# W3D2 Assignment

**Top Down**

Data Set 1: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

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| --- | --- | --- | --- |
|  |  | #Comparisons | #Swaps |
| 1 | {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16} | 0 | 0 |
| 2 | {3,2,1,4,5,6,7,8,9,10,11,12,13,14,15,16} | 2 | 1 |
| 3 | {4,3,1,2,5,6,7,8,9,10,11,12,13,14,15,16} | 2 | 2 |
| 4 | {5,4,1,2,3,6,7,8,9,10,11,12,13,14,15,16} | 2 | 2 |
| 5 | {6,4,5,2,3,1,7,8,9,10,11,12,13,14,15,16} | 2 | 2 |
| 6 | {7,4,6,2,3,1,5,8,9,10,11,12,13,14,15,16} | 2 | 2 |
| 7 | {8,7,6,4,3,1,5,2,9,10,11,12,13,14,15,16} | 3 | 3 |
| 8 | {9,8,6,7,3,1,5,2,4,10,11,12,13,14,15,16} | 3 | 3 |
| 9 | {10,9,6,7,8,1,5,2,4,3,11,12,13,14,15,16} | 3 | 3 |
| 10 | {11,10,6,7,9 ,1,5,2,4,3,8,12,13,14,15,16} | 3 | 3 |
| 11 | {12,10,11,7,9 ,6,5,2,4,3,8,1,13,14,15,16} | 3 | 3 |
| 12 | {13,10,12,7,9 ,11,5,2,4,3,8,1,6,14,15,16} | 3 | 3 |
| 13 | {14,10,13,7,9 ,11,12,1,4,3,8,2,6,5,15,16} | 3 | 3 |
| 14 | {15,10,14,7,9 ,11,13,1,4,3,8,2,6,5,12,16} | 3 | 3 |
| 15 | {16,15,14,10,9 ,11,13,7,4,3,8,2,6,5,12,1} | 4 | 4 |
|  |  | Total 38 | Total 38 |

Data Set 2: 2 1 4 3 6 5 8 7 10 9 12 11 14 13 16 15

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|  |  | #Comparisons | #Swaps |
| 1 | {2,1,4,3,6,5,8,7,10,9,12,11,14,13,16,15} | 0 | 0 |
| 2 | {2,1,4,3,6,5,8,7,10,9,12,11,14,13,16,15} | 2 | 1 |
| 3 | {3,2,4,1,6,5,8,7,10,9,12,11,14,13,16,15} | 2 | 2 |
| 4 | {6,3,4,1,2,5,8,7,10,9,12,11,14,13,16,15} | 2 | 2 |
| 5 | {6,3,5,1,2,4,8,7,10,9,12,11,14,13,16,15} | 2 | 1 |
| 6 | {8,3,6,1,2,4,5,7,10,9,12,11,14,13,16,15} | 2 | 2 |
| 7 | {8,7,6,3,2,4,5,1,10,9,12,11,14,13,16,15} | 3 | 2 |
| 8 | {10,8,6,7,2,4,5,1,3,9,12,11,14,13,16,15} | 3 | 3 |
| 9 | {10,9,6,7,8,4,5,1,3,2,12,11,14,13,16,15} | 3 | 2 |
| 10 | {12,10,6,7,9,4,5,1,3,2,8,11,14,13,16,15} | 3 | 3 |
| 11 | {12,10,11,7,9,6,5,1,3,2,8,4,14,13,16,15} | 3 | 2 |
| 12 | {14,10,12,7,9,11,5,1,3,2,8,4,6,13,16,15} | 3 | 3 |
| 13 | {14,10,13,7,9,11,12,1,3,2,8,4,6,5,16,15} | 3 | 2 |
| 14 | {16,10,14,7,9,11,13,1,3,2,8,4,6,5,12,15} | 3 | 3 |
| 15 | {16,15,14,10,9,11,13,7,4,3,8,2,6,5,12,1} | 4 | 3 |
|  |  | Total 38 | Total 31 |

