**Introduction:**

I chose this dataset because it can give us a deeper understanding of how individuals connect and interact with each other online. It can also be very practical for businesses and help them understand what content audiences are attracted to. By using Breadth-First Search, I hope to be able to find mutual connections between the Facebook followers. Furthermore, this project has features finding the shortest paths between nodes and calculating average and median shortest path lengths.

**Code Structure:**

1. **Imports:** The code imports necessary modules from the standard library such as HashMap, HashSet, VecDeequee, Filee, Io, and BuFRead.
2. **SocialNetwork Struct:** This struct represents the social network and contains a HashMap named Edges to store the adjacency list representation of the graph.
3. **Implementation of SocialNetwork:**
   * **load\_from\_txt:** Loads the social network from a text file into memory, assuming each line represents an edge between two nodes.
   * **bfs:** I performs a Breadth-First Search traversal starting from a given node and returns a HashMap containing the distances from the start node to each reachable node.
   * **shortest\_path:** This finds the shortest path between two nodes using BFS and returns the path as a vector of node IDs.
   * **average\_shortest\_path\_length:** It calculates the average shortest path length in the network by iterating over all nodes and computing the average distance.
   * **median\_shortest\_path\_length:** It calculates the median shortest path length in the network by sorting all distances and finding the median.
4. **Main Function:**
   * It first loads the social network from a file.
   * Then it demonstrates example usage of BFS traversal and finding the shortest path between two nodes.
   * Lastly, it calculates and displays the average and median shortest path lengths in the network.

**Conclusion:**

The provided code offers a solid foundation for analyzing social networks, including loading data, traversing the network, finding shortest paths, and computing path lengths.

**Output:**

The output represents the following:

1. **Mutual connections:** This displays the mutual connections starting from node 0, along with their distances from node 0.
2. **Shortest path:** It will show the shortest path from node 1 to node 10.
3. **Average shortest path length:** This will print the average shortest path length in the network.
4. **Median shortest path length:** It should display the median shortest path length in the network.

