

Recursion relation

Q1.

$$\begin{aligned} \rightarrow T(n) &= 3T(n-1) + 12n \\ T(2) &= 3T(2-1) + (12 \times 2) \\ T(1) &= 3T(1-1) + (12 \times 1) \\ T(1) &= 3T(0) + 12 \\ T(1) &= 27 \end{aligned}$$

$$\begin{aligned} T(2) &= 3 \times T(1) + (12 \times 2) \\ &= 81 + 24 \\ &= 105 \end{aligned}$$

Q2

$$\begin{aligned} \rightarrow a. T(n) &= T(n-1) + c \\ A_n + B &= A(n-1) + B + c \\ A_n + B &= A_n - A + B + c \\ 0 &= -A + c \\ A &= c \end{aligned}$$

$$\begin{aligned} b. T(n) &= 2T(n/2) + n \\ A_n \log n + Bn &= 2A(n/2) \log(n/2) + B(n/2) + n \\ 0 &= -A \log 2 + Bn/2 \\ B &= 2A / \log 2 \end{aligned}$$

$$\begin{aligned} c. T(n) &= 2T(n/2) + c \\ A_n + B &= 2A(n/2) + B + c \\ B &= c \end{aligned}$$

$$\begin{aligned} d. T(n) &= T(n/2) + c \\ A &= 2c/n \end{aligned}$$

Q3.

$$\rightarrow a. T(n) = 2T(n-1) + 1$$

$$\Rightarrow T(n) = 2^{\log n + 1} - 1$$
$$= 2n - 1$$

$$b. T(n) = 2T(n/2) + n$$
$$= n \log n + n$$