**ASSIGNMENT 2**

|  |  |
| --- | --- |
| **NAME** | **MANISH SENCHA** |
| **CLASS** | **B. TECH. III YEAR** |
| **BRANCH** | **CSE** |
| **SUBJECT** | **DESIGN AND ANALYSIS OF ALGORITHMS (CO34563)** |
| **ENROLMENT NUMBER** | **0801CS191048** |

Algorithm 1:

MergeSort(arr[], l, r)

If r > l

1. Find the middle point to divide the array into two halves:

middle m = l+ (r-l)/2

2. Call mergeSort for first half:

Call mergeSort(arr, l, m)

3. Call mergeSort for second half:

Call mergeSort(arr, m+1, r)

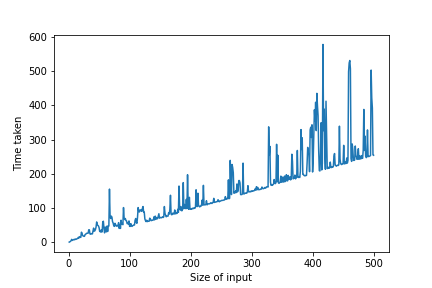
4. Merge the two halves sorted in step 2 and 3:

Call merge(arr, l, m, r)

Time Complexity:

T(n) = 2T(n/2) + O(n)

* O(n\*log(base 2)(n))



|  |  |  |
| --- | --- | --- |
| Input | Output | Time taken |
| [41] | [41] | 0 |
| [8467, 6334] | [6334, 8467] | 1 |
| [6500, 9169, 5724] | [5724, 6500, 9169] | 2 |
| [1478, 9358, 6962, 4464] | [1478, 4464, 6962, 9358] | 4 |
| [5705, 8145, 3281, 6827, 9961] | [3281, 5705, 6827, 8145, 9961] | 8 |
| [491, 2995, 1942, 4827, 5436, 2391] | [491, 1942, 2391, 2995, 4827, 5436] | 5 |
| [4604, 3902, 153, 292, 2382, 7421, 8716] | [153, 292, 2382, 3902, 4604, 7421, 8716] | 6 |
| [9718, 9895, 5447, 1726, 4771, 1538, 1869, 9912] | [1538, 1726, 1869, 4771, 5447, 9718, 9895, 9912] | 7 |
| [5667, 6299, 7035, 9894, 8703, 3811, 1322, 333, 7673] | [333, 1322, 3811, 5667, 6299, 7035, 7673, 8703, 9894] | 8 |
| [4664, 5141, 7711, 8253, 6868, 5547, 7644, 2662, 2757, 37] | [37, 2662, 2757, 4664, 5141, 5547, 6868, 7644, 7711, 8253] | 7 |
| [2859, 8723, 9741, 7529, 778, 2316, 3035, 2190, 1842, 288, 106] | [106, 288, 778, 1842, 2190, 2316, 2859, 3035, 7529, 8723, 9741] | 9 |
| [9040, 8942, 9264, 2648, 7446, 3805, 5890, 6729, 4370, 5350, 5006, 1101] | [1101, 2648, 3805, 4370, 5006, 5350, 5890, 6729, 7446, 8942, 9040, 9264] | 8 |
| [4393, 3548, 9629, 2623, 4084, 9954, 8756, 1840, 4966, 7376, 3931, 6308, 6944] | [1840, 2623, 3548, 3931, 4084, 4393, 4966, 6308, 6944, 7376, 8756, 9629, 9954] | 9 |
| [2439, 4626, 1323, 5537, 1538, 6118, 2082, 2929, 6541, 4833, 1115, 4639, 9658, 2704] | [1115, 1323, 1538, 2082, 2439, 2704, 2929, 4626, 4639, 4833, 5537, 6118, 6541, 9658] | 10 |
| [9930, 3977, 2306, 1673, 2386, 5021, 8745, 6924, 9072, 6270, 5829, 6777, 5573, 5097, 6512] | [1673, 2306, 2386, 3977, 5021, 5097, 5573, 5829, 6270, 6512, 6777, 6924, 8745, 9072, 9930] | 11 |
| [3986, 3290, 9161, 8636, 2355, 4767, 3655, 5574, 4031, 2052, 7350, 1150, 6941, 1724, 3966, 3430] | [1150, 1724, 2052, 2355, 3290, 3430, 3655, 3966, 3986, 4031, 4767, 5574, 6941, 7350, 8636, 9161] | 14 |
| [1107, 191, 8007, 1337, 5457, 2287, 7753, 383, 4945, 8909, 2209, 9758, 4221, 8588, 6422, 4946, 7506] | [191, 383, 1107, 1337, 2209, 2287, 4221, 4945, 4946, 5457, 6422, 7506, 7753, 8007, 8588, 8909, 9758] | 12 |
| [3030, 6413, 9168, 900, 2591, 8762, 1655, 7410, 6359, 7624, 537, 1548, 6483, 7595, 4041, 3602, 4350, 291] | [291, 537, 900, 1548, 1655, 2591, 3030, 3602, 4041, 4350, 6359, 6413, 6483, 7410, 7595, 7624, 8762, 9168] | 16 |
| [836, 9374, 1020, 4596, 4021, 7348, 3199, 9668, 4484, 8281, 4734, 53, 1999, 6418, 7938, 6900, 3788, 8127, 467] | [53, 467, 836, 1020, 1999, 3199, 3788, 4021, 4484, 4596, 4734, 6418, 6900, 7348, 7938, 8127, 8281, 9374, 9668] | 14 |
| [3728, 4893, 4648, 2483, 7807, 2421, 4310, 6617, 2813, 9514, 4309, 7616, 8935, 7451, 600, 5249, 6519, 1556, 2798, 303] | [303, 600, 1556, 2421, 2483, 2798, 2813, 3728, 4309, 4310, 4648, 4893, 5249, 6519, 6617, 7451, 7616, 7807, 8935, 9514] | 14 |
| [6224, 1008, 5844, 2609, 4989, 2702, 3195, 485, 3093, 4343, 523, 1587, 9314, 9503, 7448, 5200, 3458, 6618, 580, 9796, 4798] | [485, 523, 580, 1008, 1587, 2609, 2702, 3093, 3195, 3458, 4343, 4798, 4989, 5200, 5844, 6224, 6618, 7448, 9314, 9503, 9796] | 29 |
| [5281, 9589, 798, 8009, 7157, 472, 3622, 8538, 2292, 6038, 4179, 8190, 9657, 7958, 6191, 9815, 2888, 9156, 1511, 6202, 2634, 4272] | [472, 798, 1511, 2292, 2634, 2888, 3622, 4179, 4272, 5281, 6038, 6191, 6202, 7157, 7958, 8009, 8190, 8538, 9156, 9589, 9657, 9815] | 26 |
| [55, 328, 2646, 6362, 4886, 8875, 8433, 9869, 142, 3844, 1416, 1881, 1998, 322, 8651, 21, 5699, 3557, 8476, 7892, 4389, 5075, 712] | [21, 55, 142, 322, 328, 712, 1416, 1881, 1998, 2646, 3557, 3844, 4389, 4886, 5075, 5699, 6362, 7892, 8433, 8476, 8651, 8875, 9869] | 19 |
| [2600, 2510, 1003, 6869, 7861, 4688, 3401, 9789, 5255, 6423, 5002, 585, 4182, 285, 7088, 1426, 8617, 3757, 9832, 932, 4169, 2154, 5721, 7189] | [285, 585, 932, 1003, 1426, 2154, 2510, 2600, 3401, 3757, 4169, 4182, 4688, 5002, 5255, 5721, 6423, 6869, 7088, 7189, 7861, 8617, 9789, 9832] | 18 |
| [9976, 1329, 2368, 8692, 1425, 555, 3434, 6549, 7441, 9512, 145, 8060, 1718, 3753, 6139, 2423, 6279, 5996, 6687, 2529, 2549, 7437, 9866, 2949, 193] | [145, 193, 555, 1329, 1425, 1718, 2368, 2423, 2529, 2549, 2949, 3434, 3753, 5996, 6139, 6279, 6549, 6687, 7437, 7441, 8060, 8692, 9512, 9866, 9976] | 17 |
| [3195, 3297, 416, 8286, 6105, 4488, 6282, 2455, 5734, 8114, 1701, 1316, 671, 5786, 2263, 4313, 4355, 1185, 53, 912, 808, 1832, 945, 4313, 7756, 8321] | [53, 416, 671, 808, 912, 945, 1185, 1316, 1701, 1832, 2263, 2455, 3195, 3297, 4313, 4313, 4355, 4488, 5734, 5786, 6105, 6282, 7756, 8114, 8286, 8321] | 17 |
| [9558, 3646, 7982, 481, 4144, 3196, 222, 7129, 2161, 5535, 450, 1173, 466, 2044, 1659, 6292, 6439, 7253, 24, 6154, 9510, 4745, 649, 3186, 8313, 4474, 8022] | [24, 222, 450, 466, 481, 649, 1173, 1659, 2044, 2161, 3186, 3196, 3646, 4144, 4474, 4745, 5535, 6154, 6292, 6439, 7129, 7253, 7982, 8022, 8313, 9510, 9558] | 22 |
| [2168, 4018, 8787, 9905, 7958, 7391, 202, 3625, 6477, 4414, 9314, 5824, 9334, 5874, 4372, 159, 1833, 8070, 7487, 8297, 7518, 8177, 7773, 2270, 1763, 2668, 7192, 3985] | [159, 202, 1763, 1833, 2168, 2270, 2668, 3625, 3985, 4018, 4372, 4414, 5824, 5874, 6477, 7192, 7391, 7487, 7518, 7773, 7958, 8070, 8177, 8297, 8787, 9314, 9334, 9905] | 23 |
| [3102, 8480, 9213, 7627, 4802, 4099, 527, 2625, 1543, 1924, 1023, 9972, 3061, 4181, 1003, 7432, 7505, 7593, 2725, 3031, 8492, 142, 7222, 1286, 3064, 7900, 9187, 8360, 2413] | [142, 527, 1003, 1023, 1286, 1543, 1924, 2413, 2625, 2725, 3031, 3061, 3064, 3102, 4099, 4181, 4802, 7222, 7432, 7505, 7593, 7627, 7900, 8360, 8480, 8492, 9187, 9213, 9972] | 25 |
| [974, 4270, 9170, 235, 833, 9711, 5760, 8896, 4667, 7285, 2550, 140, 3694, 2695, 1624, 8019, 2125, 6576, 1694, 2658, 6302, 7371, 2466, 4678, 2593, 3851, 5484, 1018, 8464, 1119] | [140, 235, 833, 974, 1018, 1119, 1624, 1694, 2125, 2466, 2550, 2593, 2658, 2695, 3694, 3851, 4270, 4667, 4678, 5484, 5760, 6302, 6576, 7285, 7371, 8019, 8464, 8896, 9170, 9711] | 26 |
| [3152, 2800, 8087, 1060, 1926, 9010, 4757, 2170, 315, 9576, 227, 2043, 2758, 7164, 5109, 7882, 7086, 9565, 3487, 9577, 4474, 2625, 5627, 5629, 1928, 5423, 8520, 6902, 4962, 123, 4596] | [123, 227, 315, 1060, 1926, 1928, 2043, 2170, 2625, 2758, 2800, 3152, 3487, 4474, 4596, 4757, 4962, 5109, 5423, 5627, 5629, 6902, 7086, 7164, 7882, 8087, 8520, 9010, 9565, 9576, 9577] | 26 |
| [3737, 3261, 195, 2525, 1264, 8260, 6202, 8116, 5030, 326, 9011, 771, 6411, 5547, 1153, 1520, 9790, 4924, 188, 1763, 4940, 851, 8662, 3829, 900, 7713, 8958, 7578, 8365, 3007, 1477, 1200] | [188, 195, 326, 771, 851, 900, 1153, 1200, 1264, 1477, 1520, 1763, 2525, 3007, 3261, 3737, 3829, 4924, 4940, 5030, 5547, 6202, 6411, 7578, 7713, 8116, 8260, 8365, 8662, 8958, 9011, 9790] | 26 |
| [6058, 6439, 2303, 2760, 9357, 2324, 6477, 5108, 1113, 4887, 9801, 2850, 4460, 2428, 2993, 7384, 9405, 6540, 1111, 8704, 2835, 2356, 6072, 9350, 8823, 4485, 556, 3216, 1626, 9357, 8526, 3357, 9337] | [556, 1111, 1113, 1626, 2303, 2324, 2356, 2428, 2760, 2835, 2850, 2993, 3216, 3357, 4460, 4485, 4887, 5108, 6058, 6072, 6439, 6477, 6540, 7384, 8526, 8704, 8823, 9337, 9350, 9357, 9357, 9405, 9801] | 36 |

Algorithm 2:

Dividing the arrays into 1/3 and 2/3 parts

MergeSort(arr[], l, r)

If r > l

1. Find the 1/3rd point to divide the array into two halves:

mid m = l+ (r-l)/3

2. Call mergeSort for first half:

Call mergeSort(arr, l, m)

3. Call mergeSort for second half:

Call mergeSort(arr, m+1, r)

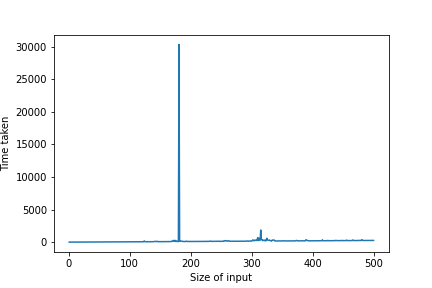
4. Merge the two halves sorted in step 2 and 3:

Call merge(arr, l, m, r)

Time complexity:

T(n) = T(n / 3) + T(2n / 3) + O(n)

* O(n\*log(base 3/2)(n))