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3771: 4, 5: 1, 73: 1, 2000: 3, 2375: 3, 3358: 3, 3761: 4, 1186: 2, 3941: 4, 914: 2, 703: 5, 2352: 3, 1408: 2, 81: 1, 1528: 2, 296: 1, 2094: 3, 2395: 3, 1377: 2, 161: 1, 1243: 2, 960: 2, 3204: 3, 1998: 2, 3896: 4, 1228: 2, 2606: 3, 1951: 2, 1800: 2, 3092: 3, 235: 1, 1557: 2, 1310: 2, 403: 3, 3724: 4, 3681: 4, 3791: 4, 3643: 4, 3318: 3, 808: 6, 1375: 2, 744: 6, 2010: 3, 1795: 2, 718: 6, 195: 1, 1057: 2, 1054: 2, 1974: 3, 1802: 2, 3647: 4, 1123: 2, 3944: 4, 1776: 2, 3434: 3, 3882: 4, 3616: 4, 3345: 3, 3201: 3, 2563: 3, 420: 2, 3878: 4, 1749: 2, 3666: 4, 2810: 3, 3538: 4, 1037: 2, 1163: 2, 3924: 4, 229: 1, 1277: 2, 3144: 3, 2203: 2, 3404: 3, 1145: 2, 2295: 3, 783: 6, 780: 6, 999: 2, 2946: 3, 2382: 3, 2331: 3, 3687: 4, 1847: 2, 581: 3, 2445: 2, 1492: 2, 1789: 2, 456: 3, 2099: 3, 2574: 3, 1025: 2, 737: 6, 1734: 2, 1200: 2, 1990: 3, 2551: 3, 3585: 4, 1276: 2, 3136: 3, 3169: 3, 1882: 2, 2726: 3, 3399: 3, 2360: 3, 3514: 4, 1844: 2, 1244: 2, 3512: 4, 1051: 2, 2330: 3, 3545: 4, 2643: 2, 3380: 3, 891: 5, 795: 6, 2235: 3, 3566: 4, 1035: 2, 2482: 3, 2956: 3, 2889: 3, 2106: 3, 636: 3, 702: 6, 1987: 3, 1203: 2, 2965: 3, 1195: 2, 3154: 3, 46: 1, 149: 1, 2961: 3, 1946: 3, 2617: 2, 1572: 2, 494: 3, 572: 3, 2080: 3, 2304: 3, 3299: 3, 30: 1, 3419: 3, 2992: 3, 1448: 2, 2801: 3, 3338: 3, 3751: 4, 627: 3, 1233: 2, 942: 2, 125: 1, 975: 2, 2632: 3, 2927: 3, 3734: 4, 749: 6, 2542: 3, 2857: 3, 3155: 3, 3244: 3, 3006: 3, 1454: 2, 896: 2, 1732: 2, 979: 2, 982: 2, 1673: 2, 1629: 2, 4019: 5, 770: 6, 3367: 3, 3262: 3, 2860: 3, 2891: 3, 3354: 3, 2942: 3, 2126: 3, 3199: 3, 3919: 4, 1868: 2, 2745: 3, 3794: 4, 1843: 2, 1291: 2, 1619: 2, 1337: 2, 1546: 2, 1171: 2, 1183: 2, 445: 3, 258: 1, 2899: 3, 368: 3, 3559: 4, 859: 5, 984: 2, 3123: 3, 2641: 3, 1829: 2, 3175: 3, 3324: 3, 326: 1, 1019: 2, 658: 3, 1013: 2, 683: 3, 3143: 3, 771: 6, 1393: 2, 537: 3, 374: 3, 3117: 3, 1106: 2, 530: 3, 3040: 3, 697: 5, 1597: 2, 3355: 3, 1722: 2, 1615: 2, 2646: 3, 2915: 3, 2328: 3, 1451: 2, 2494: 2, 1115: 2, 2812: 3, 794: 6, 1900: 2, 256: 1, 3781: 4, 3035: 3, 2708: 3, 544: 3, 1618: 2, 1700: 2, 1339: 2, 2830: 3, 3753: 4, 2639: 3, 2988: 3, 3245: 3, 2964: 3, 858: 5, 2341: 3, 2359: 3, 132: 1, 249: 1, 2378: 2, 2460: 3, 2987: 3, 690: 6, 695: 6, 306: 1, 1817: 2, 1642: 2, 540: 3, 3149: 3, 2585: 3, 3156: 3, 3696: 4, 232: 1, 1381: 2, 116: 1, 2744: 3, 562: 3, 2774: 3, 2285: 3, 2531: 3, 401: 3, 555: 3, 2722: 3, 1059: 2, 3731: 4, 2642: 3, 2169: 3, 3580: 4, 56: 1, 190: 1, 3198: 3, 2693: 3, 2766: 3, 1672: 2, 972: 2, 2552: 3, 2402: 3, 2789: 3, 3986: 5, 3002: 3, 356: 3, 2385: 3, 1853: 2, 2844: 3, 3024: 3, 3158: 3, 3471: 4, 450: 3, 3836: 4, 1866: 2, 2357: 3, 2581: 3, 2313: 3, 2201: 3, 3540: 3, 582: 3, 1323: 2, 1034: 2, 684: 3, 2602: 3, 2096: 3, 1074: 2, 449: 3, 1206: 2, 3137: 3, 1212: 2, 1498: 2, 3531: 4, 3983: 5, 2162: 3, 623: 3, 2364: 2, 2982: 3, 836: 6, 800: 5, 207: 1, 3189: 3, 1604: 2, 2253: 3, 160: 1, 319: 1, 3346: 3, 3114: 3, 1656: 2, 69: 1, 1664: 2, 1110: 2, 419: 3, 1814: 2, 3266: 3, 3046: 3, 2730: 3, 1433: 2, 2343: 3, 784: 6, 2904: 3, 2213: 3, 826: 6, 227: 1, 3381: 3, 3780: 4, 1837: 2, 1610: 2, 1527: 2, 2178: 3, 3203: 3, 2818: 3, 3105: 3, 3745: 4, 731: 6, 3339: 3, 913: 2, 986: 2, 3657: 4, 1119: 2, 1231: 2, 1634: 2, 825: 5, 312: 1, 1070: 2, 3861: 4, 3741: 3, 1112: 2, 2603: 3, 2527: 3, 3689: 4, 1956: 3, 3444: 4, 964: 2, 2062: 3, 3990: 5, 656: 3, 1024: 2, 1788: 2, 20: 1, 2483: 3, 2614: 3, 1733: 2, 1641: 2, 107: 1, 2971: 3, 