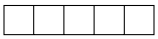
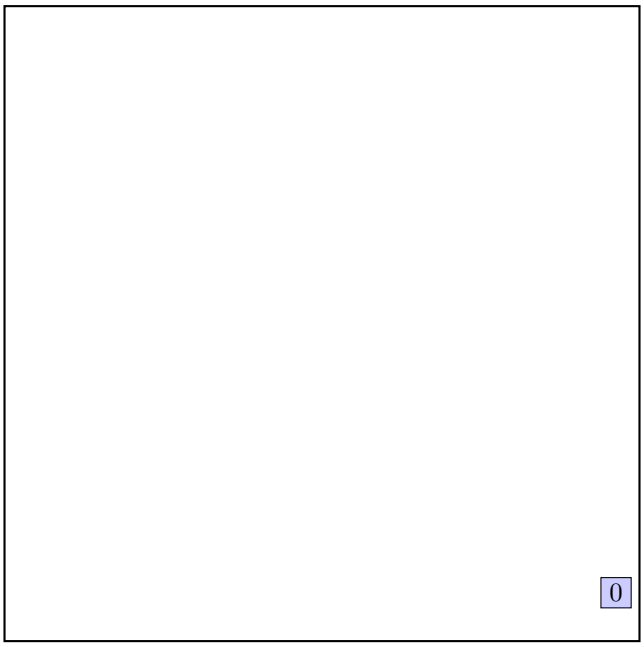
call INSERT $R$, `#S(P :X 789/200 :Y 11/50)`

structure view:



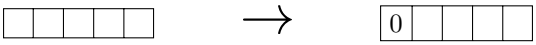
data view:




call CHOOSE-LEAF $R$, 0

a leaf is found: root
return from CHOOSE-LEAF

the leaf root is not full, add the record.

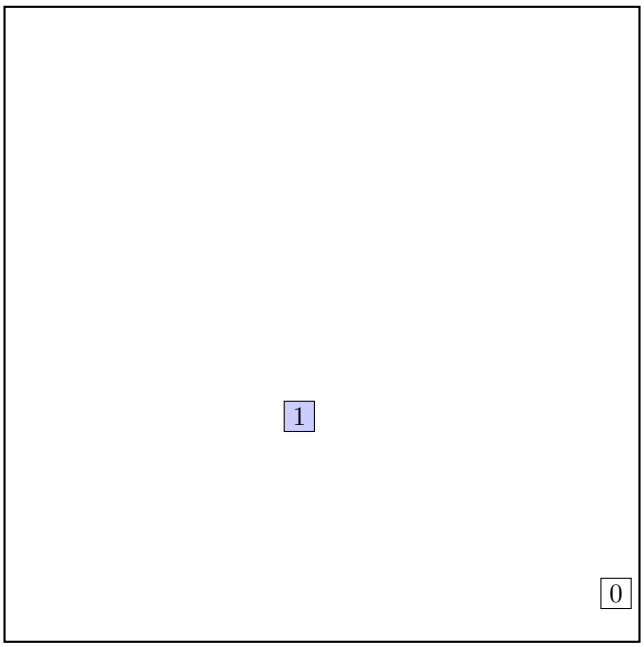



call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 37/20 :Y 1391/1000)`

structure view:

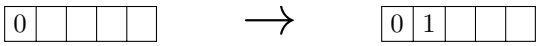

data view:




call CHOOSE-LEAF $R$, 1

a leaf is found: root
return from CHOOSE-LEAF

the leaf root is not full, add the record.

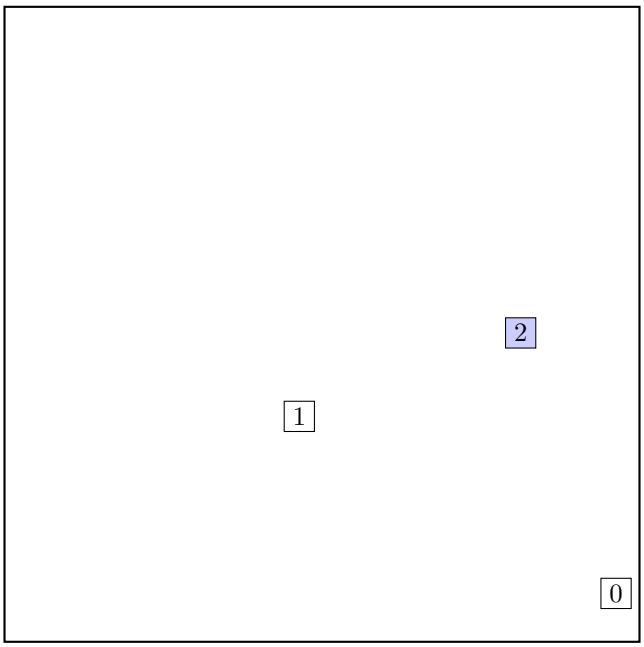



call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1657/500 :Y 1943/1000)`

structure view:

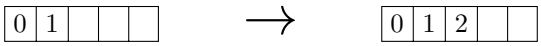

data view:




call CHOOSE-LEAF $R$, 2

a leaf is found: root
return from CHOOSE-LEAF

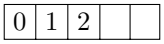
the leaf root is not full, add the record.



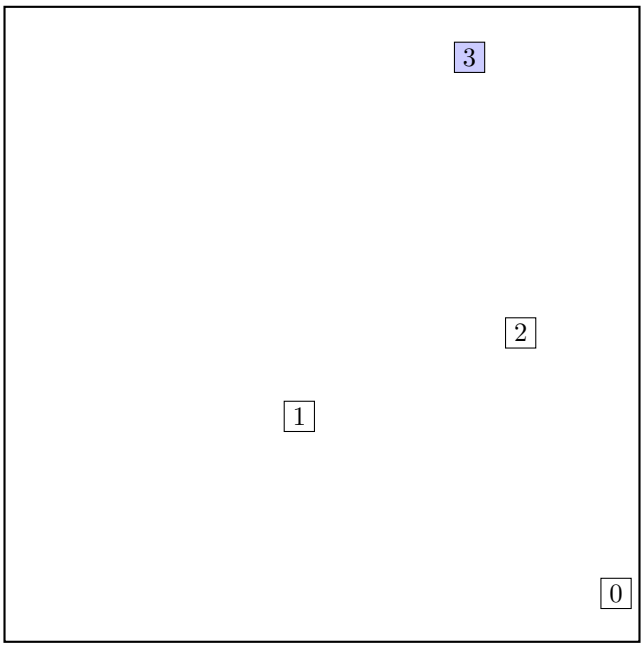

call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 372/125 :Y 1883/500)`

structure view:



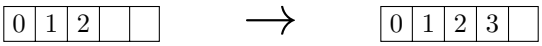

data view:




call CHOOSE-LEAF $R$, 3

a leaf is found: root
return from CHOOSE-LEAF

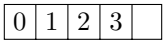
the leaf root is not full, add the record.



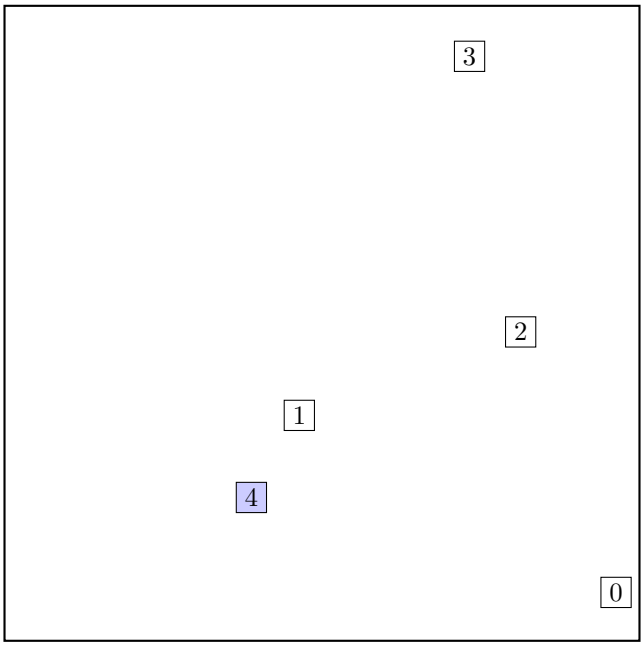

call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1533/1000 :Y 106/125)`

structure view:



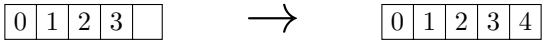

data view:




call CHOOSE-LEAF $R$, 4

a leaf is found: root
return from CHOOSE-LEAF

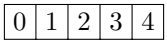
the leaf root is not full, add the record.



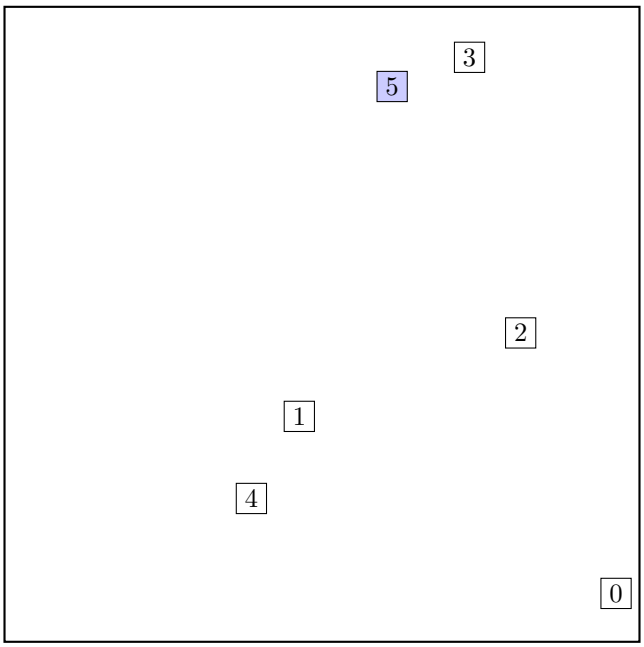

call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 308/125 :Y 3573/1000)`

structure view:




data view:



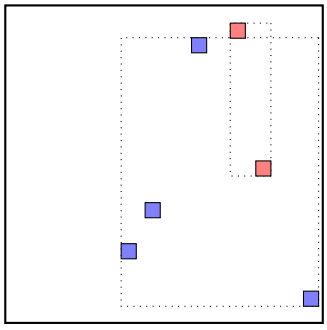

call CHOOSE-LEAF $R$, 5

a leaf is found: root

return from CHOOSE-LEAF

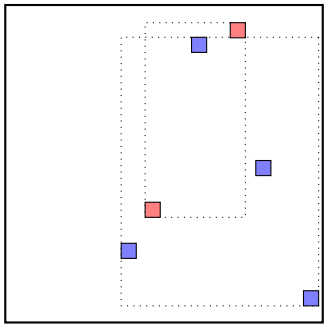
call SPLIT-NODE (bruteforce)