|  |  |  |
| --- | --- | --- |
| Input | Output | Time taken |
| [6993] | [6993] | 0 |
| [6353, 5626] | [5626, 6353] | 0 |
| [5486, 6184, 5243] | [5243, 5486, 6184] | 0 |
| [572, 2334, 2695, 6507] | [572, 2334, 2695, 6507] | 1 |
| [3394, 9766, 7170, 4470, 435] | [435, 3394, 4470, 7170, 9766] | 1 |
| [3810, 8274, 8014, 2949, 9088, 7834] | [2949, 3810, 7834, 8014, 8274, 9088] | 2 |
| [6491, 1376, 2855, 6442, 8701, 5669, 8118] | [1376, 2855, 5669, 6442, 6491, 8118, 8701] | 2 |
| [5011, 7856, 3647, 7755, 6923, 6465, 2361, 2645] | [2361, 2645, 3647, 5011, 6465, 6923, 7755, 7856] | 2 |
| [7332, 4673, 785, 7420, 9337, 7688, 2475, 1311, 8968] | [785, 1311, 2475, 4673, 7332, 7420, 7688, 8968, 9337] | 3 |
| [2443, 4376, 6014, 566, 8049, 2729, 4202, 6623, 6787, 2078] | [566, 2078, 2443, 2729, 4202, 4376, 6014, 6623, 6787, 8049] | 3 |
| [7209, 7533, 834, 676, 2767, 3164, 1469, 6111, 841, 3835, 9779] | [676, 834, 841, 1469, 2767, 3164, 3835, 6111, 7209, 7533, 9779] | 4 |
| [7060, 9371, 3877, 5621, 90, 7053, 705, 32, 5873, 8177, 2758, 6122] | [32, 90, 705, 2758, 3877, 5621, 5873, 6122, 7053, 7060, 8177, 9371] | 4 |
| [9556, 1144, 8003, 890, 6603, 4582, 3118, 8541, 4229, 5907, 1676, 487, 1412] | [487, 890, 1144, 1412, 1676, 3118, 4229, 4582, 5907, 6603, 8003, 8541, 9556] | 4 |
| [9827, 6977, 487, 3961, 1896, 1240, 9486, 9409, 327, 4484, 9664, 1952, 9033, 6056] | [327, 487, 1240, 1896, 1952, 3961, 4484, 6056, 6977, 9033, 9409, 9486, 9664, 9827] | 5 |
| [2891, 2029, 3234, 4276, 6489, 9518, 2919, 9313, 241, 9958, 5035, 9392, 4803, 7947, 4011] | [241, 2029, 2891, 2919, 3234, 4011, 4276, 4803, 5035, 6489, 7947, 9313, 9392, 9518, 9958] | 5 |
| [5261, 1139, 8397, 5932, 9210, 2677, 2085, 3825, 8617, 1498, 490, 2161, 1865, 3018, 377, 1224] | [377, 490, 1139, 1224, 1498, 1865, 2085, 2161, 2677, 3018, 3825, 5261, 5932, 8397, 8617, 9210] | 6 |
| [1686, 1107, 3542, 6876, 9914, 864, 6654, 3427, 264, 829, 2335, 6819, 9866, 490, 1130, 7723, 8953] | [264, 490, 829, 864, 1107, 1130, 1686, 2335, 3427, 3542, 6654, 6819, 6876, 7723, 8953, 9866, 9914] | 6 |
| [7295, 9080, 6928, 6046, 3215, 7611, 9594, 6951, 3824, 1078, 3505, 9388, 2074, 2688, 9857, 7090, 6077, 2708] | [1078, 2074, 2688, 2708, 3215, 3505, 3824, 6046, 6077, 6928, 6951, 7090, 7295, 7611, 9080, 9388, 9594, 9857] | 7 |
| [7638, 111, 5048, 1132, 4820, 9823, 7335, 8512, 7637, 1319, 5165, 7754, 3305, 6616, 8947, 604, 7881, 8791, 4687] | [111, 604, 1132, 1319, 3305, 4687, 4820, 5048, 5165, 6616, 7335, 7637, 7638, 7754, 7881, 8512, 8791, 8947, 9823] | 7 |
| [6516, 541, 1498, 4424, 1646, 6671, 5, 2328, 2282, 1231, 1573, 4692, 5984, 1575, 1501, 5641, 1969, 9314, 8464, 2071] | [5, 541, 1231, 1498, 1501, 1573, 1575, 1646, 1969, 2071, 2282, 2328, 4424, 4692, 5641, 5984, 6516, 6671, 8464, 9314] | 9 |
| [1888, 4409, 8414, 8562, 5105, 2623, 9154, 2646, 1505, 4766, 8331, 4315, 9783, 5296, 7946, 3353, 4057, 3187, 91, 9454, 7569] | [91, 1505, 1888, 2623, 2646, 3187, 3353, 4057, 4315, 4409, 4766, 5105, 5296, 7569, 7946, 8331, 8414, 8562, 9154, 9454, 9783] | 8 |
| [2775, 9336, 7630, 2289, 1193, 7530, 490, 7652, 4725, 929, 1764, 5560, 8807, 8166, 2289, 3785, 4835, 671, 5968, 2784, 1079, 675] | [490, 671, 675, 929, 1079, 1193, 1764, 2289, 2289, 2775, 2784, 3785, 4725, 4835, 5560, 5968, 7530, 7630, 7652, 8166, 8807, 9336] | 10 |
| [6731, 7244, 3629, 1790, 620, 2639, 3797, 71, 6530, 3036, 6450, 9921, 9363, 9167, 9907, 6767, 8243, 1054, 5, 5163, 8006, 2318, 647] | [5, 71, 620, 647, 1054, 1790, 2318, 2639, 3036, 3629, 3797, 5163, 6450, 6530, 6731, 6767, 7244, 8006, 8243, 9167, 9363, 9907, 9921] | 9 |
| [2712, 2595, 9402, 239, 2310, 4747, 2368, 3995, 2487, 1208, 9275, 2603, 4496, 2792, 5880, 1229, 1025, 1276, 9251, 9816, 7769, 2620, 2162, 5885] | [239, 1025, 1208, 1229, 1276, 2162, 2310, 2368, 2487, 2595, 2603, 2620, 2712, 2792, 3995, 4496, 4747, 5880, 5885, 7769, 9251, 9275, 9402, 9816] | 9 |
| [5668, 8798, 2822, 3098, 3382, 5110, 9117, 7266, 2076, 8672, 6410, 6426, 8417, 5836, 2345, 2676, 14, 1658, 4029, 2113, 726, 230, 1965, 6355, 9153] | [14, 230, 726, 1658, 1965, 2076, 2113, 2345, 2676, 2822, 3098, 3382, 4029, 5110, 5668, 5836, 6355, 6410, 6426, 7266, 8417, 8672, 8798, 9117, 9153] | 11 |
| [3285, 9023, 3265, 9895, 5617, 5443, 9279, 3040, 2848, 4148, 8621, 3769, 8412, 9834, 6910, 8634, 1583, 9811, 2124, 2070, 2654, 1731, 7193, 4626, 6632, 8506] | [1583, 1731, 2070, 2124, 2654, 2848, 3040, 3265, 3285, 3769, 4148, 4626, 5443, 5617, 6632, 6910, 7193, 8412, 8506, 8621, 8634, 9023, 9279, 9811, 9834, 9895] | 10 |
| [3193, 4953, 8782, 3237, 335, 3007, 2324, 4007, 8326, 6517, 8665, 5641, 1153, 5580, 2340, 2304, 5716, 6014, 9807, 815, 9812, 4345, 4265, 5148, 7820, 3389, 1335] | [335, 815, 1153, 1335, 2304, 2324, 2340, 3007, 3193, 3237, 3389, 4007, 4265, 4345, 4953, 5148, 5580, 5641, 5716, 6014, 6517, 7820, 8326, 8665, 8782, 9807, 9812] | 10 |
| [2007, 5139, 2809, 394, 248, 1402, 4849, 5319, 1736, 5242, 9026, 8338, 9172, 8285, 3817, 2028, 781, 7323, 2337, 16, 2339, 4665, 1307, 6680, 7027, 8189, 7363, 5365] | [16, 248, 394, 781, 1307, 1402, 1736, 2007, 2028, 2337, 2339, 2809, 3817, 4665, 4849, 5139, 5242, 5319, 5365, 6680, 7027, 7323, 7363, 8189, 8285, 8338, 9026, 9172] | 11 |
| [1278, 7908, 5696, 1807, 3276, 7784, 6172, 8009, 1809, 668, 9589, 3273, 3663, 5130, 3236, 4839, 28, 336, 7788, 5300, 4118, 4517, 1941, 9868, 5380, 274, 6809, 207, 5902] | [28, 207, 274, 336, 668, 1278, 1807, 1809, 1941, 3236, 3273, 3276, 3663, 4118, 4517, 4839, 5130, 5300, 5380, 5696, 5902, 6172, 6809, 7784, 7788, 7908, 8009, 9589, 9868] | 11 |
| [5167, 9886, 7100, 3136, 6843, 6582, 7791, 3643, 5617, 1443, 5789, 124, 7751, 9855, 1565, 4913, 504, 9547, 3818, 2633, 3429, 7622, 6326, 7532, 6983, 1984, 6689, 331, 8489, 3952] | [124, 331, 504, 1443, 1565, 1984, 2633, 3136, 3429, 3643, 3818, 3952, 4913, 5167, 5617, 5789, 6326, 6582, 6689, 6843, 6983, 7100, 7532, 7622, 7751, 7791, 8489, 9547, 9855, 9886] | 13 |
| [2587, 4569, 1395, 2003, 166, 7898, 1913, 9606, 1263, 2602, 5574, 470, 3614, 1602, 9475, 2293, 139, 1078, 1085, 6992, 3604, 3587, 3190, 8479, 1213, 8135, 9882, 5804, 983, 2177, 2548] | [139, 166, 470, 983, 1078, 1085, 1213, 1263, 1395, 1602, 1913, 2003, 2177, 2293, 2548, 2587, 2602, 3190, 3587, 3604, 3614, 4569, 5574, 5804, 6992, 7898, 8135, 8479, 9475, 9606, 9882] | 12 |
| [7368, 1508, 4315, 2898, 4458, 1594, 7124, 3239, 7065, 7990, 1043, 9343, 7452, 4306, 7033, 3800, 5056, 5498, 9143, 8576, 9722, 8236, 8336, 2537, 5326, 9855, 1664, 356, 8464, 7893, 9213, 6829] | [356, 1043, 1508, 1594, 1664, 2537, 2898, 3239, 3800, 4306, 4315, 4458, 5056, 5326, 5498, 6829, 7033, 7065, 7124, 7368, 7452, 7893, 7990, 8236, 8336, 8464, 8576, 9143, 9213, 9343, 9722, 9855] | 13 |
| [8728, 3987, 588, 1523, 2043, 8592, 1847, 6539, 5527, 9228, 7854, 6757, 1711, 2564, 9452, 3215, 7800, 6867, 8555, 2824, 1475, 8091, 106, 1688, 3565, 404, 9086, 1999, 1843, 4436, 4743, 235, 2905] | [106, 235, 404, 588, 1475, 1523, 1688, 1711, 1843, 1847, 1999, 2043, 2564, 2824, 2905, 3215, 3565, 3987, 4436, 4743, 5527, 6539, 6757, 6867, 7800, 7854, 8091, 8555, 8592, 8728, 9086, 9228, 9452] | 13 |
| [2528, 8533, 8957, 205, 3009, 250, 7598, 296, 27, 545, 5166, 453, 6026, 7968, 8574, 6149, 30, 154, 3967, 9409, 3720, 5432, 4762, 5634, 4805, 2761, 3153, 7406, 571, 3687, 37, 9043, 658, 2989] | [27, 30, 37, 154, 205, 250, 296, 453, 545, 571, 658, 2528, 2761, 2989, 3009, 3153, 3687, 3720, 3967, 4762, 4805, 5166, 5432, 5634, 6026, 6149, 7406, 7598, 7968, 8533, 8574, 8957, 9043, 9409] | 15 |
| [2714, 2281, 6869, 7222, 7800, 2643, 1993, 1862, 8372, 471, 8669, 5007, 3566, 9998, 4562, 4477, 3052, 7502, 5852, 8627, 3175, 7174, 8794, 4746, 308, 2809, 2595, 5974, 1877, 5022, 8466, 2956, 2913, 1191, 1299] | [308, 471, 1191, 1299, 1862, 1877, 1993, 2281, 2595, 2643, 2714, 2809, 2913, 2956, 3052, 3175, 3566, 4477, 4562, 4746, 5007, 5022, 5852, 5974, 6869, 7174, 7222, 7502, 7800, 8372, 8466, 8627, 8669, 8794, 9998] | 14 |
| [9265, 4130, 8114, 6686, 3173, 6621, 9213, 7412, 6304, 4712, 5213, 9991, 4523, 5879, 7616, 1551, 5618, 3943, 8096, 8058, 6792, 4702, 5291, 2516, 4844, 386, 4690, 1527, 7130, 2730, 4975, 7604, 3429, 866, 8219, 4995] | [386, 866, 1527, 1551, 2516, 2730, 3173, 3429, 3943, 4130, 4523, 4690, 4702, 4712, 4844, 4975, 4995, 5213, 5291, 5618, 5879, 6304, 6621, 6686, 6792, 7130, 7412, 7604, 7616, 8058, 8096, 8114, 8219, 9213, 9265, 9991] | 14 |
| [1076, 9379, 942, 3815, 5371, 4130, 9160, 7942, 4684, 6391, 9503, 824, 4573, 6914, 4282, 3150, 4811, 9561, 1678, 1445, 2383, 9636, 8935, 3674, 8368, 717, 6793, 1728, 74, 6194, 5975, 6063, 797, 2557, 6116, 1312, 9033] | [74, 717, 797, 824, 942, 1076, 1312, 1445, 1678, 1728, 2383, 2557, 3150, 3674, 3815, 4130, 4282, 4573, 4684, 4811, 5371, 5975, 6063, 6116, 6194, 6391, 6793, 6914, 7942, 8368, 8935, 9033, 9160, 9379, 9503, 9561, 9636] | 15 |
| [4006, 5176, 5527, 6280, 8822, 9733, 1088, 2508, 4768, 3114, 4573, 8876, 6252, 9448, 670, 2921, 5459, 1844, 5298, 9221, 2946, 7692, 4254, 4566, 7288, 5902, 60, 2792, 4050, 9237, 3509, 193, 9354, 3636, 3649, 328, 8315, 5528] | [60, 193, 328, 670, 1088, 1844, 2508, 2792, 2921, 2946, 3114, 3509, 3636, 3649, 4006, 4050, 4254, 4566, 4573, 4768, 5176, 5298, 5459, 5527, 5528, 5902, 6252, 6280, 7288, 7692, 8315, 8822, 8876, 9221, 9237, 9354, 9448, 9733] | 17 |

Algorithm 3:

Dividing the arrays into 3 equal parts

MergeSort(arr[], l, r)

If r > l

* Find the 1/3rd and 2/3rd point to divide the array into three halves:

mid m1 = l+ (r-l)/3, m2 = l + 2((r-l)/3)+1

* Call mergeSort for first part:

Call mergeSort(arr, l, m1)

* Call mergeSort for second part:

Call mergeSort(arr,m1,m2)

* Call mergeSort for third part:

Call mergeSort(arr, m2, r)

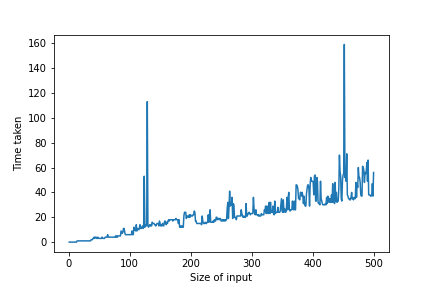
* Merge the two halves sorted in step 2, 3 and 4:

Call merge(arr, l, m, r)

Time complexity:

T(n)=3T(n/3)+ O(n)

* O(n\*log(base 3) (n))