1398: 2, 3497: 4, 1379: 2, 3821: 4, 225: 1, 665: 3, 4031: 4, 288: 1, 3291: 3, 3876: 4, 1871: 2, 3315: 3, 3982: 5, 3415: 3, 1255: 2, 2545: 3, 1162: 2, 2621: 3, 2380: 3, 1479: 2, 3570: 4, 1922: 3, 25: 1, 1502: 2, 2568: 3, 1176: 2, 655: 3, 552: 3, 1321: 2, 1082: 2, 1931: 3, 622: 3, 1861: 2, 2023: 3, 2405: 3, 3898: 4, 3726: 4, 1755: 2, 2048: 3, 1981: 3, 3997: 5, 685: 3, 2625: 3, 3053: 3, 931: 2, 3177: 3, 3961: 4, 3163: 3, 370: 3, 3484: 4, 274: 1, 2243: 3, 3637: 4, 2896: 3, 2717: 3, 3868: 4, 3359: 3, 1785: 2, 1413: 2, 705: 6, 2539: 3, 3184: 3, 2856: 3, 291: 1, 3511: 4, 2596: 3, 2018: 2, 3999: 5, 223: 1, 2651: 3, 504: 3, 2115: 3, 316: 1, 1624: 2, 2610: 3, 3319: 3, 2361: 3, 3762: 4, 2269: 3, 3891: 4, 1012: 2, 3478: 4, 158: 1, 3913: 4, 2741: 3, 3001: 3, 1622: 2, 3665: 4, 1050: 2, 2185: 3, 1011: 2, 389: 2, 632: 3, 2697: 3, 3638: 4, 3636: 4, 371: 3, 331: 1, 542: 3, 259: 1, 1552: 2, 2845: 3, 290: 1, 434: 3, 3817: 4, 213: 1, 832: 6, 49: 1, 1949: 3, 525: 3, 2004: 2, 375: 3, 1997: 3, 646: 3, 2270: 3, 1293: 2, 1585: 2, 2536: 3, 3343: 3, 3673: 4, 3397: 3, 3041: 3, 51: 1, 746: 6, 3065: 3, 3904: 4, 3718: 4, 981: 2, 980: 2, 3612: 4, 707: 6, 2248: 3, 2820: 3, 2377: 3, 1151: 2, 3828: 4, 1399: 2, 441: 2, 1362: 2, 3965: 4, 1898: 2, 1284: 2, 3940: 4, 970: 2, 448: 3, 1156: 2, 2417: 2, 2155: 3, 188: 1, 1487: 2, 1668: 2, 1519: 2, 421: 3, 70: 1, 558: 3, 1963: 3, 2612: 3, 3435: 3, 2699: 3, 234: 1, 3537: 4, 1056: 2, 2215: 3, 2695: 3, 3774: 4, 2913: 3, 3946: 4, 4001: 5, 110: 1, 438: 3, 2191: 3, 3470: 4, 3257: 3, 191: 1, 963: 2, 1627: 2, 219: 1, 1839: 2, 3361: 3, 3221: 3, 3954: 4, 3506: 4, 3851: 3, 1009: 2, 988: 2, 2995: 3, 886: 5, 1187: 2, 2252: 3, 1095: 2, 1158: 2, 1682: 2, 74: 1, 1760: 2, 2907: 3, 430: 3, 1646: 2, 2274: 3, 3728: 4, 3682: 4, 1225: 2, 402: 3, 1072: 2, 3344: 3, 3740: 4, 3920: 4, 712: 6, 16: 1, 1367: 2, 3743: 4, 3009: 3, 2300: 3, 3230: 3, 668: 3, 3122: 3, 462: 3, 3732: 4, 1373: 2, 1364: 2, 1522: 2, 1422: 2, 2195: 3, 2029: 3, 3067: 3, 3683: 4, 2072: 2, 2425: 3, 1340: 2, 399: 2, 3487: 4, 3128: 3, 87: 1, 2497: 3, 2747: 3, 3146: 3, 2680: 3, 2308: 3, 2573: 3, 3730: 4, 1598: 2, 3008: 3, 1237: 2, 89: 1, 3842: 4, 2237: 3, 594: 3, 3242: 3, 2258: 3, 2271: 3, 1077: 2, 1374: 2, 3102: 3, 318: 1, 1105: 2, 1617: 2, 2254: 2, 3578: 4, 2090: 3, 3932: 4, 3712: 4, 53: 1, 2174: 2, 3313: 3, 2430: 3, 2419: 3, 3922: 4, 1283: 2, 3776: 4, 973: 2, 4025: 5, 3872: 3, 3224: 3, 2776: 3, 35: 1, 3078: 3, 2622: 3, 299: 1, 2752: 3, 1139: 2, 3432: 3, 3479: 4, 2247: 2, 1480: 2, 2873: 3, 314: 1, 4007: 5, 2238: 3, 2397: 3, 217: 1, 3018: 3, 1307: 2, 915: 2, 3210: 3, 271: 1, 1081: 2, 3140: 3, 1657: 2, 3243: 3, 2865: 3, 3428: 3, 1579: 2, 844: 6, 3502: 4, 2358: 3, 2457: 3, 3956: 4, 1168: 2, 486: 3, 588: 3, 2864: 3, 1503: 2, 3642: 4, 3547: 4, 741: 6, 674: 3, 2444: 3, 3855: 4, 431: 3, 2709: 3, 1841: 2, 520: 3, 1456: 2, 1698: 2, 510: 3, 2796: 3, 3820: 4, 3883: 4, 861: 5, 3007: 3, 57: 1, 1217: 2, 2920: 3, 1197: 2, 3874: 4, 3921: 4, 2441: 3, 793: 6, 2433: 3, 2884: 3, 2827: 3, 3408: 3, 289: 1, 1213: 2, 2757: 3, 3672: 4, 2733: 3, 