left(\frac{n}{12}\right) + T\left(\frac{n}{8}\right) + \frac{n}{9} + T\left(\frac{n}{18}\right) + T\left(\frac{n}{27}\right) + \frac{n}{6}$$

$$= n + \frac{5n}{6} + \frac{n}{4} + \frac{n}{9} + \frac{2n}{6} + 3T\left(\frac{n}{18}\right) + 3T\left(\frac{n}{12}\right) + T\left(\frac{n}{8}\right) + T\left(\frac{n}{27}\right)$$

$$= n + \frac{5}{6}n + \left(\frac{5}{6}\right)^2 n \quad \text{- - - - Continue}$$

$\therefore O(n)$ //

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$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$

$T\left(\frac{n}{2}\right) = T\left(\frac{n}{4}\right) + T\left(\frac{n}{6}\right) + \frac{n}{2}$

$T\left(\frac{n}{2^2}\right) = T\left(\frac{n}{2^3}\right) + T\left(\frac{n}{12}\right) + \frac{n}{2^2}$

$\Rightarrow T\left(\frac{n}{2^3}\right) = T\left(\frac{n}{2^4}\right) + T\left(\frac{n}{24}\right) + \frac{n}{2^3}$

$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$

$T(n/3) = T\left(\frac{n}{6}\right) + T\left(\frac{n}{3^2}\right) + \frac{n}{3}$

$T(n/3^2) = T\left(\frac{n}{18}\right) + T\left(\frac{n}{3^3}\right) + \frac{n}{3^2}$

$T(n/3^3) = T\left(\frac{n}{54}\right) + T\left(\frac{n}{3^4}\right) + \frac{n}{3^3}$

$\frac{n}{4} + \frac{n}{9} = \frac{9n+4n}{36} = \frac{11n}{36} + \frac{5n}{6} = \frac{11n+}{36}$

$\frac{5n}{6} + \frac{n}{4} + \frac{n}{9} =$

$T(n/6) = T\left(\frac{n}{12}\right) + T\left(\frac{n}{18}\right) + \frac{n}{6}$

$\frac{n}{4} + \frac{n}{9} + \frac{2n}{6} = \frac{9n+4n+12n}{36} = \frac{25n}{36} = \left(\frac{5}{6}\right)^2 n$

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$$T(n) = n^2 + T(n/2) + T(n/4)$$

$$= n^2 + \left(\frac{n}{2}\right)^2 + T\left(\frac{n}{4}\right) + T\left(\frac{n}{8}\right) + \left(\frac{n}{4}\right)^2 + T\left(\frac{n}{8}\right) + T\left(\frac{n}{16}\right)$$

$$= n^2 + \frac{5n^2}{16} + T\left(\frac{n}{4}\right) + 2T\left(\frac{n}{8}\right) + T\left(\frac{n}{16}\right)$$

$$= n^2 + \frac{5}{16}n^2 + \left(\frac{n}{4}\right)^2 + T\left(\frac{n}{8}\right) + T\left(\frac{n}{16}\right) + 2\left(\frac{n}{8}\right)^2 + 2T\left(\frac{n}{16}\right) + 2T\left(\frac{n}{32}\right)$$

$$+ \left(\frac{n}{16}\right)^2 + T\left(\frac{n}{32}\right) + T\left(\frac{n}{64}\right)$$

$$= n^2 + \frac{5n^2}{16} + \left(\frac{5}{16}\right)^2 n^2 + T\left(\frac{n}{8}\right) + 3T\left(\frac{n}{16}\right) + 3T\left(\frac{n}{32}\right) + T\left(\frac{n}{64}\right)$$

$$= n^2 + \frac{5n^2}{16} + \left(\frac{5}{16}\right)^2 n^2 + T\left(\frac{n}{16}\right) + T\left(\frac{n}{32}\right) + \left(\frac{n}{8}\right)^2 + 3T\left(\frac{n}{32}\right) + 3T\left(\frac{n}{64}\right)$$

$$+ 3\left(\frac{n}{16}\right)^2 + 3T\left(\frac{n}{64}\right) + 3T\left(\frac{n}{128}\right) + 3\left(\frac{n}{32}\right)^2 + T\left(\frac{n}{128}\right) + T\left(\frac{n}{256}\right) + \left(\frac{n}{64}\right)^2$$

$$\Theta(n^2) \;//$$

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2. $T(n) = n^2 + T(n/2) + T(n/4)$.

$T(n) = n^2 + T\left(\frac{n}{2}\right) + T\left(\frac{n}{4}\right)$

$T(n/2) = \left(\frac{n}{2}\right)^2 + T\left(\frac{n}{4}\right) + T\left(\frac{n}{8}\right)$

$T\left(\frac{n}{4}\right) = \left(\frac{n}{4}\right)^2 + T\left(\frac{n}{8}\right) + T\left(\frac{n}{16}\right)$

$T\left(\frac{n}{8}\right) = \left(\frac{n}{8}\right)^2 + T\left(\frac{n}{16}\right) + T\left(\frac{n}{32}\right)$

$T(n/4) = (n/4)^2 + T\left(\frac{n}{8}\right) + T\left(\frac{n}{16}\right)$

$T\left(\frac{n}{16}\right) = \left(\frac{n}{16}\right)^2 + T\left(\frac{n}{32}\right) + T\left(\frac{n}{64}\right)$.

