**Module 1 - Activity 7**

**Question:**

Show the contents of the id[ ] array and the number of times the array is accessed for each input pair when you use quick-find, quick-union, weighted quick-union, weighted quick-union path compression, for the sequence of inputs 9-0 3-4 5-8 7-2 2-1 5-7 0-3 4-2.

**Solution:**

**Quick Find :**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indexes : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| union(9,0) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 |
| union(3,4) | 0 | 1 | 2 | 4 | 4 | 5 | 6 | 7 | 8 | 0 |
| union(5,8) | 0 | 1 | 2 | 4 | 4 | 8 | 6 | 7 | 8 | 0 |
| union(7,2) | 0 | 1 | 2 | 4 | 4 | 8 | 6 | 2 | 8 | 0 |
| union(2,1) | 0 | 1 | 1 | 4 | 4 | 8 | 6 | 1 | 8 | 0 |
| union(5,7) | 0 | 1 | 1 | 4 | 4 | 1 | 6 | 1 | 1 | 0 |
| union(0,3) | 4 | 1 | 1 | 4 | 4 | 1 | 6 | 1 | 1 | 4 |
| union(4,2) | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 | 1 | 1 |

**Quick Union :**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indexes : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| union(9,0) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 |
| union(3,4) | 0 | 1 | 2 | 4 | 4 | 5 | 6 | 7 | 8 | 0 |
| union(5,8) | 0 | 1 | 2 | 4 | 4 | 8 | 6 | 7 | 8 | 0 |
| union(7,2) | 0 | 1 | 2 | 4 | 4 | 8 | 6 | 2 | 8 | 0 |
| union(2,1) | 0 | 1 | 1 | 4 | 4 | 8 | 6 | 2 | 8 | 0 |
| union(5,7) | 0 | 1 | 1 | 4 | 4 | 8 | 6 | 2 | 1 | 0 |
| union(0,3) | 4 | 1 | 1 | 4 | 4 | 8 | 6 | 2 | 1 | 0 |
| union(4,2) | 4 | 1 | 1 | 4 | 1 | 8 | 6 | 2 | 1 | 0 |

**Weighted Quick Union :**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indexes : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| weights: | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **union(9,0)** | **9** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| weights: | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| **union(3,4)** | **9** | **1** | **2** | **3** | **3** | **5** | **6** | **7** | **8** | **9** |
| weights: | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 |
| **union(5,8)** | **9** | **1** | **2** | **3** | **3** | **5** | **6** | **7** | **5** | **9** |
| weights: | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 |
| **union(7,2)** | **9** | **1** | **7** | **3** | **3** | **5** | **6** | **7** | **5** | **9** |
| weights: | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| **union(2,1)** | **9** | **7** | **7** | **3** | **3** | **5** | **6** | **7** | **5** | **9** |
| weights: | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| **union(5,7)** | **9** | **7** | **7** | **3** | **3** | **7** | **6** | **7** | **5** | **9** |
| weights: | 1 | 1 | 2 | 2 | 1 | 4 | 1 | 2 | 1 | 2 |
| **union(0,3)** | **9** | **7** | **7** | **9** | **3** | **7** | **6** | **7** | **5** | **9** |
| weights: | 1 | 1 | 2 | 3 | 1 | 4 | 1 | 2 | 1 | 2 |
| **union(4,2)** | **9** | **7** | **7** | **9** | **3** | **7** | **6** | **7** | **5** | **7** |
| weights: | 1 | 1 | 3 | 3 | 1 | 4 | 1 | 2 | 1 | 2 |

**Weighted Quick Union - Path Compression:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indexes : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| union(9,0) | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| union(3,4) | 9 | 1 | 2 | 3 | 3 | 5 | 6 | 7 | 8 | 9 |
| union(5,8) | 9 | 1 | 2 | 3 | 3 | 5 | 6 | 7 | 5 | 9 |
| union(7,2) | 9 | 1 | 7 | 3 | 3 | 5 | 6 | 7 | 5 | 9 |
| union(2,1) | 9 | 7 | 7 | 3 | 3 | 5 | 6 | 7 | 5 | 9 |
| union(5,7) | 9 | 7 | 7 | 3 | 3 | 7 | 6 | 7 | 5 | 9 |
| union(0,3) | 9 | 7 | 7 | 9 | 3 | 7 | 6 | 7 | 5 | 9 |
| union(4,2) | 9 | 7 | 7 | 9 | 9 | 7 | 6 | 7 | 5 | 7 |