1390: 2, 2014: 3, 47: 1, 1262: 2, 3423: 3, 1932: 2, 1992: 3, 1913: 3, 3826: 4, 1798: 2, 3464: 4, 2578: 3, 3390: 3, 1026: 2, 517: 2, 1762: 2, 298: 1, 361: 3, 1508: 2, 2661: 3, 1862: 2, 477: 3, 1474: 2, 3447: 4, 910: 2, 1953: 3, 1488: 2, 1717: 2, 3069: 3, 3265: 3, 3935: 4, 719: 5, 255: 1, 1016: 2, 1704: 2, 2530: 3, 2244: 3, 541: 3, 1020: 2, 3473: 4, 2146: 3, 1758: 2, 3302: 3, 1960: 3, 3985: 5, 1806: 2, 822: 6, 2859: 3, 1102: 2, 2700: 3, 205: 1, 1684: 2, 323: 1, 2898: 3, 1235: 2, 3857: 4, 2944: 3, 1010: 2, 1014: 2, 1309: 2, 580: 2, 1623: 2, 1167: 2, 3830: 3, 1006: 2, 124: 1, 2605: 3, 1636: 2, 2645: 3, 902: 2, 1750: 2, 991: 2, 2059: 3, 2293: 3, 3564: 4, 159: 1, 178: 1, 388: 3, 1885: 2, 2324: 3, 2452: 3, 3613: 4, 3256: 3, 1257: 2, 1182: 2, 3448: 4, 4021: 5, 969: 2, 77: 1, 4027: 5, 1942: 3, 2199: 2, 2678: 3, 3784: 4, 1394: 2, 2279: 2, 2786: 3, 2909: 3, 3401: 3, 3877: 3, 3232: 3, 3207: 3, 2030: 3, 906: 2, 1831: 2, 1570: 2, 2479: 3, 3656: 4, 704: 6, 2009: 2, 3825: 4, 2386: 3, 539: 3, 2513: 3, 3528: 4, 1721: 2, 2826: 3, 899: 2, 2716: 3, 475: 2, 508: 3, 1392: 2, 2847: 3, 1607: 2, 3347: 3, 2154: 3, 3211: 3, 2832: 3, 3461: 4, 3923: 4, 3272: 3, 735: 6, 2133: 2, 3260: 3, 925: 2, 3603: 4, 3706: 4, 2854: 3, 774: 5, 2652: 3, 2767: 3, 3495: 3, 3951: 4, 2256: 3, 976: 2, 3852: 4, 2011: 3, 3972: 4, 382: 3, 1797: 2, 1177: 2, 2694: 3, 3060: 3, 2938: 3, 1423: 2, 3363: 3, 2167: 3, 3309: 3, 1278: 2, 2224: 2, 1028: 2, 133: 1, 2165: 3, 437: 3, 2163: 3, 957: 2, 3618: 4, 1224: 2, 381: 3, 1906: 2, 2193: 3, 2650: 3, 2342: 3, 1136: 2, 2069: 3, 1825: 2, 3664: 4, 2510: 2, 383: 3, 1985: 3, 182: 1, 1637: 2, 1855: 2, 3042: 3, 1357: 2, 3475: 4, 1431: 2, 260: 1, 1550: 2, 2555: 3, 2813: 3, 315: 1, 1048: 2, 3425: 3, 1482: 2, 2043: 3, 769: 5, 2861: 3, 2572: 3, 396: 3, 985: 2, 1122: 2, 2480: 3, 630: 3, 2960: 3, 2093: 3, 3858: 4, 1645: 2, 163: 1, 2591: 3, 869: 5, 2735: 3, 1486: 2, 944: 2, 934: 2, 617: 3, 2101: 3, 3164: 3, 2903: 3, 3989: 4, 2656: 3, 3449: 4, 631: 3, 329: 1, 1688: 2, 1779: 2, 2272: 3, 883: 5, 2033: 3, 1223: 2, 664: 3, 549: 2, 1354: 2, 66: 1, 3677: 3, 2381: 3, 1860: 2, 2623: 3, 3873: 4, 3674: 3, 1547: 2, 3909: 4, 3778: 4, 2469: 3, 654: 3, 590: 3, 2724: 3, 1447: 2, 3384: 3, 1586: 2, 3141: 3, 3654: 4, 2734: 3, 805: 5, 1549: 2, 216: 1, 2400: 3, 2985: 3, 1542: 2, 2793: 3, 995: 2, 2420: 3, 3145: 3, 3190: 3, 3043: 3, 2720: 3, 3138: 3, 3798: 4, 2095: 3, 3225: 3, 1324: 2, 1348: 2, 1366: 2, 1450: 2, 38: 1, 2448: 3, 446: 3, 2451: 2, 3438: 4, 2321: 3, 1108: 2, 3106: 3, 3233: 3, 1306: 2, 2493: 3, 1927: 3, 2868: 3, 2877: 3, 152: 1, 3527: 4, 2070: 3, 3759: 4, 3699: 4, 2858: 3, 1556: 2, 2307: 3, 1545: 2, 1952: 3, 855: 6, 338: 1, 3356: 3, 1582: 2, 50: 1, 766: 6, 2848: 3, 680: 3, 3396: 3, 3693: 4, 797: 6, 3553: 4, 3738: 4, 1708: 2, 816: 6, 3337: 3, 3927: 4, 2963: 3, 3037: 3, 1040: 2, 1305: 2, 3025: 3, 762: 6, 10: 1, 900: 2, 113: 1, 1663: 2, 2770: 3, 42: 1, 1461: 2, 1361: 2, 1569: 2, 2978: 3, 2472: 2, 2298: 3, 317: 1, 2217: 3, 1111: 2, 3472: 4, 2660: 2, 2627: 3, 3620: 4, 2780: 3, 2471: 2, 2467: 3, 1877: 2, 1996: 