$\frac{n^2}{4} + \frac{n^2}{16} = \frac{4n^2 + n^2}{16} = \frac{5n^2}{16}$

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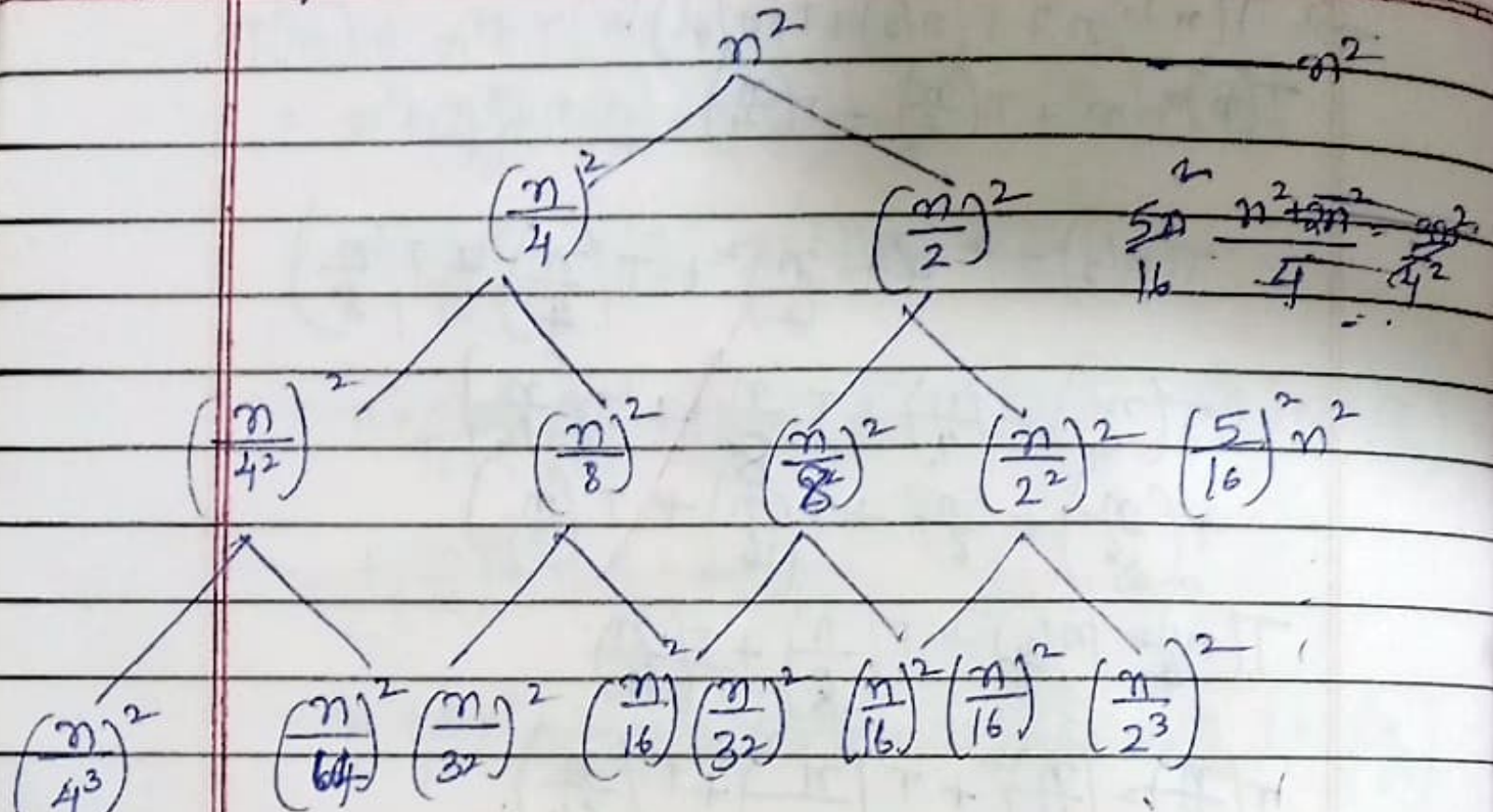
$\therefore T(n) = T(n/4) + T(n/2) + n^2$



n^2

$\frac{5}{16} n^2 + \frac{n^2}{4} + \frac{n^2}{4^2}$

$\left(\frac{5}{16}\right)^i n^2$

$T(n) = 2^h \cdot T(1) + \sum_{i=0}^{h-1} \left(\frac{5}{16}\right)^i \cdot n^2$

$= 2^{\log_2 n} T(1) + n^2 \sum_{i=0}^{h-1} \left(\frac{5}{16}\right)^i$

$= n^{\log_2 2} \cdot 1 + \frac{16}{11} n^2$

$= n + \frac{16}{11} n^2$

$\Theta(n^2)$ //.