|  |  |  |
| --- | --- | --- |
| Input | Output | Time taken |
| [3439, 794, 9718, 9799] | [794, 3439, 9718, 9799] | 0 |
| [1896, 2713, 5707, 8167, 5226] | [1896, 2713, 5707, 8167, 5226] | 0 |
| [2683, 1102, 6403, 6427, 12, 2491] | [1102, 2683, 6403, 6427, 12, 2491] | 0 |
| [2947, 7471, 7921, 5976, 4315, 4764, 10] | [2947, 4764, 7471, 7921, 5976, 4315, 10] | 0 |
| [1459, 7838, 4971, 5798, 3739, 4174, 7154, 1196] | [1459, 4174, 4971, 5798, 3739, 7154, 7838, 1196] | 0 |
| [5601, 1687, 6464, 5958, 4048, 7837, 888, 1408, 123] | [5601, 1687, 6464, 5958, 4048, 7837, 888, 1408, 123] | 0 |
| [5043, 1378, 1986, 6070, 1437, 1758, 3466, 5993, 8248, 8763] | [5043, 1378, 1986, 5993, 6070, 1437, 1758, 3466, 8248, 8763] | 0 |
| [782, 1424, 2537, 7063, 8289, 4597, 419, 7767, 499, 5458, 749] | [782, 1424, 2537, 7063, 7767, 499, 5458, 8289, 4597, 419, 749] | 0 |
| [3113, 3182, 5026, 8499, 3688, 1950, 4552, 4779, 273, 2528, 5842, 3803] | [3113, 3182, 4779, 273, 2528, 5026, 5842, 8499, 3688, 1950, 4552, 3803] | 0 |
| [2179, 895, 1118, 7402, 4188, 4891, 3326, 1588, 1794, 5947, 1865, 2834, 718] | [2179, 895, 1118, 4188, 4891, 3326, 1588, 1794, 5947, 1865, 2834, 7402, 718] | 0 |
| [9124, 9746, 1321, 9776, 746, 5453, 3297, 9823, 3510, 7646, 3817, 2799, 8361, 8948] | [746, 5453, 3297, 7646, 3817, 2799, 8361, 9124, 9746, 1321, 9776, 9823, 3510, 8948] | 1 |
| [121, 1449, 1761, 8455, 2025, 325, 3353, 3678, 5728, 1451, 4805, 3892, 191, 1387, 7135] | [121, 1449, 1451, 1761, 2025, 325, 3353, 3678, 4805, 3892, 191, 1387, 5728, 8455, 7135] | 1 |
| [7099, 159, 2457, 6060, 1, 5608, 8909, 8226, 9619, 9555, 3962, 5869, 2287, 9363, 8525, 272] | [5608, 5869, 2287, 7099, 159, 2457, 6060, 1, 8909, 8226, 9363, 8525, 9619, 9555, 3962, 272] | 1 |
| [4654, 9807, 9240, 3898, 9634, 2883, 1712, 8793, 8108, 5993, 8100, 5603, 3170, 1345, 3871, 6322, 6623] | [2883, 1712, 4654, 5603, 3170, 1345, 3871, 6322, 8793, 8108, 5993, 8100, 9807, 9240, 3898, 9634, 6623] | 1 |
| [4216, 6896, 4512, 5611, 4568, 7352, 2884, 780, 2012, 9027, 6891, 1085, 5223, 8794, 6554, 3246, 7302, 2520] | [1085, 4216, 5223, 6896, 4512, 5611, 4568, 7352, 2884, 780, 2012, 8794, 6554, 3246, 7302, 9027, 6891, 2520] | 1 |
| [4979, 4364, 5155, 6508, 439, 2930, 8059, 7647, 9851, 4416, 5170, 1542, 6510, 6860, 6693, 5466, 1769, 9063, 8929] | [4979, 4364, 5155, 6508, 439, 2930, 6860, 6693, 5466, 1769, 8059, 7647, 9063, 9851, 4416, 5170, 1542, 6510, 8929] | 1 |
| [3255, 8455, 5921, 6835, 1937, 9543, 3950, 7087, 270, 9872, 5995, 6980, 8047, 4613, 940, 4911, 3616, 7002, 1896, 9936] | [3255, 3950, 4613, 940, 4911, 3616, 7002, 1896, 7087, 270, 8455, 5921, 6835, 1937, 9543, 9872, 5995, 6980, 8047, 9936] | 1 |
| [4883, 1990, 6967, 7386, 968, 4488, 3930, 7423, 257, 5294, 6157, 8411, 739, 4164, 4489, 9407, 9198, 2506, 1340, 7938, 6656] | [3930, 4164, 4489, 4883, 1990, 6967, 7386, 968, 4488, 7423, 257, 5294, 6157, 8411, 739, 9407, 9198, 2506, 1340, 7938, 6656] | 1 |
| [2842, 8333, 2435, 471, 2584, 2666, 9361, 678, 6523, 7380, 4382, 5258, 3867, 7934, 3778, 1917, 2538, 5346, 3756, 5707, 2728, 6005] | [678, 1917, 2538, 2842, 5346, 3756, 5707, 2728, 6523, 7380, 4382, 5258, 3867, 7934, 3778, 8333, 2435, 471, 2584, 2666, 9361, 6005] | 1 |
| [6638, 963, 1330, 2860, 9866, 2432, 6332, 5326, 9127, 4857, 2943, 8156, 9241, 4022, 8851, 1695, 240, 1300, 2529, 1456, 607, 2106, 7506] | [1695, 240, 1300, 2529, 1456, 607, 2106, 5326, 6638, 963, 1330, 2860, 9127, 4857, 2943, 8156, 9241, 4022, 8851, 9866, 2432, 6332, 7506] | 1 |
| [510, 8496, 3965, 9500, 3851, 9494, 1377, 5279, 1032, 7299, 1057, 1226, 8802, 6491, 8384, 6212, 221, 2072, 3281, 376, 7521, 6656, 6357, 9711] | [510, 5279, 1032, 6212, 221, 2072, 3281, 376, 7299, 1057, 1226, 7521, 6656, 6357, 8496, 3965, 8802, 6491, 8384, 9500, 3851, 9494, 1377, 9711] | 1 |
| [722, 3188, 8899, 2340, 5892, 7034, 8348, 4037, 1197, 5757, 9887, 2470, 813, 2115, 9178, 2634, 1437, 4144, 6883, 8916, 9780, 2314, 8918, 4746, 6416] | [722, 1197, 3188, 4144, 5757, 6883, 8899, 2340, 5892, 7034, 8348, 4037, 8916, 9780, 2314, 8918, 4746, 9887, 2470, 813, 2115, 9178, 2634, 1437, 6416] | 1 |
| [1020, 9072, 6364, 2643, 8686, 9179, 4404, 2987, 8373, 4554, 1534, 6614, 8535, 9256, 7529, 7045, 9842, 8428, 9567, 2833, 3853, 1680, 3586, 9036, 2063, 3042] | [1020, 8373, 4554, 1534, 6614, 8428, 8535, 9072, 6364, 2643, 8686, 9179, 4404, 2987, 9256, 7529, 7045, 9567, 2833, 3853, 1680, 3586, 9036, 2063, 9842, 3042] | 1 |
| [3255, 5722, 9582, 1018, 1943, 7615, 1355, 877, 5924, 9434, 253, 7618, 6809, 7810, 1563, 9155, 6709, 9248, 1966, 3526, 1161, 110, 6165, 2604, 9935, 7902, 619] | [3255, 5722, 5924, 9248, 1966, 3526, 1161, 110, 6165, 2604, 9434, 253, 7618, 6809, 7810, 1563, 9155, 6709, 9582, 1018, 1943, 7615, 1355, 877, 9935, 7902, 619] | 1 |
| [3801, 7102, 7886, 470, 1174, 4124, 7946, 6993, 6788, 9683, 8067, 5757, 8850, 5095, 3502, 1028, 3616, 8214, 5056, 6894, 6788, 8257, 809, 5095, 6669, 8283, 9598, 208] | [3801, 6894, 6788, 7102, 7886, 470, 1174, 4124, 7946, 6993, 6788, 8257, 809, 5095, 6669, 8283, 9598, 9683, 8067, 5757, 8850, 5095, 3502, 1028, 3616, 8214, 5056, 208] | 1 |
| [9703, 975, 940, 308, 47, 1255, 890, 7151, 3351, 9658, 4702, 9690, 683, 7253, 5330, 6970, 6341, 5406, 4616, 4362, 9774, 1780, 2364, 5798, 3047, 4827, 6314, 3210, 4855] | [4362, 9658, 4702, 9690, 683, 7253, 5330, 6970, 6341, 5406, 4616, 9703, 975, 940, 308, 47, 1255, 890, 7151, 3351, 9774, 1780, 2364, 5798, 3047, 4827, 6314, 3210, 4855] | 1 |
| [4119, 1423, 7513, 213, 9415, 9332, 34, 2808, 9828, 5960, 5488, 8684, 9018, 3933, 4802, 2281, 4118, 7510, 6106, 975, 7712, 2240, 8361, 1044, 8075, 3455, 8075, 7794, 6091, 9401] | [975, 4119, 1423, 5960, 5488, 7513, 213, 7712, 2240, 8361, 1044, 8075, 3455, 8075, 7794, 6091, 8684, 9018, 3933, 4802, 2281, 4118, 7510, 6106, 9415, 9332, 34, 2808, 9828, 9401] | 1 |
| [8047, 1066, 9606, 5881, 1994, 589, 1934, 1853, 7820, 2365, 2942, 9857, 6163, 9487, 5155, 511, 8671, 9044, 8845, 6023, 9878, 1880, 5590, 9996, 2040, 266, 7842, 8127, 821, 1325, 8280] | [1880, 2942, 5590, 8047, 1066, 9606, 5881, 1994, 589, 1934, 1853, 7820, 2365, 9857, 6163, 9487, 5155, 511, 8671, 9044, 8845, 6023, 9878, 9996, 2040, 266, 7842, 8127, 821, 1325, 8280] | 1 |
| [640, 5022, 1711, 6480, 8274, 7626, 9864, 4541, 9743, 9210, 1349, 893, 9884, 8223, 2342, 6510, 9005, 8554, 788, 2947, 2828, 2292, 4152, 1944, 8438, 6399, 7095, 930, 1190, 9501, 8210, 7579] | [640, 1349, 893, 2292, 4152, 1944, 5022, 1711, 6480, 8274, 7626, 8438, 6399, 7095, 930, 1190, 9501, 8210, 9864, 4541, 9743, 9210, 9884, 8223, 2342, 6510, 9005, 8554, 788, 2947, 2828, 7579] | 1 |
| [3063, 1535, 2782, 7724, 9988, 3985, 4734, 8731, 5634, 3428, 7514, 1384, 3889, 3548, 2570, 8082, 2606, 9227, 6915, 9808, 8733, 2957, 4390, 2397, 581, 1654, 4613, 7363, 764, 2409, 7287, 2267, 3861] | [2957, 3063, 1535, 2782, 4390, 2397, 581, 1654, 4613, 7363, 764, 2409, 7287, 2267, 7514, 1384, 3889, 3548, 2570, 7724, 8082, 2606, 9227, 6915, 9808, 8733, 9988, 3985, 4734, 8731, 5634, 3428, 3861] | 1 |
| [1435, 5390, 2659, 7414, 3479, 8935, 2561, 4623, 8914, 962, 9528, 3032, 4082, 1459, 5896, 2507, 9147, 3016, 4683, 6786, 9850, 5163, 6365, 834, 7237, 5482, 4572, 1048, 7906, 598, 577, 4386, 552, 8537] | [834, 1435, 3032, 4082, 1459, 5390, 2659, 5896, 2507, 7237, 5482, 4572, 1048, 7414, 3479, 7906, 598, 577, 4386, 552, 8935, 2561, 4623, 8914, 962, 9147, 3016, 4683, 6786, 9528, 9850, 5163, 6365, 8537] | 1 |
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| [113, 7108, 1381, 7995, 8494, 277, 5166, 2088, 4499, 89, 2933, 6627, 7122, 4221, 7466, 6236, 2714, 1473, 6242, 3820, 1836, 5943, 6034, 9180, 1132, 7629, 2346, 2009, 8667, 1159, 3999, 2867, 8243, 3520, 1213, 1781] | [113, 6627, 7108, 1381, 7122, 4221, 7466, 6236, 2714, 1473, 6242, 3820, 1836, 5943, 6034, 7995, 8494, 277, 5166, 2088, 4499, 89, 2933, 9180, 1132, 7629, 2346, 2009, 8667, 1159, 3999, 2867, 8243, 3520, 1213, 1781] | 1 |
| [1154, 1842, 1501, 3146, 3210, 868, 2180, 4413, 8072, 3667, 5516, 3073, 3844, 6565, 391, 4227, 5480, 8170, 1856, 1373, 1653, 6259, 9893, 1020, 3715, 6680, 1490, 3925, 5239, 5428, 5503, 7219, 2713, 7908, 6894, 2116, 8006] | [1154, 1842, 1501, 3146, 3210, 868, 2180, 3844, 4413, 6565, 391, 4227, 5480, 6680, 1490, 3925, 5239, 5428, 5503, 7219, 2713, 7908, 6894, 2116, 8072, 3667, 5516, 3073, 8170, 1856, 1373, 1653, 6259, 9893, 1020, 3715, 8006] | 2 |
| [1152, 2397, 4661, 9348, 4537, 9331, 2522, 820, 8612, 3401, 1010, 9869, 69, 1701, 59, 1303, 9360, 1231, 898, 9892, 2539, 174, 942, 8518, 6008, 3987, 526, 4413, 4018, 9065, 639, 2159, 6550, 3882, 9138, 3837, 6356, 1286] | [69, 1152, 1701, 59, 1303, 2397, 3987, 526, 4413, 4018, 4661, 9065, 639, 2159, 6550, 3882, 9138, 3837, 6356, 9348, 4537, 9331, 2522, 820, 8612, 3401, 1010, 9360, 1231, 898, 9869, 9892, 2539, 174, 942, 8518, 6008, 1286] | 2 |
| [9486, 2660, 2150, 4320, 1378, 4961, 7809, 5257, 7757, 4105, 5817, 5121, 2482, 9032, 9737, 6314, 8854, 9768, 1155, 6096, 5436, 1540, 4197, 5206, 3187, 445, 9230, 6627, 6062, 9549, 527, 8765, 3396, 5418, 9972, 1892, 1753, 9677, 9429] | [445, 2482, 9032, 9230, 6627, 6062, 9486, 2660, 2150, 4320, 1378, 4961, 7809, 5257, 7757, 4105, 5817, 5121, 9549, 527, 8765, 3396, 5418, 9737, 6314, 8854, 9768, 1155, 6096, 5436, 1540, 4197, 5206, 3187, 9972, 1892, 1753, 9677, 9429] | 2 |
| [8290, 8125, 52, 5544, 17, 1364, 2549, 8378, 6719, 7125, 3876, 3326, 2654, 9366, 39, 1573, 9662, 9833, 839, 9615, 4782, 2864, 9610, 4160, 5232, 7590, 3887, 4198, 7326, 3313, 9753, 378, 7114, 7650, 6176, 6709, 1306, 9583, 2516, 1509] | [4198, 7326, 3313, 8290, 8125, 52, 5544, 17, 1364, 2549, 8378, 6719, 7125, 3876, 3326, 2654, 9366, 39, 1573, 9662, 9753, 378, 7114, 7650, 6176, 6709, 1306, 9583, 2516, 9833, 839, 9615, 4782, 2864, 9610, 4160, 5232, 7590, 3887, 1509] | 3 |
| [5971, 1892, 2771, 8769, 6949, 3413, 973, 1145, 3480, 711, 8359, 9153, 7733, 8960, 6733, 3471, 232, 9931, 8827, 9667, 3220, 912, 3277, 6279, 4120, 2884, 7173, 6807, 1297, 1165, 3357, 1283, 272, 3817, 4350, 6451, 893, 6192, 2224, 3626, 2092] | [5971, 1892, 2771, 6807, 1297, 1165, 3357, 1283, 272, 3817, 4350, 6451, 893, 6192, 2224, 3626, 8769, 6949, 3413, 973, 1145, 3480, 711, 8359, 8960, 6733, 3471, 232, 9153, 7733, 9931, 8827, 9667, 3220, 912, 3277, 6279, 4120, 2884, 7173, 2092] | 3 |
| [1558, 3987, 7549, 719, 213, 7054, 9318, 5548, 6651, 5269, 7780, 9105, 3088, 8992, 1861, 9477, 8747, 314, 3287, 6464, 1045, 4616, 28, 3598, 9166, 2475, 1900, 4399, 2766, 630, 8831, 8707, 943, 212, 1067, 1445, 8937, 6292, 9962, 1813, 4046, 4215] | [1558, 3987, 4399, 2766, 630, 7549, 719, 213, 7054, 8831, 8707, 943, 212, 1067, 1445, 8937, 6292, 8992, 1861, 9318, 5548, 6651, 5269, 7780, 9105, 3088, 9477, 8747, 314, 3287, 6464, 1045, 4616, 28, 3598, 9166, 2475, 1900, 9962, 1813, 4046, 4215] | 4 |
| [2656, 1434, 8664, 7996, 7564, 6664, 223, 6073, 157, 8510, 1679, 5420, 4711, 467, 9801, 818, 1669, 8771, 9113, 4313, 3985, 4308, 264, 5489, 1458, 78, 6659, 2521, 3845, 5738, 6780, 8167, 512, 1897, 4608, 6503, 163, 2473, 2360, 888, 7984, 4996, 9203] | [2656, 1434, 5738, 6780, 8167, 512, 1897, 4608, 6503, 163, 2473, 2360, 888, 7984, 4996, 8664, 7996, 7564, 6664, 223, 6073, 157, 8510, 1679, 5420, 4711, 467, 9801, 818, 1669, 8771, 9113, 4313, 3985, 4308, 264, 5489, 1458, 78, 6659, 2521, 3845, 9203] | 3 |
| [8322, 9708, 5945, 7652, 717, 566, 9471, 5960, 2047, 951, 1495, 6523, 5316, 7035, 2642, 4123, 1699, 1279, 6275, 9581, 1134, 3051, 805, 2639, 3082, 3843, 7008, 1342, 1008, 4520, 1481, 3433, 2691, 1268, 3943, 7478, 3314, 4422, 7197, 6019, 7729, 1770, 5109, 9551] | [2642, 4123, 1699, 1279, 4520, 1481, 3433, 2691, 1268, 3943, 6275, 7478, 3314, 4422, 7197, 6019, 7729, 1770, 5109, 8322, 9581, 1134, 3051, 805, 2639, 3082, 3843, 7008, 1342, 1008, 9708, 5945, 7652, 717, 566, 9471, 5960, 2047, 951, 1495, 6523, 5316, 7035, 9551] | 4 |
| [5619, 1597, 3161, 1290, 2139, 9984, 3992, 7242, 324, 7466, 5399, 5391, 4188, 5731, 8150, 650, 5880, 2382, 2149, 4473, 8549, 8583, 6150, 5174, 187, 2862, 4036, 2914, 7606, 354, 8837, 9244, 6600, 9969, 7052, 7334, 5577, 2319, 1698, 8457, 2752, 3045, 5382, 3015, 8631] | [354, 5619, 1597, 3161, 1290, 2139, 8150, 650, 5880, 2382, 2149, 4473, 8549, 8583, 6150, 5174, 187, 2862, 4036, 2914, 7606, 8837, 9244, 6600, 9969, 7052, 7334, 5577, 2319, 1698, 8457, 2752, 3045, 5382, 3015, 9984, 3992, 7242, 324, 7466, 5399, 5391, 4188, 5731, 8631] | 4 |