5 0 1 4 — 3 2



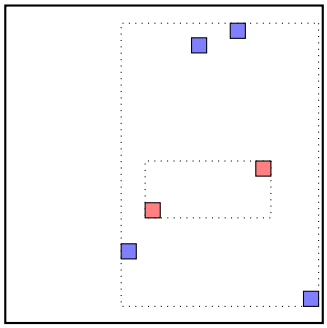
$S = 10.368809$

5 0 2 4 — 3 1



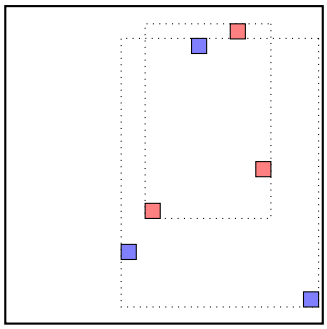
$S = 12.694885$

5 0 3 4 — 2 1



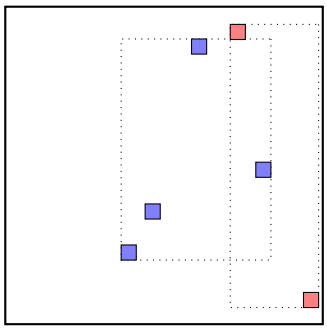
$S = 11.035879$

5 0 4 — 3 2 1



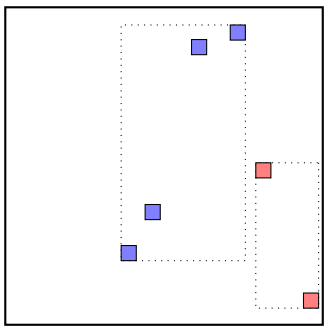
$S = 13.565235$

5 1 2 4 — 3 0



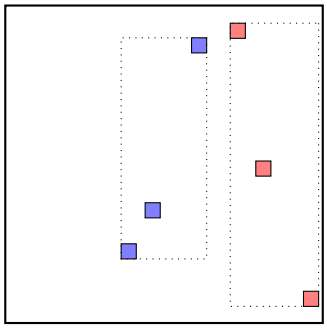
$S = 10.173498$

5 1 3 4 — 2 0



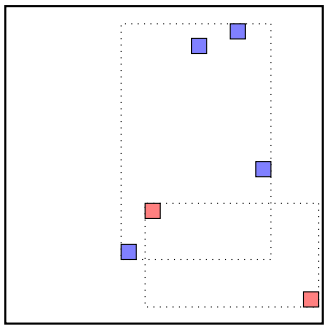
$S = 6.720887$

5 1 4 — 3 2 0



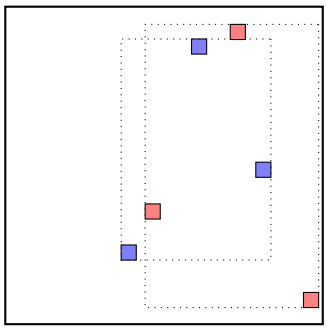
$S = 7.687248$

5 2 3 4 — 1 0



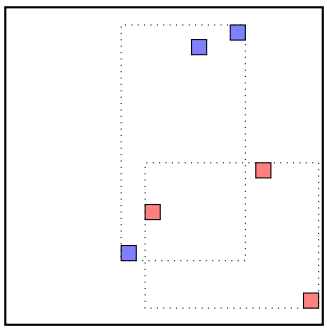
$S = 9.323202$

5 2 4 — 3 1 0



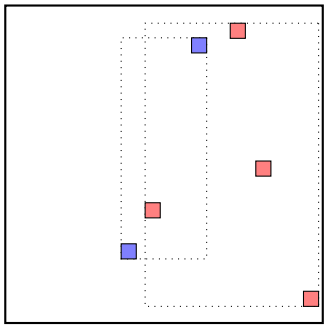
$S = 14.391495$

5 3 4 — 2 1 0



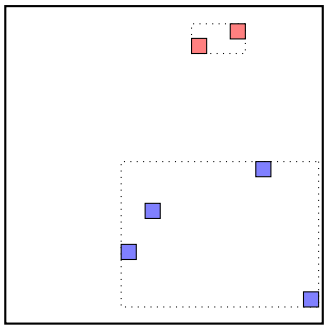
$S = 9.5361595$

5 4 — 3 2 1 0



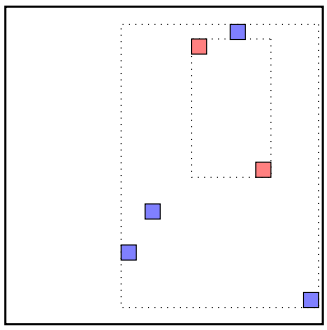
$S = 11.905245$

0 1 2 4 — 3 5



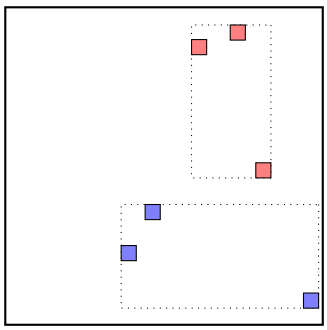
$S = 5.3026915$

0 1 3 4 — 2 5



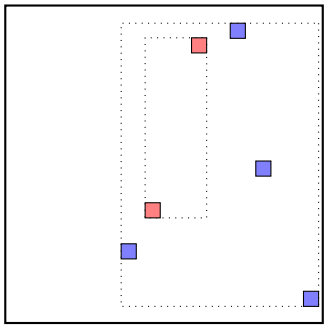
$S = 11.706051$

0 1 4 — 3 2 5



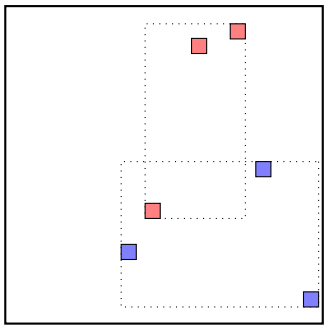
$S = 5.705201$

0 2 3 4 — 1 5



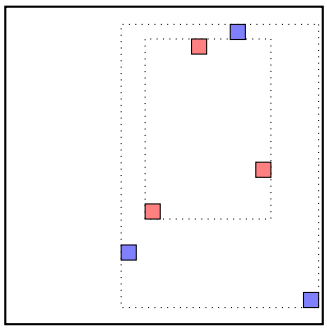
$S = 11.723499$

0 2 4 — 3 1 5



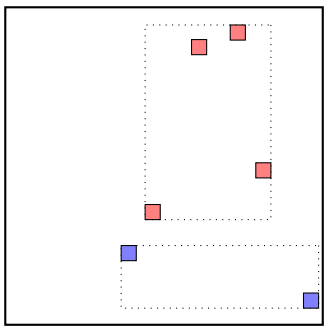
$S = 8.4373255$

0 3 4 — 2 1 5



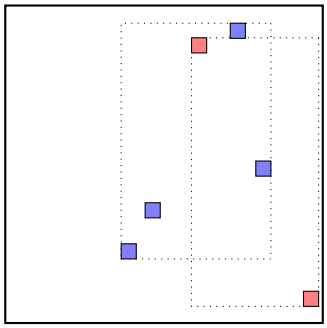
$S = 13.748199$

0 4 — 3 2 1 5



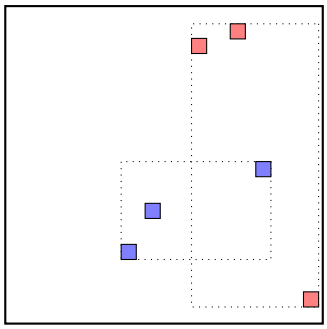
$S = 6.447535$

1 2 3 4 — 0 5



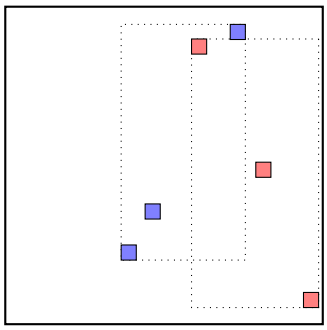
$S = 12.14935$

1 2 4 — 3 0 5



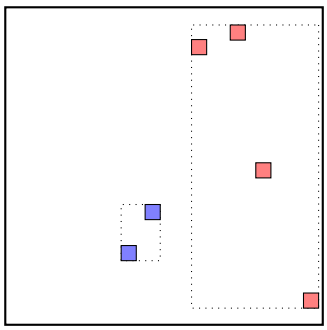
$S = 8.862421$

1 3 4 — 2 0 5



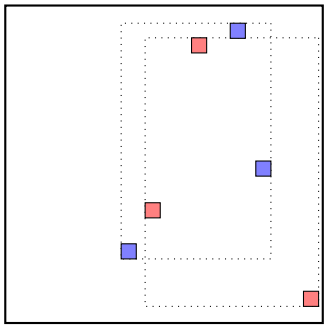
$S = 11.095467$

1 4 — 3 2 0 5



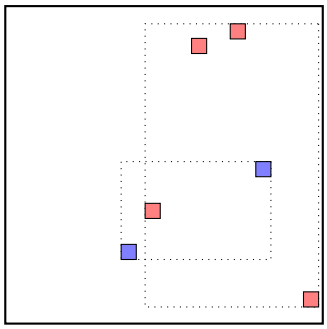
$S = 6.681157$

2 3 4 — 1 0 5



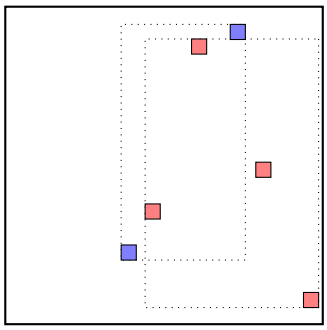
$S = 14.330893$

2 4 — 3 1 0 5



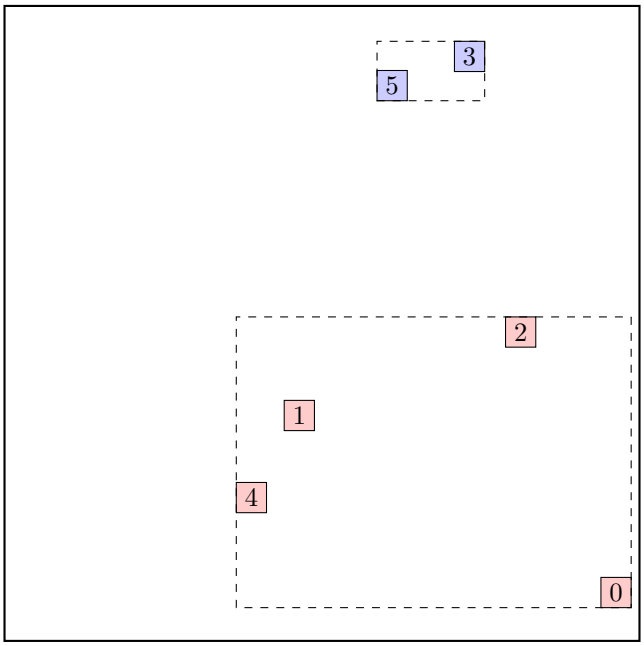
$S = 11.162466$

3 4 — 2 1 0 5



$S = 13.277009$

. . . the final split is:

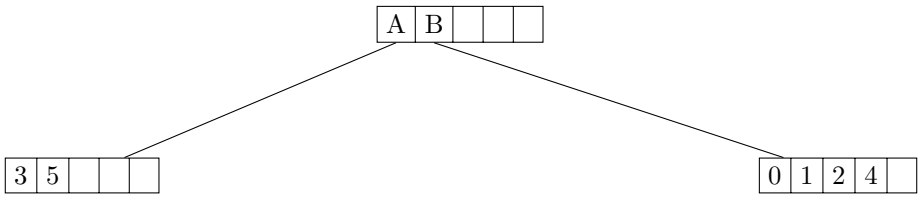



return from SPLIT-NODE

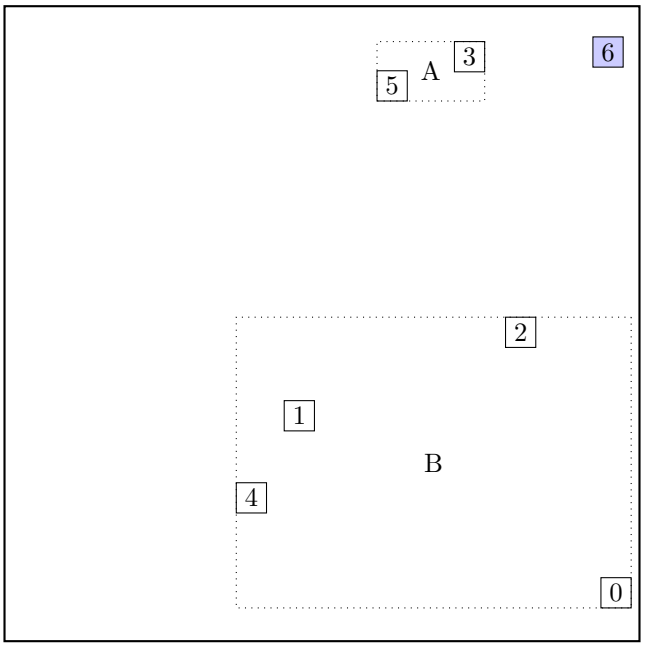
call ADJUST-TREE with $R$, node A and the new node
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 973/250 :Y 3797/1000)`

structure view:

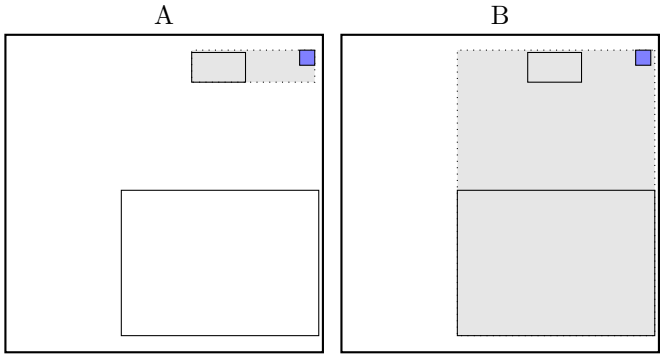



data view:




call CHOOSE-LEAF $R$, 6

choose among children:




old area: 0.27981588
new area: 0.69027156
extension: 0.41045567

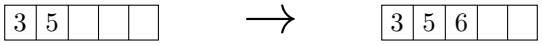
old area: 5.022876
new area: 9.865524
extension: 4.8426485

selected A

a leaf is found: A

return from CHOOSE-LEAF

the leaf A is not full, add the record.




call ADJUST-TREE with $R$, node A

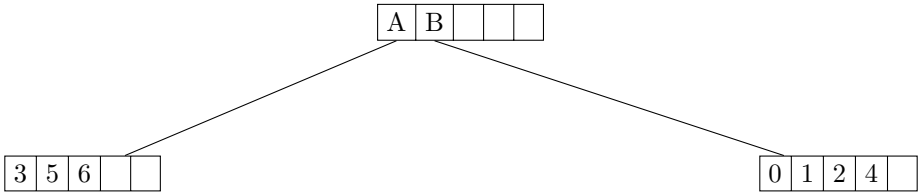
update MBR of node A.

continue by adjusting the parent node root

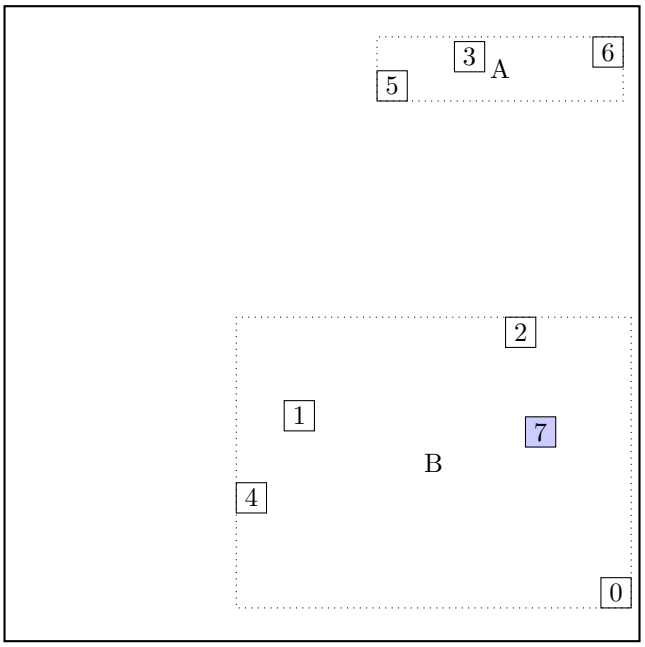
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1723/500 :Y 321/250)`

structure view:

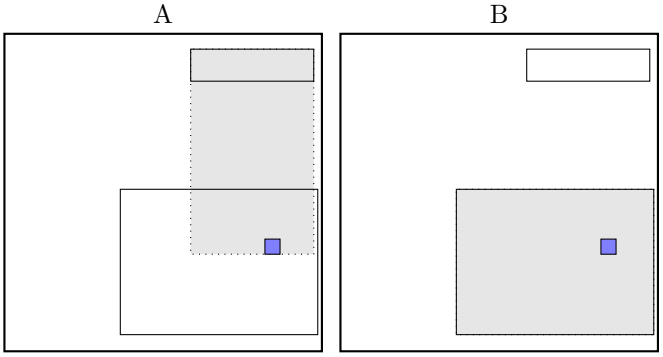



data view:




call CHOOSE-LEAF $R$, 7

choose among children:



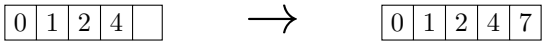

| A | B |
|---|---|
| old area: 0.69027156 | old area: 5.022876 |
| new area: 4.4167633 | new area: 5.022876 |
| extension: 3.7264917 | extension: 0.0 |

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.




call ADJUST-TREE with $R$, node B

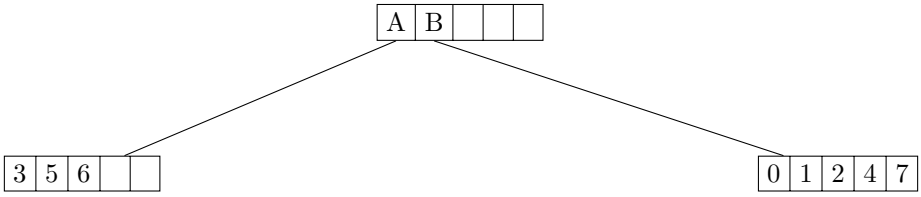
update MBR of node B.

continue by adjusting the parent node root

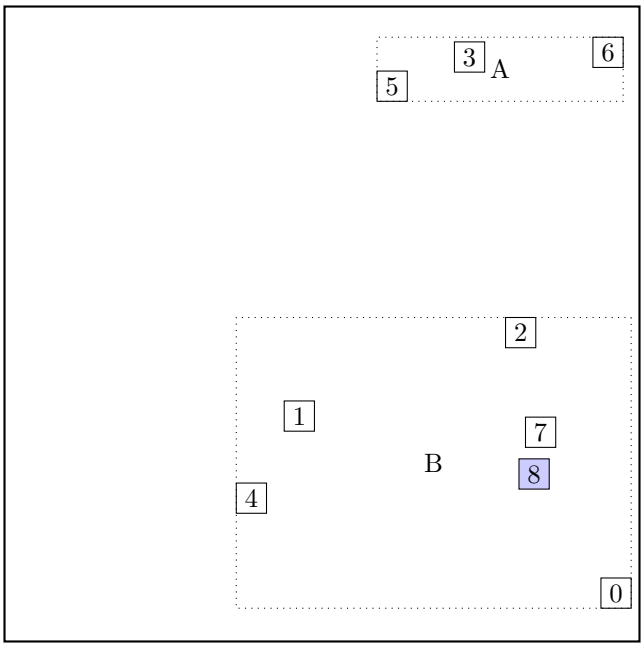
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 3403/1000 :Y 126/125)`

structure view:

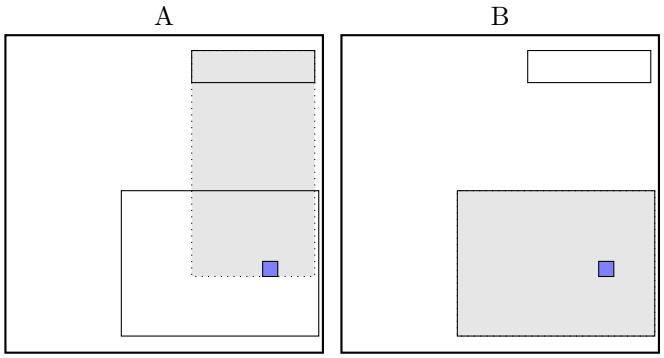



data view:




call CHOOSE-LEAF $R$, 8

choose among children:




| A | B |
|---|---|
| old area: 0.69027156 | old area: 5.022876 |
| new area: 4.8660913 | new area: 5.022876 |
| extension: 4.17582 | extension: 0.0 |

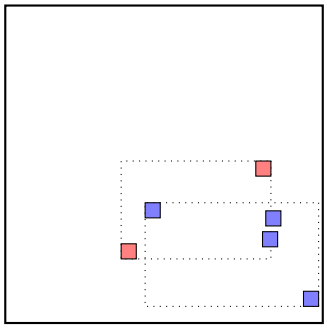
selected B

a leaf is found: B

return from CHOOSE-LEAF

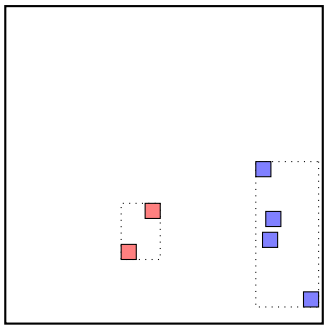
call SPLIT-NODE (bruteforce)

