Resulting sketch has $\leq r^4$ bits.

Now sketch(node) = $1\,\underbrace{\text{sketch}(x_0)}_{\leq r^4}\,1\,\underbrace{\text{sketch}(x_1)}_{\leq r^4}\cdots 1\,\underbrace{\text{sketch}(x_{k-1})}_{\leq r^4}$

$k(r^4+1) \leq k^5 = \Theta(B^5) = \Theta(\lg n)$.

$\Rightarrow O(1)$ words.

Compare sketch(q) vs. all sketchs(x_i):

sketch(q) $\times$ (00…01 00…01 … 00…01)

= ∅sketch(q) ∅sketch(q) … ∅sketch(q)

sketch(node) − (sketch(q) replicated)

↳ extra 1's protect from underflow

↳ remain 1 if sketch(q) $\leq$ sketch(x_i)

↳ become 0 if sketch(q) > sketch(x_i)

x_i's are sorted

$\Rightarrow$ difference @ relevant bits has 1's for a while, then 0's.

So take least-sig. (rightmost) 1-bit in (difference AND relevant bits).

$\Rightarrow$ find where sketch(q) fits among sketchs(x_i).