$\frac{5}{16} \cdot \frac{16-5}{16} = \frac{11}{16} \cdot \frac{16}{11}$

1	16, 8, 8, 4
2	8, 1, 1, 2
4	4, 1, 1, 1

1/12/21 morning = quiz)

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$T(n) = 2T(\sqrt{n}) + \log n$ $\quad n = 2^k$

$T(n) = 2T(n^{1/2}) + \log 2^k$

$T(2^k) = 2T(2^{k/2}) + \log 2^k$

$T(2^k) = 2T(2^{k/2}) + \log 2 \log 2^k$

$S(k) = 2T(k/2) + \log k = k \log_2^2 = k.$ $\quad T(2^k) = S(k)$

$a=2, b=2, f(n) = \log k$ $\quad$ only $T(2^k)$ not $\log 2^k$.

$k^{\log_2^2} = k \quad f(n) = k$

$\therefore$ ~~$k > \log k$~~ $\therefore k = k$

Case 2.

$\therefore$

$\therefore$ ~~$\Theta(k \log_2 n) = \Theta(\log \log_2 n)$~~

$S(k) = \Theta(k \log k)$

$T(2^k) = \Theta(\log \log \log_2 n)$

$T(n) = \Theta(\log n \log \log \log n)$ //

$\frac{n^2}{16^2}$

$\frac{n^2}{256} + \frac{n^2}{64} + \frac{n^2}{64} + \frac{n^2}{16} = \frac{n^2 + 4n^2 + 4n^2 + 16n^2}{256} + \frac{n^2}{4^2} + \frac{n^2}{2^2} = \frac{n^2 + 4n^2}{16} = \frac{5n^2}{16}$

$= \frac{25n^2}{256} = \left(\frac{5}{16}\right)^2 n^2$

2	256,	64,	64,	16
2	128	32	32	8
2	64	16	16	4
2	32	8	8	2
4	16	4	4	1
4	4,	1	1	

2	16,	4	
2	8,	2	
4	1,	1	

64
× 41
256

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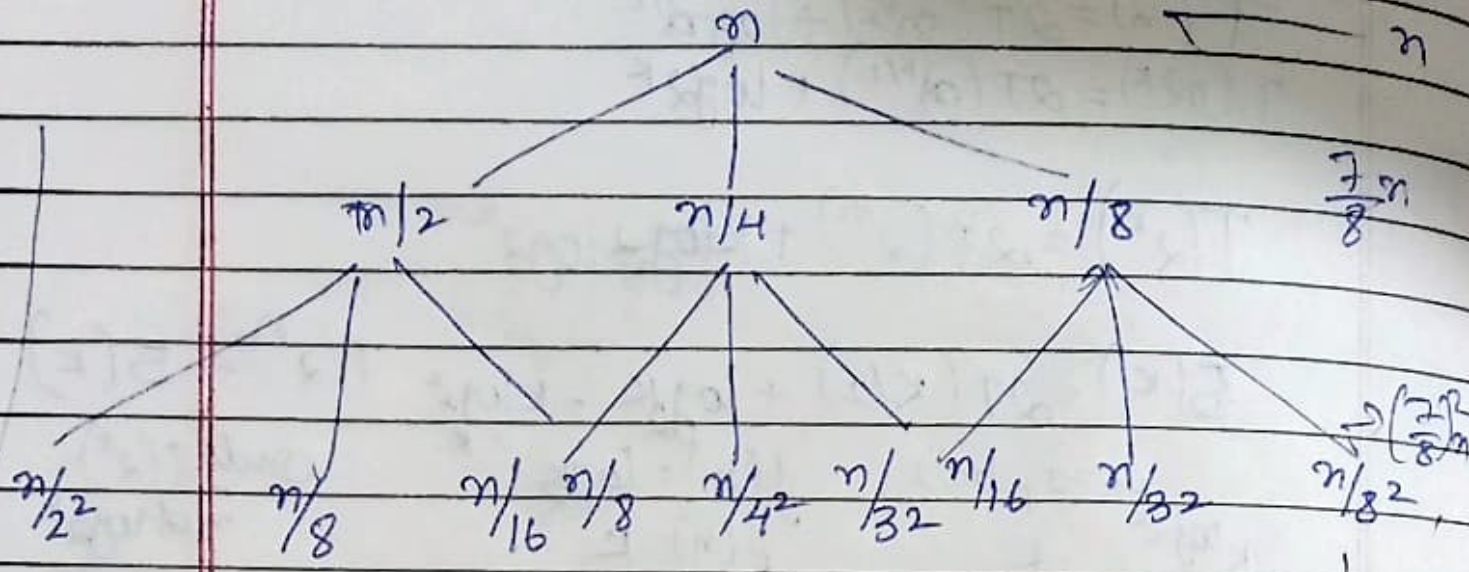
$$T(n) = T(n/2) + T(n/4) + T(n/8) + n$$