8 0 1 7 — 4 2



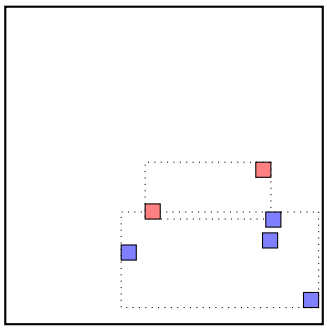
$S = 5.71184$

8 0 2 7 — 4 1



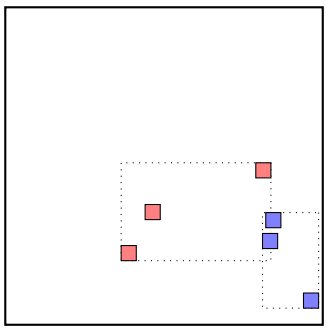
$S = 1.9821442$

8 0 4 7 — 2 1



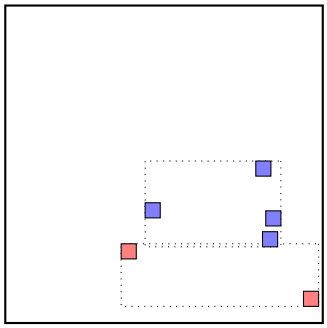
$S = 4.5528956$

8 0 7 — 4 2 1



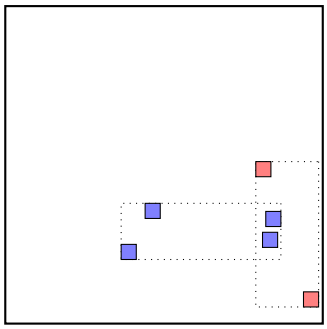
$S = 3.5032828$

8 1 2 7 — 4 0



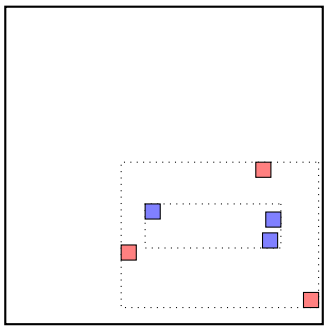
$S = 4.2011957$

8 1 4 7 — 2 0



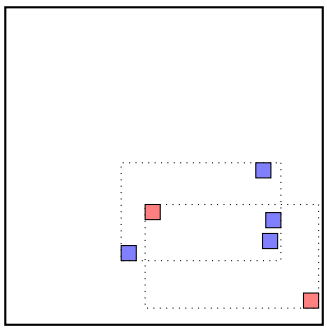
$S = 3.1679724$

8 1 7 — 4 2 0



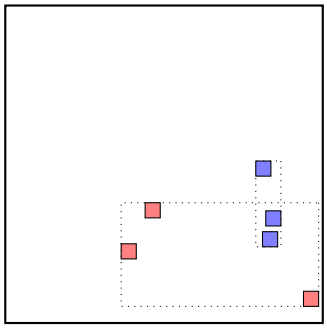
$S = 6.069944$

8 2 4 7 — 1 0



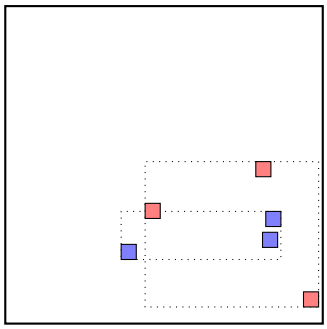
$S = 5.88278$

8 2 7 — 4 1 0



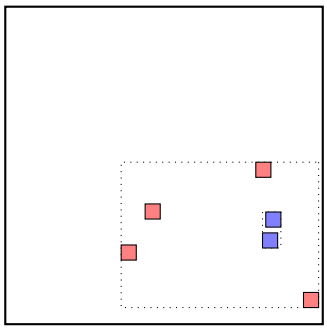
$S = 3.9578722$

8 4 7 — 2 1 0



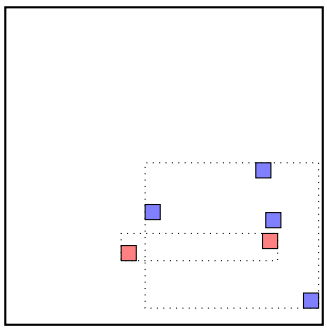
$S = 5.7571535$

8 7 — 4 2 1 0



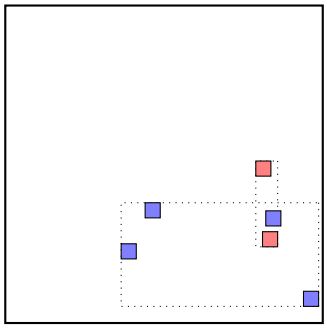
$S = 5.1385436$

0 1 2 7 — 4 8



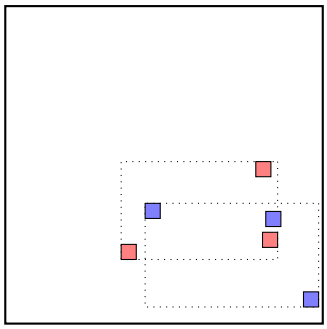
$S = 5.1584854$

0 1 4 7 — 2 8



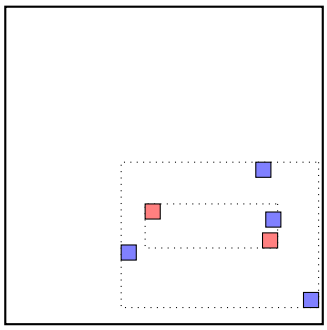
$S = 3.9090672$

0 1 7 — 4 2 8



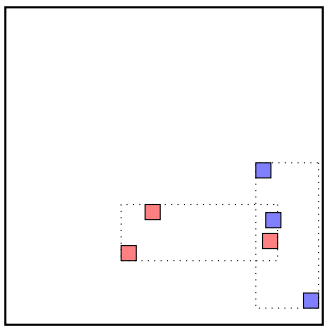
$S = 5.827096$

0 2 4 7 — 1 8



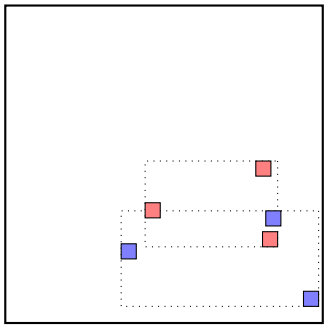
$S = 6.044875$

0 2 7 — 4 1 8



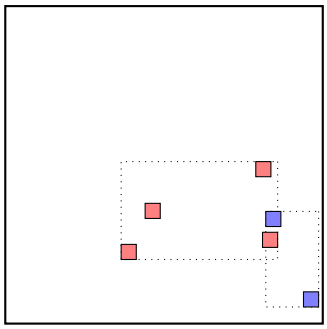
$S = 3.1360236$

0 4 7 — 2 1 8



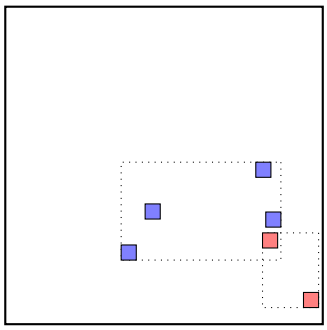
$S = 5.291223$

0 7 — 4 2 1 8



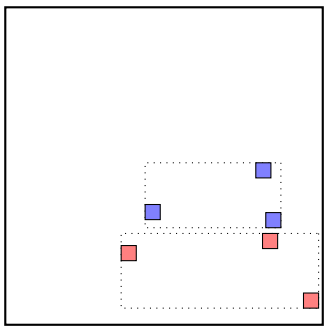
$S = 3.5641864$

1 2 4 7 — 0 8



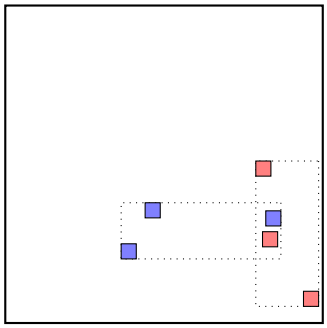
$S = 3.469431$

1 2 7 — 4 0 8



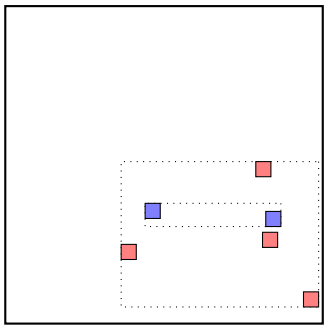
$S = 4.12342$

1 4 7 — 2 0 8



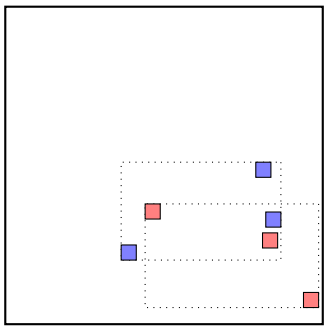
$S = 3.1679724$

1 7 — 4 2 0 8



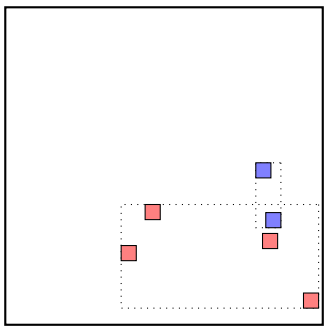
$S = 5.574248$

2 4 7 — 1 0 8



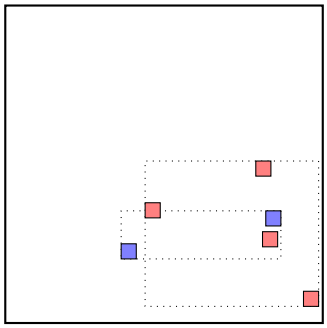
$S = 5.88278$

2 7 — 4 1 0 8



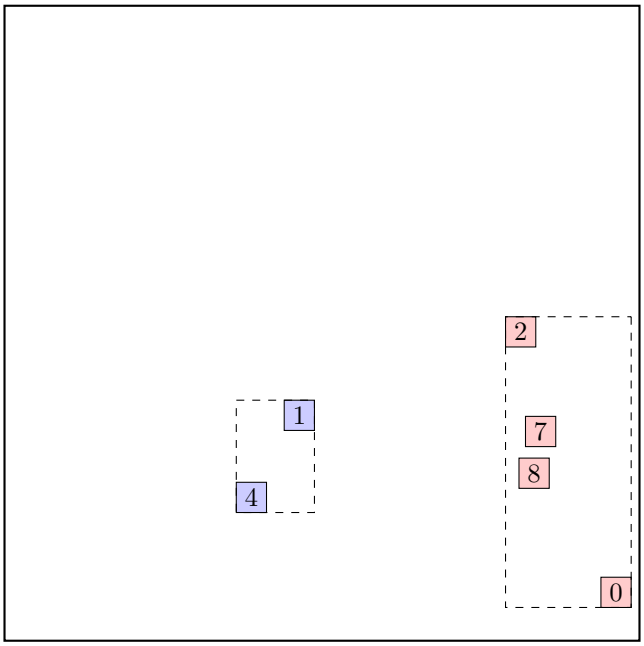
$S = 3.86624$

4 7 — 2 1 0 8



$S = 5.7571535$

. . . the final split is:



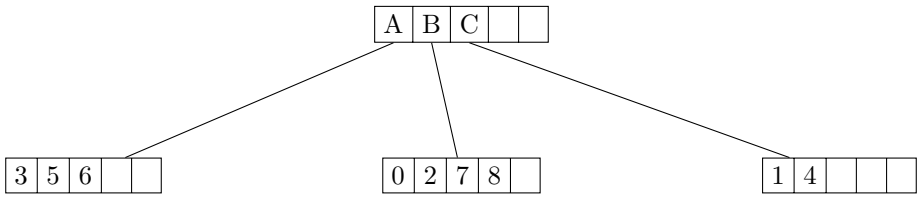

return from SPLIT-NODE

call ADJUST-TREE with $R$, node B and the new node
update MBR of node B.
add the new node to the parent node root

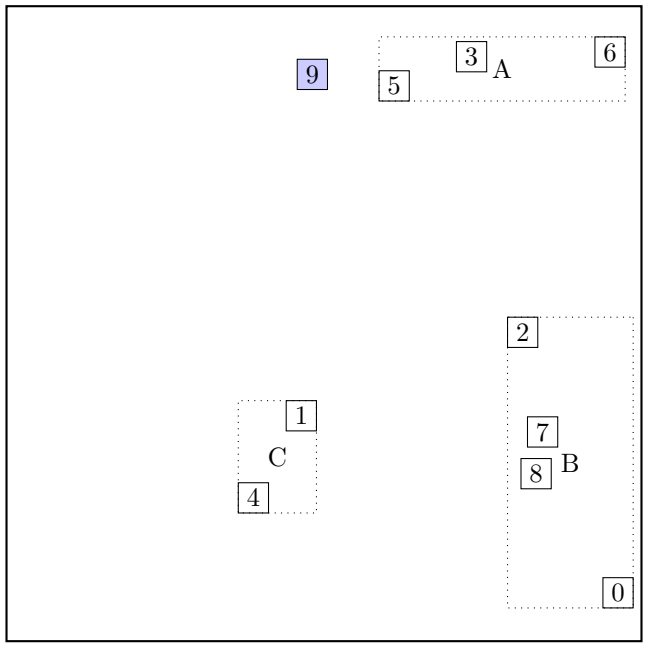
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1923/1000 :Y 3649/1000)`

structure view:

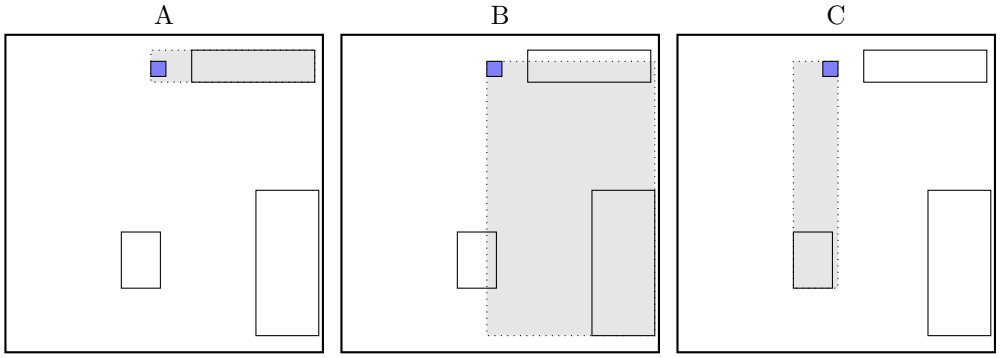



data view:




call CHOOSE-LEAF $R$, 9

choose among children:



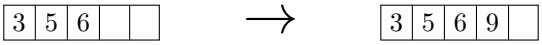

| A | B | C |
|---|---|---|
| old area: 0.69027156 | old area: 1.5980132 | old area: 0.3841311 |
| new area: 0.9196555 | new area: 8.063639 | new area: 1.7705901 |
| extension: 0.22938395 | extension: 6.465626 | extension: 1.386459 |

selected A

a leaf is found: A

return from CHOOSE-LEAF

the leaf A is not full, add the record.




call ADJUST-TREE with $R$, node A

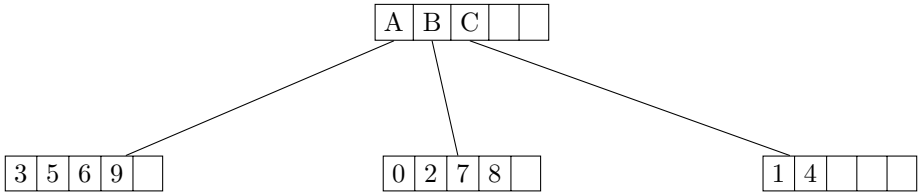
update MBR of node A.

continue by adjusting the parent node root

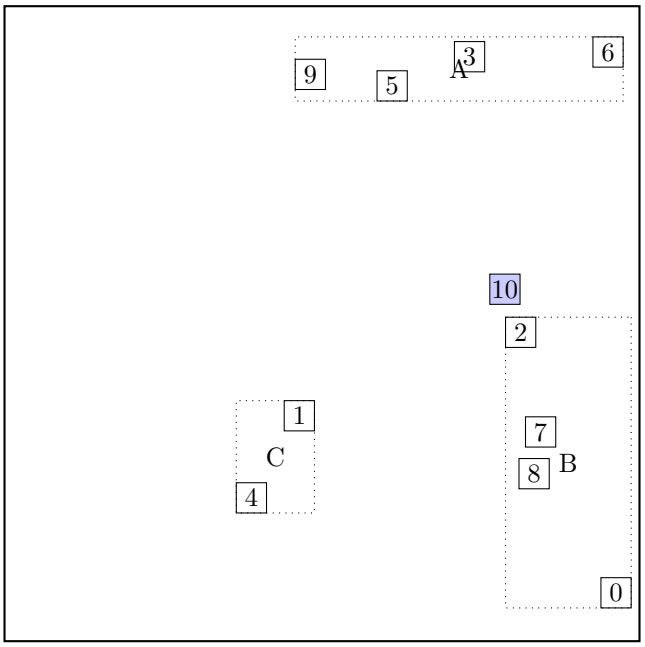
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 321/100 :Y 557/250)`

structure view:

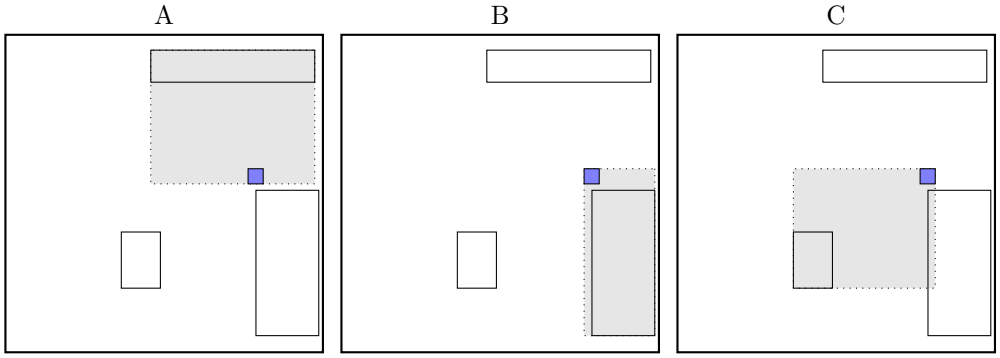



data view:




call CHOOSE-LEAF $R$, 10

choose among children:



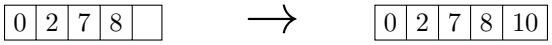

| A | B | C |
|---|---|---|
| old area: 0.9196555 | old area: 1.5980132 | old area: 0.3841311 |
| new area: 3.8369606 | new area: 2.0644799 | new area: 2.9656599 |
| extension: 2.917305 | extension: 0.46646667 | extension: 2.5815287 |

selected B

a leaf is found: B

return from CHOOSE-LEAF

the leaf B is not full, add the record.




call ADJUST-TREE with $R$, node B

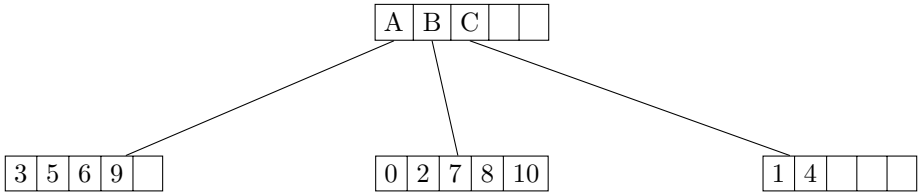
update MBR of node B.

