**Compute Relative Frequencies**

Number of Input-Splits: 2

Number of Reducers: 1

Input Split 0

15 91 80 12 19 80 18

17 15 80 18 19 18

Input Split 1

19 15 80 18 19 18

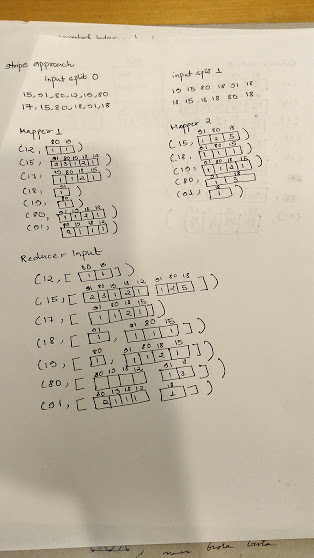
18 15 18 18 80 18

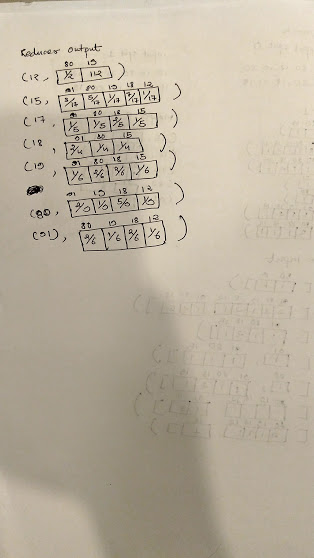
1. Pair Approach
2. Stripe Approach

**(a): Pair Approach**

|  |  |  |
| --- | --- | --- |
| **0** | **1** | **Input-split (mapper input)** |
| 15 91 80 12 19 80 18  17 15 80 18 19 18 | 19 15 80 18 19 18  18 15 18 18 80 18 |
| **Record 1** | | **Mapper output** |
| ((15,91),1)  ((15,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,12),1)  ((15,\*),1)  ((15,19),1)  ((15,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((91,80),1)  ((91,\*),1)  ((91,12),1)  ((91,\*),1)  ((91,19),1)  ((91,\*),1)  ((91,80),1)  ((91,\*),1)  ((91,18),1)  ((91,\*),1)  ((80,12),1)  ((80,\*),1)  ((80,90),1)  ((80,\*),1)  ((12,19),1)  ((12,\*),1)  ((12,80),1)  ((12,\*),1)  ((12,18),1)  ((12,\*),1)  ((19,80),1)  ((19,\*),1)  ((19,18),1)  ((19,\*),1)  ((80,18),1)  (80,\*),1) | ((19,15),1)  ((19,\*),1)  ((19,80),1)  ((19,\*),1)  ((19,18),1)  ((19,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,19),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((80,18),1)  ((80,\*),1)  ((80,19),1)  ((80,\*),1)  ((80,18),1)  ((80,\*),1)  ((18,19),1)  ((18,\*),1)  ((19,18),1)  ((19,\*),1) |
| **Record 2** | |
| ((17,15),1)  ((17,\*),1)  ((17,80),1)  ((17,\*),1)  ((17,18),1)  ((17,\*),1)  ((17,19),1)  ((17,\*),1)  ((17,18),1)  ((17,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,19),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((80,18),1)  ((80,\*),1)  ((80,19),1)  ((80,\*),1)  ((80,18),1)  ((80,\*),1)  ((18,19),1)  ((18,\*),1)  ((19,18),1)  ((19,\*),1) | ((18,15),1)  ((18,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((15,80),1)  ((15,\*),1)  ((15,18),1)  ((15,\*),1)  ((18,80),1)  ((18,\*),1)  ((80,18),1)  ((80,\*),1) |
|  |  | **Shuffle & Sort** |
| ((12,\*),[1,1,1])  ((12,18),[1])  ((12,19),[1])  ((12,80),[1])  ((15,\*),[1,1,1,1,1,1])  ((15,12),[1])  ((15,18),[1])  ((15,19),[1])  ((15,80),[1,1])  ((15,91),[1])  ((19,\*),[1,1])  ((19,18),[1])  ((19,80),[1])  ((80,\*),[1,1,1])  ((80,12),[1])  ((80,18),[1])  ((80,19),[1])  ((91,\*),[ 1,1,1,1,1])  ((91,12),[1])  ((91,18),[1])  ((91,19),[1])  ((91,80),[1,1]) | ((15,\*),[1,1,1,1])  ((15,18),[1,1])  ((15,19),[1])  ((15,80),[1])  ((18,\*),[1])  ((18,19),[1])  ((19,\*),[1,1,1,1])  ((19,15),[1])  ((19,18),[1,1])  ((19,80),[1])  ((80,\*),[1,1,1])  ((80,18),[1,1])  ((80,19),[1]) |  |
| ((12,18),[1/3])  ((12,19),[1/3])  ((12,80),[1]/3)  ((15,12),[1/10])  ((15,18),[3/10])  ((15,19),[2/10])  ((15,80),[3/10])  ((15,91),[1/10])  ((18,19),[1])  ((19,15),[1/6])  ((19,18),[3]/6)  ((19,80),[2/6])  ((80,12),[1/6])  ((80,18),[3/6])  ((80,19),[2/6])  ((91,12),[1/5])  ((91,18),[1/5])  ((91,19),[1/5])  ((91,80),[2/5]) | | **Reducer Output** |

**b. Stripe Approach**

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