

$$T(u) = T(\sqrt{u}) + O(1).$$

$$T(n) = T(\sqrt{n}) + O(1)$$

$$\left(\begin{array}{l} m = \lg n \rightarrow n = 2^m \\ \uparrow \\ T(2^m) = T(2^{m/2}) + O(1) \end{array} \right)$$

$$T(u) = 2T(\sqrt{u}) + \Theta(\lg \sqrt{u})$$

$$S(m) = T(2^m) \quad \downarrow$$

$$\lg \sqrt{u} = \frac{1}{2} \lg u \quad S\left(\frac{m}{2}\right) = T\left(2^{\frac{m}{2}}\right)$$

$$\Theta(\lg \sqrt{u}) = \Theta(\lg u) \quad S(m) = S\left(\frac{m}{2}\right) + O(1)$$

$$S(m) = O(\lg m)$$

$$T(n) = T(2^m) = S(m) = O(\lg m) = O(\lg \lg n)$$

$$T(u) = 2T(\sqrt{u}) + O(1).$$

$$T(n) = 2T(\sqrt{n}) + O(1)$$

$$T(2^m) = 2T(2^{m/2}) + O(1)$$

$$S(m) = 2S\left(\frac{m}{2}\right) + O(1)$$

$$m = \lg n, \quad n = 2^m$$

$$S(m) = T(2^m)$$

$$S\left(\frac{m}{2}\right) = T(2^{m/2})$$

$$S(m) = O(m)$$

$$T(n) = T(2^m) = S(m) = O(m) = O(\lg n)$$

$$T(u) = 2T(\sqrt{u}) + \Theta(\lg \sqrt{u})$$

$$m = \lg u$$

$$2^m = u$$

$$\sqrt{u} = 2^{m/2}$$

$$T(2^m) = 2T(2^{m/2}) + \Theta(\lg 2^{m/2})$$

$$S(m) = T(2^m)$$

$$S(m) = 2 S\left(\frac{m}{2}\right) + \Theta(m)$$

$$S(m) = \Theta(m \lg m)$$

$$T(u) \doteq T(2^m) = S(m) = \Theta(m \lg m)$$

$$= \Theta(\lg u \lg \lg u)$$