Data Set 3: 4 2 3 1 5 8 7 6 11 10 12 9 13 14 16 15

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | #Comparisons | #Swaps |
| 1 | {4,2,3,1,5,8,7,6,11,10,12,9,13,14,16,15} | 0 | 0 |
| 2 | {4,2,3,1,5,8,7,6,11,10,12,9,13,14,16,15} | 2 | 0 |
| 3 | {4,2,3,1,5,8,7,6,11,10,12,9,13,14,16,15} | 2 | 0 |
| 4 | {5,4,3,1,2,8,7,6,11,10,12,9,13,14,16,15} | 2 | 2 |
| 5 | {8,4,5,1,2,3,7,6,11,10,12,9,13,14,16,15} | 2 | 2 |
| 6 | {8,4,7,1,2,3,5,6,11,10,12,9,13,14,16,15} | 2 | 1 |
| 7 | {8,6,7,4,2,3,5,1,11,10,12,9,13,14,16,15} | 3 | 2 |
| 8 | {11,8,7,6,2,3,5,1,4,10,12,9,13,14,16,15} | 3 | 3 |
| 9 | {11,10,7,6,8,3,5,1,4,2,12,9,13,14,16,15} | 3 | 2 |
| 10 | {12,11,7,6,10,3,5,1,4,2,8,9,13,14,16,15} | 3 | 3 |
| 11 | {12,11,9,6,10,7,5,1,4,2,8,3,13,14,16,15} | 3 | 2 |
| 12 | {13,11,12,6,10,9,5,1,4,2,8,3,7,14,16,15} | 3 | 3 |
| 13 | {14,11,13,6,10,9,12,1,4,2,8,3,7,5,16,15} | 3 | 3 |
| 14 | {16,11,14,6,10,9,13,1,4,2,8,3,7,5,12,15} | 3 | 3 |
| 15 | {16,15,14,11,10,9,13,6,4,2,8,3,7,5,12,1} | 4 | 3 |
|  |  | Total 38 | Total 29 |

Data Set 4: 5 6 7 4 2 3 1 8 11 13 14 16 10 12 11 9

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | #Comparisons | #Swaps |
| 1 | {5,6,7,4,2,3,1,8,11,13,14,16,10,12,11,9} | 0 | 0 |
| 2 | {7,6,5,4,2,3,1,8,11,13,14,16,10,12,11,9} | 2 | 2 |
| 3 | {7,6,5,4,2,3,1,8,11,13,14,16,10,12,11,9} | 2 | 0 |
| 4 | {7,6,5,4,2,3,1,8,11,13,14,16,10,12,11,9} | 2 | 0 |
| 5 | {7,6,5,4,2,3,1,8,11,13,14,16,10,12,11,9} | 2 | 0 |
| 6 | {7,6,5,4,2,3,1,8,11,13,14,16,10,12,11,9} | 2 | 0 |
| 7 | {8,7,5,6,2,3,1,4,11,13,14,16,10,12,11,9} | 3 | 3 |
| 8 | {11,8,5,7,2,3,1,4,6,13,14,16,10,12,11,9} | 3 | 3 |
| 9 | {13,11,5,7,8,3,1,4,6,2,14,16,10,12,11,9} | 3 | 3 |
| 10 | {14,13,5,7,11,3,1,4,6,2,8,16,10,12,11,9} | 3 | 3 |
| 11 | {16,13,14,7,11,5,1,4,6,2,8,3,10,12,11,9} | 3 | 3 |
| 12 | {16,13,14,7,11,10,1,4,6,2,8,3,5,12,11,9} | 3 | 1 |
| 13 | {16,13,14,7,11,10,12,4,6,2,8,3,5,1,11,9} | 3 | 1 |
| 14 | {16,13,14,7,11,10,12,4,6,2,8,3,5,1,11,9} | 3 | 0 |
| 15 | {16,13,14,9,11,10,12,7,6,2,8,3,5,1,11,4} | 4 | 2 |
|  |  | Total 38 | Total 21 |