$$T(n) = T(1) \cdot 2^h + \sum_{i=0}^{h-1} \left(\frac{7}{8}\right)^i \cdot n$$

$$= 2^{\log_2 n} + n \sum_{i=0}^{h-1} \left(\frac{7}{8}\right)^i$$

$$\left(\frac{7}{8}\right)^0 + \left(\frac{7}{8}\right)^1 + \left(\frac{7}{8}\right)^2 \text{ maximum } \frac{4}{7}$$

$$= \frac{1}{1-\frac{7}{8}} = \frac{1}{\frac{1}{8}} \cdot 8$$

$$= n^{\log_2 2} + 8n$$

$$= n^1 + 8n \quad \Theta(n).$$

$\frac{n}{2^k} = 1$

$n = 2^k$

$\log_2 n = k$

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→ $T(n) = 2T(\sqrt{n}) + c$

Assume :- $\frac{n}{2^k} = 1$

$n = 2^k$

Taking log b.s

$\log n = k \log_2 2$

$k = \log_2 n$

$T(n) = 2T(\sqrt{n}) + c$

$T(2^k) = 2T(2^k)^{1/2} + c$

$T(2^k) = 2T(2^{k/2}) + c$ Assume $T(2^k) = S(k)$

$S(k) = 2T(m/2) + c$

$a=2, b=2, f(n) = c$ $n^0 = 1$

$k^{\log_b a} = k$ $\therefore n > c$

$S(m) = k$ Convert it back.

$T(2^k) = k$

$T(n) = \log_2 n$ $\therefore \Theta(\log_2 n)$

2×2×2×2×2×2×2

$\frac{n}{2} + \frac{n}{4} + \frac{n}{8} = \frac{32n + 16n + 2n}{64} = \frac{50n}{64}$ $\frac{25n}{32}$ $\left(\frac{5}{16}\right)^2 n$

$= \frac{2n + n}{4} = \frac{3n}{4} + \frac{n}{8}$ $\frac{6n + n}{8} = \frac{7n}{8}$.

16 × 2 = 22

4 | 4,8
| 1,2

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$T(n) = T\left(\frac{n}{3}\right) + n$

$= T\left(\frac{n}{3^2}\right) + \frac{n}{3} + n$

$= T\left(\frac{n}{3^3}\right) + \frac{n}{3^2} + \frac{n}{3} + n$

$= T\left(\frac{n}{3^i}\right) + n\left[1 + \frac{1}{3} + \frac{1}{3^2}\right]$

$\frac{1}{1-\frac{1}{3}} = \frac{1}{\frac{2}{3}} = \frac{3}{2}$

$= T\left(\frac{n}{T(2)}\right) + n \times \frac{3}{2}$

$= 1 + \frac{3}{2}n$

$\Theta(n)$ //.

$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$

$= T\left(\frac{n}{2^2}\right) + T\left(\frac{n}{6}\right) + \frac{n}{2} + T\left(\frac{n}{3^2}\right) + T\left(\frac{n}{6}\right) + \frac{n}{3} + n$

$= T\left(\frac{n}{2^2}\right) + T\left(\frac{n}{3^2}\right) + 2T\left(\frac{n}{6}\right) + \frac{n}{3} + \frac{n}{2} + n$

$\frac{n}{3} + \frac{n}{2} + n = \frac{2n+3n+6n}{6} = \frac{11n}{6}$

$= T\left(\frac{n}{2^i}\right) + T\left(\frac{n}{3^i}\right) + 2T\left(\frac{n}{3^i}\right) + \frac{11n}{6}\left[1 + \frac{1}{2} + \frac{1}{3} \cdots\right]$.

$= T\left(\frac{n}{n}\right) + T\left(\frac{n}{3^{\log_3 n}}\right) + 2T\left(\frac{n}{3^{\log_2 n}}\right) + \frac{11}{6}n$

$= T(1) + T\left(\frac{n}{n^{\log 3}}\right) + 2T\left(\frac{n}{3^{\log n}}\right) + \frac{11}{6}n$

$= 1 + T\left(\frac{n}{n^{1.5}}\right) + 2T\left(\frac{n}{3^{\log n}}\right) + \frac{11}{6}n$

$\Theta(n)$ //.

