

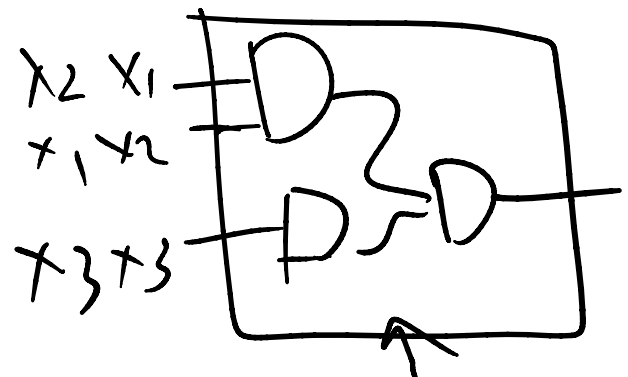
$$f = X_1 \bar{X}_2 + X_3 + X_1 X_3$$

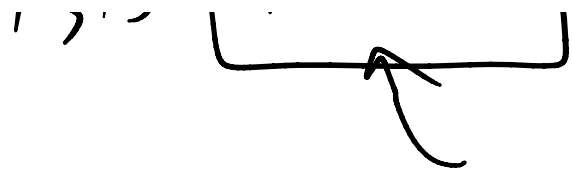
Truth Table

$$f = X_2 \bar{X}_1 + X_3 + X_2 X_3$$

$X_1$	$X_2$	$X_3$	$f$
0	0	0	0
0	0	1	1
0	1	0	1
.	.	.	0
1	.	.	1

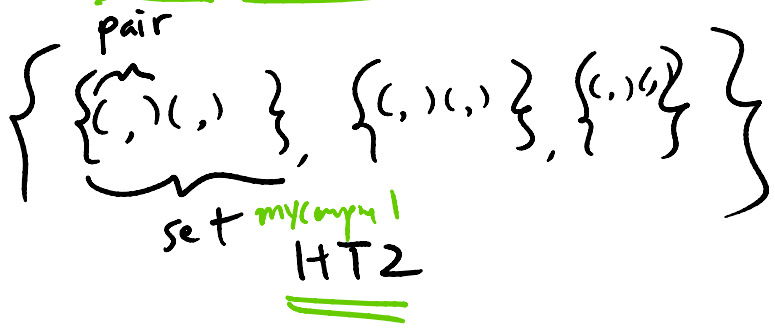
$$f = X_1 \bar{X}_2 + X_3 + X_1 \bar{X}_3 + \dots$$



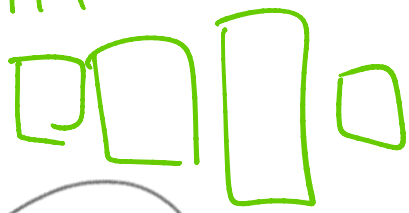


f =

```
unordered_set<set<pair<list<int*>*, vector<int*>>,
myCompare1>,
my_hash2, my_equal_to2> HT2;
```

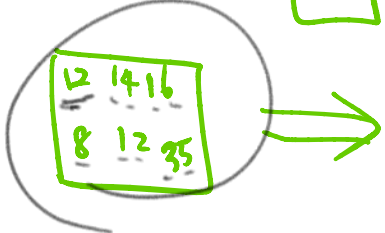


HT1



HT1

to "index"



12 → "12" → ASCII  
49 50

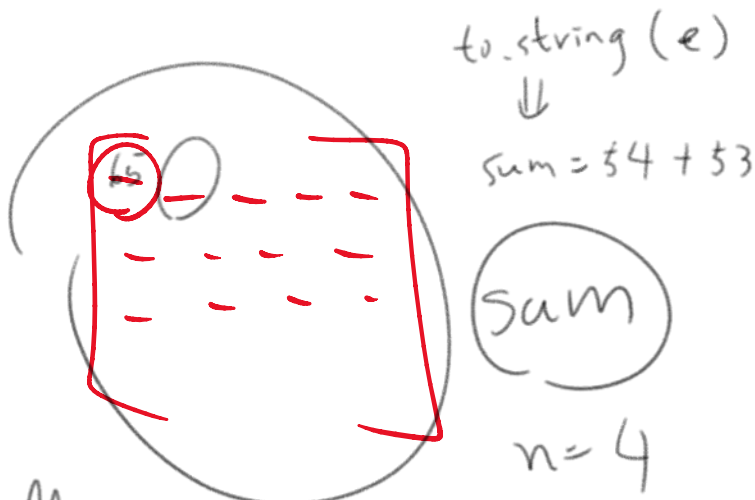
$$\text{ASCII}(1) + \text{ASCII}(2) + \text{ASCII}(1) + \text{ASCII}(2)$$

Sum of ASCII of all digits

Sum1 → hash(sum)

HT2





M:

```

[ [ ] [ ] [ ] [ ] ]
for (int i = 0; i < n; ++i) {
    vector<vector<int>> V;

