

Activity - 7

Quick And:-

initial \rightarrow

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

\Rightarrow union (9, 0)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 |

no. of iterations for array = 10 times

\Rightarrow union (3, 4)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 4 | 4 | 5 | 6 | 7 | 8 | 0 |

no. of iterations for array = 10 times

\Rightarrow union (5, 8)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 4 | 4 | 8 | 6 | 7 | 8 | 0 |

No. of iterations for array = 10 times

\Rightarrow union (7, 2)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 4 | 4 | 8 | 6 | 2 | 8 | 0 |

No. of iterations for array = 10 times

\Rightarrow union (2, 1)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 1 | 4 | 4 | 8 | 6 | 1 | 8 | 0 |

No. of iterations for array = 10 times

\Rightarrow union (5, 7)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 1 | 4 | 4 | 1 | 6 | 1 | 1 | 0 |

No. of iterations for array = 10 times

⇒ union (0, 3)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 4 | 1 | 1 | 4 | 4 | 1 | 6 | 1 | 1 | 4 |

no. of iterations of array = 10

⇒ union (4, 2)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1 | 1 | 1 |

no. of iterations of array = 10.

Quick-Union:-

9-0, 3-4, 5-8, 7-2, 2-1, 5-7, 0-3, 4-2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

— 10 times

⇒ Union(9, 0)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 0 |

$i = \text{root}(9) \rightarrow 9$
 $j = \text{root}(0) \rightarrow 0$
 $\text{id}[i] = 9$
 $\text{id}[j] = 0 \rightarrow 1$
 3 times

⇒ Union(3, 4)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 4 | 4 | 5 | 6 | 7 | 8 | 0 |

$i = \text{root}(3) \rightarrow 4$
 $j = \text{root}(4) \rightarrow 4$
 $\text{id}[i] = 4 \rightarrow 1$
 4 times

⇒ Union(5, 8)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 4 | 4 | 8 | 6 | 7 | 8 | 0 |

$i = \text{root}(5) \rightarrow 8$
 $j = \text{root}(8) \rightarrow 8$
 $\text{id}[i] = 8 \rightarrow 1$
 4 times

⇒ Union(7, 2)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 4 | 4 | 8 | 6 | 2 | 8 | 0 |

$i = \text{root}(7) \rightarrow 2$
 $j = \text{root}(2) \rightarrow 2$
 $\text{id}[i] = 2 \rightarrow 1$
 4 times

⇒ Union(2, 1)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 1 | 4 | 4 | 8 | 6 | 2 | 8 | 0 |

$i = \text{root}(2) \rightarrow 1$
 $j = \text{root}(1) \rightarrow 1$
 $\text{id}[i] = 1 \rightarrow 1$
 1 time

$\Rightarrow \text{union}(5, 7)$

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 4 | 4 | 2 | 6 | 2 | 8 | 0 |

$i = \text{root}(p) \rightarrow 2$
 $j = \text{root}(q) \rightarrow 2$
 $\text{id}[i] = j \rightarrow 1$

5 times

$\Rightarrow \text{union}(0, 3)$

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 4 | 4 | 2 | 6 | 2 | 8 | 0 |

$i = \text{root}(p) \rightarrow 2$
 $j = \text{root}(q) \rightarrow 2$
 $\text{id}[i] = j \rightarrow 1$

5 times

$\Rightarrow \text{union}(4, 2)$

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 4 | 1 | 2 | 6 | 2 | 8 | 0 |

$i = \text{root}(p) \rightarrow 2$
 $j = \text{root}(q) \rightarrow 2$
 $\text{id}[i] = j \rightarrow 1$

5 times

weighted quick-unions

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

-10

union(1,0)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |

-3

weights

union(3,4)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 1 | 2 | 3 | 3 | 5 | 6 | 7 | 8 | 9 |
| 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 |

-3

weights

union(5,8)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 1 | 2 | 3 | 3 | 5 | 6 | 7 | 5 | 9 |
| 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 2 |

-3

weights

union(7,2)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 1 | 7 | 3 | 3 | 5 | 6 | 7 | 5 | 9 |
| 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |

-3

weights

union (2,1)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 7 | 7 | 3 | 3 | 5 | 6 | 7 | 5 | 7 |
| 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |

— 3
weights

union (5,7)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 7 | 7 | 3 | 3 | 5 | 6 | 5 | 5 | 9 |
| 1 | 1 | 2 | 2 | 1 | 4 | 1 | 2 | 1 | 2 |

— 3
weights

union (0,3)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 7 | 7 | 3 | 3 | 5 | 6 | 5 | 5 | 3 |
| 1 | 1 | 2 | 3 | 1 | 4 | 1 | 2 | 1 | 2 |

— 3
weights

union (4,2)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | 7 | 7 | 5 | 3 | 5 | 6 | 5 | 5 | 3 |
| 1 | 1 | 3 | 3 | 1 | 4 | 1 | 2 | 1 | 2 |

— 3
weights