3, 998: 2, 2577: 3, 3854: 4, 3481: 4, 2773: 3, 52: 1, 1098: 2, 621: 3, 2374: 3, 2074: 3, 1872: 2, 1271: 2, 756: 6, 2172: 3, 3036: 3, 3151: 3, 349: 3, 514: 3, 734: 6, 2846: 3, 657: 3, 2736: 3, 679: 3, 379: 3, 3755: 4, 2647: 2, 2936: 3, 2476: 3, 3770: 4, 1826: 2, 1415: 2, 2296: 3, 1298: 2, 3206: 3, 2701: 3, 1470: 2, 2294: 3, 3084: 3, 100: 1, 91: 1, 1833: 2, 2538: 2, 660: 3, 3777: 4, 372: 3, 3246: 3, 281: 1, 2373: 3, 2442: 3, 439: 3, 3785: 4, 536: 3, 2465: 3, 1523: 2, 2473: 3, 266: 1, 3066: 3, 3492: 4, 3711: 4, 743: 6, 2266: 3, 3173: 2, 19: 1, 1192: 2, 1328: 2, 272: 1, 2535: 3, 2008: 3, 1140: 2, 2396: 3, 32: 1, 1481: 2, 1434: 2, 786: 6, 2429: 3, 1638: 2, 3258: 3, 2148: 3, 2277: 3, 3881: 4, 907: 2, 2986: 3, 2636: 2, 1748: 2, 2002: 3, 112: 1, 1954: 3, 2306: 3, 3768: 4, 1455: 2, 130: 1, 2837: 3, 3597: 4, 1526: 2, 1404: 2, 2003: 3, 3277: 3, 2064: 3, 1765: 2, 2347: 3, 2229: 3, 353: 2, 3631: 4, 3097: 3, 2086: 3, 3975: 4, 3698: 4, 3000: 3, 2496: 3, 1504: 2, 455: 3, 3139: 3, 1947: 3, 3494: 4, 3110: 3, 3646: 4, 3275: 3, 3818: 4, 535: 3, 2953: 3, 833: 6, 3835: 4, 1043: 2, 2399: 3, 3217: 3, 1073: 2, 2882: 3, 3676: 4, 3953: 4, 548: 3, 691: 6, 1740: 2, 1995: 2, 214: 1, 2691: 3, 2020: 3, 1360: 2, 2221: 3, 94: 1, 212: 1, 3431: 3, 340: 1, 3349: 3, 1249: 2, 233: 1, 292: 1, 1565: 2, 1194: 2, 1567: 2, 2232: 3, 729: 5, 2045: 3, 3667: 4, 694: 6, 1563: 2, 3467: 4, 1728: 2, 1558: 2, 940: 2, 2991: 3, 3942: 4, 3113: 3, 2799: 3, 3274: 3, 3083: 3, 3212: 3, 12: 1, 294: 1, 1811: 2, 3606: 4, 1100: 2, 2088: 3, 3124: 3, 3062: 3, 345: 1, 3703: 4, 809: 6, 202: 1, 689: 6, 1593: 2, 801: 6, 1512: 2, 1680: 2, 1147: 2, 3943: 3, 3715: 4, 1268: 2, 3307: 3, 3947: 4, 3593: 4, 3412: 3, 1643: 2, 1584: 2, 2674: 3, 3288: 3, 3452: 4, 1352: 2, 3969: 4, 1592: 2, 3166: 3, 287: 1, 3335: 3, 2016: 3, 1921: 3, 1821: 2, 352: 3, 2842: 3, 710: 6, 1319: 2, 3107: 3, 1138: 2, 2517: 3, 2902: 3, 721: 6, 1576: 2, 515: 3, 408: 3, 611: 3, 3984: 5, 880: 5, 3341: 3, 785: 6, 169: 1, 3218: 3, 1753: 2, 1003: 2, 3523: 4, 1380: 2, 1631: 2, 1791: 2, 3524: 4, 176: 1, 1973: 2, 3542: 4, 333: 1, 2996: 3, 3813: 4, 3457: 4, 3453: 4, 663: 3, 1902: 2, 1694: 2, 2969: 3, 3503: 4, 593: 3, 1174: 2, 3483: 4, 3901: 4, 638: 3, 597: 3, 1444: 2, 2712: 3, 2052: 3, 711: 6, 490: 3, 2521: 3, 3560: 4, 773: 6, 327: 1, 3388: 3, 2949: 3, 3670: 4, 2132: 3, 3045: 3, 2140: 3, 2262: 3, 2428: 3, 2654: 3, 2087: 3, 3323: 3, 1764: 2, 147: 1, 3450: 4, 905: 2, 3633: 3, 1449: 2, 2940: 3, 1738: 2, 2177: 3, 3021: 3, 1863: 2, 2768: 3, 3591: 4, 2710: 3, 2635: 2, 1676: 2, 924: 2, 3403: 3, 736: 6, 1302: 2, 2968: 3, 3539: 4, 3100: 3, 3414: 3, 461: 3, 959: 2, 3704: 4, 2669: 3, 3080: 3, 3804: 4, 3112: 3, 2206: 3, 681: 3, 3099: 3, 2677: 3, 3411: 3, 3867: 4, 3161: 3, 1613: 2, 2309: 3, 237: 1, 1671: 2, 2411: 3, 3875: 4, 3278: 3, 2403: 3, 3445: 4, 1401: 2, 1856: 2, 1842: 2, 864: 5, 1086: 2, 3019: 3, 1903: 2, 2921: 3, 3939: 4, 779: 6, 2111: 2, 278: 1, 1218: 2, 851: 6, 3057: 3, 164: 1, 2180: 2, 2831: 3, 3172: 3, 3760: 4, 2923: 3, 2807: 3, 1845: 2, 347: 1, 1376: 2, 2311: 3, 3971: 4, 31: 1, 