```

```

M.emplace_back(V);
}

```

for (auto

```

int operator() (vector<int> &V) {
    sum = ...
    hash<int> h1;
    return h1(sum);
}

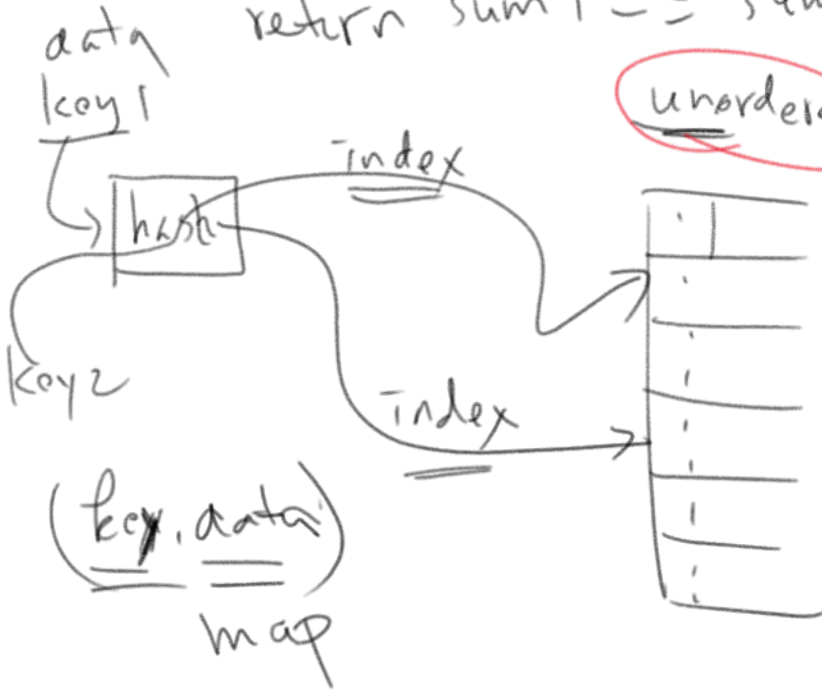
```

return h1(sum);

bool operator() ( my-equal-to ΔV1, &V2 )

return sum1 == sum2 & k

unordered-set, map



set < pair < list < int \* > \*, vector < int \* > >, my-compare >

class my-compare {

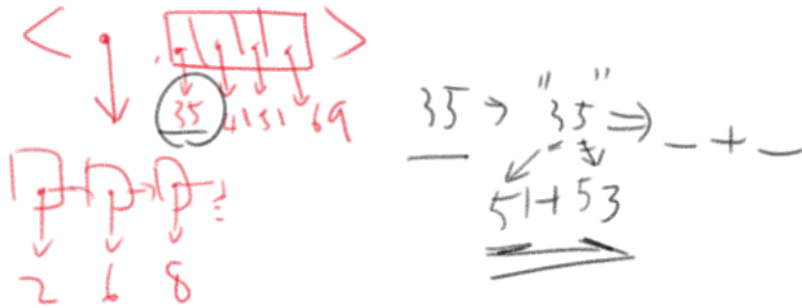
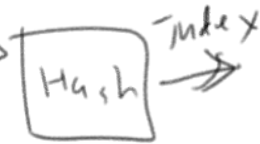
class  
containing  
functor

bool operator() ( pair < ... > & s1, pair < ... > & s2 )  
 sum1 = ...  
 sum2 = ...  
 } directly sum up integers.  
 return sum1 < sum2;

HITZ:

set < pair < u, - >, compare1 >

set < pair < ... > , ... >  
 all int  $\Rightarrow$  string  
 $\Rightarrow$  int



$$35 + 41 \rightarrow 51 + 53 + 52 + 49$$

```
class my-hash2 {
```

```
int operator( ) (set <pair<...>>, my_compare) &S)
    sum = ...
    hashcnt > h1;
    return h1 < sum;
}
```

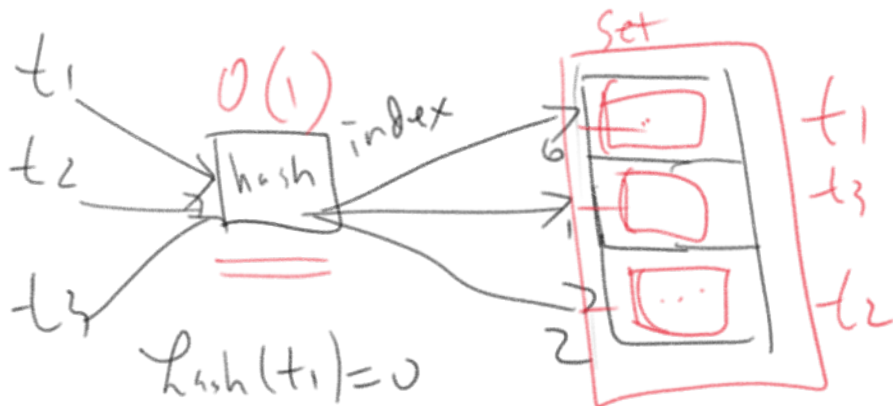
```
class my-equt-to2 {
```

```
bool operator( ) (set... &S1, set... &S2)
    sum1 = ...
    sum2 = ...
    return sum1 == sum2;
}
```

```

return sum1 == sum2;
}

```



$$hash(t_1) = 0$$

$$hash(t_2) = 2$$

$$hash(t_3) = 1$$

unordered\_set, map

insert :  $O(1)$

delete :  $O(1)$

find :  $O(1)$



set, map

$$O(\log n)$$

$$O(\log n)$$

$$O(\log n)$$

# Final Exam

Sat. 12/5. 9:00 am

$$\begin{array}{r} \underline{\underline{8.5}} + \underline{\underline{7}} \checkmark \\ \hline \cancel{9} + \cancel{0} \end{array}$$