| [9292, 9858, 9362, 3690, 4138, 6416, 572, 5504, 9948, 7565, 8398, 2718, 3765, 1773, 2253, 3048, 790, 6911, 1097, 2729, 3535, 6658, 7880, 5028, 5284, 6584, 915, 5868, 9027, 4618, 9343, 337, 3701, 6636, 2159, 4124, 1683, 5091, 1960, 3822, 3836, 964, 8709, 5492, 8804, 6351] | [337, 3048, 790, 3701, 6636, 2159, 4124, 1683, 5091, 1960, 3822, 3836, 964, 6911, 1097, 2729, 3535, 6658, 7880, 5028, 5284, 6584, 915, 5868, 8709, 5492, 8804, 9027, 4618, 9292, 9343, 9858, 9362, 3690, 4138, 6416, 572, 5504, 9948, 7565, 8398, 2718, 3765, 1773, 2253, 6351] | 3 |
| [6092, 3309, 3502, 4107, 8976, 8910, 9166, 6787, 2232, 6934, 6056, 8082, 1745, 1390, 3981, 3899, 7423, 1124, 4471, 6301, 3786, 5608, 2402, 5909, 8086, 581, 590, 740, 4963, 1828, 7906, 6178, 8471, 9998, 7396, 1282, 1272, 7089, 7526, 872, 9983, 85, 3683, 8937, 7065, 7007, 4730] | [3899, 6092, 3309, 3502, 4107, 6178, 7423, 1124, 4471, 6301, 3786, 5608, 2402, 5909, 8086, 581, 590, 740, 4963, 1828, 7906, 8471, 8976, 8910, 9166, 6787, 2232, 6934, 6056, 8082, 1745, 1390, 3981, 9998, 7396, 1282, 1272, 7089, 7526, 872, 9983, 85, 3683, 8937, 7065, 7007, 4730] | 3 |
| [3714, 3984, 5158, 58, 7212, 1817, 836, 4703, 9070, 4847, 9054, 731, 6291, 1616, 9320, 2024, 8286, 7110, 4307, 477, 7067, 4745, 2409, 304, 7576, 8867, 5626, 7388, 740, 4133, 7447, 6355, 8710, 6040, 6191, 3557, 1041, 4966, 5705, 6321, 6167, 7353, 1025, 9418, 332, 8724, 1526, 3134] | [2024, 3714, 3984, 5158, 58, 6355, 7212, 1817, 836, 4703, 8286, 7110, 4307, 477, 7067, 4745, 2409, 304, 7576, 8710, 6040, 6191, 3557, 1041, 4966, 5705, 6321, 6167, 7353, 1025, 8867, 5626, 7388, 740, 4133, 7447, 9070, 4847, 9054, 731, 6291, 1616, 9320, 9418, 332, 8724, 1526, 3134] | 4 |
| [7708, 4481, 3620, 5396, 3407, 1755, 9821, 4676, 6955, 1374, 8125, 8268, 91, 5803, 638, 7727, 3232, 5984, 1401, 9936, 5541, 3703, 382, 2176, 8487, 2702, 6, 3684, 8884, 871, 3511, 7003, 8099, 6737, 9368, 4975, 5557, 1959, 1942, 9913, 1530, 902, 3430, 4826, 2439, 9461, 6011, 8743, 5782] | [3232, 5984, 1401, 6737, 7708, 4481, 3620, 5396, 3407, 1755, 9368, 4975, 5557, 1959, 1942, 9821, 4676, 6955, 1374, 8125, 8268, 91, 5803, 638, 7727, 9913, 1530, 902, 3430, 4826, 2439, 9461, 6011, 8743, 9936, 5541, 3703, 382, 2176, 8487, 2702, 6, 3684, 8884, 871, 3511, 7003, 8099, 5782] | 3 |
| [960, 7546, 4340, 703, 9638, 1005, 9285, 4246, 1669, 3557, 6273, 8517, 9313, 9075, 4888, 2811, 9244, 3641, 3910, 2085, 611, 1196, 5240, 5212, 8373, 3580, 2975, 5471, 3626, 1736, 7555, 7330, 97, 6508, 6553, 8135, 7210, 7980, 152, 8589, 4245, 4357, 6264, 9110, 7067, 3522, 7372, 7661, 6588, 877] | [960, 6508, 6553, 7546, 4340, 703, 8135, 7210, 7980, 152, 8589, 4245, 4357, 6264, 9110, 7067, 3522, 7372, 7661, 6588, 9244, 3641, 3910, 2085, 611, 1196, 5240, 5212, 8373, 3580, 2975, 5471, 3626, 1736, 7555, 7330, 97, 9638, 1005, 9285, 4246, 1669, 3557, 6273, 8517, 9313, 9075, 4888, 2811, 877] | 3 |
| [9842, 2103, 4104, 438, 3673, 7145, 5618, 201, 498, 1259, 9649, 7483, 6106, 7468, 665, 5285, 3766, 4454, 923, 7684, 1072, 6355, 9640, 5744, 146, 3855, 5515, 8123, 7760, 4320, 9799, 637, 6747, 2500, 590, 9566, 4787, 2330, 9221, 35, 8124, 4116, 6180, 1661, 4596, 1018, 226, 8766, 5044, 7891, 880] | [2500, 590, 3766, 4454, 923, 7684, 1072, 6355, 9566, 4787, 2330, 9221, 35, 8124, 4116, 6180, 1661, 4596, 1018, 226, 8766, 5044, 7891, 9640, 5744, 146, 3855, 5515, 8123, 7760, 4320, 9799, 637, 6747, 9842, 2103, 4104, 438, 3673, 7145, 5618, 201, 498, 1259, 9649, 7483, 6106, 7468, 665, 5285, 880] | 3 |
| [5229, 9366, 6544, 6277, 7868, 7350, 9257, 4410, 1192, 379, 2460, 1895, 4832, 1544, 1779, 9358, 7210, 3646, 3766, 9445, 2179, 2917, 4433, 3002, 4182, 9786, 6966, 4483, 8654, 2395, 8918, 5555, 2767, 5073, 7852, 1796, 4306, 3645, 6827, 5265, 8703, 1654, 3146, 2338, 6032, 3026, 3452, 9758, 7971, 6339, 5845, 5772] | [1796, 3646, 3766, 4306, 3645, 5229, 6827, 5265, 8703, 1654, 3146, 2338, 6032, 3026, 3452, 9366, 6544, 6277, 7868, 7350, 9257, 4410, 1192, 379, 2460, 1895, 4832, 1544, 1779, 9358, 7210, 9445, 2179, 2917, 4433, 3002, 4182, 9758, 7971, 6339, 5845, 9786, 6966, 4483, 8654, 2395, 8918, 5555, 2767, 5073, 7852, 5772] | 3 |
| [6385, 7652, 5914, 9963, 925, 3924, 1224, 6659, 79, 1394, 4087, 5179, 113, 3098, 368, 7517, 5449, 7742, 6925, 6262, 9209, 2425, 9905, 7042, 6387, 160, 7112, 3976, 7953, 2746, 2655, 9665, 4756, 4209, 5575, 9743, 9276, 282, 9398, 892, 519, 1633, 6031, 3888, 6893, 8296, 9411, 6744, 2347, 226, 456, 7347, 4462] | [6385, 7652, 5914, 7742, 6925, 6262, 9209, 2425, 9743, 9276, 282, 9398, 892, 519, 1633, 6031, 3888, 6893, 8296, 9411, 6744, 2347, 226, 456, 7347, 9905, 7042, 6387, 160, 7112, 3976, 7953, 2746, 2655, 9665, 4756, 4209, 5575, 9963, 925, 3924, 1224, 6659, 79, 1394, 4087, 5179, 113, 3098, 368, 7517, 5449, 4462] | 3 |
| [5627, 2121, 3902, 3171, 3787, 2894, 9794, 4764, 8234, 9677, 6268, 8982, 4646, 5441, 7854, 8121, 3154, 8490, 3301, 7039, 737, 2389, 5882, 1465, 2084, 1694, 4765, 5630, 1857, 4403, 6830, 2181, 5221, 2715, 7262, 1542, 2154, 1478, 598, 4748, 7500, 390, 2709, 1405, 2888, 9151, 5408, 2317, 3399, 7963, 6454, 4591, 2042, 9650] | [1542, 2154, 1478, 598, 4748, 5627, 2121, 3902, 3171, 3787, 2894, 7500, 390, 2709, 1405, 2888, 8490, 3301, 7039, 737, 2389, 5882, 1465, 2084, 1694, 4765, 5630, 1857, 4403, 6830, 2181, 5221, 2715, 7262, 9151, 5408, 2317, 3399, 7963, 6454, 4591, 2042, 9794, 4764, 8234, 9677, 6268, 8982, 4646, 5441, 7854, 8121, 3154, 9650] | 3 |
| [5426, 5390, 4134, 856, 7780, 6587, 2498, 7990, 1393, 9896, 654, 7694, 682, 9013, 918, 6857, 7067, 216, 7959, 4131, 2565, 9490, 3042, 2586, 6350, 992, 4591, 1442, 7670, 6015, 3523, 9309, 5150, 7268, 5141, 5769, 6741, 3322, 7725, 2058, 2243, 5565, 5167, 5530, 6937, 8215, 7607, 6334, 8248, 521, 3588, 8235, 5858, 7517, 1082] | [3322, 5426, 5390, 4134, 856, 7725, 2058, 2243, 5565, 5167, 5530, 6937, 7780, 6587, 2498, 7959, 4131, 2565, 7990, 1393, 8215, 7607, 6334, 8248, 521, 3588, 8235, 5858, 7517, 9490, 3042, 2586, 6350, 992, 4591, 1442, 7670, 6015, 3523, 9309, 5150, 7268, 5141, 5769, 6741, 9896, 654, 7694, 682, 9013, 918, 6857, 7067, 216, 1082] | 4 |
| [6008, 7454, 6473, 6866, 5014, 2415, 3735, 565, 1710, 519, 8898, 9594, 3929, 6280, 4595, 9452, 5222, 8956, 1421, 255, 4391, 5253, 1366, 2692, 525, 3255, 8215, 6619, 5894, 7365, 5958, 392, 1923, 8329, 898, 1385, 3391, 904, 830, 7656, 7741, 7062, 6354, 236, 2529, 3013, 4286, 9764, 9410, 3940, 1200, 6743, 6606, 4070, 6872, 2981] | [904, 830, 1421, 255, 4391, 5253, 1366, 2692, 525, 3255, 6008, 7454, 6473, 6866, 5014, 2415, 3735, 565, 1710, 519, 7656, 7741, 7062, 6354, 236, 2529, 3013, 4286, 8215, 6619, 5894, 7365, 5958, 392, 1923, 8329, 898, 1385, 3391, 8898, 9594, 3929, 6280, 4595, 9452, 5222, 8956, 9764, 9410, 3940, 1200, 6743, 6606, 4070, 6872, 2981] | 3 |
| [7823, 9567, 7354, 3075, 5532, 5542, 2100, 4533, 6147, 4184, 4065, 4796, 6517, 5338, 7197, 2226, 8835, 8673, 7210, 836, 5688, 5, 5858, 8160, 7094, 2435, 9070, 5406, 1430, 8274, 9958, 996, 5466, 1960, 3498, 4468, 9734, 8062, 5584, 8937, 574, 3057, 5583, 306, 8497, 8827, 3388, 9118, 6967, 3777, 9475, 3417, 4454, 6766, 3432, 8774, 6827] | [7210, 836, 5688, 5, 5858, 7823, 8062, 5584, 8160, 7094, 2435, 8937, 574, 3057, 5583, 306, 8497, 8827, 3388, 9070, 5406, 1430, 8274, 9118, 6967, 3777, 9475, 3417, 4454, 6766, 3432, 8774, 9567, 7354, 3075, 5532, 5542, 2100, 4533, 6147, 4184, 4065, 4796, 6517, 5338, 7197, 2226, 8835, 8673, 9958, 996, 5466, 1960, 3498, 4468, 9734, 6827] | 3 |
| [5281, 9006, 3581, 7816, 7506, 8200, 1126, 2937, 3578, 8174, 6103, 779, 9043, 2243, 907, 7646, 3054, 1028, 2148, 4826, 3700, 2307, 9506, 193, 7471, 965, 2100, 9572, 330, 712, 7614, 4936, 3382, 953, 2396, 8874, 2318, 9830, 9638, 4097, 397, 9951, 9844, 2339, 4591, 9186, 692, 347, 645, 9176, 7274, 1769, 7037, 4746, 7511, 9882, 6610, 5463] | [4097, 397, 4826, 3700, 2307, 5281, 9006, 3581, 7816, 7506, 8200, 1126, 2937, 3578, 8174, 6103, 779, 9043, 2243, 907, 7646, 3054, 1028, 2148, 9506, 193, 7471, 965, 2100, 9572, 330, 712, 7614, 4936, 3382, 953, 2396, 8874, 2318, 9830, 9638, 9951, 9844, 2339, 4591, 9186, 692, 347, 645, 9176, 7274, 1769, 7037, 4746, 7511, 9882, 6610, 5463] | 3 |
| [5421, 8713, 3103, 9290, 6401, 3830, 3242, 6360, 5698, 7414, 8014, 2663, 2970, 5052, 5689, 5062, 7506, 3319, 24, 9720, 3179, 507, 2368, 1378, 7498, 5908, 9599, 1080, 4660, 5177, 6417, 5491, 6779, 941, 5015, 3110, 423, 6460, 4197, 2641, 6664, 404, 811, 7941, 4970, 7985, 3863, 2312, 234, 4014, 4344, 1196, 7897, 9432, 358, 6652, 1823, 7365, 8592] | [2641, 5421, 6664, 404, 811, 7941, 4970, 7985, 3863, 2312, 234, 4014, 4344, 1196, 7897, 8713, 3103, 9290, 6401, 3830, 3242, 6360, 5698, 7414, 8014, 2663, 2970, 5052, 5689, 5062, 7506, 3319, 24, 9432, 358, 6652, 1823, 7365, 9720, 3179, 507, 2368, 1378, 7498, 5908, 9599, 1080, 4660, 5177, 6417, 5491, 6779, 941, 5015, 3110, 423, 6460, 4197, 8592] | 3 |
| [9574, 1586, 5766, 7718, 2303, 2294, 553, 2441, 6771, 679, 6322, 1183, 5948, 1189, 4506, 4443, 950, 4127, 8392, 9389, 3712, 4660, 4416, 1302, 4389, 6245, 2809, 9582, 3820, 8575, 2116, 5978, 844, 4632, 2953, 8632, 1428, 4648, 468, 972, 8922, 2810, 224, 3664, 9475, 7266, 6082, 3560, 7635, 801, 2314, 2340, 5, 6743, 8678, 2793, 9660, 5336, 1335, 7842] | [972, 8922, 2810, 224, 3664, 9389, 3712, 4660, 4416, 1302, 4389, 6245, 2809, 9475, 7266, 6082, 3560, 7635, 801, 2314, 2340, 5, 6743, 8678, 2793, 9574, 1586, 5766, 7718, 2303, 2294, 553, 2441, 6771, 679, 6322, 1183, 5948, 1189, 4506, 4443, 950, 4127, 8392, 9582, 3820, 8575, 2116, 5978, 844, 4632, 2953, 8632, 1428, 4648, 468, 9660, 5336, 1335, 7842] | 4 |
| [2139, 4339, 5831, 4627, 3394, 6479, 283, 8415, 1594, 4774, 1606, 9882, 1636, 1559, 5519, 545, 9612, 2838, 2884, 7560, 6292, 8295, 9102, 84, 3438, 2395, 646, 1003, 5257, 8618, 1785, 3001, 5136, 6722, 6648, 4933, 848, 9982, 7379, 851, 5801, 1867, 3512, 426, 9334, 4615, 8406, 6952, 4256, 2410, 2358, 6757, 336, 1786, 5884, 3894, 4996, 9625, 3867, 1795, 1780] | [1867, 2139, 3512, 426, 4339, 5831, 4627, 3394, 6292, 6479, 283, 8295, 8415, 1594, 4774, 1606, 9102, 84, 3438, 2395, 646, 1003, 5257, 8618, 1785, 3001, 5136, 6722, 6648, 4933, 848, 9334, 4615, 8406, 6952, 4256, 2410, 2358, 6757, 336, 1786, 5884, 3894, 4996, 9625, 3867, 1795, 9882, 1636, 1559, 5519, 545, 9612, 2838, 2884, 7560, 9982, 7379, 851, 5801, 1780] | 4 |
| [2482, 4247, 4059, 613, 7125, 1327, 8198, 3645, 5406, 7178, 860, 5784, 8908, 5424, 5844, 1563, 1537, 93, 4687, 2807, 8742, 8882, 8982, 1073, 8321, 8637, 6800, 7167, 3625, 6042, 4713, 2181, 2425, 3818, 7312, 4032, 9667, 1858, 4944, 1187, 4887, 3159, 3426, 4785, 9908, 3513, 288, 218, 2062, 7869, 76, 633, 8385, 6528, 210, 2157, 661, 3880, 5740, 1175, 7218, 9037] | [2482, 3159, 3426, 4247, 4059, 613, 4785, 7125, 1327, 8198, 3645, 5406, 7178, 860, 5784, 8742, 8882, 8908, 5424, 5844, 1563, 1537, 93, 4687, 2807, 8982, 1073, 8321, 8637, 6800, 7167, 3625, 6042, 4713, 2181, 2425, 3818, 7312, 4032, 9667, 1858, 4944, 1187, 4887, 9908, 3513, 288, 218, 2062, 7869, 76, 633, 8385, 6528, 210, 2157, 661, 3880, 5740, 1175, 7218, 9037] | 4 |
| [4053, 2835, 6886, 4440, 7424, 3435, 565, 4395, 7674, 1384, 736, 2114, 6365, 2010, 9897, 3640, 5430, 2314, 7797, 6797, 585, 4606, 6147, 3526, 3939, 6829, 7901, 5909, 2177, 9747, 7645, 4411, 559, 6935, 6178, 603, 3587, 7292, 8754, 6481, 2572, 8341, 9906, 1379, 3093, 5404, 4932, 3063, 1086, 2756, 528, 8021, 973, 5869, 630, 7806, 7344, 1753, 2082, 5101, 8710, 8813, 7009] | [585, 4053, 2835, 4606, 6147, 3526, 3939, 6829, 6886, 4440, 7424, 3435, 565, 4395, 7674, 1384, 736, 2114, 6365, 2010, 7901, 5909, 2177, 8341, 9747, 7645, 4411, 559, 6935, 6178, 603, 3587, 7292, 8754, 6481, 2572, 9897, 3640, 5430, 2314, 7797, 6797, 9906, 1379, 3093, 5404, 4932, 3063, 1086, 2756, 528, 8021, 973, 5869, 630, 7806, 7344, 1753, 2082, 5101, 8710, 8813, 7009] | 4 |
| [6189, 6959, 5561, 5252, 7339, 1666, 8348, 4195, 3661, 3342, 5745, 3988, 4371, 9858, 2719, 2092, 1501, 1824, 8800, 1140, 5998, 8831, 5999, 1455, 1455, 6817, 3176, 9884, 2375, 5237, 1339, 135, 9785, 4126, 9377, 9237, 2991, 9283, 850, 6176, 102, 9064, 5174, 9215, 9513, 2972, 6602, 6713, 2834, 8661, 54, 699, 2959, 2889, 845, 969, 3490, 7966, 5236, 7090, 4731, 21, 9030, 2871] | [6189, 6959, 5561, 5252, 7339, 1666, 8348, 4195, 3661, 3342, 5745, 3988, 4371, 8831, 5999, 1455, 1455, 6817, 3176, 9215, 9513, 2972, 6602, 6713, 2834, 8661, 54, 699, 2959, 2889, 845, 969, 3490, 7966, 5236, 7090, 4731, 21, 9030, 9858, 2719, 2092, 1501, 1824, 8800, 1140, 5998, 9884, 2375, 5237, 1339, 135, 9785, 4126, 9377, 9237, 2991, 9283, 850, 6176, 102, 9064, 5174, 2871] | 6 |