276: 1, 1089: 2, 3072: 3, 1334: 2, 3229: 3, 3202: 3, 2999: 3, 3458: 4, 119: 1, 1137: 2, 2890: 3, 1417: 2, 2371: 3, 946: 2, 2038: 2, 3607: 4, 253: 1, 2562: 3, 3827: 4, 3510: 4, 3351: 3, 757: 6, 2205: 3, 1322: 2, 2141: 3, 1820: 2, 2748: 3, 3417: 3, 2618: 3, 1135: 2, 3859: 4, 2137: 3, 464: 2, 2325: 3, 3522: 4, 3254: 3, 3439: 4, 2670: 3, 2684: 3, 538: 2, 2388: 3, 901: 2, 791: 6, 268: 1, 519: 3, 871: 5, 1714: 2, 392: 3, 2852: 3, 1780: 2, 3352: 3, 3571: 4, 1644: 2, 1274: 2, 1169: 2, 101: 1, 2534: 3, 2729: 3, 118: 1, 2283: 2, 2340: 3, 3841: 4, 840: 5, 248: 1, 1945: 2, 2350: 3, 3090: 3, 1383: 2, 282: 1, 4034: 5, 777: 6, 2061: 3, 2512: 3, 2524: 3, 3429: 3, 2303: 3, 76: 1, 3988: 5, 2490: 3, 1562: 2, 1181: 2, 2432: 3, 2707: 3, 2200: 3, 1347: 2, 2166: 3, 2933: 3, 1378: 2, 2951: 3, 1261: 2, 3263: 3, 444: 3, 1442: 2, 1113: 2, 1805: 2, 2130: 3, 2147: 3, 1822: 2, 2532: 3, 733: 6, 852: 6, 2015: 3, 1329: 2, 2523: 3, 2389: 3, 3992: 5, 829: 6, 1142: 2, 613: 3, 1711: 2, 2489: 3, 1920: 3, 3554: 4, 3622: 4, 1295: 2, 2862: 3, 3796: 4, 3075: 3, 1875: 2, 2560: 3, 492: 3, 2046: 3, 1314: 2, 3903: 4, 485: 3, 3295: 3, 2607: 3, 1039: 2, 2592: 3, 1815: 2, 54: 1, 103: 1, 2794: 3, 366: 2, 2416: 3, 2037: 3, 3314: 3, 922: 2, 1904: 2, 313: 1, 3325: 3, 2470: 3, 3981: 5, 186: 1, 2083: 3, 3963: 4, 3271: 3, 3329: 3, 277: 1, 3962: 3, 2138: 2, 1403: 2, 978: 2, 2604: 3, 2353: 3, 2260: 3, 2379: 3, 1178: 2, 1216: 2, 837: 6, 1491: 2, 2565: 3, 3623: 4, 834: 6, 1227: 2, 2156: 3, 1917: 3, 2089: 3, 3614: 4, 1573: 2, 189: 1, 2427: 3, 639: 3, 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1854: 2, 1180: 2, 1118: 2, 700: 6, 1529: 2, 577: 3, 2125: 3, 1709: 2, 243: 1, 3889: 4, 1266: 2, 3871: 4, 2461: 2, 2: 1, 856: 5, 1148: 2, 1703: 2, 3661: 4, 1252: 2, 522: 3, 3934: 4, 881: 5, 2053: 3, 143: 1, 460: 3, 1999: 3, 2319: 2, 1256: 2, 1928: 3, 2544: 3, 3929: 4, 1770: 2, 96: 1, 1234: 2, 1282: 2, 2082: 3, 3261: 3, 3536: 4, 820: 6, 666: 3, 2723: 3, 3626: 4, 653: 3, 751: 6, 2431: 3, 3280: 3, 3474: 4, 3543: 4, 1338: 2, 2511: 2, 1884: 2, 2462: 3, 2522: 3, 3421: 3, 3879: 4, 3725: 4, 2391: 3, 722: 6, 3749: 4, 2372: 3, 4026: 5, 376: 2, 3719: 4, 1926: 2, 2230: 3, 2814: 2, 1989: 3, 3130: 3, 662: 3, 3884: 4, 3837: 4, 815: 6, 2413: 3, 1253: 2, 111: 1, 1970: 3, 60: 1, 2100: 3, 2662: 3, 65: 1, 951: 2, 1683: 2, 3688: 4, 3722: 4, 1681: 2, 3695: 4, 1468: 2, 1823: 2, 1693: 2, 43: 1, 2121: 3, 4002: 5, 2783: 3, 3584: 4, 2394: 3, 267: 1, 1692: 2, 2782: 3, 1889: 2, 1124: 2, 2110: 3, 4004: 5, 3003: 2, 605: 3, 2853: 3, 3900: 4, 2044: 3, 1170: 2, 2149: 3, 1933: 3, 598: 3, 3856: 4, 252: 1, 3519: 4, 3615: 4, 2362: 3, 1880: 2, 426: 3, 3195: 3, 921: 2, 2239: 3, 2184: 3, 3214: 3, 3120: 3, 3930: 4, 1464: 2, 2323: 3, 2316: 3, 1427: 2, 496: 3, 2288: 3, 3125: 3, 1126: 2, 1524: 2, 3786: 4, 799: 6, 346: 1, 2348: 3, 2228: 3, 2050: 3, 1751: 2, 566: 2, 428: 2, 3548: 4, 1661: 2, 882: 5, 3949: 4, 1896: 2, 2533: 2, 1007: 2, 2930: 3, 2808: 3, 3264: 3, 3684: 3, 2595: 3, 3601: 4, 2412: 3, 3869: 4, 821: 6, 2815: 3, 2756: 3, 2196: 3, 418: 3, 1746: 2, 192: 1, 1965: 