continue by adjusting the parent node root

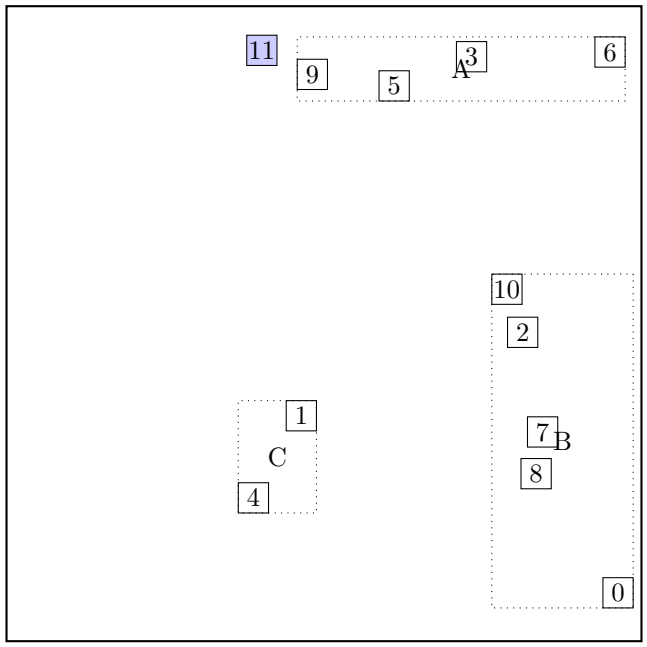
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1589/1000 :Y 476/125)`

structure view:

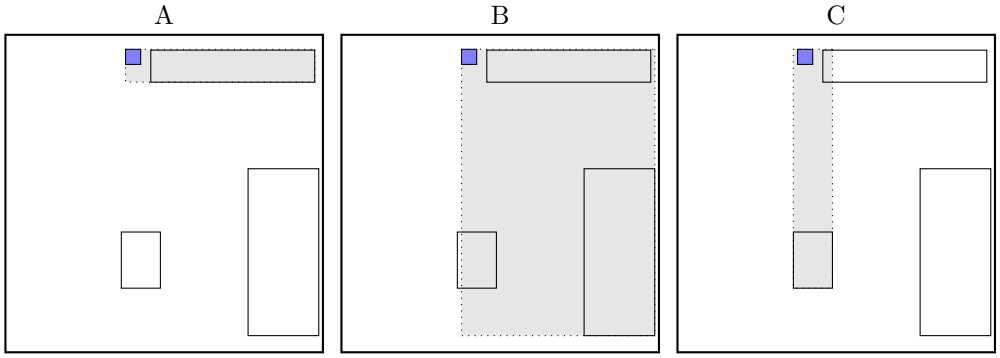



data view:




call CHOOSE-LEAF $R$, 11

choose among children:



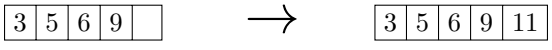

| A | B | C |
|---|---|---|
| old area: 0.9196555 | old area: 2.0644799 | old area: 0.3841311 |
| new area: 1.0888047 | new area: 9.682129 | new area: 1.6337203 |
| extension: 0.16914922 | extension: 7.617649 | extension: 1.2495892 |

selected A

a leaf is found: A

return from CHOOSE-LEAF

the leaf A is not full, add the record.




call ADJUST-TREE with $R$, node A

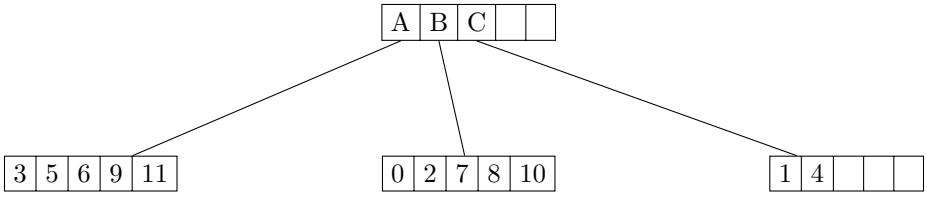
update MBR of node A.

continue by adjusting the parent node root

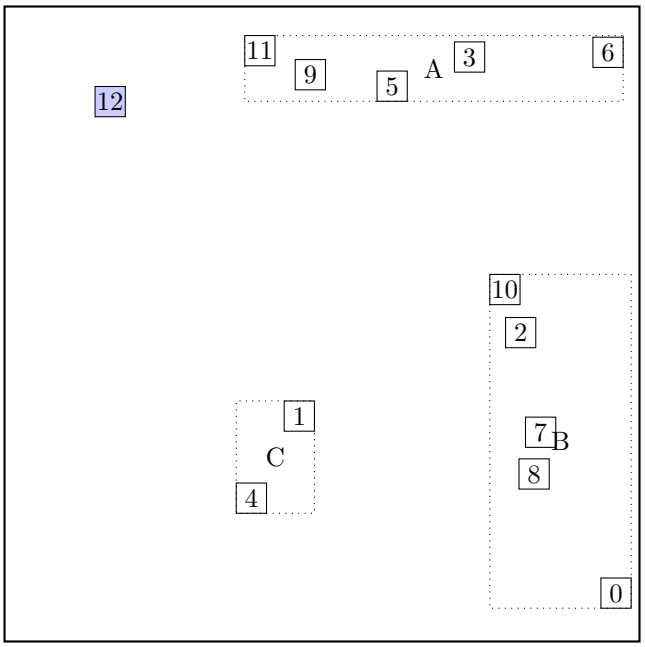
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 599/1000 :Y 3471/1000)`

structure view:

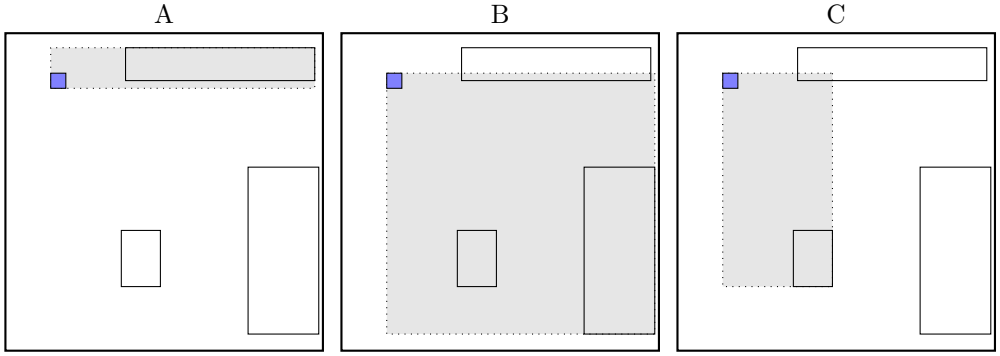



data view:




call CHOOSE-LEAF $R$, 12

choose among children:




| A | B | C |
|---|---|---|
| old area: 1.0888047 | old area: 2.0644799 | old area: 0.3841311 |
| new area: 1.8757407 | new area: 12.237246 | new area: 4.0961733 |
| extension: 0.7869359 | extension: 10.172766 | extension: 3.712042 |

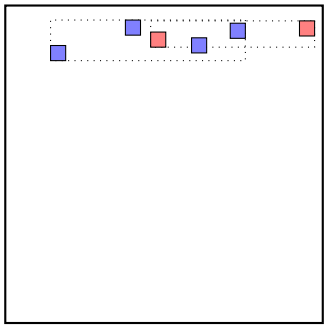
selected A

a leaf is found: A

return from CHOOSE-LEAF

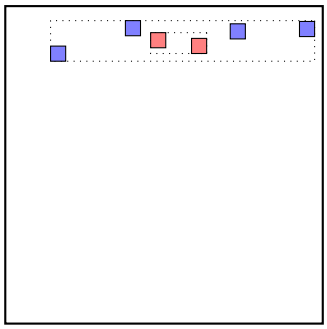
call SPLIT-NODE (bruteforce)

12 3 5 11 — 9 6



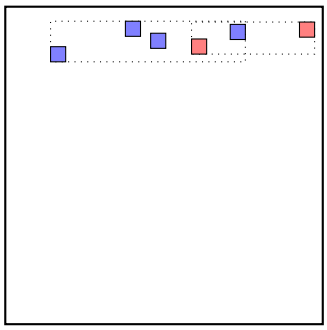
$S = 2.1386605$

12 3 6 11 — 9 5



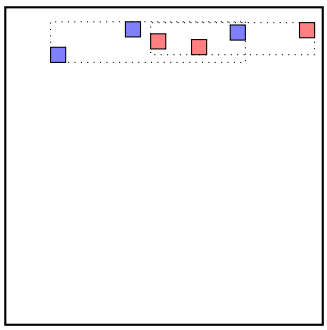
$S = 2.0802565$

12 3 9 11 — 6 5



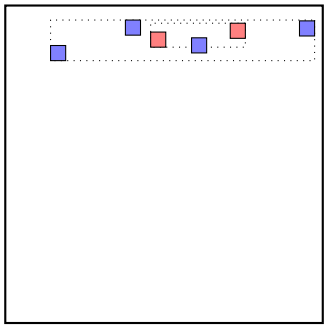
$S = 2.0741203$

12 3 11 — 9 6 5



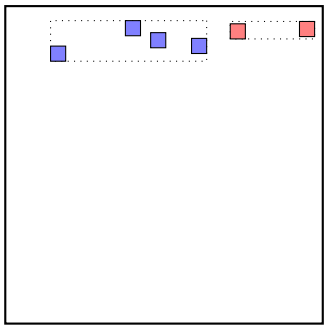
$S = 2.3035043$

12 5 6 11 — 9 3



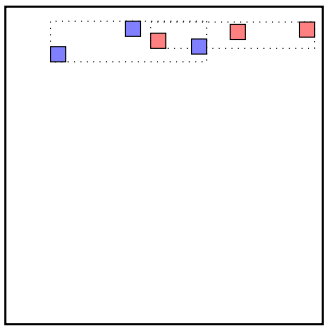
$S = 2.2729416$

12 5 9 11 — 6 3



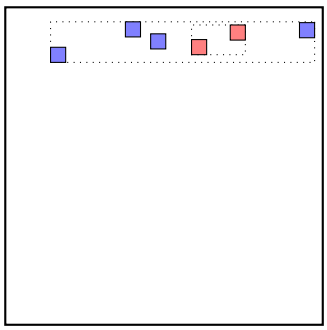
$S = 1.3667004$

12 5 11 — 9 6 3



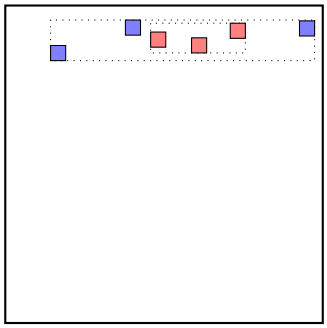
$S = 1.8637164$

12 6 9 11 — 5 3



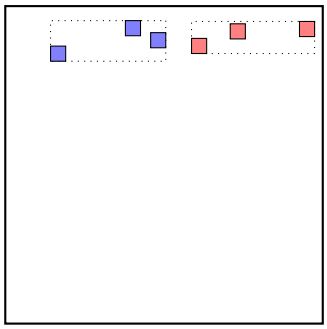
$S = 2.1555565$

12 6 11 — 9 5 3



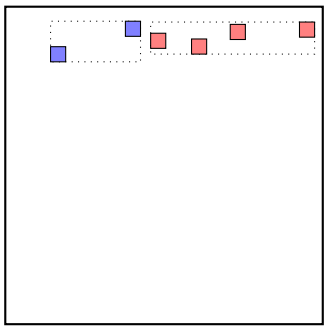
$S = 2.3681696$

12 9 11 — 6 5 3



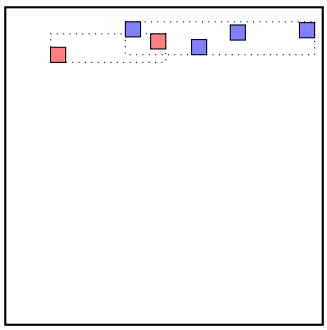
$S = 1.5086595$

12 11 — 9 6 5 3



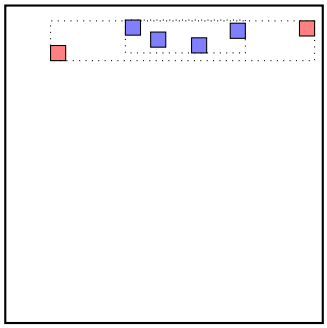
$S = 1.5586856$

3 5 6 11 — 9 12



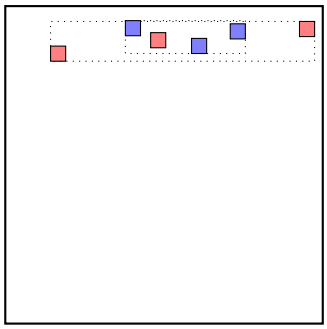
$S = 1.6648765$

3 5 9 11 — 6 12



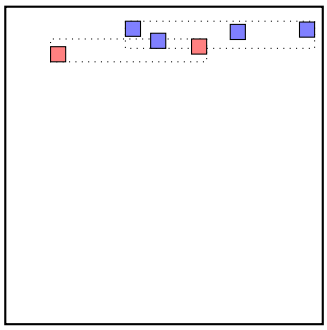
$S = 2.527662$

3 5 11 — 9 6 12



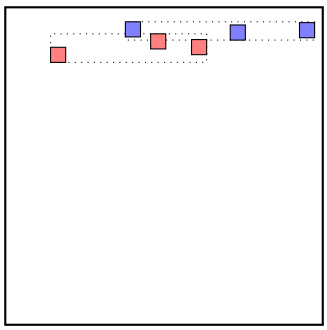
$S = 2.527662$

3 6 9 11 — 5 12



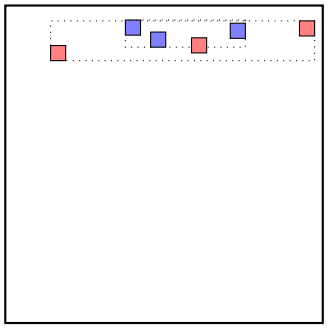
$S = 1.5222064$

3 6 11 — 9 5 12



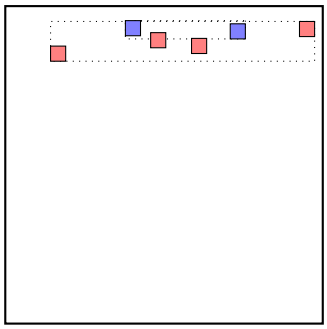
$S = 1.3862951$

3 9 11 — 6 5 12



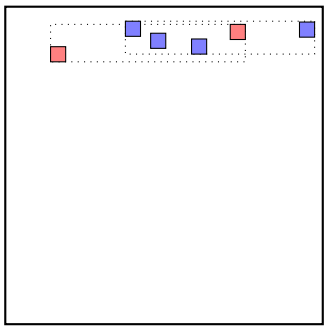
$S = 2.4070502$

3 11 — 9 6 5 12



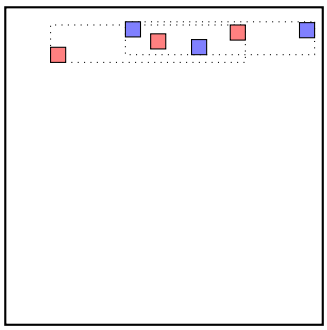
$S = 2.221371$

5 6 9 11 — 3 12



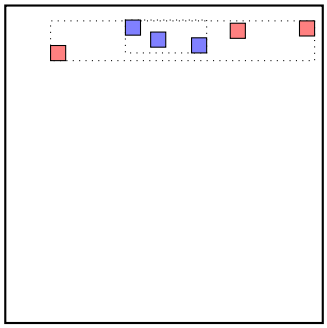
$S = 2.3644195$

5 6 11 — 9 3 12



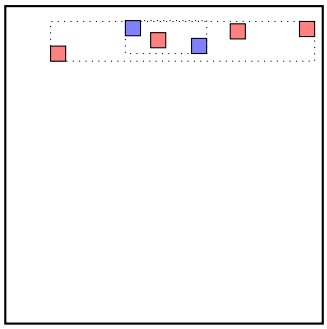
$S = 2.3644195$

5 9 11 — 6 3 12



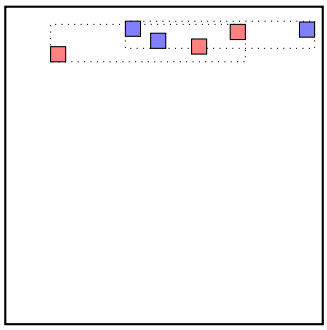
$S = 2.3049422$

5 11 — 9 6 3 12



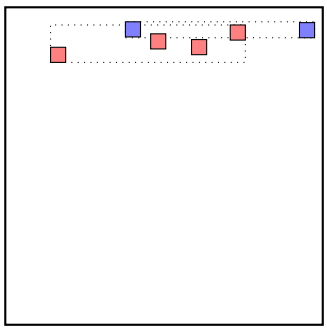
$S = 2.3049422$

6 9 11 — 5 3 12



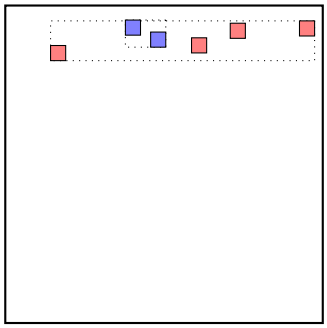
$S = 2.1741915$

6 11 — 9 5 3 12



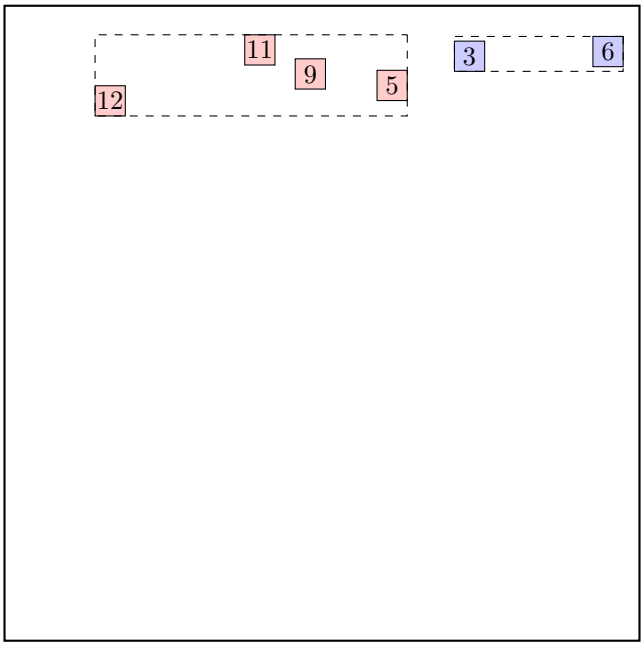
$S = 1.8037474$

9 11 — 6 5 3 12



$S = 2.0290232$

. . . the final split is:



