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HW3 Problem 3

worset cases.

$$\text{Amortized runtime} = \frac{\sum_{k=1}^{\sqrt{n}} \sum_{i=1}^{n} \sum_{j=0}^{i+1} O(1) + (n-\sqrt{n}) \cdot O(1)}{n}$$

$$= \frac{\sum_{k=1}^{\sqrt{n}} \sum_{i=1}^{n} i \cdot O(1) + (n-\sqrt{n}) \cdot O(1)}{n}$$

$$= \frac{\sum_{k=1}^{\sqrt{n}} \frac{n(n+1)}{2} \cdot O(1) + (n-\sqrt{n}) \cdot O(1)}{n}$$

$$= \frac{\frac{\sqrt{n} \cdot n(n+1)}{2} \cdot O(1) + (n-\sqrt{n}) \cdot O(1)}{n}$$

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

$$= \frac{1}{2} n^{\frac{3}{2}} \cdot \Theta(1)$$

$$= \Theta(n^{\frac{3}{2}})$$