$\frac{5n+6n}{6} = \frac{11n}{6}$

$\frac{n}{3} + \frac{n}{2} + n = \frac{2n+3n+6n}{6}$

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$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$

$$T(n) = T\left(\frac{n}{2}\right) + n$$

$$= T\left(\frac{n}{4}\right) + \frac{n}{2} + n$$

$$= T\left(\frac{n}{2^3}\right) + \frac{n}{2^2} + \frac{n}{2} + n \quad \text{— } n\left(\frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3}\right)$$

$$= n\,\frac{\frac{1}{2}\left(1 - \frac{1}{2^3}\right)}{1 - \frac{1}{2}}$$

$$= T\left(\frac{n}{2^i}\right) + \frac{n}{2^{i-1}} + \frac{n}{2^{i-2}} + \cdots + n$$

$2^i = n$

$$= T\left(\frac{n}{n}\right) + \frac{n}{2^{\log_2 n - 1}} + \frac{n}{2^{\log_2 n - 2}} + \cdots + n$$

$$= T(1) + \frac{n}{n^{\log_2 2 - 1}} + \frac{n}{n^{\log_2 2^2 - 2}} + \cdots + n$$

$$= 1 + \frac{n}{n^{1-1}} + \frac{n}{n^{2-2}} + \cdots + n$$

$$= 1 + \frac{n}{n^0} + \frac{n}{n^0} + \cdots + n$$

$$= 1 + \frac{n}{1} + \frac{n}{1} + \cdots + n$$

$$\Theta(n) \text{ //:}$$

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$$\frac{n}{3^2} + \frac{n}{2^2} + \frac{n}{3} + \frac{n}{2} + n$$

$$\frac{n}{3^2} + \frac{n}{3} = \frac{3n+9n}{27} = \frac{12n}{27} = \frac{4n}{9} + \frac{n}{2^2} + \frac{n}{2} + n$$

$$\frac{n}{4} + \frac{n}{2} = \frac{2n+4n}{8} = \frac{6n}{8} = \frac{3n}{4} + \frac{4n}{9} + n$$

$$= \frac{27n + 16n + 36n}{36} = \frac{79n}{36}$$

$$T(n) = T\left(\frac{n}{2}\right) + n$$
$$= T\left(\frac{n}{2^2}\right) + \frac{n}{2} + n$$
$$= T\left(\frac{n}{2^3}\right) + \frac{n}{2^2} + n$$

$$T(n) = T\left(\frac{n}{2}\right) + n$$
$$T\left(\frac{n}{2}\right) = T\left(\frac{n}{2^2}\right) + \frac{n}{2}$$
$$T\left(\frac{n}{2^2}\right) = T\left(\frac{n}{2^3}\right) + \frac{n}{2^2}$$

$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$
$$= T\left(\frac{n}{2^2}\right) + T\left(\frac{n}{6}\right) + \frac{n}{2}$$
$$= T\left(\frac{n}{2^3}\right) + T\left(\frac{n}{12}\right) + \frac{n}{2^2}$$

$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$
$$T\left(\frac{n}{3}\right) = T\left(\frac{n}{6}\right) + T\left(\frac{n}{3^2}\right) + \frac{n}{3}$$
$$T\left(\frac{n}{3^2}\right) = T\left(\frac{n}{18}\right) + T\left(\frac{n}{3^3}\right) + \frac{n}{3^2}$$

$$T(n) = T\left(\frac{n}{2^3}\right) + T\left(\frac{n}{3^3}\right) + T\left(\frac{n}{18}\right) + T\left(\frac{n}{12}\right) + \frac{n}{3^2} + \frac{n}{2^2} + n$$

$$= T\left(\frac{n}{2^i}\right) + T\left(\frac{n}{3^i}\right) + T\left(\frac{n}{6^i}\right) + T\left(\frac{n}{4^i}\right) + n\left[1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2}\right]$$

$$3^i = n$$
$$i \log_3 3 = \log_3 n$$
$$i = \log_3 n$$

$$= T\left(\frac{n}{2^{\log_3 n}}\right) + T\left(\frac{n}{n}\right) + T\left(\frac{n}{6^{\log_3 n}}\right) + T\left(\frac{n}{4^{\log_3 n}}\right) + n$$

$$= T\left(\frac{n}{n^{\log 3}}\right) + 1 + O(n)$$

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$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n \quad \ldots (1)$$

$$= T\left(\frac{n}{2}\right) + T\left(\frac{n}{6}\right) + \frac{n}{2} + n$$

$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$

$$T\left(\frac{n}{2}\right) = T\left(\frac{n}{2^2}\right) + T\left(\frac{n}{6}\right) + \frac{n}{2}$$

$$T\left(\frac{n}{2^2}\right) = T\left(\frac{n}{2^3}\right) + T\left(\frac{n}{12}\right) + \frac{n}{2^2}$$

$$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{3}\right) + n$$

$$T\left(\frac{n}{3}\right) = T\left(\frac{n}{6}\right) + T\left(\frac{n}{3^2}\right) + \frac{n}{3}$$

$$T\left(\frac{n}{3^2}\right) = T\left(\frac{n}{18}\right) + T\left(\frac{n}{3^3}\right) + \frac{n}{3^2}$$