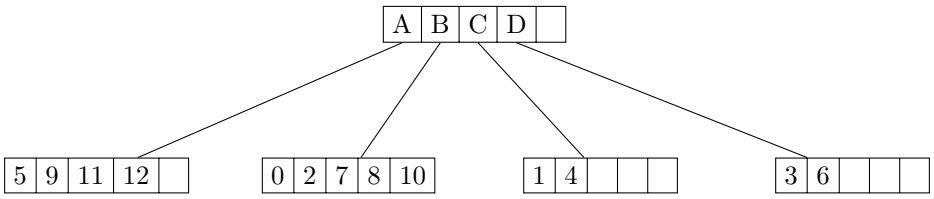

return from SPLIT-NODE

call ADJUST-TREE with $R$, node A and the new node
update MBR of node A.
add the new node to the parent node root

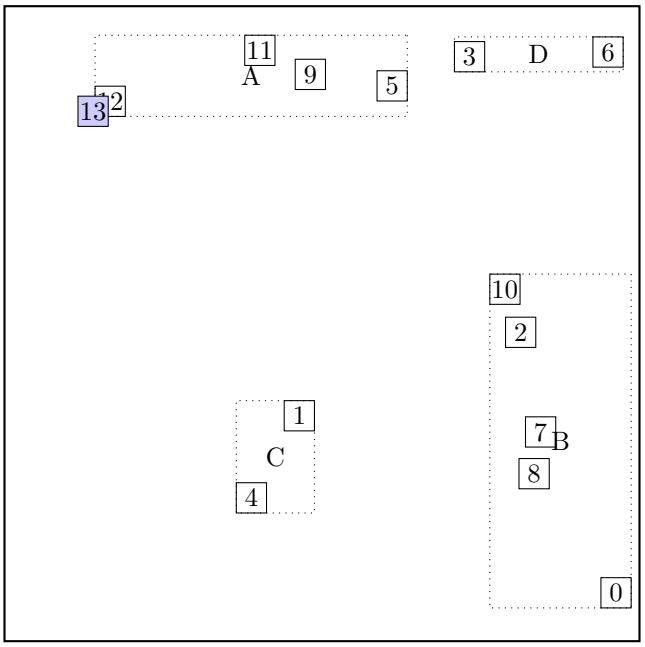
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 243/500 :Y 681/200)`

structure view:

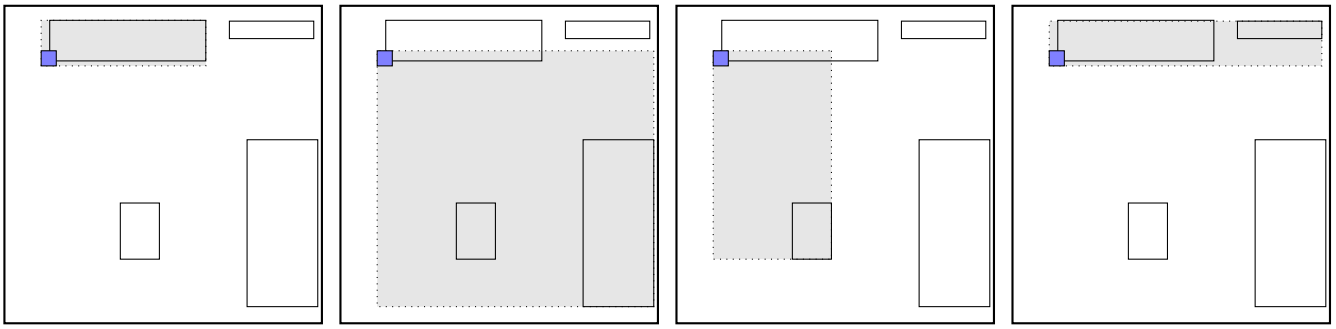



data view:




call CHOOSE-LEAF $R$, 13

choose among children:



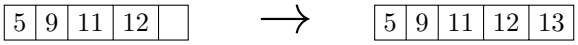

| A | B | C | D |
|---|---|---|---|
| old area: 1.1089048 | old area: 2.0644799 | old area: 0.3841311 | old area: 0.2577956 |
| new area: 1.3133339 | new area: 12.3857155 | new area: 4.311948 | new area: 2.134751 |
| extension: 0.20442903 | extension: 10.321236 | extension: 3.9278167 | extension: 1.8769555 |

selected A

a leaf is found: A

return from CHOOSE-LEAF

the leaf A is not full, add the record.




call ADJUST-TREE with $R$, node A

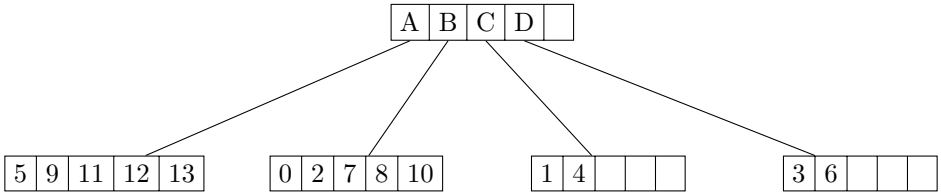
update MBR of node A.

continue by adjusting the parent node root

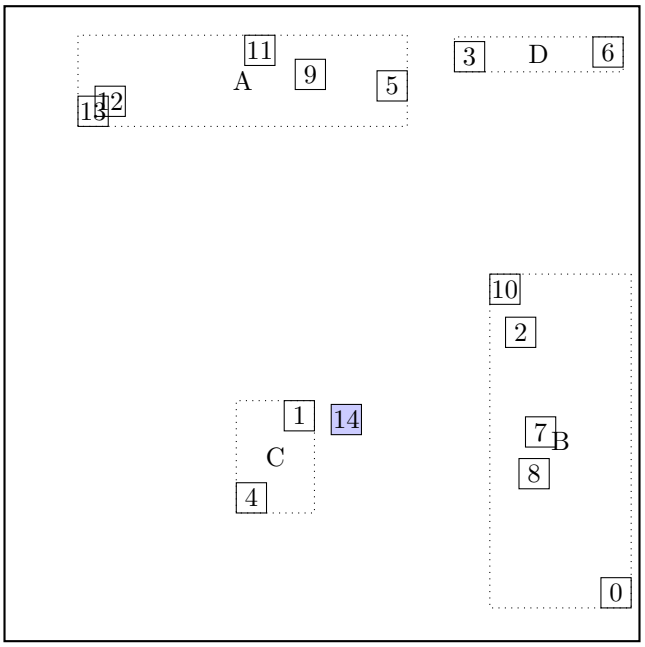
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 2161/1000 :Y 683/500)`

structure view:

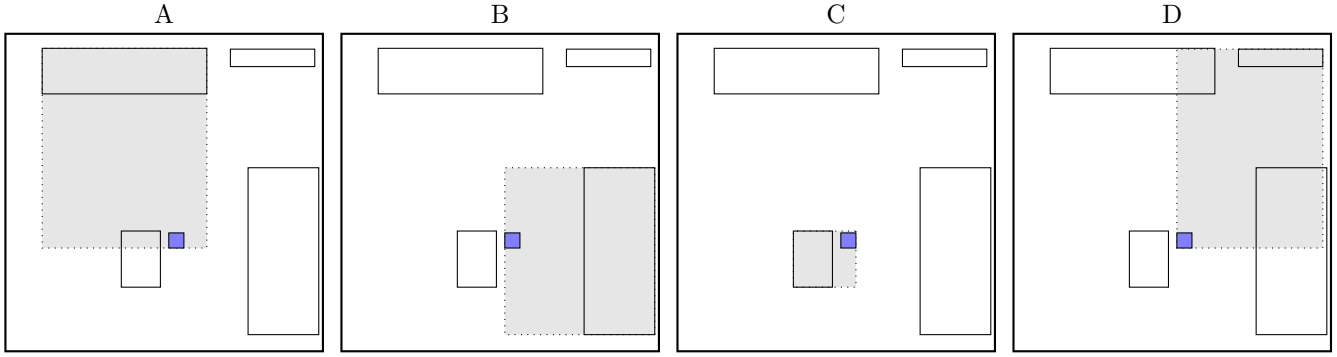



data view:




call CHOOSE-LEAF $R$, 14

choose among children:



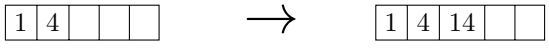

| A | B | C | D |
|---|---|---|---|
| old area: 1.3133339 | old area: 2.0644799 | old area: 0.3841311 | old area: 0.2577956 |
| new area: 5.754276 | new area: 4.380672 | new area: 0.61520404 | new area: 5.08046 |
| extension: 4.440942 | extension: 2.3161922 | extension: 0.23107293 | extension: 4.8226643 |

selected C

a leaf is found: C

return from CHOOSE-LEAF

the leaf C is not full, add the record.




call ADJUST-TREE with $R$, node C

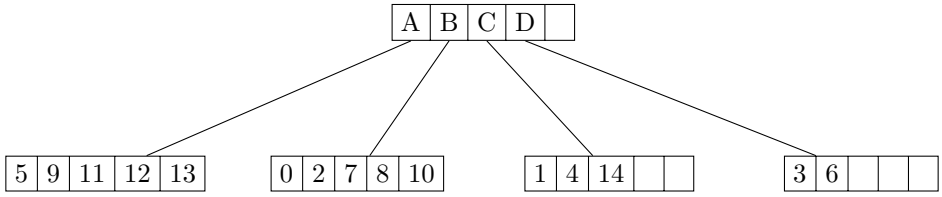
update MBR of node C.

continue by adjusting the parent node root

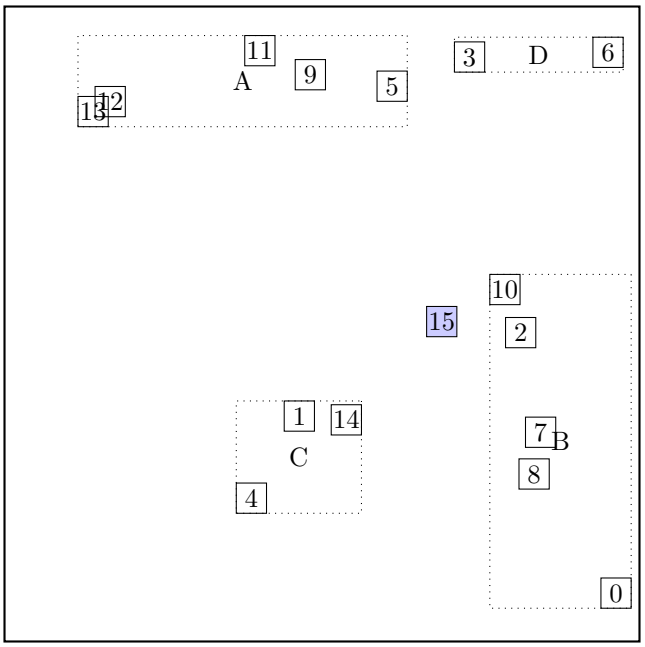
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 349/125 :Y 252/125)`

structure view:

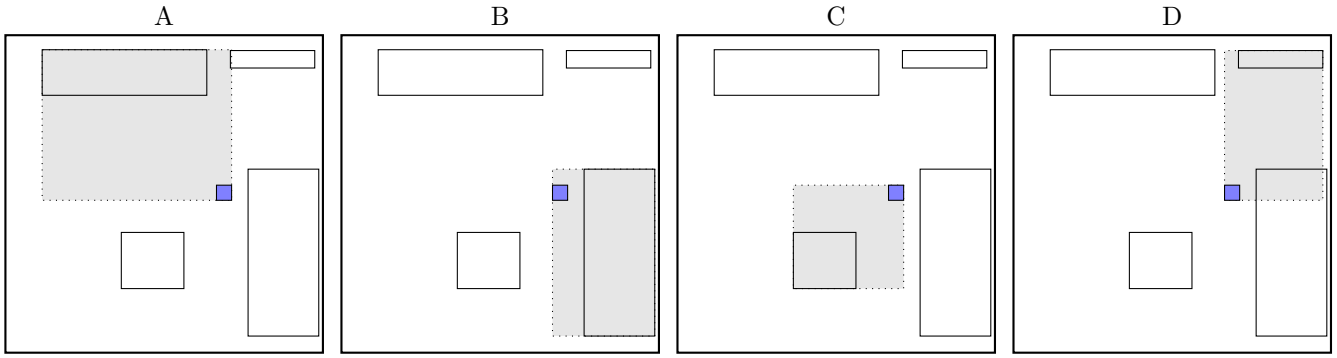



data view:




call CHOOSE-LEAF $R$, 15

choose among children:




| A | B | C | D |
|---|---|---|---|
| old area: 1.3133339 | old area: 2.0644799 | old area: 0.61520404 | old area: 0.2577956 |
| new area: 4.991952 | new area: 2.9874237 | new area: 1.9959121 | new area: 2.5752993 |
| extension: 3.678618 | extension: 0.92294384 | extension: 1.380708 | extension: 2.3175037 |

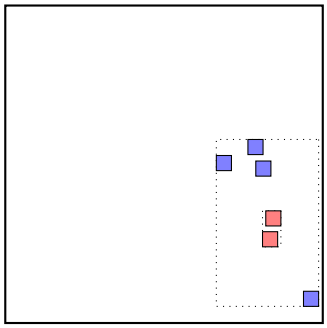
selected B

a leaf is found: B

return from CHOOSE-LEAF

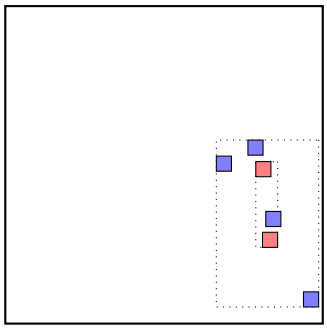
call SPLIT-NODE (bruteforce)

