# Master's Theorem

1) $T(n) = 8T(n/2) + 1000n^2$

$a = 8$

$b = 2$

$f(n) = 1000n^2$

wkt $f(n) = c * n^d$

$\therefore d = 2.$

$b^d = 2^2 = 4$

$\Rightarrow a > b^d$

$\therefore T(n) \in O(n^{\log_b a})$

$\log_b a = \log_2 8$

$= 3$

$\Rightarrow T(n) \in \Theta(n^3)$ //

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

$a = 2 \quad b = 2 \quad d = 2.$

$b^d = 4$

$\rightarrow a < b^d$

$\therefore T(n) \in \Theta(n^d)$

$\Rightarrow T(n) \in \Theta(n^2)$ //

3) $T(n) = 2T(n/2) + 10n$

$a = 2$

$b = 2$

$d = 1$

$b^d = 2$

$\Rightarrow a = b^d$

$\therefore T(n) = \Theta(n^d \log n)$

$\Rightarrow T(n) = \Theta(n \log n)$.