| [7545, 3218, 2471, 7900, 1983, 2431, 9480, 3936, 2436, 9106, 554, 1994, 6846, 9884, 9511, 693, 3407, 4595, 6781, 445, 7216, 9170, 524, 6378, 2621, 2847, 1651, 7964, 4178, 8622, 6790, 4856, 8741, 6308, 8514, 2883, 979, 9935, 1492, 6043, 8687, 3748, 935, 606, 8648, 2568, 2636, 8645, 955, 6307, 1599, 721, 4857, 3762, 1127, 4842, 7259, 5500, 6798, 340, 1570, 7736, 9330, 9522, 5107] | [606, 7545, 3218, 2471, 7900, 1983, 2431, 8648, 2568, 2636, 8645, 955, 6307, 1599, 721, 4857, 3762, 1127, 4842, 7259, 5500, 6798, 340, 1570, 7736, 9170, 524, 6378, 2621, 2847, 1651, 7964, 4178, 8622, 6790, 4856, 8741, 6308, 8514, 2883, 979, 9330, 9480, 3936, 2436, 9106, 554, 1994, 6846, 9522, 9884, 9511, 693, 3407, 4595, 6781, 445, 7216, 9935, 1492, 6043, 8687, 3748, 935, 5107] | 4 |
| [4685, 3532, 8767, 1028, 3449, 1807, 9323, 2112, 2486, 7715, 3506, 6049, 1370, 370, 1748, 143, 9694, 3938, 9280, 819, 6657, 1941, 82, 7201, 6414, 1869, 2223, 8310, 1355, 9028, 3023, 2542, 4387, 1435, 2010, 5417, 231, 5153, 6086, 4590, 9568, 2950, 1024, 3489, 9464, 6913, 4968, 5329, 2634, 2191, 1282, 7813, 2375, 2061, 1306, 1945, 5291, 4248, 4568, 3571, 9071, 834, 836, 1099, 2368, 4024] | [1941, 82, 3489, 4685, 3532, 7201, 6414, 1869, 2223, 8310, 1355, 8767, 1028, 3449, 1807, 9028, 3023, 2542, 4387, 1435, 2010, 5417, 231, 5153, 6086, 4590, 9323, 2112, 2486, 7715, 3506, 6049, 1370, 370, 1748, 143, 9464, 6913, 4968, 5329, 2634, 2191, 1282, 7813, 2375, 2061, 1306, 1945, 5291, 4248, 4568, 3571, 9071, 834, 836, 1099, 2368, 9568, 2950, 1024, 9694, 3938, 9280, 819, 6657, 4024] | 4 |
| [940, 6282, 367, 9458, 7972, 466, 154, 8282, 893, 414, 2860, 6897, 5993, 571, 9457, 8798, 9294, 1864, 3804, 3784, 4281, 682, 5516, 5366, 4661, 2611, 3308, 133, 1164, 531, 4794, 2682, 6828, 768, 6779, 4153, 4878, 3778, 1389, 469, 1027, 5122, 3165, 1993, 1840, 1317, 937, 4086, 7756, 6771, 3896, 6446, 5800, 3996, 5225, 7313, 7198, 6765, 4858, 3813, 1532, 7519, 2587, 3915, 5587, 402, 2450] | [940, 1317, 937, 4086, 5516, 5366, 4661, 2611, 3308, 133, 1164, 531, 4794, 2682, 6282, 367, 6828, 768, 6779, 4153, 4878, 3778, 1389, 469, 1027, 5122, 3165, 1993, 1840, 7756, 6771, 3896, 6446, 5800, 3996, 5225, 7313, 7198, 6765, 4858, 3813, 1532, 7519, 2587, 3915, 5587, 402, 9458, 7972, 466, 154, 8282, 893, 414, 2860, 6897, 5993, 571, 9457, 8798, 9294, 1864, 3804, 3784, 4281, 682, 2450] | 4 |
| [7407, 4955, 7192, 9631, 4161, 2906, 3684, 2050, 7074, 2245, 5477, 9836, 737, 8518, 5182, 8436, 7047, 5374, 2168, 1771, 1759, 9820, 2377, 9042, 266, 2191, 8439, 7578, 2113, 7769, 3416, 8731, 1661, 148, 5836, 4922, 6356, 2025, 8253, 4021, 8516, 3503, 5125, 2593, 4853, 3601, 7521, 1574, 5162, 4612, 7941, 648, 1033, 6503, 9104, 9546, 9387, 2715, 3825, 6350, 1254, 8565, 2426, 9808, 9785, 657, 4532, 2052] | [2377, 3601, 7407, 4955, 7192, 7521, 1574, 5162, 4612, 7941, 648, 1033, 6503, 9042, 266, 2191, 8439, 7578, 2113, 7769, 3416, 8731, 1661, 148, 5836, 4922, 6356, 2025, 8253, 4021, 8516, 3503, 5125, 2593, 4853, 9104, 9546, 9387, 2715, 3825, 6350, 1254, 8565, 2426, 9631, 4161, 2906, 3684, 2050, 7074, 2245, 5477, 9808, 9785, 657, 4532, 9836, 737, 8518, 5182, 8436, 7047, 5374, 2168, 1771, 1759, 9820, 2052] | 4 |
| [6407, 1913, 1524, 1949, 6967, 5703, 9260, 7632, 3819, 4136, 293, 295, 801, 609, 5451, 410, 2583, 6934, 2681, 5659, 4274, 8168, 1143, 6401, 3199, 7807, 5057, 9928, 4459, 473, 9498, 9495, 4321, 4578, 6737, 1538, 9043, 8884, 3811, 2592, 1211, 4192, 545, 6112, 8242, 8718, 2995, 4984, 7904, 7138, 6620, 3966, 5061, 4639, 7552, 2746, 7703, 8272, 5012, 8939, 1565, 4613, 9414, 4938, 9692, 1131, 3213, 5788, 96] | [1143, 6401, 3199, 6407, 1913, 1524, 1949, 6967, 5703, 7807, 5057, 8718, 2995, 4984, 7904, 7138, 6620, 3966, 5061, 4639, 7552, 2746, 7703, 8272, 5012, 8939, 1565, 4613, 9260, 7632, 3819, 4136, 293, 295, 801, 609, 5451, 410, 2583, 6934, 2681, 5659, 4274, 8168, 9414, 4938, 9692, 1131, 3213, 5788, 9928, 4459, 473, 9498, 9495, 4321, 4578, 6737, 1538, 9043, 8884, 3811, 2592, 1211, 4192, 545, 6112, 8242, 96] | 4 |
| [5183, 7169, 8795, 7421, 4180, 5869, 4439, 502, 851, 6868, 3049, 4686, 3314, 514, 2185, 7853, 2008, 4373, 8545, 4101, 1840, 9308, 2289, 8485, 6348, 4350, 820, 7230, 2860, 5278, 6067, 4213, 2224, 6350, 5080, 3496, 2986, 4402, 758, 9333, 4407, 9222, 5271, 2967, 1839, 7266, 8102, 7489, 8410, 2621, 7246, 6848, 566, 9968, 5490, 4109, 2743, 9612, 7727, 9536, 5694, 8878, 6575, 2523, 1422, 3602, 8431, 2838, 3066, 3127] | [5183, 7169, 7489, 8410, 2621, 7246, 6848, 566, 8485, 6348, 4350, 820, 7230, 2860, 5278, 6067, 4213, 2224, 6350, 5080, 3496, 2986, 4402, 758, 8795, 7421, 4180, 5869, 4439, 502, 851, 6868, 3049, 4686, 3314, 514, 2185, 7853, 2008, 4373, 8545, 4101, 1840, 9308, 2289, 9333, 4407, 9222, 5271, 2967, 1839, 7266, 8102, 9968, 5490, 4109, 2743, 9612, 7727, 9536, 5694, 8878, 6575, 2523, 1422, 3602, 8431, 2838, 3066, 3127] | 4 |
| [3380, 7990, 578, 7442, 3225, 2372, 960, 4788, 6795, 7547, 3006, 240, 441, 8290, 8379, 632, 9654, 6059, 6350, 9127, 994, 1562, 201, 4965, 4344, 3818, 9681, 2566, 7817, 1197, 2589, 4036, 3448, 5699, 7118, 302, 471, 3181, 798, 9841, 7250, 8641, 8747, 9334, 4474, 3121, 9382, 2716, 5958, 7927, 9047, 9288, 5173, 6148, 4356, 570, 9238, 2234, 466, 6577, 6956, 2214, 8827, 7970, 7708, 8722, 8960, 9045, 7017, 8025, 4417] | [2716, 3380, 4965, 4344, 3818, 5958, 7927, 7990, 578, 7442, 3225, 2372, 960, 4788, 6795, 7547, 3006, 240, 441, 8290, 8379, 632, 9047, 9288, 5173, 6148, 4356, 570, 9238, 2234, 466, 6577, 6956, 2214, 8827, 7970, 7708, 8722, 8960, 9045, 7017, 8025, 9654, 6059, 6350, 9127, 994, 1562, 201, 9681, 2566, 7817, 1197, 2589, 4036, 3448, 5699, 7118, 302, 471, 3181, 798, 9841, 7250, 8641, 8747, 9334, 4474, 3121, 9382, 4417] | 4 |
| [6960, 2978, 1821, 4074, 4472, 2138, 1157, 9552, 5413, 1176, 347, 8205, 646, 8496, 2950, 8008, 3269, 9490, 4034, 5497, 5900, 7713, 1881, 9227, 775, 2967, 988, 5907, 6300, 4855, 1890, 9520, 9529, 8627, 5173, 6755, 1613, 9903, 4568, 2273, 6762, 453, 4381, 2214, 6217, 1179, 2279, 3949, 1182, 7858, 828, 285, 493, 6704, 4077, 5878, 7150, 1633, 1769, 477, 9933, 5193, 7646, 5683, 3173, 6141, 9985, 45, 9181, 1762, 6177, 1104] | [3949, 1182, 6960, 2978, 1821, 4074, 4472, 2138, 1157, 7858, 828, 285, 493, 6704, 4077, 5878, 7150, 1633, 1769, 477, 9227, 775, 2967, 988, 5907, 6300, 4855, 1890, 9520, 9529, 8627, 5173, 6755, 1613, 9552, 5413, 1176, 347, 8205, 646, 8496, 2950, 8008, 3269, 9490, 4034, 5497, 5900, 7713, 1881, 9903, 4568, 2273, 6762, 453, 4381, 2214, 6217, 1179, 2279, 9933, 5193, 7646, 5683, 3173, 6141, 9985, 45, 9181, 1762, 6177, 1104] | 4 |
| [5347, 3462, 8135, 491, 409, 9886, 2336, 6841, 8510, 5472, 1886, 5831, 1710, 6994, 5036, 5507, 9564, 8946, 5232, 8982, 3663, 151, 518, 9892, 2362, 3064, 1819, 2689, 9761, 5388, 8391, 8709, 297, 1009, 8447, 6243, 7327, 3265, 8137, 8759, 7228, 1826, 3521, 9694, 599, 861, 3340, 2251, 3803, 5746, 5355, 5991, 9210, 6601, 3618, 9304, 7651, 2540, 4969, 8294, 2864, 7667, 8739, 7930, 4051, 1200, 8126, 935, 5234, 3644, 5354, 877, 5392] | [2362, 3064, 1819, 2689, 5347, 3462, 5746, 5355, 5991, 8135, 491, 409, 9210, 6601, 3618, 9304, 7651, 2540, 4969, 8294, 2864, 7667, 8739, 7930, 4051, 1200, 8126, 935, 5234, 3644, 5354, 877, 9761, 5388, 8391, 8709, 297, 1009, 8447, 6243, 7327, 3265, 8137, 8759, 7228, 1826, 3521, 9694, 599, 861, 3340, 2251, 3803, 9886, 2336, 6841, 8510, 5472, 1886, 5831, 1710, 6994, 5036, 5507, 9564, 8946, 5232, 8982, 3663, 151, 518, 9892, 5392] | 4 |
| [946, 781, 4923, 670, 2571, 8230, 4886, 8962, 5705, 9312, 2632, 2455, 631, 2410, 2954, 9061, 545, 5237, 7652, 7699, 9169, 2637, 6244, 2361, 7737, 1483, 9822, 7627, 5336, 2011, 2852, 4371, 2454, 4682, 3894, 4061, 4530, 8530, 2363, 4682, 9791, 8552, 5520, 669, 2010, 4709, 7280, 1002, 351, 1621, 885, 7632, 5212, 7853, 8542, 1524, 9926, 7104, 3649, 6624, 1867, 8483, 675, 540, 4344, 511, 1702, 8140, 9436, 951, 2738, 6681, 2876, 491] | [946, 781, 1621, 885, 4923, 670, 2571, 7632, 5212, 7737, 1483, 7853, 8230, 4886, 8542, 1524, 8962, 5705, 9312, 2632, 2455, 631, 2410, 2954, 9061, 545, 5237, 7652, 7699, 9169, 2637, 6244, 2361, 9822, 7627, 5336, 2011, 2852, 4371, 2454, 4682, 3894, 4061, 4530, 8530, 2363, 4682, 9791, 8552, 5520, 669, 2010, 4709, 7280, 1002, 351, 9926, 7104, 3649, 6624, 1867, 8483, 675, 540, 4344, 511, 1702, 8140, 9436, 951, 2738, 6681, 2876, 491] | 4 |
| [2295, 3589, 5256, 8989, 594, 5657, 3598, 162, 9135, 5729, 334, 4506, 1581, 5611, 7134, 4003, 6952, 4043, 446, 3035, 515, 9123, 4671, 9525, 7236, 8897, 895, 1791, 7012, 5689, 4360, 9585, 9927, 645, 3035, 6072, 4153, 5754, 294, 99, 6266, 9213, 9982, 606, 2300, 3078, 7097, 1005, 826, 1396, 7498, 1819, 411, 5888, 4322, 4485, 407, 4790, 4501, 768, 5289, 1282, 2012, 7954, 2566, 2663, 1065, 6367, 1085, 102, 4976, 7714, 5471, 7773, 7123] | [1396, 2295, 3589, 5256, 7236, 7498, 1819, 411, 5888, 4322, 4485, 407, 4790, 4501, 768, 5289, 1282, 2012, 7954, 2566, 2663, 1065, 6367, 1085, 102, 4976, 7714, 5471, 7773, 8897, 895, 1791, 7012, 5689, 4360, 8989, 594, 5657, 3598, 162, 9135, 5729, 334, 4506, 1581, 5611, 7134, 4003, 6952, 4043, 446, 3035, 515, 9123, 4671, 9525, 9585, 9927, 645, 3035, 6072, 4153, 5754, 294, 99, 6266, 9213, 9982, 606, 2300, 3078, 7097, 1005, 826, 7123] | 4 |
| [2047, 5041, 1854, 4846, 7366, 6319, 1585, 4197, 5035, 1348, 7148, 9787, 9652, 2151, 3970, 9525, 4419, 7848, 3579, 3662, 4757, 6460, 163, 7676, 938, 1925, 2516, 546, 5253, 8197, 9720, 2871, 8774, 484, 8713, 1015, 6614, 3809, 5516, 5401, 1843, 645, 2527, 7617, 2493, 1662, 5982, 2759, 7168, 2378, 476, 2743, 3427, 3346, 591, 1482, 5968, 1850, 5661, 2742, 933, 4150, 1366, 8625, 9691, 558, 978, 4603, 6549, 1925, 9949, 2413, 2682, 1335, 4959, 9964] | [1925, 2047, 2516, 546, 2743, 3427, 3346, 591, 1482, 5041, 1854, 4846, 5253, 5968, 1850, 5661, 2742, 933, 4150, 1366, 7366, 6319, 1585, 4197, 5035, 1348, 7148, 8197, 8625, 9691, 558, 978, 4603, 6549, 1925, 9720, 2871, 8774, 484, 8713, 1015, 6614, 3809, 5516, 5401, 1843, 645, 2527, 7617, 2493, 1662, 5982, 2759, 7168, 2378, 476, 9787, 9652, 2151, 3970, 9525, 4419, 7848, 3579, 3662, 4757, 6460, 163, 7676, 938, 9949, 2413, 2682, 1335, 4959, 9964] | 4 |
| [279, 7458, 65, 6371, 8559, 5670, 1485, 1056, 5060, 8751, 1093, 4781, 9995, 7907, 5511, 130, 7242, 2359, 7648, 6697, 4981, 5223, 9278, 1906, 2634, 326, 4106, 8520, 1418, 5554, 7926, 1812, 7945, 779, 2387, 5585, 487, 229, 5591, 2159, 3328, 6461, 204, 1852, 1137, 2857, 3052, 4112, 8172, 1810, 3196, 5847, 8254, 8454, 4791, 4820, 2910, 9689, 1373, 6228, 4265, 2845, 5451, 3745, 3004, 3890, 1581, 3769, 9969, 4895, 3392, 750, 9567, 1281, 1693, 5119, 3707] | [279, 326, 4106, 5847, 7458, 65, 6371, 8254, 8454, 4791, 4820, 2910, 8520, 1418, 5554, 7926, 1812, 7945, 779, 2387, 5585, 487, 229, 5591, 2159, 3328, 6461, 204, 1852, 1137, 2857, 3052, 4112, 8172, 1810, 3196, 8559, 5670, 1485, 1056, 5060, 8751, 1093, 4781, 9689, 1373, 6228, 4265, 2845, 5451, 3745, 3004, 3890, 1581, 3769, 9969, 4895, 3392, 750, 9567, 1281, 1693, 5119, 9995, 7907, 5511, 130, 7242, 2359, 7648, 6697, 4981, 5223, 9278, 1906, 2634, 3707] | 5 |
| [1331, 883, 1686, 915, 8047, 2341, 9587, 2700, 5028, 2004, 5306, 8617, 1721, 365, 1720, 9792, 2929, 406, 6411, 632, 5615, 2133, 3507, 4678, 1451, 6035, 4356, 4920, 4581, 5183, 61, 6065, 7066, 1077, 7150, 9702, 406, 800, 7877, 2168, 2665, 8717, 6458, 9731, 9148, 5555, 396, 1686, 4629, 672, 6059, 5813, 265, 3765, 2135, 6332, 3554, 7973, 6105, 3732, 3217, 1066, 304, 7226, 6742, 89, 8703, 9198, 941, 9527, 7126, 7322, 9259, 507, 8669, 4964, 2954, 6646] | [1331, 883, 1686, 915, 5813, 265, 3765, 2135, 6035, 4356, 4920, 4581, 5183, 61, 6065, 6332, 3554, 7066, 1077, 7150, 7973, 6105, 3732, 3217, 1066, 304, 7226, 6742, 89, 8047, 2341, 8703, 9198, 941, 9527, 7126, 7322, 9259, 507, 8669, 4964, 2954, 9587, 2700, 5028, 2004, 5306, 8617, 1721, 365, 1720, 9702, 406, 800, 7877, 2168, 2665, 8717, 6458, 9731, 9148, 5555, 396, 1686, 4629, 672, 6059, 9792, 2929, 406, 6411, 632, 5615, 2133, 3507, 4678, 1451, 6646] | 4 |
| [5176, 4293, 9714, 208, 4535, 3963, 3177, 3125, 669, 2843, 2267, 8672, 6420, 1851, 2301, 8359, 1455, 1328, 4446, 2151, 1841, 3875, 3807, 865, 188, 2249, 9045, 9029, 7931, 67, 685, 7502, 4356, 8771, 9055, 751, 984, 7537, 9014, 1020, 9342, 6173, 3295, 9211, 4095, 9397, 6271, 236, 8339, 2089, 6138, 2040, 2123, 4173, 338, 6854, 7440, 7855, 9197, 6484, 301, 6762, 8138, 8915, 3752, 4170, 3701, 5651, 151, 7728, 2393, 722, 2064, 1704, 2517, 5679, 7985, 4154, 2290] | [4173, 338, 5176, 4293, 6854, 7440, 7855, 9045, 9029, 7931, 67, 685, 7502, 4356, 8771, 9055, 751, 984, 7537, 9014, 1020, 9197, 6484, 301, 6762, 8138, 8915, 3752, 4170, 3701, 5651, 151, 7728, 2393, 722, 2064, 1704, 2517, 5679, 7985, 4154, 9342, 6173, 3295, 9211, 4095, 9397, 6271, 236, 8339, 2089, 6138, 2040, 2123, 9714, 208, 4535, 3963, 3177, 3125, 669, 2843, 2267, 8672, 6420, 1851, 2301, 8359, 1455, 1328, 4446, 2151, 1841, 3875, 3807, 865, 188, 2249, 2290] | 5 |