15 0 2 10 — 8 7



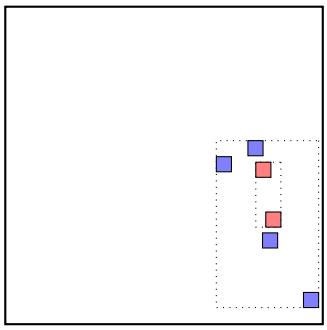
$S = 3.1030915$

15 0 7 10 — 8 2



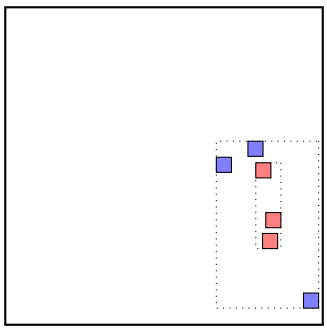
$S = 3.3154388$

15 0 8 10 — 7 2



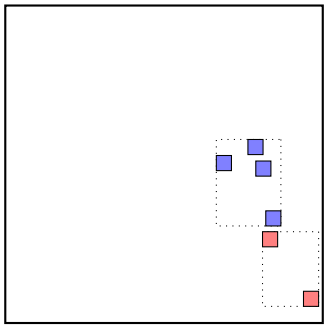
$S = 3.2726116$

15 0 10 — 8 7 2



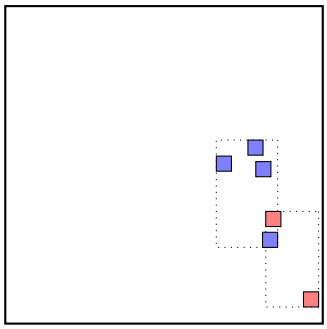
$S = 3.3642438$

15 2 7 10 — 8 0



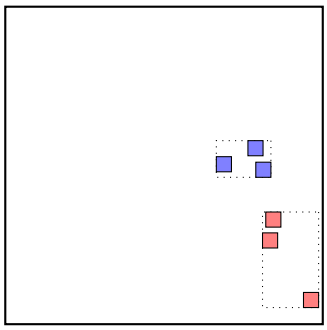
$S = 1.7100716$

15 2 8 10 — 7 0



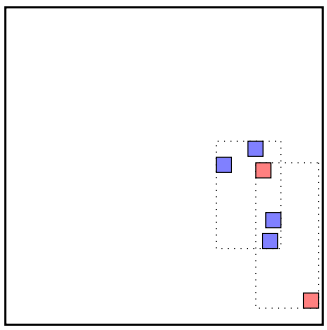
$S = 2.0351556$

15 2 10 — 8 7 0



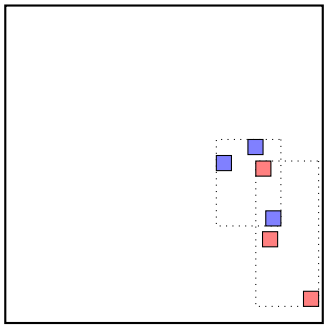
$S = 1.2880576$

15 7 8 10 — 2 0



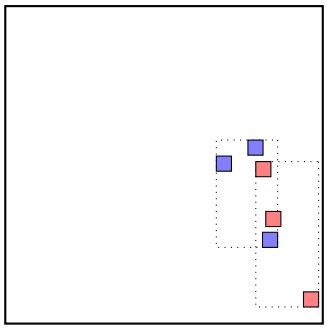
$S = 2.8106928$

15 7 10 — 8 2 0



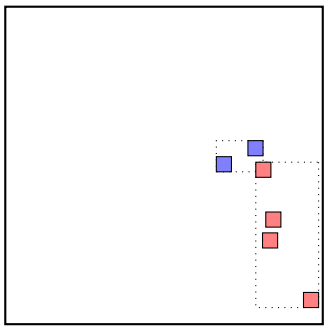
$S = 2.5749889$

15 8 10 — 7 2 0



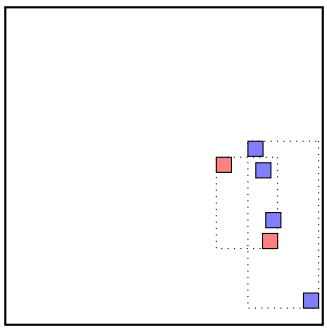
$S = 2.7496329$

15 10 — 8 7 2 0



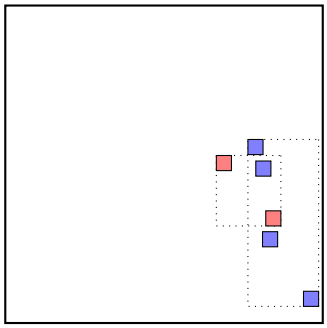
$S = 1.852629$

0 2 7 10 — 8 15



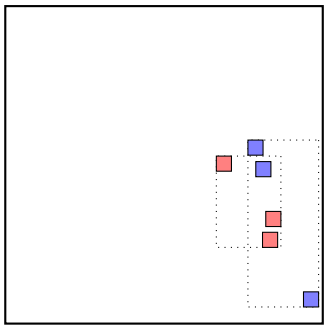
$S = 3.0441675$

0 2 8 10 — 7 15



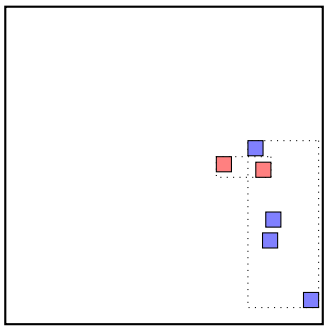
$S = 2.8604076$

0 2 10 — 8 7 15



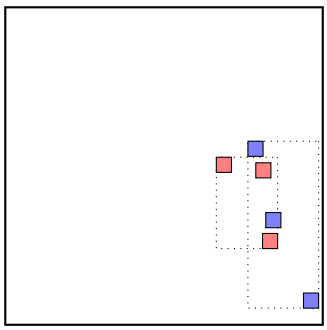
$S = 3.0961118$

0 7 8 10 — 2 15



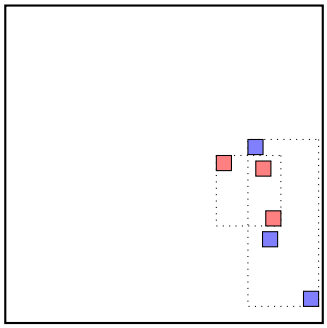
$S = 2.2615857$

0 7 10 — 8 2 15



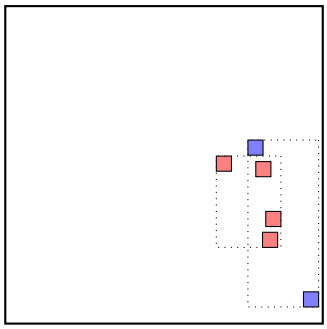
$S = 3.0441675$

0 8 10 — 7 2 15



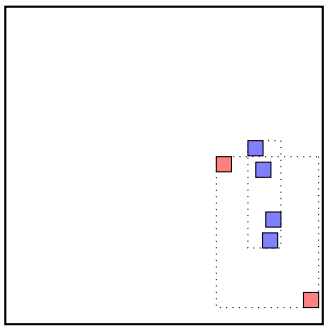
$S = 2.8604076$

0 10 — 8 7 2 15



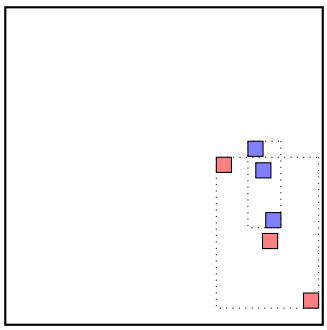
$S = 3.0961118$

2 7 8 10 — 0 15



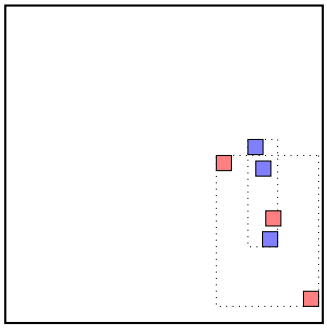
$S = 3.3197074$

2 7 10 — 8 0 15



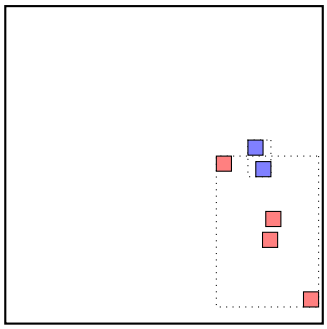
$S = 3.1993716$

2 8 10 — 7 0 15



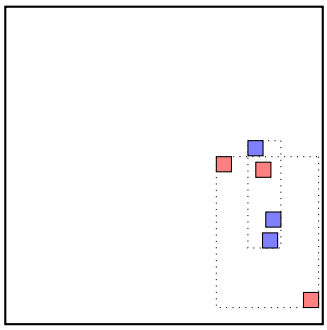
$S = 3.2586475$

2 10 — 8 7 0 15



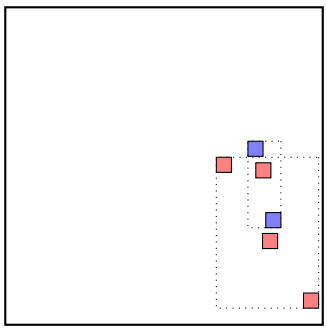
$S = 2.8480275$

7 8 10 — 2 0 15



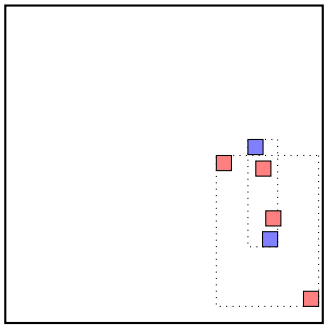
$S = 3.3197074$

7 10 — 8 2 0 15



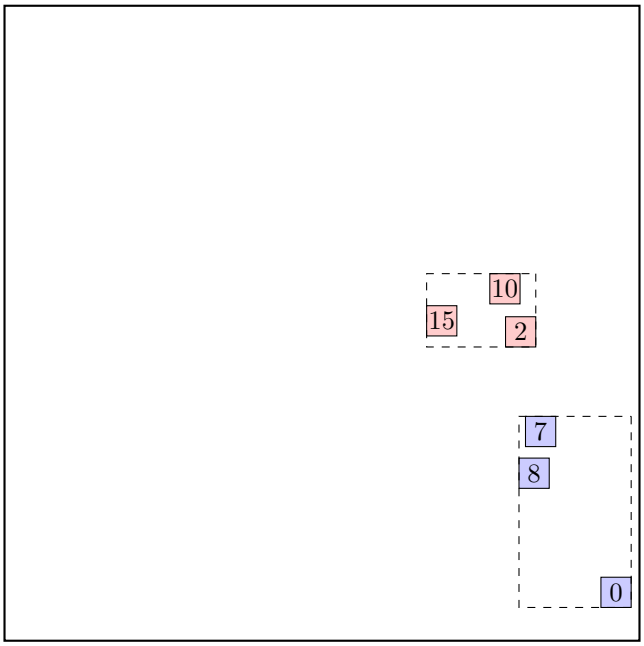
$S = 3.1993716$

8 10 — 7 2 0 15



$S = 3.2586475$

. . . the final split is:



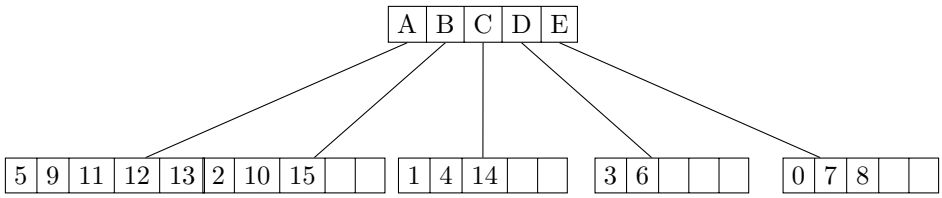

return from SPLIT-NODE

call ADJUST-TREE with $R$, node B and the new node
update MBR of node B.
add the new node to the parent node root

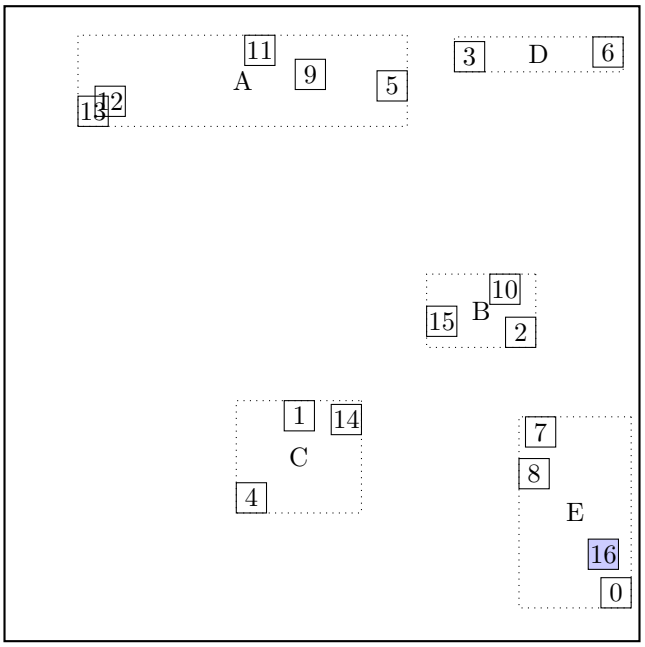
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 3861/1000 :Y 19/40)`

structure view:

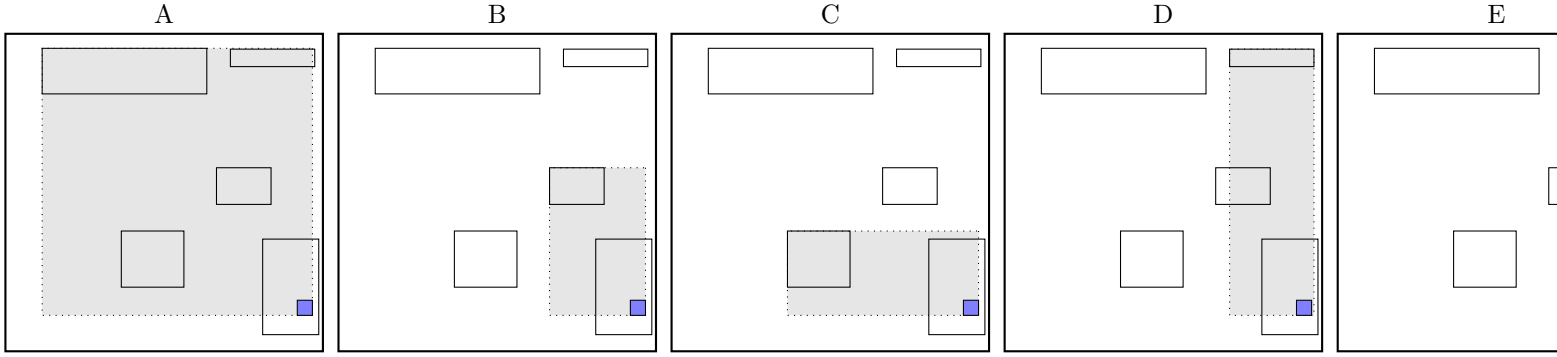



data view:




call CHOOSE-LEAF $R$, 16

choose among children:



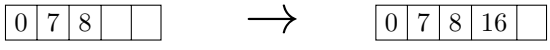

| A | B | C | D | E |
|---|---|---|---|---|
| old area: 1.3133339 | old area: 0.35016975 | old area: 0.61520404 | old area: 0.2577956 | old area: 0.9378 |
| new area: 12.630475 | new area: 2.4783564 | new area: 2.821248 | new area: 3.9305508 | new area: 0.937 |
| extension: 11.317142 | extension: 2.1281867 | extension: 2.206044 | extension: 3.6727553 | extension: 0 |

selected E

a leaf is found: E

return from CHOOSE-LEAF

the leaf E is not full, add the record.




call ADJUST-TREE with $R$, node E

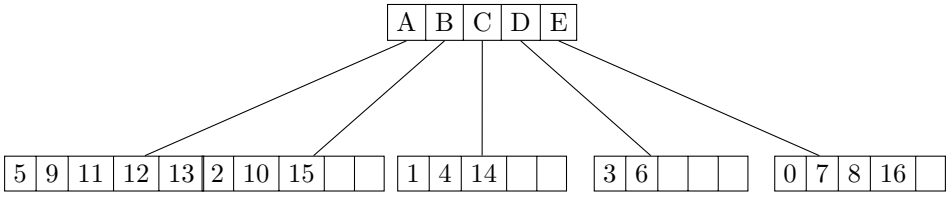
update MBR of node E.

continue by adjusting the parent node root

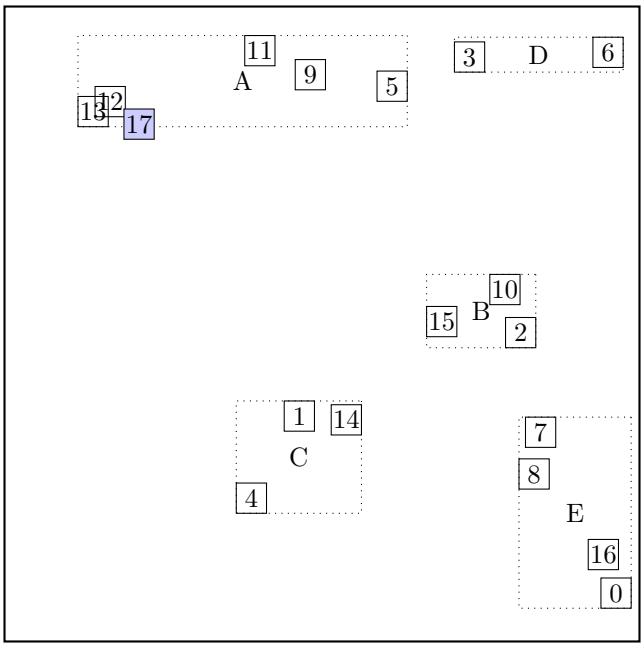
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 79/100 :Y 1661/500)`

structure view:

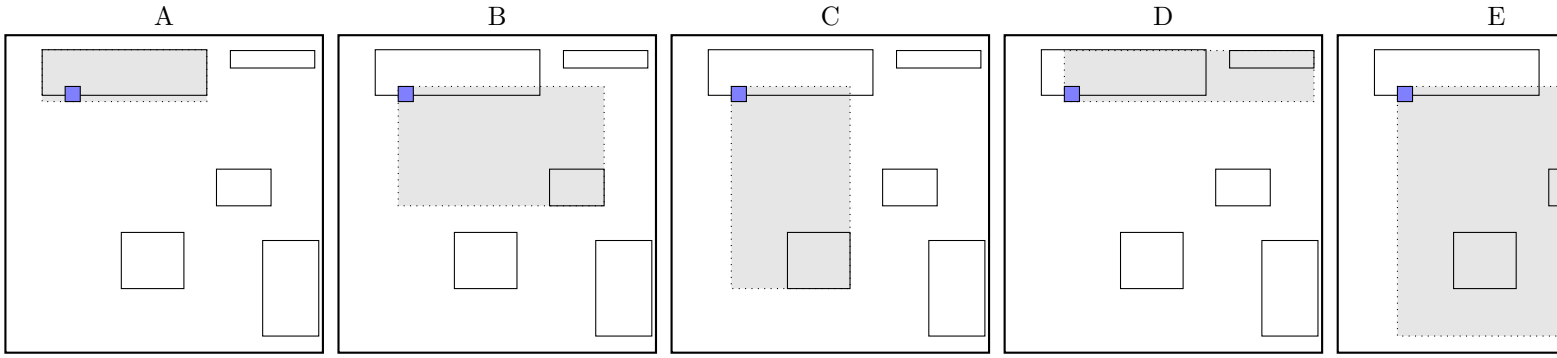



data view:




call CHOOSE-LEAF $R$, 17

choose among children:




| A | B | C | D | E |
|---|---|---|---|---|
| old area: 1.3133339 | old area: 0.35016975 | old area: 0.61520404 | old area: 0.2577956 | old area: 0.9378 |
| new area: 1.4941077 | new area: 4.3011956 | new area: 4.200854 | new area: 2.228849 | new area: 11.0 |
| extension: 0.18077386 | extension: 3.951026 | extension: 3.5856498 | extension: 1.9710534 | extension: 10.14 |