$$T(n) = T\left(\frac{n}{2^2}\right) + T\left(\frac{n}{6}\right) + \frac{n}{2} + T\left(\frac{n}{6}\right) + T\left(\frac{n}{3^2}\right) + \frac{n}{3} + n$$

$$= T\left(\frac{n}{2^2}\right) + T\left(\frac{n}{3^2}\right) + 2T\left(\frac{n}{6}\right) + \frac{n}{3} + \frac{n}{2} + n$$

$$= T\left(\frac{n}{2^3}\right) + T\left(\frac{n}{12}\right) + \frac{n}{2^2} + T\left(\frac{n}{18}\right) + T\left(\frac{n}{3^3}\right) + \frac{n}{3^2} + 2T\left(\frac{n}{6}\right) + \frac{n}{3} + \frac{n}{2} + n$$

$$= T\left(\frac{n}{2^3}\right) + T\left(\frac{n}{3^3}\right) + T\left(\frac{n}{3\times4}\right) + T\left(\frac{n}{3\times6}\right) + 2T\left(\frac{n}{3\times2}\right) + \frac{n}{3^2} + \frac{n}{2^2} + \frac{n}{3} + \frac{n}{2} + n$$

$$2^i = T\left(\frac{n}{2^{2i}}\right) + T\left(\frac{n}{3^i}\right) +$$

$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{2n}{5}\right) + 7n$

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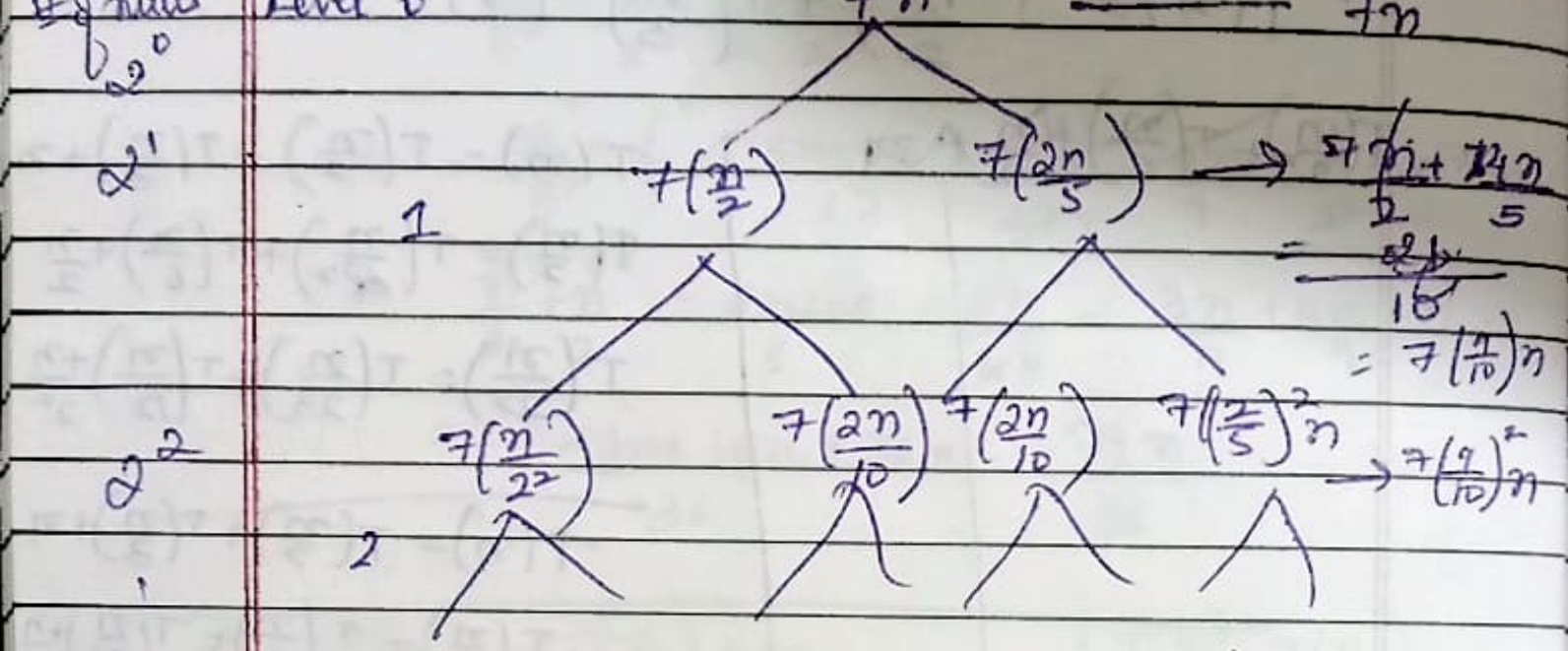

$T(n) = 7n + 7n\left(\frac{1}{2} + \frac{2}{5}\right) + 7n\left(\left(\frac{1}{2}\right)^2 + \frac{1}{5} + \frac{1}{5} + \left(\frac{2}{5}\right)^2\right) + \pi(1)$