Algorithm 4:

Dividing the arrays into 1/4 and 3/4 parts

MergeSort(arr[], l, r)

If r > l

1. Find the 1/4rd point to divide the array into two halves:

mid m = l+ (r-l)/4

2. Call mergeSort for first half:

Call mergeSort(arr, l, m)

3. Call mergeSort for second half:

Call mergeSort(arr, m+1, r)

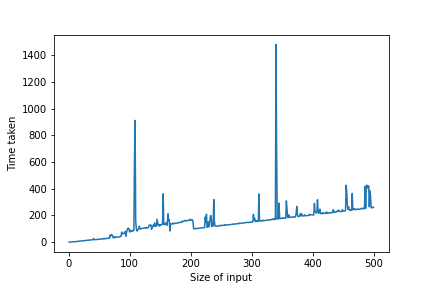
4. Merge the two halves sorted in step 2 and 3:

Call merge(arr, l, m, r)

Time complexity:

T(n) = T(n / 4) + T(3n / 4) + O(n)

* O(n\*log(base 4/3)(n))



|  |  |  |
| --- | --- | --- |
| Input | Output | Time taken |
| [7885] | [7885] | 0 |
| [485, 2350] | [485, 2350] | 0 |
| [5458, 1807, 4926] | [1807, 4926, 5458] | 1 |
| [4957, 2206, 8923, 4260] | [2206, 4260, 4957, 8923] | 1 |
| [4458, 6375, 1603, 7221, 754] | [754, 1603, 4458, 6375, 7221] | 1 |
| [7604, 4817, 3615, 9414, 7025, 1246] | [1246, 3615, 4817, 7025, 7604, 9414] | 2 |
| [778, 206, 4247, 1890, 476, 2413, 3627] | [206, 476, 778, 1890, 2413, 3627, 4247] | 2 |
| [3261, 3400, 7799, 6886, 2965, 2839, 5793, 3157] | [2839, 2965, 3157, 3261, 3400, 5793, 6886, 7799] | 3 |
| [9233, 1721, 3288, 3249, 6646, 141, 9333, 6273, 6559] | [141, 1721, 3249, 3288, 6273, 6559, 6646, 9233, 9333] | 3 |
| [5423, 4784, 943, 1539, 6754, 4434, 7113, 4610, 7679, 7855] | [943, 1539, 4434, 4610, 4784, 5423, 6754, 7113, 7679, 7855] | 3 |
| [7369, 8191, 7244, 6451, 567, 741, 7552, 652, 9276, 1507, 8054] | [567, 652, 741, 1507, 6451, 7244, 7369, 7552, 8054, 8191, 9276] | 4 |
| [1529, 8571, 809, 5873, 7361, 8108, 872, 959, 519, 1112, 8917, 6896] | [519, 809, 872, 959, 1112, 1529, 5873, 6896, 7361, 8108, 8571, 8917] | 4 |
| [2589, 7740, 9694, 5704, 3383, 1335, 1648, 8531, 1937, 5254, 7561, 6121, 8531] | [1335, 1648, 1937, 2589, 3383, 5254, 5704, 6121, 7561, 7740, 8531, 8531, 9694] | 4 |
| [1347, 9401, 499, 116, 5178, 3502, 8189, 1581, 2748, 5424, 1675, 9711, 134, 1434] | [116, 134, 499, 1347, 1434, 1581, 1675, 2748, 3502, 5178, 5424, 8189, 9401, 9711] | 5 |
| [2641, 8423, 9556, 7035, 7518, 3649, 7747, 2684, 1225, 476, 5237, 7314, 4527, 2604, 7784] | [476, 1225, 2604, 2641, 2684, 3649, 4527, 5237, 7035, 7314, 7518, 7747, 7784, 8423, 9556] | 5 |
| [2390, 2587, 2101, 1049, 2819, 4167, 6903, 4485, 5759, 9937, 9589, 8496, 5166, 2754, 1498, 4665] | [1049, 1498, 2101, 2390, 2587, 2754, 2819, 4167, 4485, 4665, 5166, 5759, 6903, 8496, 9589, 9937] | 7 |
| [6052, 8523, 9534, 1406, 2474, 9729, 7141, 9932, 6259, 412, 7705, 2730, 9134, 7882, 3097, 2982, 2958] | [412, 1406, 2474, 2730, 2958, 2982, 3097, 6052, 6259, 7141, 7705, 7882, 8523, 9134, 9534, 9729, 9932] | 7 |
| [5065, 8386, 5888, 8841, 8740, 5885, 8006, 2974, 1869, 4201, 5295, 1931, 7148, 4651, 6252, 2030, 1047, 5347] | [1047, 1869, 1931, 2030, 2974, 4201, 4651, 5065, 5295, 5347, 5885, 5888, 6252, 7148, 8006, 8386, 8740, 8841] | 7 |
| [6524, 6602, 4227, 3632, 5247, 9596, 1609, 3142, 7789, 5070, 1837, 7423, 3624, 6363, 1083, 7457, 4911, 1284, 5427] | [1083, 1284, 1609, 1837, 3142, 3624, 3632, 4227, 4911, 5070, 5247, 5427, 6363, 6524, 6602, 7423, 7457, 7789, 9596] | 7 |
| [6095, 1301, 7731, 8263, 146, 9921, 815, 529, 9721, 359, 7327, 8363, 6206, 375, 1218, 2729, 6155, 1092, 3150, 6729] | [146, 359, 375, 529, 815, 1092, 1218, 1301, 2729, 3150, 6095, 6155, 6206, 6729, 7327, 7731, 8263, 8363, 9721, 9921] | 8 |
| [8172, 2760, 7352, 7887, 983, 4470, 5892, 5578, 7162, 0, 2700, 6459, 9028, 842, 2198, 6967, 2695, 9215, 2881, 1291, 4188] | [0, 842, 983, 1291, 2198, 2695, 2700, 2760, 2881, 4188, 4470, 5578, 5892, 6459, 6967, 7162, 7352, 7887, 8172, 9028, 9215] | 9 |
| [2738, 9489, 7727, 2999, 8487, 9628, 3518, 6364, 8548, 803, 7860, 4722, 4514, 6949, 1321, 6104, 8424, 8880, 3662, 8662, 330, 2681] | [330, 803, 1321, 2681, 2738, 2999, 3518, 3662, 4514, 4722, 6104, 6364, 6949, 7727, 7860, 8424, 8487, 8548, 8662, 8880, 9489, 9628] | 11 |
| [629, 340, 622, 9198, 8774, 432, 1151, 1771, 6079, 5228, 4517, 1178, 3804, 7159, 4757, 6638, 4823, 3917, 6213, 1553, 1730, 5265, 3827] | [340, 432, 622, 629, 1151, 1178, 1553, 1730, 1771, 3804, 3827, 3917, 4517, 4757, 4823, 5228, 5265, 6079, 6213, 6638, 7159, 8774, 9198] | 10 |
| [6332, 1218, 2042, 5910, 552, 2318, 3659, 6213, 4019, 6681, 9848, 8311, 5605, 1884, 2486, 1003, 6019, 8103, 6946, 7112, 5715, 5897, 661, 375] | [375, 552, 661, 1003, 1218, 1884, 2042, 2318, 2486, 3659, 4019, 5605, 5715, 5897, 5910, 6019, 6213, 6332, 6681, 6946, 7112, 8103, 8311, 9848] | 10 |
| [8561, 4207, 9862, 832, 3986, 5241, 5584, 6003, 3943, 2147, 7749, 1033, 9556, 5939, 2708, 793, 8241, 2686, 2599, 8030, 7249, 9136, 4064, 6873, 6738] | [793, 832, 1033, 2147, 2599, 2686, 2708, 3943, 3986, 4064, 4207, 5241, 5584, 5939, 6003, 6738, 6873, 7249, 7749, 8030, 8241, 8561, 9136, 9556, 9862] | 10 |
| [1595, 373, 2852, 3236, 6255, 1561, 7671, 7677, 252, 2173, 6670, 4572, 7172, 7543, 7482, 9724, 9700, 6338, 7111, 3052, 3556, 5830, 7278, 1149, 4973, 5033] | [252, 373, 1149, 1561, 1595, 2173, 2852, 3052, 3236, 3556, 4572, 4973, 5033, 5830, 6255, 6338, 6670, 7111, 7172, 7278, 7482, 7543, 7671, 7677, 9700, 9724] | 11 |
| [3116, 4011, 5243, 5382, 8003, 2703, 6275, 701, 6047, 1764, 694, 1228, 3500, 7770, 7030, 8524, 1670, 2135, 937, 5246, 9232, 2356, 6028, 616, 6681, 7159, 1610] | [616, 694, 701, 937, 1228, 1610, 1670, 1764, 2135, 2356, 2703, 3116, 3500, 4011, 5243, 5246, 5382, 6028, 6047, 6275, 6681, 7030, 7159, 7770, 8003, 8524, 9232] | 12 |
| [7435, 1708, 4509, 893, 519, 1656, 3659, 2324, 2737, 927, 2500, 8422, 1123, 7458, 4445, 6277, 6037, 3085, 1359, 2406, 7979, 5759, 6157, 129, 7182, 3357, 2023, 8772] | [129, 519, 893, 927, 1123, 1359, 1656, 1708, 2023, 2324, 2406, 2500, 2737, 3085, 3357, 3659, 4445, 4509, 5759, 6037, 6157, 6277, 7182, 7435, 7458, 7979, 8422, 8772] | 13 |
| [7552, 1496, 4814, 1180, 9706, 1259, 4362, 1591, 9352, 9881, 9080, 5444, 1272, 5015, 679, 2572, 5150, 7062, 9541, 869, 1212, 20, 2469, 5268, 7600, 9779, 5701, 2979, 6846] | [20, 679, 869, 1180, 1212, 1259, 1272, 1496, 1591, 2469, 2572, 2979, 4362, 4814, 5015, 5150, 5268, 5444, 5701, 6846, 7062, 7552, 7600, 9080, 9352, 9541, 9706, 9779, 9881] | 12 |
| [2026, 413, 9363, 6576, 2522, 6842, 3524, 5371, 2100, 9947, 3698, 4292, 1545, 8283, 6002, 2835, 5234, 7761, 1518, 7063, 4049, 437, 8045, 2521, 9656, 3860, 8295, 309, 2089, 2182] | [309, 413, 437, 1518, 1545, 2026, 2089, 2100, 2182, 2521, 2522, 2835, 3524, 3698, 3860, 4049, 4292, 5234, 5371, 6002, 6576, 6842, 7063, 7761, 8045, 8283, 8295, 9363, 9656, 9947] | 13 |
| [9591, 1047, 3005, 2413, 7490, 8514, 1640, 6417, 6231, 3239, 2605, 2010, 7639, 2260, 4079, 1629, 5575, 9195, 9384, 8538, 148, 5300, 4061, 101, 3254, 6277, 8481, 4260, 2424, 1489, 1960] | [101, 148, 1047, 1489, 1629, 1640, 1960, 2010, 2260, 2413, 2424, 2605, 3005, 3239, 3254, 4061, 4079, 4260, 5300, 5575, 6231, 6277, 6417, 7490, 7639, 8481, 8514, 8538, 9195, 9384, 9591] | 13 |
| [7673, 3015, 7135, 6895, 7185, 6632, 3885, 1019, 4603, 5375, 7125, 4607, 8333, 7630, 1567, 4131, 132, 3147, 1590, 865, 6538, 7765, 9695, 1952, 4925, 2120, 2103, 5815, 2205, 4078, 3453, 3418] | [132, 865, 1019, 1567, 1590, 1952, 2103, 2120, 2205, 3015, 3147, 3418, 3453, 3885, 4078, 4131, 4603, 4607, 4925, 5375, 5815, 6538, 6632, 6895, 7125, 7135, 7185, 7630, 7673, 7765, 8333, 9695] | 15 |
| [3830, 8168, 8544, 1593, 2623, 8526, 138, 970, 4818, 596, 2461, 2147, 7133, 606, 8525, 7564, 1624, 2341, 4575, 373, 6793, 8538, 2543, 4564, 884, 2138, 5704, 6578, 1127, 1778, 8208, 4166, 2965] | [138, 373, 596, 606, 884, 970, 1127, 1593, 1624, 1778, 2138, 2147, 2341, 2461, 2543, 2623, 2965, 3830, 4166, 4564, 4575, 4818, 5704, 6578, 6793, 7133, 7564, 8168, 8208, 8525, 8526, 8538, 8544] | 14 |
| [1845, 6482, 8897, 8128, 1468, 4416, 6556, 5596, 7245, 9688, 8255, 898, 5600, 8070, 6692, 1827, 1421, 4315, 2508, 302, 9354, 5837, 9648, 3540, 2676, 5023, 218, 9801, 6764, 1922, 3892, 4205, 9316, 1003] | [218, 302, 898, 1003, 1421, 1468, 1827, 1845, 1922, 2508, 2676, 3540, 3892, 4205, 4315, 4416, 5023, 5596, 5600, 5837, 6482, 6556, 6692, 6764, 7245, 8070, 8128, 8255, 8897, 9316, 9354, 9648, 9688, 9801] | 15 |
| [5137, 1836, 6473, 8023, 9291, 595, 2547, 5325, 7101, 852, 1595, 7603, 5810, 1579, 3293, 9220, 862, 6802, 894, 192, 2476, 4643, 1583, 9620, 87, 1900, 1299, 2155, 8732, 103, 6653, 7173, 7775, 7850, 1118] | [87, 103, 192, 595, 852, 862, 894, 1118, 1299, 1579, 1583, 1595, 1836, 1900, 2155, 2476, 2547, 3293, 4643, 5137, 5325, 5810, 6473, 6653, 6802, 7101, 7173, 7603, 7775, 7850, 8023, 8732, 9220, 9291, 9620] | 15 |
| [9192, 9902, 8589, 8366, 6436, 2916, 6954, 6904, 5915, 5663, 6842, 3803, 3777, 8467, 301, 4861, 4224, 9231, 9994, 275, 9599, 6833, 6440, 6975, 7236, 1270, 27, 5641, 6136, 1573, 4548, 4002, 3082, 2797, 7938, 6740] | [27, 275, 301, 1270, 1573, 2797, 2916, 3082, 3777, 3803, 4002, 4224, 4548, 4861, 5641, 5663, 5915, 6136, 6436, 6440, 6740, 6833, 6842, 6904, 6954, 6975, 7236, 7938, 8366, 8467, 8589, 9192, 9231, 9599, 9902, 9994] | 17 |
| [630, 8299, 7902, 8094, 4263, 3441, 1462, 7903, 3018, 115, 6311, 6752, 2406, 5315, 8816, 5879, 73, 6704, 7333, 5337, 1348, 8843, 4001, 9936, 2346, 4122, 9040, 9214, 4549, 7136, 428, 8816, 1594, 380, 9430, 9990, 8062] | [73, 115, 380, 428, 630, 1348, 1462, 1594, 2346, 2406, 3018, 3441, 4001, 4122, 4263, 4549, 5315, 5337, 5879, 6311, 6704, 6752, 7136, 7333, 7902, 7903, 8062, 8094, 8299, 8816, 8816, 8843, 9040, 9214, 9430, 9936, 9990] | 16 |
| [8321, 3336, 5186, 8056, 8966, 776, 7551, 4440, 879, 7151, 1860, 537, 8780, 5530, 4489, 1140, 2465, 4401, 3369, 5269, 4150, 7175, 169, 5377, 8527, 194, 8680, 792, 190, 4939, 1207, 5192, 3159, 6551, 955, 7778, 8245, 3911] | [169, 190, 194, 537, 776, 792, 879, 955, 1140, 1207, 1860, 2465, 3159, 3336, 3369, 3911, 4150, 4401, 4440, 4489, 4939, 5186, 5192, 5269, 5377, 5530, 6551, 7151, 7175, 7551, 7778, 8056, 8245, 8321, 8527, 8680, 8780, 8966] | 17 |
| [9265, 4193, 9755, 1693, 1857, 9960, 4974, 3489, 6326, 186, 6833, 3187, 1645, 3216, 4913, 3537, 3004, 1511, 9026, 8187, 2293, 8537, 3289, 7637, 1386, 2157, 8331, 4781, 4083, 4385, 9542, 2974, 463, 2454, 2223, 1491, 9687, 8924, 2796] | [186, 463, 1386, 1491, 1511, 1645, 1693, 1857, 2157, 2223, 2293, 2454, 2796, 2974, 3004, 3187, 3216, 3289, 3489, 3537, 4083, 4193, 4385, 4781, 4913, 4974, 6326, 6833, 7637, 8187, 8331, 8537, 8924, 9026, 9265, 9542, 9687, 9755, 9960] | 18 |
| [6864, 5465, 3456, 6931, 8510, 5107, 580, 803, 4214, 414, 1358, 2673, 8784, 3022, 147, 6373, 6700, 8423, 7926, 2358, 6816, 1922, 6155, 4515, 2883, 7968, 9713, 3316, 713, 1038, 5791, 9824, 8352, 3081, 3918, 8656, 2571, 7044, 1224, 740] | [147, 414, 580, 713, 740, 803, 1038, 1224, 1358, 1922, 2358, 2571, 2673, 2883, 3022, 3081, 3316, 3456, 3918, 4214, 4515, 5107, 5465, 5791, 6155, 6373, 6700, 6816, 6864, 6931, 7044, 7926, 7968, 8352, 8423, 8510, 8656, 8784, 9713, 9824] | 18 |
| [6797, 3352, 4719, 9956, 5945, 1644, 7025, 666, 39, 4005, 1162, 5742, 6569, 2623, 6378, 7650, 5599, 6861, 617, 8976, 5879, 6237, 2233, 2000, 6617, 1375, 395, 4350, 5458, 9848, 628, 7548, 2080, 6562, 1089, 5043, 4286, 806, 1112, 8528, 9839] | [39, 395, 617, 628, 666, 806, 1089, 1112, 1162, 1375, 1644, 2000, 2080, 2233, 2623, 3352, 4005, 4286, 4350, 4719, 5043, 5458, 5599, 5742, 5879, 5945, 6237, 6378, 6562, 6569, 6617, 6797, 6861, 7025, 7548, 7650, 8528, 8976, 9839, 9848, 9956] | 27 |
| [845, 1921, 973, 304, 8355, 7189, 1805, 9049, 6013, 2278, 7132, 1397, 3020, 3232, 9798, 6291, 3571, 6943, 1111, 7915, 550, 7584, 8579, 7893, 275, 9660, 2391, 8006, 3333, 7666, 2383, 8716, 9910, 7188, 6985, 2173, 9317, 1269, 4362, 5435, 5321, 7665] | [275, 304, 550, 845, 973, 1111, 1269, 1397, 1805, 1921, 2173, 2278, 2383, 2391, 3020, 3232, 3333, 3571, 4362, 5321, 5435, 6013, 6291, 6943, 6985, 7132, 7188, 7189, 7584, 7665, 7666, 7893, 7915, 8006, 8355, 8579, 8716, 9049, 9317, 9660, 9798, 9910] | 20 |
| [7697, 6794, 6533, 1550, 361, 9045, 1148, 9010, 2482, 4734, 1894, 8661, 2321, 8037, 1284, 1016, 1830, 6426, 3920, 2486, 255, 6326, 3193, 9178, 6396, 1447, 6958, 6305, 3843, 2923, 2936, 513, 1493, 1184, 3789, 8794, 9824, 2520, 9379, 7276, 5686, 1362, 5729] | [255, 361, 513, 1016, 1148, 1184, 1284, 1362, 1447, 1493, 1550, 1830, 1894, 2321, 2482, 2486, 2520, 2923, 2936, 3193, 3789, 3843, 3920, 4734, 5686, 5729, 6305, 6326, 6396, 6426, 6533, 6794, 6958, 7276, 7697, 8037, 8661, 8794, 9010, 9045, 9178, 9379, 9824] | 18 |
| [970, 1790, 7815, 4636, 5438, 714, 6755, 4673, 4684, 233, 1061, 2013, 1499, 9341, 9752, 6293, 4369, 1599, 1186, 803, 414, 6865, 4333, 4751, 1581, 997, 325, 1791, 8278, 9933, 1137, 5775, 7704, 8370, 5733, 6404, 5669, 73, 3015, 7869, 9453, 6003, 2816, 2107] | [73, 233, 325, 414, 714, 803, 970, 997, 1061, 1137, 1186, 1499, 1581, 1599, 1790, 1791, 2013, 2107, 2816, 3015, 4333, 4369, 4636, 4673, 4684, 4751, 5438, 5669, 5733, 5775, 6003, 6293, 6404, 6755, 6865, 7704, 7815, 7869, 8278, 8370, 9341, 9453, 9752, 9933] | 18 |
| [1920, 4100, 1062, 8051, 2542, 9046, 8632, 1890, 4961, 302, 8362, 1249, 8142, 1215, 5873, 5704, 6552, 6414, 6977, 1463, 2597, 1814, 101, 3683, 5845, 2925, 5422, 7662, 6992, 4086, 4689, 9611, 671, 3704, 10, 2064, 1215, 432, 9637, 7420, 7601, 5811, 7742, 4219, 6181] | [10, 101, 302, 432, 671, 1062, 1215, 1215, 1249, 1463, 1814, 1890, 1920, 2064, 2542, 2597, 2925, 3683, 3704, 4086, 4100, 4219, 4689, 4961, 5422, 5704, 5811, 5845, 5873, 6181, 6414, 6552, 6977, 6992, 7420, 7601, 7662, 7742, 8051, 8142, 8362, 8632, 9046, 9611, 9637] | 20 |
| [646, 247, 3928, 8024, 1, 6923, 8562, 5467, 6400, 5200, 4594, 7031, 8732, 1010, 76, 813, 6603, 6814, 2308, 2147, 3171, 812, 5571, 8556, 1141, 8385, 9642, 9782, 1079, 4835, 5846, 7787, 3362, 4334, 1365, 8320, 2014, 6902, 5784, 1138, 2010, 8510, 1049, 9985, 3408, 1929] | [1, 76, 247, 646, 812, 813, 1010, 1049, 1079, 1138, 1141, 1365, 1929, 2010, 2014, 2147, 2308, 3171, 3362, 3408, 3928, 4334, 4594, 4835, 5200, 5467, 5571, 5784, 5846, 6400, 6603, 6814, 6902, 6923, 7031, 7787, 8024, 8320, 8385, 8510, 8556, 8562, 8732, 9642, 9782, 9985] | 19 |
| [6846, 6045, 5736, 2528, 5615, 3201, 5660, 8339, 5989, 4349, 8317, 6723, 7363, 1577, 5780, 4351, 9114, 7286, 5195, 2221, 103, 4455, 1293, 2428, 6480, 512, 9658, 4551, 447, 2398, 2080, 989, 8813, 4519, 9271, 9439, 7667, 9315, 1851, 7049, 2605, 6155, 3008, 6308, 2112, 2753, 497] | [103, 447, 497, 512, 989, 1293, 1577, 1851, 2080, 2112, 2221, 2398, 2428, 2528, 2605, 2753, 3008, 3201, 4349, 4351, 4455, 4519, 4551, 5195, 5615, 5660, 5736, 5780, 5989, 6045, 6155, 6308, 6480, 6723, 6846, 7049, 7286, 7363, 7667, 8317, 8339, 8813, 9114, 9271, 9315, 9439, 9658] | 20 |
| [1659, 2718, 624, 345, 2269, 1559, 8678, 2054, 6899, 8642, 575, 2122, 9347, 1212, 6115, 4628, 5044, 1456, 5219, 7822, 3890, 4857, 1200, 6104, 3748, 9348, 9309, 3558, 1996, 4745, 5542, 566, 6175, 7226, 8753, 8612, 6038, 8173, 7395, 1569, 8836, 4903, 3318, 3313, 9353, 1098, 2682, 1844] | [345, 566, 575, 624, 1098, 1200, 1212, 1456, 1559, 1569, 1659, 1844, 1996, 2054, 2122, 2269, 2682, 2718, 3313, 3318, 3558, 3748, 3890, 4628, 4745, 4857, 4903, 5044, 5219, 5542, 6038, 6104, 6115, 6175, 6899, 7226, 7395, 7822, 8173, 8612, 8642, 8678, 8753, 8836, 9309, 9347, 9348, 9353] | 22 |