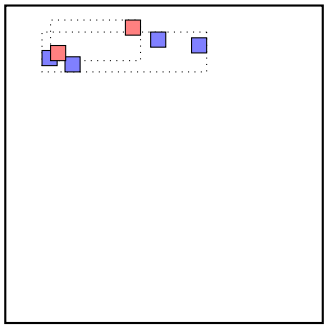
selected A

a leaf is found: A

return from CHOOSE-LEAF

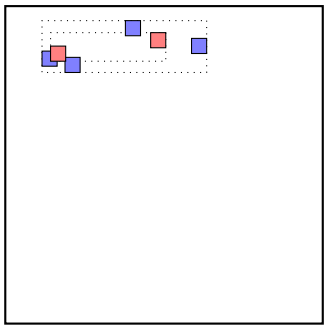
call SPLIT-NODE (bruteforce)

17 5 9 13 — 12 11



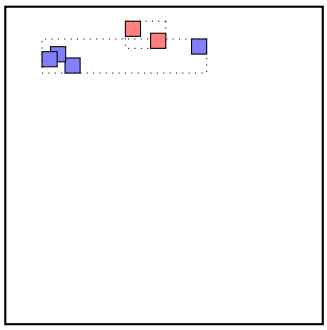
$S = 1.7868353$

17 5 11 13 — 12 9



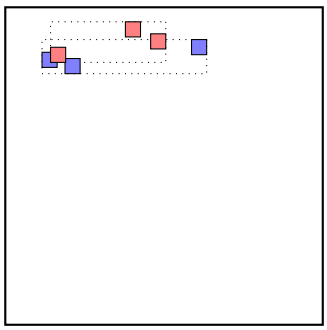
$S = 2.0701795$

17 5 12 13 — 11 9



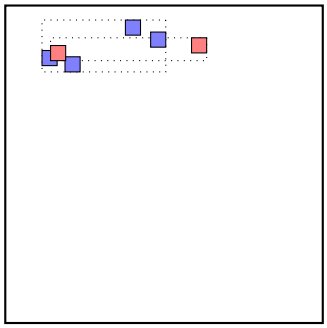
$S = 1.1739833$

17 5 13 — 12 11 9



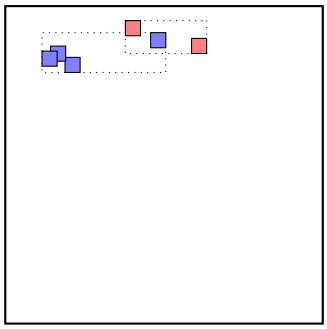
$S = 1.8006654$

17 9 11 13 — 12 5



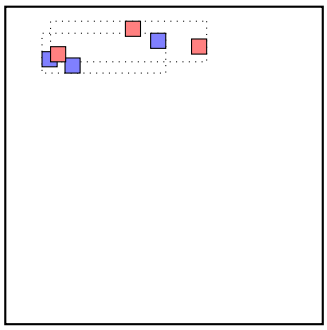
$S = 1.7466114$

17 9 12 13 — 11 5



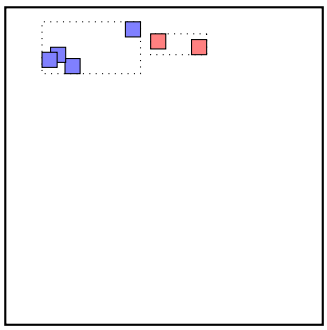
$S = 1.3303235$

17 9 13 — 12 11 5



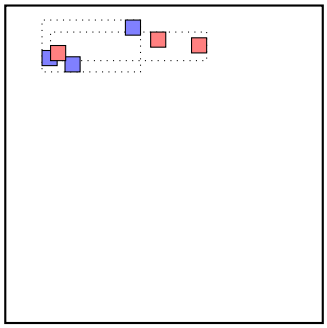
$S = 1.9716034$

17 11 12 13 — 9 5



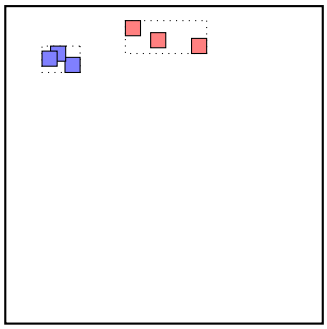
$S = 1.0983737$

17 11 13 — 12 9 5



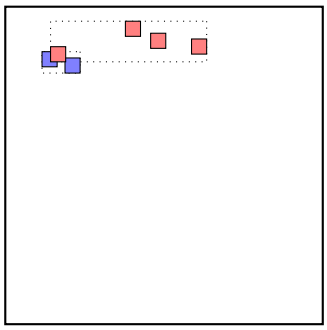
$S = 1.6744273$

17 12 13 — 11 9 5



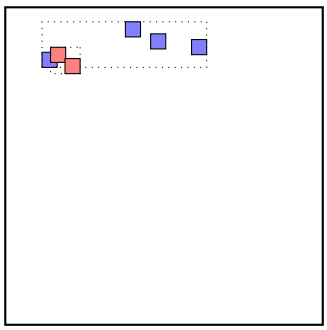
$S = 0.6435208$

17 13 — 12 11 9 5



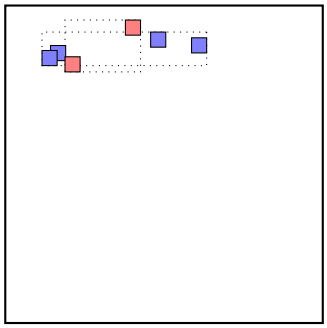
$S = 1.2515367$

5 9 11 13 — 12 17



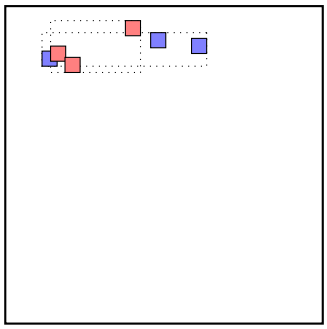
$S = 1.4497928$

5 9 12 13 — 11 17



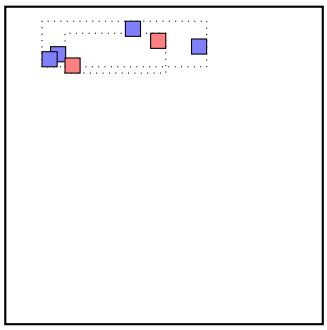
$S = 1.6523454$

5 9 13 — 12 11 17



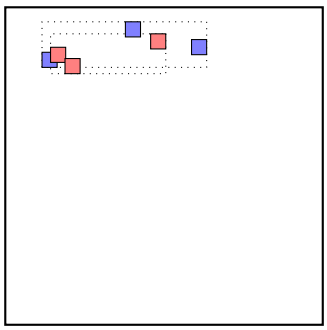
$S = 1.7833715$

5 11 12 13 — 9 17



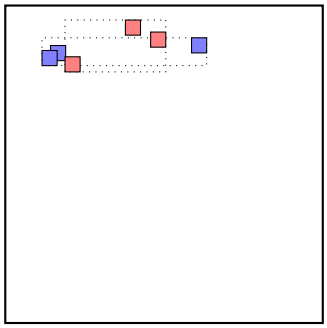
$S = 2.0158243$

5 11 13 — 12 9 17



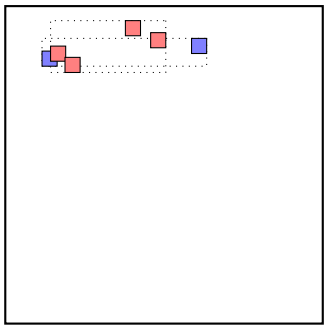
$S = 2.1164816$

5 12 13 — 11 9 17



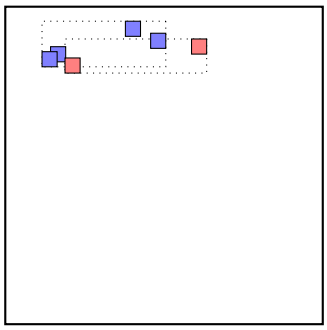
$S = 1.7159413$

5 13 — 12 11 9 17



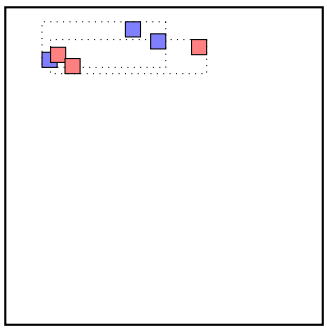
$S = 1.8469673$

9 11 12 13 — 5 17



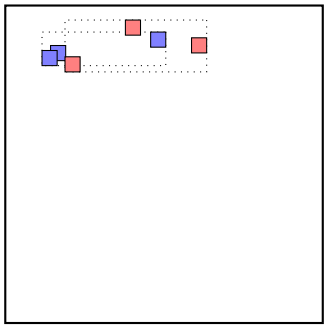
$S = 1.8322842$

9 11 13 — 12 5 17



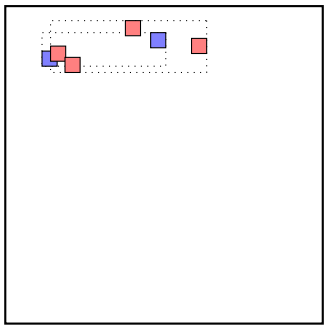
$S = 1.9184252$

9 12 13 — 11 5 17



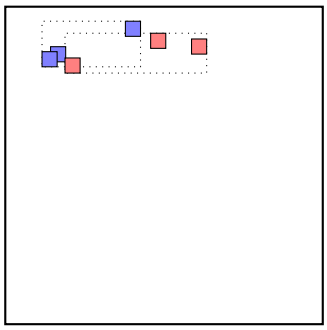
$S = 2.012391$

9 13 — 12 11 5 17



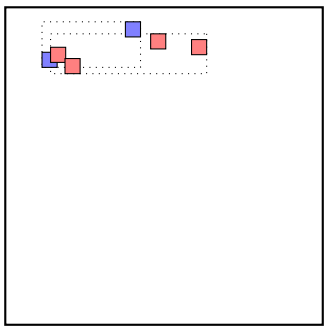
$S = 2.1434174$

11 12 13 — 9 5 17



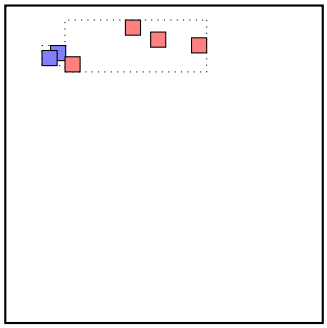
$S = 1.7733063$

11 13 — 12 9 5 17



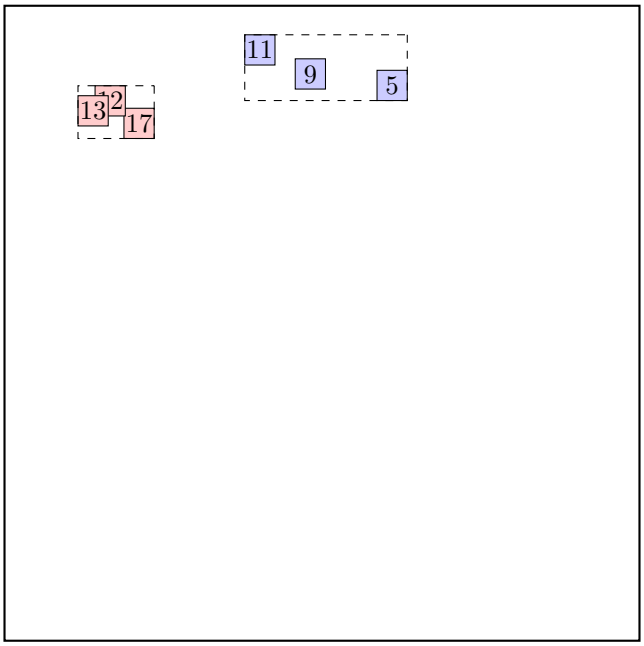
$S = 1.8739632$

12 13 — 11 9 5 17



$S = 1.3688215$

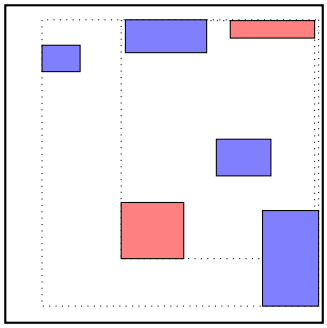
. . . the final split is:




return from SPLIT-NODE

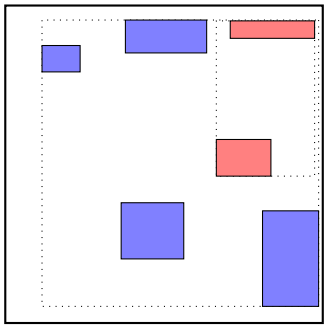
call ADJUST-TREE with $R$, node A and the new node
update MBR of node A.
add the new node to the parent node root
Parent node root is full, promote split (create a new parent)
call SPLIT-NODE (bruteforce)