$+ 7n\left(\frac{1}{2} + \frac{2}{5}\right)^3 + 7n\left(\frac{1}{2} + \frac{2}{5}\right)^4 + \cdots$

$7\left(\frac{2}{5}\right)^h n = 1$

$7n = \frac{1}{\left(\frac{2}{5}\right)^h}$

$7n = \left(\frac{5}{2}\right)^h$

$\log_{5/2} n = h \log_{5/2} 5/2$

$= h = \log_2 n$

$= 7n\left[\left(\frac{1}{2} + \frac{2}{5}\right)^0 + \left(\frac{1}{2} + \frac{2}{5}\right)^1 + \cdots + \left(\frac{1}{2} + \frac{2}{5}\right)^n\right]$

$= 7n\left[\left(\frac{9}{10}\right)^0 + \frac{9}{10} + \frac{9^2}{10} + \frac{9^3}{10} + \cdots\right]$

$= 7\left[1 + \frac{9}{10} + \left(\frac{9}{10}\right)^2 + \cdots + \frac{9}{10}\right]^{\log n}$

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$7\left(\frac{n}{2}\right) \quad 7\left(\frac{2n}{5}\right) = \frac{n}{2} + \frac{2n}{5} - \frac{5n+4n}{10}$

$7\left(\frac{9n}{10}\right)$

$= 7n \; \frac{1-\left(\frac{9}{10}\right)^{\log_2 n}}{1-\frac{9}{10}}$

$= 70n \left(1 - n^{\log_2 (9/10)}\right)$

$= 70n - \frac{70n}{n^{0.11}}$

$= O(n)$

$= \frac{n}{2^2} + \frac{2n}{10} + \frac{2^2 n}{10} + \frac{2^2 n}{5^2} =$

$\frac{4n}{10} + \frac{4n}{25} = \frac{100n + 40n}{250} = \frac{140n}{250}$

$\frac{14}{25}n + \frac{n}{4} = \frac{56n + 25n}{100} = \frac{81n}{100} \; 7\left(\frac{9}{10}\right)n$

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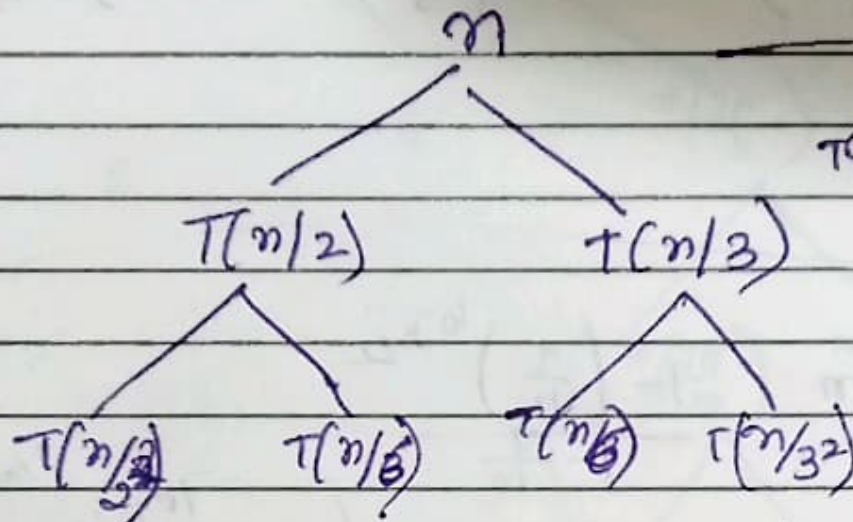
→. $T(n/2) + T(n/3) + n$



n — n

$T(n/2 + n/3) \cdot \frac{5n}{6} = \frac{5}{6}n$

$\frac{n}{4} + \frac{n}{6} + \frac{n}{6} + \frac{n}{9}$

$2\left(\frac{n}{6}\right) = \frac{n}{3} + \frac{n}{4} + \frac{n}{9}$

$= \left(\frac{5}{6}\right)^2 n$

$\frac{n}{3^i} = 1$

$n = 3^i$

$\log_3 n = i \log_3 3$

$i = \log_3 n$

$T(1)$ $T(1)$ $T(1)$ $T(1)$ $\left(\frac{5}{6}\right)^i n$

$\frac{n}{4} + \left[\frac{n}{6} + \frac{n}{6}\right] + \frac{n}{9}$

$\frac{2n}{63} = \frac{n}{3} + \frac{n}{9} = \frac{9n+3n}{27} = \frac{12n}{27}$

$\frac{n}{4} + \frac{4n}{9} = \frac{9n+16n}{36} = \frac{25n}{36} = \left(\frac{5}{6}\right)^2 n$

