1 Algorithm Example

```
counter ← Sketch.total
for h = 1 to H do
    i ← Sketch[h].hash(k_1)
    if Sketch[h][i].total ≤ counter then
        index ← h
        hash ← i
        counter ← Sketch[h][i].total
    end if
end for
result ← Sketch[index][hash][k_2]
```

2 Theory Example

Lemma 1 *Let* $h_1 ... h_n : \{1...k\} \rightarrow \{1...v\}$, H *be a set of sets* H_i *where* $h_i(x) \in H_i$, $S = \{h_i^{-1}(x) | x \in \bigcup H\}$.

$$\forall H_i \in H, |H_i| = \sum_{j}^{j \in S} \begin{cases} 0 \text{ if } h_i(j) \notin H_i \\ 1 \text{ otherwise} \end{cases} .$$

Corollary 1 *As a consequence of Lemma 1,*

$$\forall H_i \in H, \sum_{j}^{j \in H_i} j = \sum_{j}^{j \in S} \begin{cases} 0 \text{ if } h(j) \notin H_i \\ h(j) \text{ otherwise} \end{cases} .$$

Therefore, if we were to remove an arbitrary element x *from* S*, then the sum would become:*

$$\forall H_i \in H, \sum_{j}^{j \in H_i} j = \sum_{j}^{j \in S - \{x\}} \begin{cases} 0 \text{ if } h(j) \notin H_i \\ h(j) \text{ otherwise} \end{cases} + h_i(x).$$

Finally, this allows us to conclude that in the case of the sum of all elements in $S - \{x\}$ *which have images in* H_i *is equal to* $\sum_{j}^{j \in H_i} j - h_i(x)$.

3 Tikz Example