Set of points:

1, 4, 9, 16, 25, 36, 49, 64, 81

Algorithm:

WHILE it is not time to stop DO

pick the best two clusters to merge;

combine those two clusters into one cluster;

END;

Start:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 1 – 4 | 4 - 9 | 9 - 16 | 16 -25 | 25 - 36 | 36 - 49 | 49 -64 | 64 -81 |  |
| Distance | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 |  |
|  | | | | | | | | | |
| Cluster | 1 | 4 | 9 | 16 | 25 | 36 | 49 | 64 | 81 |
| Centroid | 1 | 4 | 9 | 16 | 25 | 36 | 49 | 64 | 81 |

Iteration 1:

Pair 1 and 4 has the shortest distance, merge them,

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 2.5 – 9 | 9 - 16 | 16 -25 | 25 - 36 | 36 - 49 | 49 -64 | 64 -81 |  | |
| Distance | 6.5 | 7 | 9 | 11 | 13 | 15 | 17 |
|  | | | | | | | | | |
| Cluster | (1, 4) | | 9 | 16 | 25 | 36 | 49 | 64 | 81 |
| Centroid | 2.5 | | 9 | 16 | 25 | 36 | 49 | 64 | 81 |

Iteration 2:

Pair 2.5 and 9 has the shortest distance, merge them,

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 4.67 – 16 | 16 -25 | 25 - 36 | 36 - 49 | 49 -64 | 64 -81 |  | | |
| Distance | 11.3 | 9 | 11 | 13 | 15 | 17 |
|  | | | | | | | | | |
| Cluster | (1, 4, 9) | | | 16 | 25 | 36 | 49 | 64 | 81 |
| Centroid | 4.67 | | | 16 | 25 | 36 | 49 | 64 | 81 |

Iteration 3:

Pair 16 and 25 has the shortest distance, merge them,

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 4.67 – 20.5 | 20.5 - 36 | 36 - 49 | | 49 -64 | 64 -81 |  | | | |
| Distance | 15.8 | 15.5 | 13 | | 15 | 17 |
|  | | | | | | | | | | |
| Cluster | (1, 4, 9) | | | (16, 25) | | | 36 | 49 | 64 | 81 |
| Centroid | 4.67 | | | 20.5 | | | 36 | 49 | 64 | 81 |

Iteration 4:

Pair 36 and 49 has the shortest distance, merge them,

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 4.67 – 20.5 | 20.5 - 42.5 | 42.5 -64 | | 64 -81 |  | | | |
| Distance | 15.8 | 22 | 21.5 | | 17 |
|  | | | | | | | | | |
| Cluster | (1, 4, 9) | | | (16, 25) | | | (36, 49) | 64 | 81 |
| Centroid | 4.67 | | | 20.5 | | | 42.5 | 64 | 81 |

Iteration 5:

Pair 4.67 and 20.5 has the shortest distance, merge them,

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 11 – 42.5 | 42.5 -64 | 64 -81 |  | | | |
| Distance | 31.5 | 21.5 | 17 |
|  | | | | | | | |
| Cluster | (1, 4, 9, 16, 25) | | | | (36, 49) | 64 | 81 |
| Centroid | 11 | | | | 42.5 | 64 | 81 |

Iteration 6:

Pair 64 and 81 has the shortest distance, merge them,

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cluster centroid pair | 11 – 42.5 | 42.5 – 72.5 |  | | |
| Distance | 31.5 | 30 |
|  | | | | | |
| Cluster | (1, 4, 9, 16, 25) | | | (36, 49) | (64, 81) |
| Centroid | 11 | | | 42.5 | 72.5 |

Iteration 7:

Pair 42.5 and 72.5 has the shortest distance, merge them,

|  |  |  |  |
| --- | --- | --- | --- |
| Cluster centroid pair | 11 – 57.5 |  | |
| Distance | 46.5 |
|  | | | |
| Cluster | (1, 4, 9, 16, 25) | | (36, 49, 64, 81) |
| Centroid | 11 | | 57.5 |

Iteration 8:

Pair 11and 57.5 has the shortest distance, merge them,

|  |  |
| --- | --- |
| Cluster centroid pair |  |
| Distance |
|  | |
| Cluster | (1, 4, 9, 16, 25, 36, 49, 64, 81) |
| Centroid | 31.7 |