

**GTU Department of
Computer Engineering
CSE 222/505 - Spring 2021
Homework 7
Part 3 Report**

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10000-20000 OUTPUT

*****FOR 10000*****

Binary Search tree:

75466600

Insert 100 extra random numbers BST

75733000

Average running time :7546

Red Black Tree Time:

94283600

Insert 100 extra random numbers RBT

94502900

Average running time :9428

2-3 Tree Time:

90612600

Insert 100 extra random numbers 2-3 Tree

90826400

Average running time :9061

B-Tree Time:

185278300

Insert 100 extra random numbers BTree

187696200

Average running time :18527

Skip List Time:

948914700

Insert 100 extra random numbers Skip-list

950022100

Average running time :94891

*****FOR 20000*****

Binary Search tree:

197448900

Insert 100 extra random numbers BST

197685300

Average running time :9872

Red Black Tree Time:

204357700

Insert 100 extra random numbers RBT

204564300

Average running time :10217

2-3 Tree Time:

122122600

Insert 100 extra random numbers 2-3 Tree

124806900

Average running time :6106

B-Tree Time:

120109900

Insert 100 extra random numbers BTree

120381900

Average running time :6005

Skip List Time:

424859000

Insert 100 extra random numbers Skip-list

425228700

Average running time :21242

40000-80000 OUTPUT

*****FOR 40000*****

Binary Search tree:

154630300

Insert 100 extra random numbers BST

154782300

Average running time :3865

Red Black Tree Time:

153957100

Insert 100 extra random numbers RBT

154207800

Average running time :3848

2-3 Tree Time:

135775000

Insert 100 extra random numbers 2-3 Tree

135961000

Average running time :3394

B-Tree Time:

215425700

Insert 100 extra random numbers BTree

215640800

Average running time :5385

Skip List Time:

964584000

Insert 100 extra random numbers Skip-list

964877700

Average running time :24114

*****FOR 80000*****

Binary Search tree:

248689100

Insert 100 extra random numbers BST

248852300

Average running time :3108

Red Black Tree Time:

284548000

Insert 100 extra random numbers RBT

284723900

Average running time :3556

2-3 Tree Time:

211388200

Insert 100 extra random numbers 2-3 Tree

211616900

Average running time :2642

B-Tree Time:

306475400

Insert 100 extra random numbers BTree

306622000

Average running time :3830

Skip List Time:

1263883400

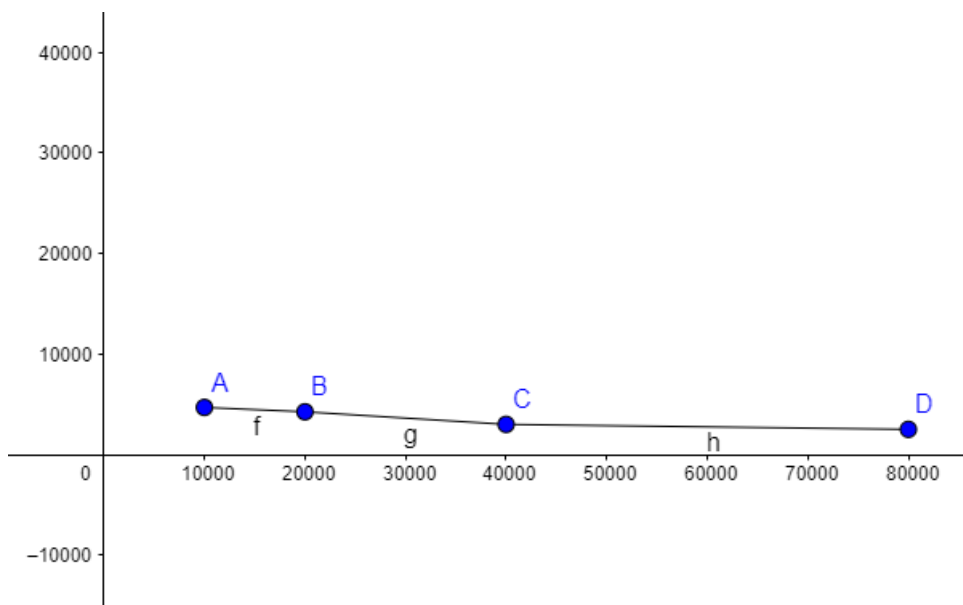
Insert 100 extra random numbers Skip-list