Algorithm 5:

Dividing the arrays into 1/5 and 4/5 parts

MergeSort(arr[], l, r)

If r > l

1. Find the 1/5rd point to divide the array into two halves:

mid m = l+ (r-l)/5

2. Call mergeSort for first half:

Call mergeSort(arr, l, m)

3. Call mergeSort for second half:

Call mergeSort(arr, m+1, r)

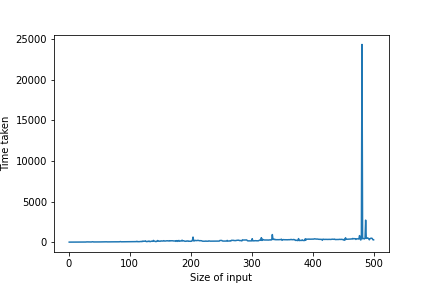
4. Merge the two halves sorted in step 2 and 3:

Call merge(arr, l, m, r)

Time complexity:

T(n) = T(n / 5) + T(4n / 5) + O(n)

* O(n\*log(base 5/4)(n))



|  |  |  |
| --- | --- | --- |
| Input | Output | Time taken |
| [5798] | [5798] | 0 |
| [2103, 9753] | [2103, 9753] | 0 |
| [9205, 968, 4188] | [968, 4188, 9205] | 0 |
| [7724, 4536, 416, 3409] | [416, 3409, 4536, 7724] | 1 |
| [1405, 8554, 2193, 4595, 1757] | [1405, 1757, 2193, 4595, 8554] | 1 |
| [9345, 9839, 7538, 3814, 2520, 7079] | [2520, 3814, 7079, 7538, 9345, 9839] | 2 |
| [5593, 4422, 9622, 9871, 7811, 2655, 1142] | [1142, 2655, 4422, 5593, 7811, 9622, 9871] | 2 |
| [8927, 5931, 4846, 6594, 384, 7524, 555, 3472] | [384, 555, 3472, 4846, 5931, 6594, 7524, 8927] | 2 |
| [3012, 171, 1136, 3954, 1159, 2874, 1070, 3481, 1812] | [171, 1070, 1136, 1159, 1812, 2874, 3012, 3481, 3954] | 3 |
| [2815, 4604, 4122, 523, 2748, 4850, 500, 1345, 2063, 8309] | [500, 523, 1345, 2063, 2748, 2815, 4122, 4604, 4850, 8309] | 3 |
| [2432, 7688, 469, 4579, 8234, 9681, 9995, 2865, 2655, 4047, 1157] | [469, 1157, 2432, 2655, 2865, 4047, 4579, 7688, 8234, 9681, 9995] | 4 |
| [5939, 5719, 5310, 6210, 4877, 7685, 932, 1664, 8599, 1133, 2150, 1116] | [932, 1116, 1133, 1664, 2150, 4877, 5310, 5719, 5939, 6210, 7685, 8599] | 6 |
| [6470, 3878, 5710, 3981, 905, 8176, 6732, 8386, 4688, 2695, 59, 5512, 7364] | [59, 905, 2695, 3878, 3981, 4688, 5512, 5710, 6470, 6732, 7364, 8176, 8386] | 5 |
| [1464, 8630, 4736, 1987, 7075, 3626, 2369, 7691, 482, 5213, 5050, 7209, 1897, 495] | [482, 495, 1464, 1897, 1987, 2369, 3626, 4736, 5050, 5213, 7075, 7209, 7691, 8630] | 5 |
| [2298, 8018, 3167, 4736, 7572, 3649, 2380, 6130, 6173, 3666, 1443, 9905, 2760, 1616, 4434] | [1443, 1616, 2298, 2380, 2760, 3167, 3649, 3666, 4434, 4736, 6130, 6173, 7572, 8018, 9905] | 6 |
| [5248, 180, 250, 231, 5766, 1140, 1914, 1253, 4809, 8895, 9097, 6088, 1465, 5881, 4285, 7398] | [180, 231, 250, 1140, 1253, 1465, 1914, 4285, 4809, 5248, 5766, 5881, 6088, 7398, 8895, 9097] | 6 |
| [81, 1202, 2085, 2262, 5257, 542, 327, 6965, 4127, 9860, 3559, 2758, 7223, 2603, 2267, 8009, 3760] | [81, 327, 542, 1202, 2085, 2262, 2267, 2603, 2758, 3559, 3760, 4127, 5257, 6965, 7223, 8009, 9860] | 6 |
| [9010, 9516, 496, 777, 9406, 4080, 9534, 8293, 3001, 2182, 3585, 9739, 4345, 9073, 6866, 8768, 9327, 2297] | [496, 777, 2182, 2297, 3001, 3585, 4080, 4345, 6866, 8293, 8768, 9010, 9073, 9327, 9406, 9516, 9534, 9739] | 7 |
| [1051, 6329, 2065, 1342, 680, 7052, 7339, 4206, 8368, 6438, 4545, 473, 1190, 482, 7672, 1875, 8171, 1976, 646] | [473, 482, 646, 680, 1051, 1190, 1342, 1875, 1976, 2065, 4206, 4545, 6329, 6438, 7052, 7339, 7672, 8171, 8368] | 7 |
| [8427, 8134, 8085, 3622, 6009, 6119, 5402, 8064, 2429, 8696, 6183, 1529, 1653, 9797, 5801, 6167, 5583, 1214, 2801, 7576] | [1214, 1529, 1653, 2429, 2801, 3622, 5402, 5583, 5801, 6009, 6119, 6167, 6183, 7576, 8064, 8085, 8134, 8427, 8696, 9797] | 9 |
| [6272, 7242, 4999, 1668, 6884, 1918, 2543, 9135, 3848, 5727, 139, 9027, 8323, 7908, 1505, 8686, 76, 9551, 7982, 5576, 3096] | [76, 139, 1505, 1668, 1918, 2543, 3096, 3848, 4999, 5576, 5727, 6272, 6884, 7242, 7908, 7982, 8323, 8686, 9027, 9135, 9551] | 8 |
| [7614, 2491, 1656, 9123, 8717, 7375, 7783, 2593, 2590, 886, 6837, 9157, 4908, 49, 1802, 34, 12, 381, 1968, 5153, 2196, 8504] | [12, 34, 49, 381, 886, 1656, 1802, 1968, 2196, 2491, 2590, 2593, 4908, 5153, 6837, 7375, 7614, 7783, 8504, 8717, 9123, 9157] | 9 |
| [1327, 2258, 2657, 1953, 25, 5381, 3540, 9472, 2936, 2171, 8524, 6710, 2996, 713, 9050, 9990, 6601, 7038, 7313, 3060, 1448, 8229, 7917] | [25, 713, 1327, 1448, 1953, 2171, 2258, 2657, 2936, 2996, 3060, 3540, 5381, 6601, 6710, 7038, 7313, 7917, 8229, 8524, 9050, 9472, 9990] | 9 |
| [2892, 8157, 6349, 5461, 3286, 338, 7014, 3796, 6169, 1841, 8302, 5284, 7838, 2303, 4430, 8764, 487, 9880, 5871, 3740, 95, 597, 96, 5829] | [95, 96, 338, 487, 597, 1841, 2303, 2892, 3286, 3740, 3796, 4430, 5284, 5461, 5829, 5871, 6169, 6349, 7014, 7838, 8157, 8302, 8764, 9880] | 9 |
| [9507, 8757, 5932, 9759, 9922, 6107, 360, 8309, 1761, 6996, 1835, 132, 8321, 5708, 9393, 1604, 229, 1314, 2417, 6102, 3647, 1944, 3997, 9695, 6875] | [132, 229, 360, 1314, 1604, 1761, 1835, 1944, 2417, 3647, 3997, 5708, 5932, 6102, 6107, 6875, 6996, 8309, 8321, 8757, 9393, 9507, 9695, 9759, 9922] | 11 |
| [5359, 2761, 7443, 2750, 5107, 6288, 7878, 416, 9603, 1412, 3407, 9848, 1109, 1157, 7454, 1814, 5495, 388, 3295, 3095, 3448, 3752, 9423, 6404, 6936, 2913] | [388, 416, 1109, 1157, 1412, 1814, 2750, 2761, 2913, 3095, 3295, 3407, 3448, 3752, 5107, 5359, 5495, 6288, 6404, 6936, 7443, 7454, 7878, 9423, 9603, 9848] | 10 |
| [5598, 9949, 7581, 1291, 6294, 8644, 7543, 6532, 3995, 8092, 5543, 3201, 6740, 7972, 3708, 3502, 7449, 7294, 1277, 502, 2205, 7910, 46, 5490, 8862, 1295, 685] | [46, 502, 685, 1277, 1291, 1295, 2205, 3201, 3502, 3708, 3995, 5490, 5543, 5598, 6294, 6532, 6740, 7294, 7449, 7543, 7581, 7910, 7972, 8092, 8644, 8862, 9949] | 11 |
| [292, 2075, 2879, 652, 8759, 597, 9550, 4068, 7791, 2313, 2731, 1047, 1527, 9628, 1776, 983, 4555, 6056, 3287, 2086, 1810, 2951, 1725, 5341, 4241, 445, 1830, 3489] | [292, 445, 597, 652, 983, 1047, 1527, 1725, 1776, 1810, 1830, 2075, 2086, 2313, 2731, 2879, 2951, 3287, 3489, 4068, 4241, 4555, 5341, 6056, 7791, 8759, 9550, 9628] | 11 |
| [4044, 922, 4385, 5682, 717, 944, 1997, 5318, 5738, 6403, 4108, 166, 3715, 9759, 2999, 2471, 8905, 750, 6611, 572, 37, 9417, 2706, 2202, 6600, 5614, 6988, 9324, 4190] | [37, 166, 572, 717, 750, 922, 944, 1997, 2202, 2471, 2706, 2999, 3715, 4044, 4108, 4190, 4385, 5318, 5614, 5682, 5738, 6403, 6600, 6611, 6988, 8905, 9324, 9417, 9759] | 24 |
| [3844, 2288, 648, 9769, 5435, 2678, 6769, 9931, 2903, 8567, 8543, 292, 4655, 8591, 1932, 3549, 9968, 241, 2095, 7715, 5640, 4875, 4591, 5305, 6976, 8428, 9040, 4951, 8553, 6404] | [241, 292, 648, 1932, 2095, 2288, 2678, 2903, 3549, 3844, 4591, 4655, 4875, 4951, 5305, 5435, 5640, 6404, 6769, 6976, 7715, 8428, 8543, 8553, 8567, 8591, 9040, 9769, 9931, 9968] | 28 |
| [2082, 1975, 9562, 2155, 5563, 4274, 5768, 8725, 5105, 2646, 1384, 8787, 8845, 1211, 7169, 8509, 6556, 7750, 1462, 4944, 2184, 2125, 9986, 7698, 7846, 3053, 9908, 3422, 2961, 7368, 9517] | [1211, 1384, 1462, 1975, 2082, 2125, 2155, 2184, 2646, 2961, 3053, 3422, 4274, 4944, 5105, 5563, 5768, 6556, 7169, 7368, 7698, 7750, 7846, 8509, 8725, 8787, 8845, 9517, 9562, 9908, 9986] | 26 |
| [4908, 8071, 6883, 4088, 3999, 5954, 7055, 9930, 3926, 218, 1237, 9770, 5787, 9497, 2408, 402, 9920, 5760, 2742, 390, 4524, 1448, 1423, 6885, 6752, 9051, 1945, 7646, 2046, 1843, 1171, 6437] | [218, 390, 402, 1171, 1237, 1423, 1448, 1843, 1945, 2046, 2408, 2742, 3926, 3999, 4088, 4524, 4908, 5760, 5787, 5954, 6437, 6752, 6883, 6885, 7055, 7646, 8071, 9051, 9497, 9770, 9920, 9930] | 18 |
| [2444, 4579, 8009, 6630, 85, 4294, 4424, 568, 5761, 1700, 658, 6310, 5159, 220, 147, 8218, 9424, 9630, 9221, 7323, 7789, 584, 7249, 4073, 4251, 8676, 9383, 3414, 54, 16, 4336, 6343, 7804] | [16, 54, 85, 147, 220, 568, 584, 658, 1700, 2444, 3414, 4073, 4251, 4294, 4336, 4424, 4579, 5159, 5761, 6310, 6343, 6630, 7249, 7323, 7789, 7804, 8009, 8218, 8676, 9221, 9383, 9424, 9630] | 20 |
| [4494, 418, 187, 4068, 3965, 6116, 6043, 3951, 1976, 6291, 1971, 6653, 7181, 8580, 6352, 2467, 1088, 6618, 2155, 8780, 3969, 1898, 6693, 5725, 1099, 1502, 1459, 1197, 1023, 7191, 6444, 7557, 768, 2374] | [187, 418, 768, 1023, 1088, 1099, 1197, 1459, 1502, 1898, 1971, 1976, 2155, 2374, 2467, 3951, 3965, 3969, 4068, 4494, 5725, 6043, 6116, 6291, 6352, 6444, 6618, 6653, 6693, 7181, 7191, 7557, 8580, 8780] | 24 |
| [1551, 9301, 336, 8684, 5515, 9831, 3532, 5025, 5978, 4183, 1299, 6978, 717, 2275, 8653, 5870, 1342, 160, 7961, 1716, 1762, 2782, 5223, 1477, 7053, 620, 4855, 2415, 1355, 1582, 1954, 4717, 8540, 1598, 3528] | [160, 336, 620, 717, 1299, 1342, 1355, 1477, 1551, 1582, 1598, 1716, 1762, 1954, 2275, 2415, 2782, 3528, 3532, 4183, 4717, 4855, 5025, 5223, 5515, 5870, 5978, 6978, 7053, 7961, 8540, 8653, 8684, 9301, 9831] | 15 |
| [9337, 6623, 9746, 2761, 8019, 9650, 6893, 4408, 4199, 1865, 5383, 8140, 3882, 8525, 2593, 2601, 6469, 6471, 2036, 1088, 149, 957, 7626, 722, 577, 7564, 304, 9434, 8718, 1688, 2633, 9035, 7633, 3343, 3350, 7815] | [149, 304, 577, 722, 957, 1088, 1688, 1865, 2036, 2593, 2601, 2633, 2761, 3343, 3350, 3882, 4199, 4408, 5383, 6469, 6471, 6623, 6893, 7564, 7626, 7633, 7815, 8019, 8140, 8525, 8718, 9035, 9337, 9434, 9650, 9746] | 25 |