3, 2159: 3, 3029: 3, 2338: 3, 1229: 2, 1505: 2, 3208: 3, 1517: 2, 997: 2, 3064: 3, 758: 6, 2526: 3, 1036: 2, 468: 3, 3159: 3, 3602: 4, 416: 3, 1326: 2, 1736: 2, 1313: 2, 135: 1, 14: 1, 3273: 3, 1713: 2, 2291: 3, 2550: 3, 2785: 3, 923: 2, 75: 1, 196: 1, 1535: 2, 92: 1, 574: 3, 842: 6, 1440: 2, 584: 3, 1114: 2, 3176: 3, 1564: 2, 3628: 4, 2925: 3, 2870: 3, 644: 3, 904: 2, 1332: 2, 3094: 3, 172: 1, 18: 1, 1311: 2, 1211: 2, 367: 3, 1725: 2, 302: 1, 893: 5, 3908: 4, 778: 6, 3508: 4, 1022: 2, 1600: 2, 2557: 3, 3023: 3, 285: 1, 2824: 3, 2152: 3, 453: 3, 2828: 3, 3056: 3, 967: 2, 2932: 3, 3945: 4, 1188: 2, 601: 2, 3055: 3, 273: 1, 254: 1, 2104: 3, 4015: 5, 2590: 3, 2168: 3, 3702: 4, 2197: 3, 3912: 4, 3167: 3, 2638: 3, 1204: 2, 2586: 3, 3617: 4, 0: 0, 845: 6, 478: 3, 1796: 2, 1264: 2, 390: 3, 208: 1, 1632: 2, 1371: 2, 2624: 3, 2516: 3, 45: 1, 1220: 2, 82: 1, 261: 1, 1385: 2, 583: 3, 2212: 3, 965: 2, 3392: 3, 2007: 2, 3185: 3, 1466: 2, 2575: 3, 3482: 4, 1783: 2, 3850: 4, 3500: 4, 1915: 3, 2564: 3, 2204: 3, 2895: 3, 1599: 2, 2683: 3, 373: 3, 1432: 2, 3634: 4, 952: 2, 488: 3, 3501: 3, 1094: 2, 3669: 4, 2803: 3, 2834: 3, 3862: 4, 1412: 2, 1743: 2, 1707: 2, 1639: 2, 560: 3, 93: 1, 1250: 2, 1536: 2, 3960: 4, 2777: 3, 1270: 2, 1687: 2, 244: 1, 1781: 2, 596: 2, 2418: 3, 1744: 2, 2297: 3, 2336: 2, 3103: 3, 3165: 3, 2888: 3, 2226: 3, 812: 6, 2994: 3, 1757: 2, 2620: 3, 3223: 3, 3926: 4, 61: 1, 955: 2, 1500: 2, 659: 3, 1850: 2, 3823: 4, 3486: 4, 2019: 3, 262: 1, 397: 3, 1948: 3, 3955: 4, 44: 1, 2519: 3, 3300: 3, 3513: 4, 2092: 3, 3583: 4, 2198: 3, 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2, 2024: 2, 1308: 2, 534: 3, 1219: 2, 380: 3, 2423: 3, 2318: 3, 3910: 4, 949: 2, 141: 1, 1001: 2, 2866: 3, 1239: 2, 1370: 2, 4000: 5, 1103: 2, 1406: 2, 1754: 2, 1724: 2, 500: 3, 2105: 3, 3082: 3, 2976: 3, 2663: 3, 3032: 3, 3014: 3, 796: 6, 1076: 2, 1172: 2, 1686: 2, 2241: 3, 1775: 2, 240: 1, 2885: 2, 603: 3, 1429: 2, 661: 3, 2263: 3, 781: 6, 1696: 2, 2422: 3, 930: 2, 2833: 3, 1407: 2, 2755: 3, 788: 6, 466: 3, 2871: 3, 1117: 2, 3052: 3, 2509: 3, 499: 3, 2219: 3, 3178: 3, 2242: 3, 3680: 4, 1272: 2, 505: 3, 3077: 3, 2273: 3, 2118: 3, 3979: 4, 2097: 3, 3816: 4, 848: 6, 2339: 3, 1153: 2, 606: 2, 667: 3, 642: 3, 599: 3, 2588: 3, 2278: 3, 1346: 2, 3907: 4, 692: 6, 1940: 3, 2629: 2, 1511: 2, 831: 6, 209: 1, 3958: 4, 3853: 4, 3991: 5, 3342: 3, 3332: 3, 2257: 3, 1495: 2, 870: 5, 404: 3, 1660: 2, 3629: 4, 516: 3, 3911: 4, 4036: 5, 616: 3, 625: 3, 1369: 2, 720: 6, 218: 1, 3459: 4, 2363: 3, 3551: 4, 3834: 4, 1104: 2, 850: 6, 3118: 3, 911: 2, 432: 3, 1768: 2, 1097: 2, 553: 3, 3013: 3, 3231: 3, 3812: 4, 2077: 3, 1342: 2, 3227: 3, 699: 6, 2601: 3, 1541: 2, 2779: 3, 4028: 5, 136: 1, 3894: 4, 790: 6, 619: 3, 1199: 2, 301: 1, 1343: 2, 1209: 2, 2176: 3, 2284: 2, 24: 1, 1890: 2, 954: 2, 2655: 3, 307: 1, 2478: 3, 2950: 3, 2765: 3, 3463: 4, 3663: 4, 1441: 2, 3532: 4, 860: 3, 80: 1, 1655: 2, 2286: 3, 467: 3, 3443: 4, 2332: 3, 2659: 3, 177: 1, 3051: 3, 2746: 3, 945: 2, 476: 2, 425: 3, 2821: 3, 2049: 3, 3793: 4, 483: 