1264248800

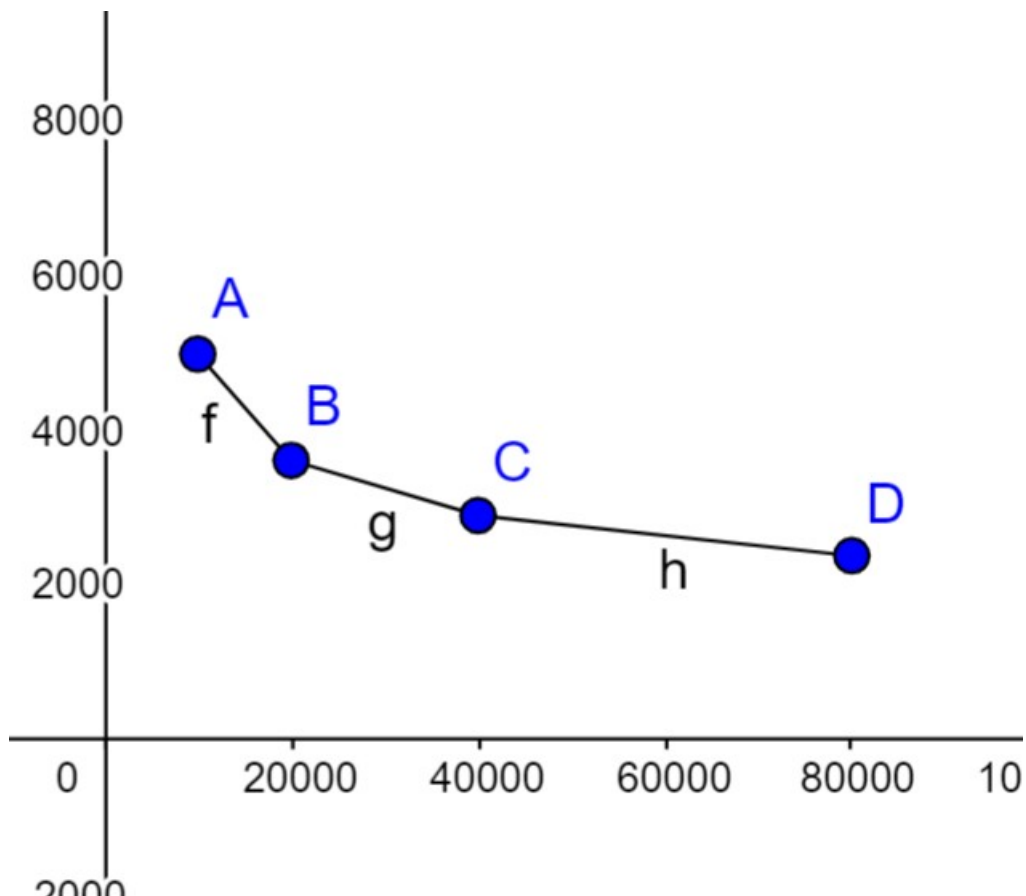
Average running time :15798

Draw a graph for running-time vs problem size

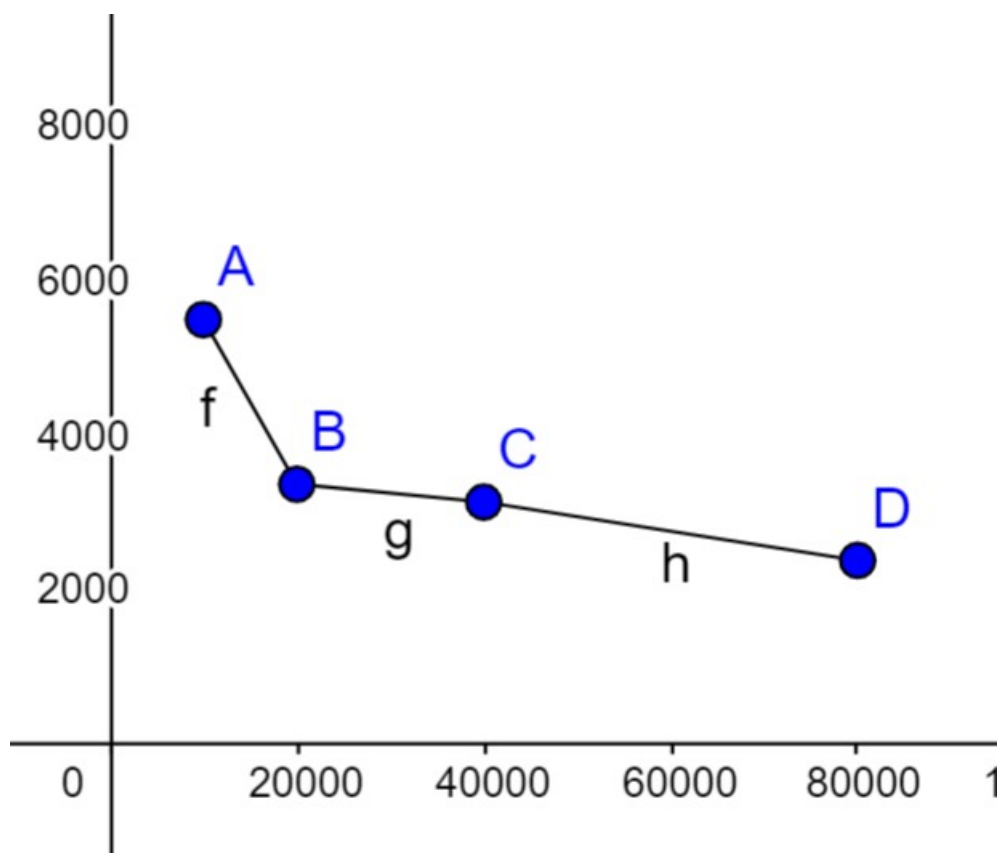
Binary Search tree



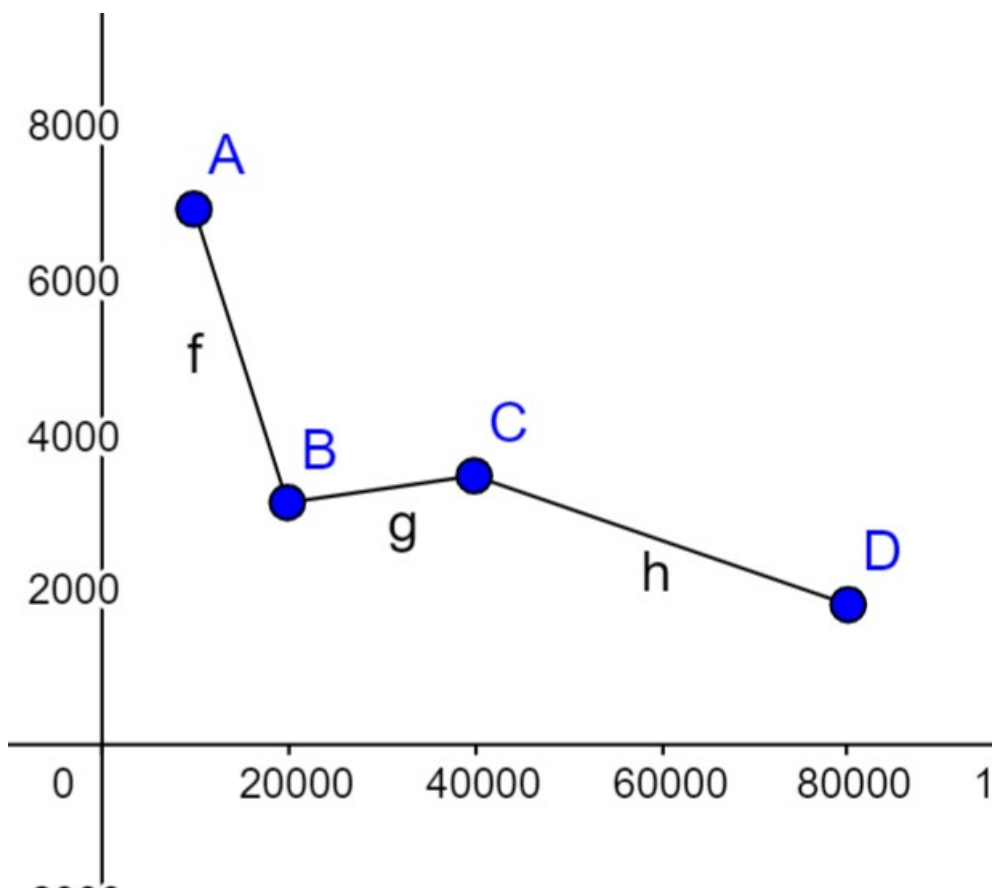
Red Black Tree



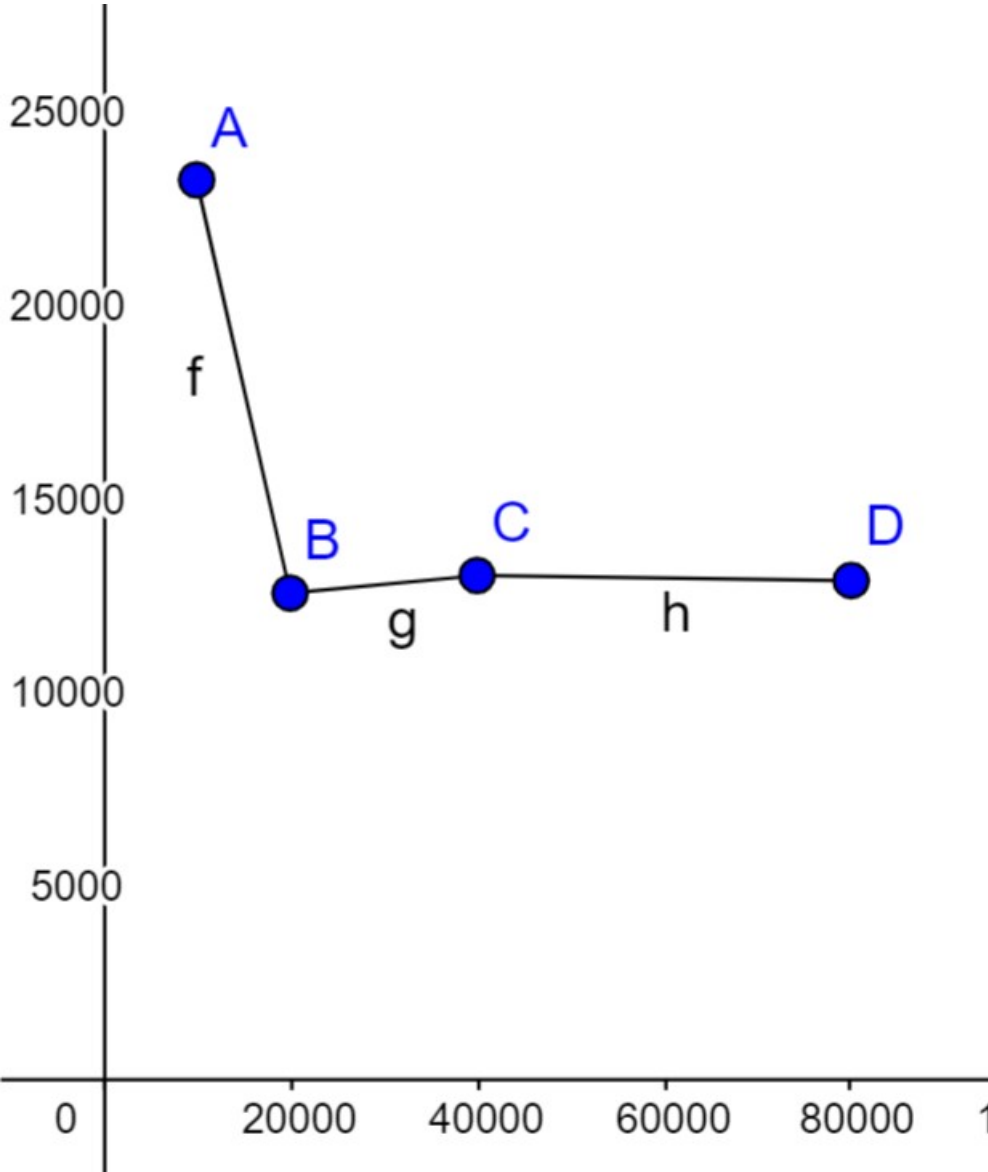
2-3 Tree



B-Tree



Skip List



Compare the running times and their increase rate.

	Binary Search tree	Red Black Tree	2-3 Tree	B-tree	Skip List
10000	57809800	79837700	82008300	145392800	382408100
20000	61253100	87849800	92280200	128882000	411143100
40000	209467900	147638000	176465700	202877900	865922000
80000	177437700	258899400	184928000	337736400	1429893600

performance:

10000| *Binary Search tree* > *Red Black Tree* > *2-3 Tree* > *B-tree* > *Skip List*
20000| *Binary Search tree* > *Red Black Tree* > *2-3 Tree* > *B-tree* > *Skip List*
40000| *Red Black Tree* > *2-3 Tree* > *B-tree* > *Binary Search tree* > *Skip List*
80000| *Binary Search tree* > *2-3 Tree* > *Red Black Tree* > *B-tree* > *Skip List*

Binary Search Tree

10000-20000 increase rate 1,05956
20000-40000 increase rate 3,41971

2-3 Tree

10000-20000 increase rate 1,12525439
20000-40000 increase rate 1,912281
40000-80000 increase rate 1,0479543

Red Black Tree

10000-20000 increase rate 1,1003548
20000-40000 increase rate 1,6805729
40000-80000 increase rate 1,75360950

B-tree

20000-40000 increase rate 1,574136
40000-80000 increase rate 1,664727

Skip-List

10000-20000 increase rate 1,075142
20000-40000 increase rate 2,1061328
40000-80000 increase rate 1,651296