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Advanced Algorithms

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1 and 2:

I used Dijkstras shortest path algorithm. I kept the vertices in the tree after they are added, their weights, and their parents. The weights correspond to the shortest possible path to get to that node total.

Added: A

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |

Added: B

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |

Added: E

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |

Added: D

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |

Added: C

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |

Added: F

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |

Added: H

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 5 | D ( or E) |

Added: L

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 5 | D ( or E) |
| L | 6 | H |

Added: G

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 5 | D ( or E) |
| L | 6 | H |
| G | 5 | F |

Added: J

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 5 | D ( or E) |
| L | 6 | H |
| G | 5 | F |
| J | 7 | H |

Added: M

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 4 | D |
| L | 5 | H |
| G | 5 | F |
| J | 6 | H |
| M | 8 | G |

Added: N

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 4 | D |
| L | 5 | H |
| G | 5 | F |
| J | 6 | H |
| M | 8 | G |
| N | 6 | L |

Added: X

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 4 | D |
| L | 5 | H |
| G | 5 | F |
| J | 6 | H |
| M | 8 | G |
| N | 6 | L |
| X | 7 | N |

Added: K

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 4 | D |
| L | 5 | H |
| G | 5 | F |
| J | 6 | H |
| M | 8 | G |
| N | 6 | L |
| X | 7 | N |
| K | 7 | N |

Added: P

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 4 | D |
| L | 5 | H |
| G | 5 | F |
| J | 6 | H |
| M | 8 | G |
| N | 6 | L |
| X | 7 | N |
| K | 7 | N |
| P | 7 | J |

Added: Q

|  |  |  |
| --- | --- | --- |
| Vertices | Weight (Total) | Parent |
| A | 0 | NA |
| B | 1 | A |
| E | 2 | B |
| D | 3 | E |
| C | 4 | A (or E or D all same) |
| F | 4 | E |
| H | 4 | D |
| L | 5 | H |
| G | 5 | F |
| J | 6 | H |
| M | 8 | G |
| N | 6 | L |
| X | 7 | N |
| K | 7 | N |
| P | 7 | J |
| Q | 9 | N |

This representation of all the nodes in the tree and their shortest path weights are shown. The shortest path from A to X is 7 long following A, B,E,D,H,L,N,X.