| [9635, 4260, 9781, 3091, 9753, 7755, 8872, 3735, 1828, 6672, 5368, 2682, 1045, 2653, 8953, 8797, 934, 491, 3983, 7047, 7366, 1737, 7457, 7425, 7155, 859, 2078, 2643, 5484, 5365, 9149, 7983, 5735, 4872, 5849, 4843, 2737] | [491, 859, 934, 1045, 1737, 1828, 2078, 2643, 2653, 2682, 2737, 3091, 3735, 3983, 4260, 4843, 4872, 5365, 5368, 5484, 5735, 5849, 6672, 7047, 7155, 7366, 7425, 7457, 7755, 7983, 8797, 8872, 8953, 9149, 9635, 9753, 9781] | 16 |
| [8219, 365, 2453, 6852, 2542, 7468, 9443, 7150, 9547, 6772, 1288, 7680, 1231, 8388, 5934, 819, 9639, 2859, 2976, 4306, 6942, 3763, 1046, 5460, 1478, 7887, 2615, 9224, 3109, 2256, 1914, 2903, 3266, 6334, 4142, 4836, 8384, 4805] | [365, 819, 1046, 1231, 1288, 1478, 1914, 2256, 2453, 2542, 2615, 2859, 2903, 2976, 3109, 3266, 3763, 4142, 4306, 4805, 4836, 5460, 5934, 6334, 6772, 6852, 6942, 7150, 7468, 7680, 7887, 8219, 8384, 8388, 9224, 9443, 9547, 9639] | 34 |
| [571, 9911, 5498, 2046, 1560, 5738, 5311, 928, 7007, 6867, 2753, 4102, 8733, 420, 3544, 5682, 5694, 9711, 7885, 1922, 6665, 670, 3315, 4787, 5767, 9586, 7544, 1028, 1482, 3162, 4701, 2988, 204, 4039, 7330, 1869, 6517, 4733, 7590] | [204, 420, 571, 670, 928, 1028, 1482, 1560, 1869, 1922, 2046, 2753, 2988, 3162, 3315, 3544, 4039, 4102, 4701, 4733, 4787, 5311, 5498, 5682, 5694, 5738, 5767, 6517, 6665, 6867, 7007, 7330, 7544, 7590, 7885, 8733, 9586, 9711, 9911] | 39 |
| [6923, 802, 1021, 1661, 2088, 178, 2785, 6371, 2754, 8946, 2743, 5423, 5856, 5147, 7681, 9164, 2761, 1546, 12, 340, 2005, 2753, 3488, 4094, 9016, 9997, 9367, 2666, 2188, 7592, 7490, 6714, 5853, 2607, 6680, 1587, 8267, 5622, 9120, 3844] | [12, 178, 340, 802, 1021, 1546, 1587, 1661, 2005, 2088, 2188, 2607, 2666, 2743, 2753, 2754, 2761, 2785, 3488, 3844, 4094, 5147, 5423, 5622, 5853, 5856, 6371, 6680, 6714, 6923, 7490, 7592, 7681, 8267, 8946, 9016, 9120, 9164, 9367, 9997] | 39 |
| [2364, 7914, 5250, 5111, 8673, 1447, 6601, 4277, 5818, 843, 987, 8351, 4603, 3531, 668, 6346, 2353, 9750, 3615, 379, 3952, 1815, 1103, 7891, 8591, 5854, 2365, 700, 167, 6208, 1419, 949, 6055, 6158, 9208, 2603, 1595, 6244, 2509, 4377, 1598] | [167, 379, 668, 700, 843, 949, 987, 1103, 1419, 1447, 1595, 1598, 1815, 2353, 2364, 2365, 2509, 2603, 3531, 3615, 3952, 4277, 4377, 4603, 5111, 5250, 5818, 5854, 6055, 6158, 6208, 6244, 6346, 6601, 7891, 7914, 8351, 8591, 8673, 9208, 9750] | 19 |
| [5539, 2744, 2912, 3006, 3297, 8294, 3338, 9391, 1247, 4087, 2908, 1427, 6283, 1404, 9051, 4008, 1495, 1716, 9040, 3090, 8682, 3176, 5390, 9531, 3686, 7251, 2659, 9160, 1353, 1990, 670, 1902, 2888, 2331, 0, 9173, 8825, 7000, 2438, 683, 8256, 5974] | [0, 670, 683, 1247, 1353, 1404, 1427, 1495, 1716, 1902, 1990, 2331, 2438, 2659, 2744, 2888, 2908, 2912, 3006, 3090, 3176, 3297, 3338, 3686, 4008, 4087, 5390, 5539, 5974, 6283, 7000, 7251, 8256, 8294, 8682, 8825, 9040, 9051, 9160, 9173, 9391, 9531] | 18 |
| [2870, 2188, 1996, 2963, 1911, 6833, 9698, 725, 8518, 5654, 9851, 3856, 4199, 961, 2490, 9898, 5752, 1983, 3120, 7596, 5388, 5457, 4899, 1915, 8535, 1144, 4188, 617, 4805, 6476, 8225, 9590, 3056, 9891, 1715, 1850, 4754, 9792, 1544, 503, 3991, 2554, 2123] | [503, 617, 725, 961, 1144, 1544, 1715, 1850, 1911, 1915, 1983, 1996, 2123, 2188, 2490, 2554, 2870, 2963, 3056, 3120, 3856, 3991, 4188, 4199, 4754, 4805, 4899, 5388, 5457, 5654, 5752, 6476, 6833, 7596, 8225, 8518, 8535, 9590, 9698, 9792, 9851, 9891, 9898] | 18 |
| [7195, 2662, 2671, 8242, 4484, 1458, 3993, 9024, 3383, 1788, 7919, 2796, 7090, 6540, 4735, 131, 4480, 7088, 1179, 7818, 365, 8131, 3201, 6566, 107, 5809, 4239, 95, 7284, 4954, 9031, 738, 129, 4326, 3919, 1366, 1770, 2296, 4125, 3841, 7679, 4150, 1873, 1484] | [95, 107, 129, 131, 365, 738, 1179, 1366, 1458, 1484, 1770, 1788, 1873, 2296, 2662, 2671, 2796, 3201, 3383, 3841, 3919, 3993, 4125, 4150, 4239, 4326, 4480, 4484, 4735, 4954, 5809, 6540, 6566, 7088, 7090, 7195, 7284, 7679, 7818, 7919, 8131, 8242, 9024, 9031] | 20 |
| [4726, 6679, 1843, 1924, 5430, 2494, 1662, 8451, 3316, 7399, 9629, 3278, 1276, 2639, 1222, 400, 5186, 8, 5332, 9304, 3865, 6525, 3657, 5966, 9332, 7123, 163, 3483, 2011, 545, 9598, 617, 7888, 4562, 2139, 7673, 6275, 2488, 8960, 9684, 6883, 7571, 1695, 1412, 406] | [8, 163, 400, 406, 545, 617, 1222, 1276, 1412, 1662, 1695, 1843, 1924, 2011, 2139, 2488, 2494, 2639, 3278, 3316, 3483, 3657, 3865, 4562, 4726, 5186, 5332, 5430, 5966, 6275, 6525, 6679, 6883, 7123, 7399, 7571, 7673, 7888, 8451, 8960, 9304, 9332, 9598, 9629, 9684] | 19 |
| [3826, 1483, 3956, 7914, 3465, 3321, 5957, 1116, 387, 4996, 5362, 5402, 7738, 435, 8390, 9412, 7302, 4766, 3533, 9224, 4898, 4143, 6616, 6863, 9557, 8262, 5829, 6321, 2767, 768, 5055, 1280, 3442, 2696, 5937, 4292, 8740, 5406, 7201, 562, 9762, 744, 2091, 563, 582, 3814] | [387, 435, 562, 563, 582, 744, 768, 1116, 1280, 1483, 2091, 2696, 2767, 3321, 3442, 3465, 3533, 3814, 3826, 3956, 4143, 4292, 4766, 4898, 4996, 5055, 5362, 5402, 5406, 5829, 5937, 5957, 6321, 6616, 6863, 7201, 7302, 7738, 7914, 8262, 8390, 8740, 9224, 9412, 9557, 9762] | 20 |
| [7370, 4418, 1772, 9050, 14, 3734, 2578, 8616, 2523, 4705, 9982, 4458, 7647, 2008, 8980, 8759, 7734, 9188, 2120, 6693, 6273, 3800, 9425, 1772, 2372, 6851, 7823, 637, 7903, 520, 9503, 9715, 2064, 301, 9564, 7209, 7366, 7074, 9896, 701, 4761, 9890, 8299, 4899, 7880, 7742, 5146] | [14, 301, 520, 637, 701, 1772, 1772, 2008, 2064, 2120, 2372, 2523, 2578, 3734, 3800, 4418, 4458, 4705, 4761, 4899, 5146, 6273, 6693, 6851, 7074, 7209, 7366, 7370, 7647, 7734, 7742, 7823, 7880, 7903, 8299, 8616, 8759, 8980, 9050, 9188, 9425, 9503, 9564, 9715, 9890, 9896, 9982] | 23 |
| [5356, 1971, 2616, 3212, 2232, 1339, 5501, 985, 5914, 3638, 4439, 3237, 8572, 999, 562, 7452, 6403, 6942, 6301, 2845, 2003, 3804, 7251, 8252, 5014, 3834, 2939, 7299, 5561, 2954, 1372, 2072, 6328, 8653, 7093, 4933, 7771, 1190, 812, 6292, 176, 1536, 982, 5689, 908, 8796, 2167, 325] | [176, 325, 562, 812, 908, 982, 985, 999, 1190, 1339, 1372, 1536, 1971, 2003, 2072, 2167, 2232, 2616, 2845, 2939, 2954, 3212, 3237, 3638, 3804, 3834, 4439, 4933, 5014, 5356, 5501, 5561, 5689, 5914, 6292, 6301, 6328, 6403, 6942, 7093, 7251, 7299, 7452, 7771, 8252, 8572, 8653, 8796] | 20 |
| [7148, 2077, 8697, 2040, 353, 3992, 4626, 1991, 555, 4773, 1409, 9102, 4885, 1275, 1402, 2439, 3522, 7036, 4115, 2684, 1461, 3404, 4573, 8393, 6375, 1128, 2871, 1430, 2629, 7924, 8095, 1428, 4072, 374, 6971, 8597, 3338, 113, 4679, 4560, 8565, 8212, 527, 8549, 5470, 7701, 5920, 1871, 1026] | [113, 353, 374, 527, 555, 1026, 1128, 1275, 1402, 1409, 1428, 1430, 1461, 1871, 1991, 2040, 2077, 2439, 2629, 2684, 2871, 3338, 3404, 3522, 3992, 4072, 4115, 4560, 4573, 4626, 4679, 4773, 4885, 5470, 5920, 6375, 6971, 7036, 7148, 7701, 7924, 8095, 8212, 8393, 8549, 8565, 8597, 8697, 9102] | 22 |
| [3672, 3914, 8424, 79, 9236, 5672, 9441, 3478, 5847, 771, 2194, 6720, 1465, 7300, 398, 4303, 2031, 4873, 4987, 4502, 5265, 778, 2353, 6363, 7614, 860, 1504, 9612, 3534, 6437, 7863, 4544, 713, 993, 5138, 8400, 3622, 3653, 1764, 9926, 4726, 1314, 741, 4788, 7250, 5548, 2590, 1047, 1154, 4892] | [79, 398, 713, 741, 771, 778, 860, 993, 1047, 1154, 1314, 1465, 1504, 1764, 2031, 2194, 2353, 2590, 3478, 3534, 3622, 3653, 3672, 3914, 4303, 4502, 4544, 4726, 4788, 4873, 4892, 4987, 5138, 5265, 5548, 5672, 5847, 6363, 6437, 6720, 7250, 7300, 7614, 7863, 8400, 8424, 9236, 9441, 9612, 9926] | 21 |
| [1939, 8781, 1759, 8642, 6399, 7350, 4811, 3407, 3158, 3768, 2064, 1282, 5319, 7557, 5911, 3058, 9601, 9824, 6250, 3179, 2329, 3005, 6859, 9868, 3624, 905, 1255, 6497, 5225, 826, 6373, 2716, 3972, 3576, 6659, 9113, 9604, 2701, 1699, 7905, 1424, 6856, 5794, 9440, 6552, 4088, 1546, 4851, 1310, 215, 6024] | [215, 826, 905, 1255, 1282, 1310, 1424, 1546, 1699, 1759, 1939, 2064, 2329, 2701, 2716, 3005, 3058, 3158, 3179, 3407, 3576, 3624, 3768, 3972, 4088, 4811, 4851, 5225, 5319, 5794, 5911, 6024, 6250, 6373, 6399, 6497, 6552, 6659, 6856, 6859, 7350, 7557, 7905, 8642, 8781, 9113, 9440, 9601, 9604, 9824, 9868] | 22 |
| [4036, 2744, 549, 6944, 6073, 5651, 6071, 4207, 8921, 170, 3472, 4690, 6608, 9399, 446, 5173, 8149, 2280, 4136, 239, 8362, 774, 9191, 908, 3941, 2978, 4242, 6570, 7085, 1857, 6830, 8296, 5590, 7562, 6469, 6972, 8304, 5421, 2679, 6052, 6716, 6695, 3823, 5935, 9730, 2019, 7880, 7262, 4063, 2147, 9455, 757] | [170, 239, 446, 549, 757, 774, 908, 1857, 2019, 2147, 2280, 2679, 2744, 2978, 3472, 3823, 3941, 4036, 4063, 4136, 4207, 4242, 4690, 5173, 5421, 5590, 5651, 5935, 6052, 6071, 6073, 6469, 6570, 6608, 6695, 6716, 6830, 6944, 6972, 7085, 7262, 7562, 7880, 8149, 8296, 8304, 8362, 8921, 9191, 9399, 9455, 9730] | 24 |