**Bottom Up**

Data Set 1: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

|  |  |  |
| --- | --- | --- |
|  |  | #Comparisons |
| 1 | {1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16} | 0 |
| 2 | {1,2,3,4,5,6,7,16,9,10,11,12,13,14,15,8} | 1 |
| 3 | {1,2,3,4,5,6,15,16,9,10,11,12,13,14,7,8} | 2 |
| 4 | {1,2,3,4,5,13,15,16,9,10,11,12,6,14,7,8} | 2 |
| 5 | {1,2,3,4,11,13,15,16,9,10,5,12,6,14,7,8} | 2 |
| 6 | {1,2,3,16,11,13,15,8,9,10,5,12,6,14,7,4} | 3 |
| 7 | {1,2,15,16,11,13,14,8,9,10,5,12,6,3,7,4} | 4 |
| 8 | {1,16,15,9,11,13,14,8,2,10,5,12,6,3,7,4} | 4 |
| 9 | {16,11,15,9,10,13,14,8,2,1,5,12,6,3,7,4} | 6 |
|  |  | Total 24 |

Data Set 2: 2 1 4 3 6 5 8 7 10 9 12 11 14 13 16 15

|  |  |  |
| --- | --- | --- |
|  |  | #Comparisons |
| 1 | {2,1,4,3,6,5,8,7,10,9,12,11,14,13,16,15} | 0 |
| 2 | {2,1,4,3,6,5,8,15,10,9,12,11,14,13,16,7} | 1 |
| 3 | {2,1,4,3,6,5,16,15,10,9,12,11,14,13,8,7} | 2 |
| 4 | {2,1,4,3,6,14,16,15,10,9,12,11,5,13,8,7} | 2 |
| 5 | {2,1,4,3,12,14,16,15,10,9,6,11,5,13,8,7} | 2 |
| 6 | {2,1,4,15,12,14,16,7,10,9,6,11,5,13,8,3} | 3 |
| 7 | {2,1,16,15,12,14,13,7,10,9,6,11,5,4,8,3} | 4 |
| 8 | {2,15,16,10,12,14,13,7,1,9,6,11,5,4,8,3} | 4 |
| 9 | {16,15,14,10,12,11,13,7,1,9,6,2,5,4,8,3} | 6 |
|  |  | Total 24 |

Data Set 3: 4 2 3 1 5 8 7 6 11 10 12 9 13 14 16 15

|  |  |  |
| --- | --- | --- |
|  |  | #Comparisons |
| 1 | {4,2,3,1,5,8,7,6,11,10,12,9,13,14,16,15} | 0 |
| 2 | {4,2,3,1,5,8,7,15,11,10,12,9,13,14,16,6} | 1 |
| 3 | {4,2,3,1,5,8,16,15,11,10,12,9,13,14,7,6} | 2 |
| 4 | {4,2,3,1,5,13,16,15,11,10,12,9,8,14,7,6} | 2 |
| 5 | {4,2,3,1,12,13,16,15,11,10,5,9,8,14,7,6} | 2 |
| 6 | {4,2,3,15,12,13,16,6,11,10,5,9,8,14,7,1} | 3 |
| 7 | {4,2,16,15,12,13,14,6,11,10,5,9,8,3,7,1} | 4 |
| 8 | {4,15,16,11,12,13,14,6,2,10,5,9,8,3,7,1} | 4 |
| 9 | {16,15,14,11,12,13,7,6,2,10,5,9,8,3,4,1} | 6 |
|  |  | Total 24 |

Data Set 4: 5 6 7 4 2 3 1 8 11 13 14 16 10 12 11 9

|  |  |  |
| --- | --- | --- |
|  |  | #Comparisons |
| 1 | {5,6,7,4,2,3,1,8,11,13,14,16,10,12,11,9} | 0 |
| 2 | {5,6,7,4,2,3,1,9,11,13,14,16,10,12,11,8} | 1 |
| 3 | {5,6,7,4,2,3,12,9,11,13,14,16,10,1,11,8} | 2 |
| 4 | {5,6,7,4,2,16,12,9,11,13,14,3,10,1,11,8} | 2 |
| 5 | {5,6,7,4,14,16,12,9,11,13,2,3,10,1,11,8} | 2 |
| 6 | {5,6,7,9,14,16,12,8,11,13,2,3,10,1,11,4} | 3 |
| 7 | {5,6,16,9,14,10,12,8,11,13,2,3,7,1,11,4} | 4 |
| 8 | {5,14,16,9,13,10,12,8,11,6,2,3,7,1,11,4} | 4 |
| 9 | {16,14,12,9,13,10,11,8,11,6,2,3,7,1,5,4} | 6 |
|  |  | Total 24 |