2, 8: 1, 2764: 3, 2689: 3, 1991: 2, 3026: 3, 585: 3, 1678: 2, 824: 6, 3655: 4, 3424: 3, 1141: 2, 926: 2, 513: 3, 4010: 5, 3716: 4, 2554: 3, 823: 5, 3552: 4, 669: 3, 2301: 3, 2809: 3, 480: 3, 3694: 4, 1439: 2, 701: 6, 1807: 2, 3109: 3, 2182: 3, 3639: 4, 2792: 3, 1857: 2, 1469: 2, 2676: 3, 2414: 3, 3374: 3, 3209: 3, 2261: 3, 1620: 2, 2084: 3, 3998: 5, 1459: 2, 1964: 3, 1017: 2, 3379: 3, 853: 6, 1121: 2, 586: 3, 2980: 3, 2144: 3, 3518: 4, 3398: 3, 2501: 3, 3782: 4, 4029: 5, 2225: 2, 2529: 2, 2153: 2, 3567: 4, 102: 1, 239: 1, 2613: 3, 3589: 4, 1389: 2, 1609: 2, 1294: 2, 1961: 3, 2477: 3, 2977: 3, 567: 3, 2628: 3, 3700: 4, 2692: 3, 3838: 4, 1520: 2, 250: 1, 3134: 3, 2626: 3, 1621: 2, 1320: 2, 2474: 3, 3788: 4, 3608: 4, 1416: 2, 2867: 3, 3792: 4, 933: 2, 3306: 3, 724: 6, 629: 2, 503: 3, 787: 6, 1939: 2, 1465: 2, 3409: 3, 3327: 3, 129: 1, 3022: 3, 3819: 4, 3171: 3, 1838: 2, 2314: 3, 3800: 4, 4018: 5, 221: 1, 2644: 3, 3305: 3, 293: 1, 3505: 4, 1809: 2, 2525: 3, 2280: 3, 154: 1, 772: 5, 1335: 2, 1438: 2, 2322: 3, 3757: 4, 251: 1, 2547: 2, 1719: 2, 2500: 3, 1911: 2, 2798: 3, 2214: 3, 157: 1, 3549: 4, 3577: 3, 3766: 4, 828: 5, 3410: 3, 3840: 4, 2142: 3, 3386: 3, 1345: 2, 325: 1, 2739: 3, 1143: 2, 1330: 2, 407: 3, 3811: 4, 994: 2, 1460: 2, 1538: 2, 3849: 4, 491: 3, 2990: 3, 1368: 2, 2576: 3, 706: 6, 2123: 3, 595: 3, 559: 3, 2934: 3, 3727: 4, 649: 2, 1729: 2, 139: 1, 879: 5, 592: 3, 79: 1, 2292: 2, 2690: 3, 2851: 3, 58: 1, 1715: 2, 3701: 4, 2559: 3, 3460: 4, 114: 1, 564: 2, 950: 2, 156: 1, 2179: 3, 2711: 3, 23: 1, 1292: 2, 339: 1, 3866: 4, 1654: 2, 2450: 3, 2438: 3, 1792: 2, 3807: 4, 1149: 2, 1534: 2, 739: 6, 3530: 4, 1773: 2, 3372: 3, 512: 3, 838: 6, 1042: 2, 2492: 3, 1916: 3, 1421: 2, 2817: 3, 3995: 5, 2320: 3, 3181: 3, 1090: 2, 993: 2, 1602: 2, 2631: 3, 2962: 3, 745: 5, 3863: 4, 121: 1, 2979: 3, 3641: 4, 753: 5, 1052: 2, 72: 1, 2456: 3, 470: 3, 2208: 3, 3596: 4, 3645: 4, 322: 1, 2916: 3, 3895: 4, 817: 6, 521: 3, 3950: 4, 675: 3, 3690: 4, 447: 3, 3546: 4, 1242: 2, 9: 1, 3767: 4, 1067: 2, 1396: 2, 608: 3, 1957: 3, 3914: 4, 962: 2, 86: 1, 1689: 2, 1851: 2, 2466: 3, 2005: 3, 2894: 3, 941: 2, 2742: 3, 3586: 4, 3238: 3, 3587: 4, 3148: 3, 2869: 3, 170: 1, 3824: 4, 3285: 3, 3093: 3, 1763: 2, 1247: 2, 1883: 2, 354: 3, 228: 1, 2970: 3, 2078: 3, 3310: 3, 1539: 2, 2728: 3, 3249: 3, 3191: 3, 943: 2, 3436: 3, 29: 1, 2649: 2, 1245: 2, 134: 1, 873: 5, 1254: 2, 1685: 2, 2275: 3, 3330: 3, 3437: 3, 3936: 4, 1669: 2, 1756: 2, 1555: 2, 2098: 3, 2609: 3, 1731: 2, 2054: 2, 1341: 2, 3402: 3, 874: 5, 2194: 3, 1336: 2, 884: 5, 3469: 4, 3268: 3, 2246: 3, 2454: 3, 1490: 2, 647: 3, 1923: 3, 2034: 3, 2249: 3, 3833: 4, 3476: 4, 1608: 2, 3561: 3, 342: 1, 3468: 4, 2202: 3, 3499: 4, 2872: 3, 286: 1, 3377: 3, 3658: 4, 391: 3, 27: 1, 1327: 2, 2571: 2, 3562: 4, 1232: 2, 1033: 2, 2259: 3, 1144: 2, 3375: 3, 1301: 2, 2233: 3, 3297: 3, 2223: 2, 2505: 3, 497: 3, 3860: 4, 423: 3, 3048: 3, 405: 3}

Shortest path from 1 to 10: [1, 0, 10]

Average shortest path length: 3.691592636562027

Median shortest path length: 4