$\left(\frac{5}{6}\right)^h n = 1$

$n = \left(\frac{6}{5}\right)^h$

$\log n = \log^{6/5} h$

$h = \log_{6/5} n$

$T(n) = 2^h \cdot T(1) + \sum_{i=0}^{h-1} \left(\frac{5}{6}\right)^i \cdot n$

$= 2^{\log_{6/5} n} \cdot 1 + n \cdot \sum_{i=0}^{h-1} \left(\frac{5}{6}\right)^i$

$= n^{\log_{6/5} 2} + 6n$

$2^{\log_3 n} = n^{\log 2} = n^{0.6}$

$\left(\frac{5}{6}\right)^0 + \left(\frac{5}{6}\right)^1 + \left(\frac{5}{6}\right)^2 + \cdots \left(\frac{5}{6}\right)^{h-1}$

$= \frac{1}{1 - \frac{5}{6}} = \frac{1}{\frac{6-5}{6}} = 6$

$O(n)$ //

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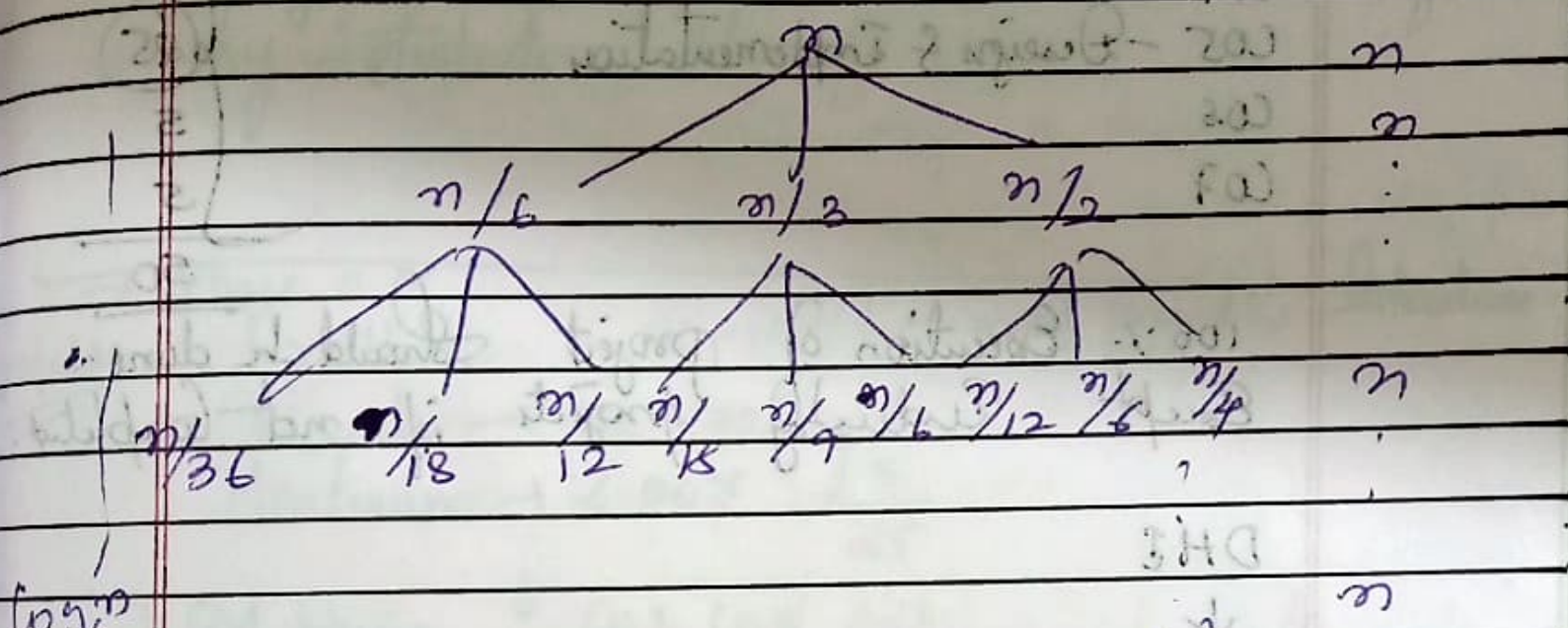
$$T(n) = T(n/6) + T(n/3) + T(n/2) + n$$



$$\frac{n}{2} + \frac{n}{3} = \frac{3n+2n}{6} = \frac{5n}{6} = \left(\frac{5}{6}\right)n.$$

$$\frac{n}{4} + \left(\frac{n}{6} + \frac{n}{6}\right) + \frac{n}{9} = \frac{6n+4n}{24} = \frac{5}{12}n$$

$$\frac{n}{6} + \frac{n}{6} = \frac{2n}{6} = \frac{n}{3} + \frac{n}{6} = \frac{6n+3n}{18} = \frac{9n}{18} + \frac{n}{9} = \frac{9n+2n}{18}$$

$$\frac{5}{12}n + \frac{n}{6} = \frac{5n+12n}{72} = \frac{17}{72}n$$

$$= \frac{21n}{36} + \frac{n}{9} = \frac{189n+36n}{324} = \frac{225}{324}$$