F A B E — D C



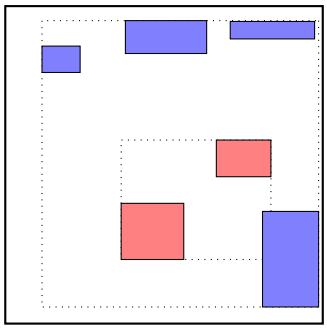
$S = 21.918583$

F A C E — D B



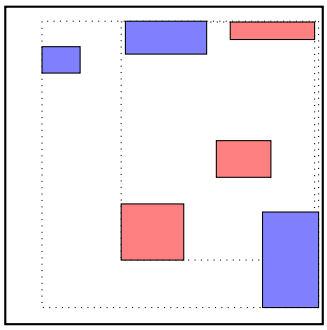
$S = 16.530493$

F A D E — C B



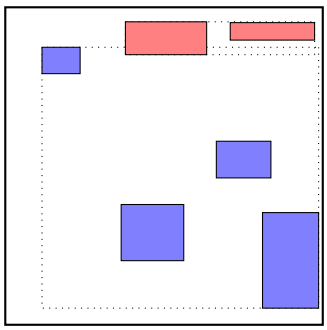
$S = 16.990273$

F A E — D C B



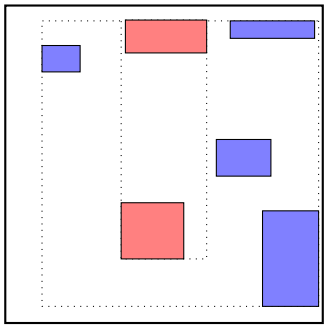
$S = 21.918583$

F B C E — D A



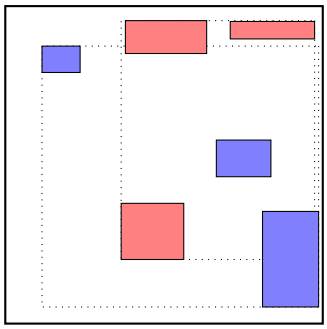
$S = 13.716015$

F B D E — C A



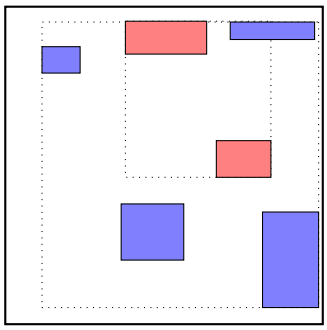
$S = 17.394003$

F B E — D C A



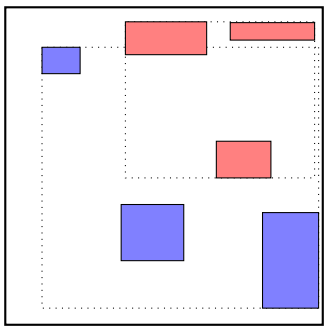
$S = 20.71365$

F C D E — B A



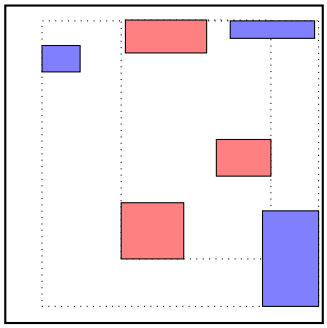
$S = 17.795168$

F C E — D B A



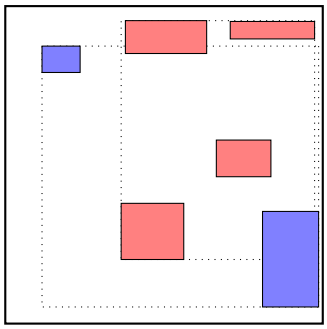
$S = 17.795905$

F D E — C B A



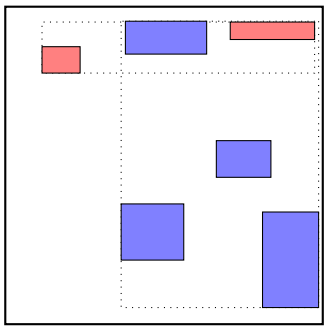
$S = 20.080004$

F E — D C B A



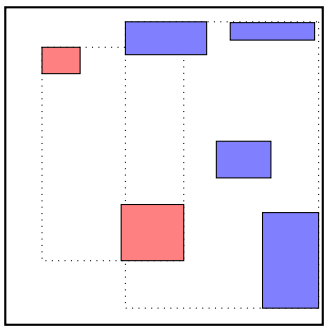
$S = 20.71365$

A B C E — D F



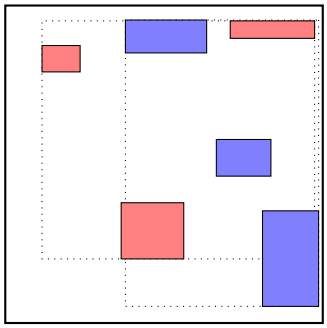
$S = 12.328305$

A B D E — C F



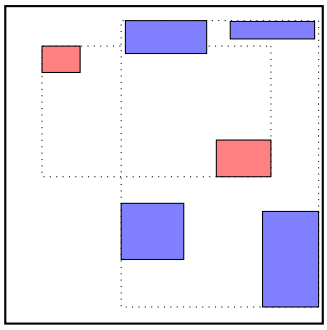
$S = 14.975254$

A B E — D C F



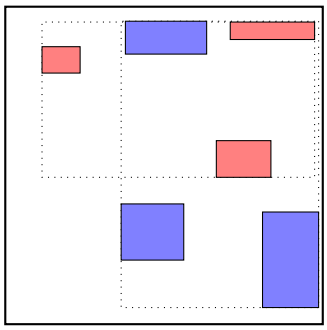
$S = 21.037423$

A C D E — B F



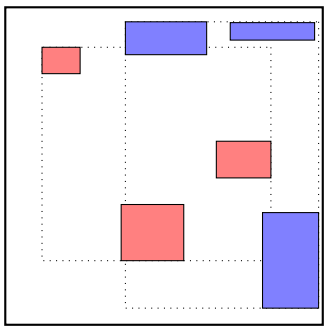
$S = 15.12664$

A C E — D B F



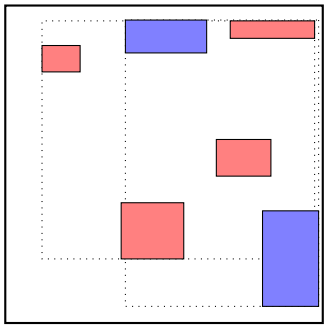
$S = 17.30098$

A D E — C B F



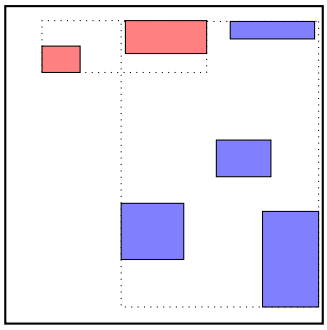
$S = 18.230172$

A E — D C B F



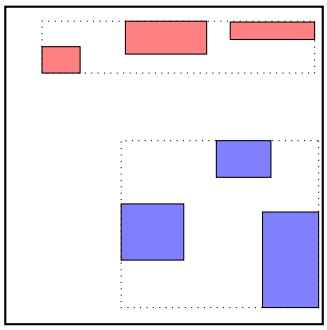
$S = 21.037423$

B C D E — A F



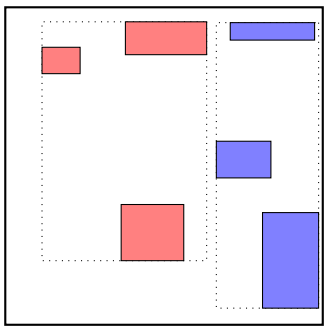
$S = 11.3596325$

B C E — D A F



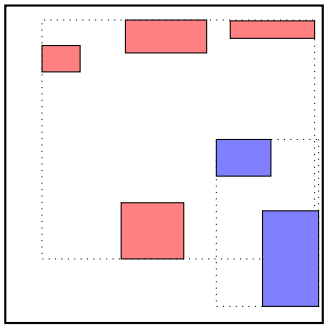
$S = 8.241012$

B D E — C A F



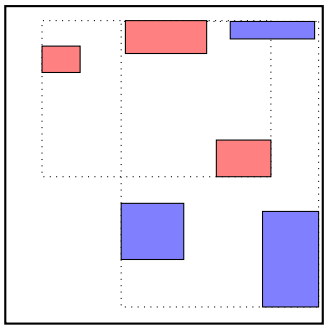
$S = 11.992761$

B E — D C A F



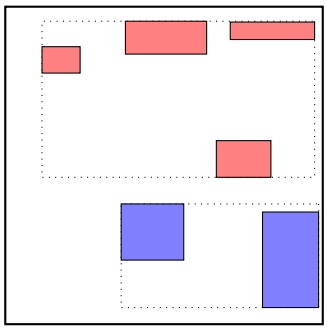
$S = 14.382384$

C D E — B A F



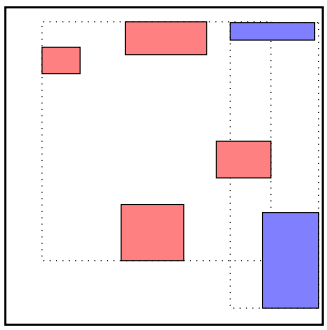
$S = 16.118344$

C E — D B A F



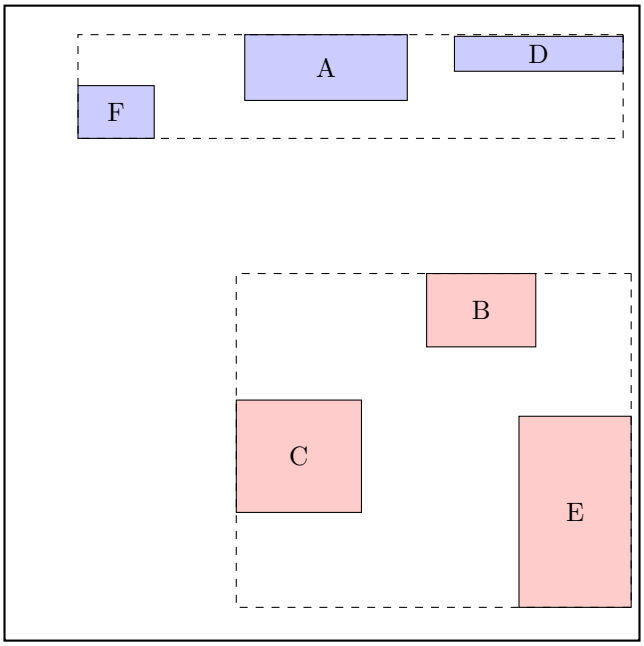
$S = 11.027442$

D E — C B A F



$S = 13.983792$

. . . the final split is:

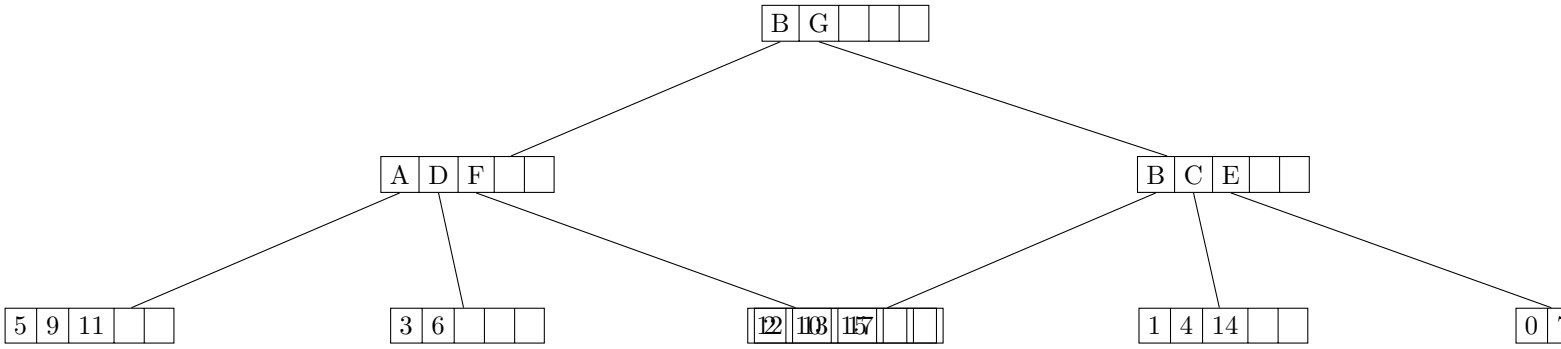



return from SPLIT-NODE
    continue by adjusting the parent node NIL, the new parent

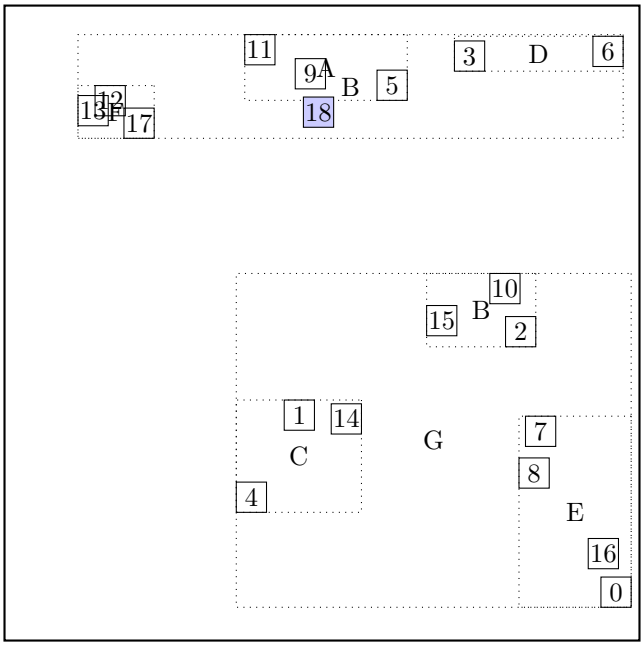
call ADJUST-TREE with $R$, node B and the new node
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1977/1000 :Y 679/200)`

structure view:

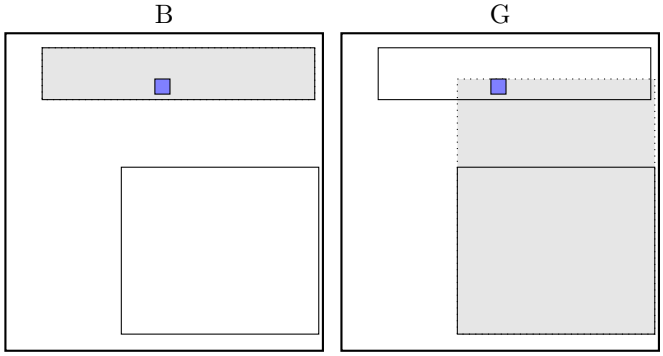



data view:




call CHOOSE-LEAF $R$, 18

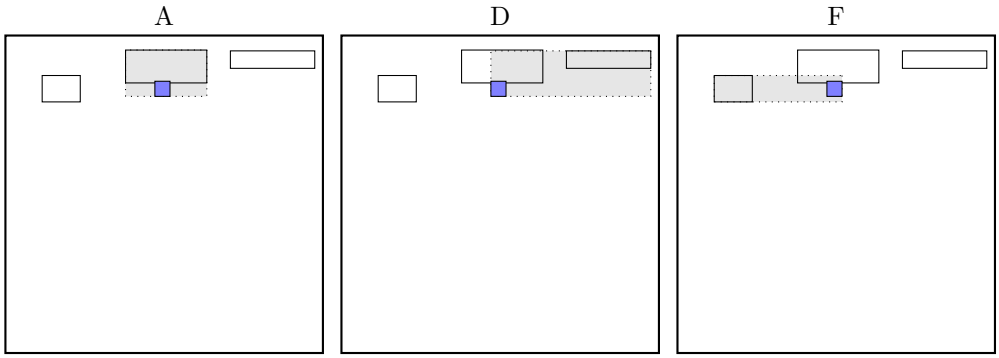
choose among children:




| B | G |
|---|---|
| old area: 2.4737156 | old area: 5.767296 |
| new area: 2.4737156 | new area: 8.8155 |
| extension: 0.0 | extension: 3.0482045 |

selected B

choose among children:



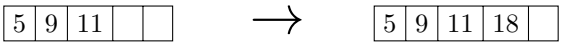

old area: 0.4676249
new area: 0.6589749
extension: 0.19134999

old area: 0.2577956
new area: 1.2732294
extension: 1.0154338

old area: 0.17589589
new area: 0.5901585
extension: 0.41426265

selected A
a leaf is found: A
return from CHOOSE-LEAF

the leaf A is not full, add the record.



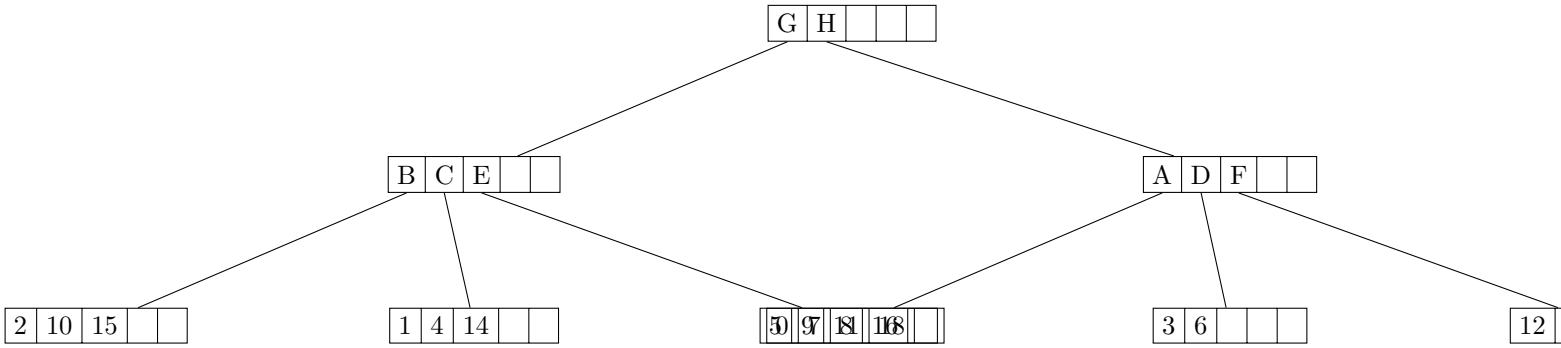

call ADJUST-TREE with $R$, node A
update MBR of node A.
continue by adjusting the parent node B

call ADJUST-TREE with $R$, node B
update MBR of node B.
continue by adjusting the parent node root

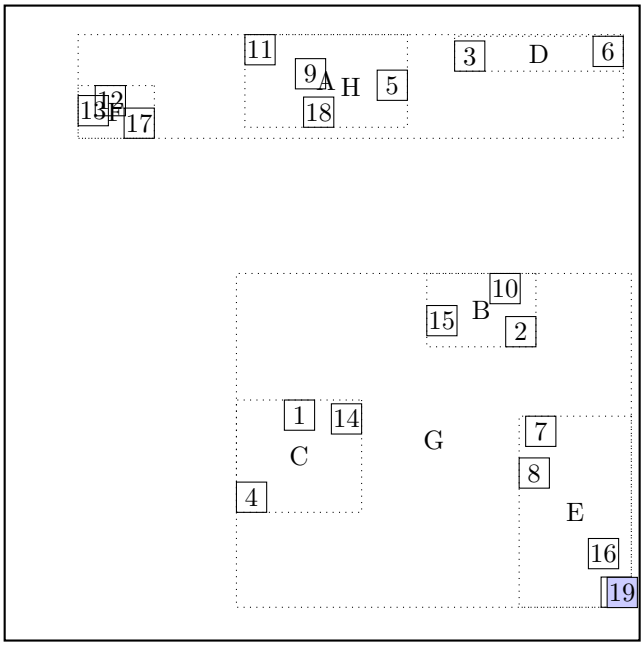
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 797/200 :Y 109/500)`

structure view:

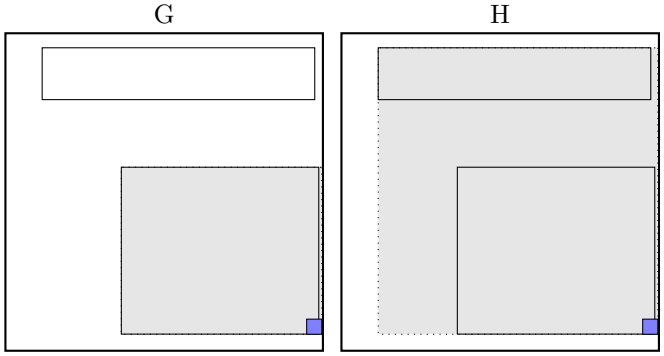



data view:




call CHOOSE-LEAF $R$, 19

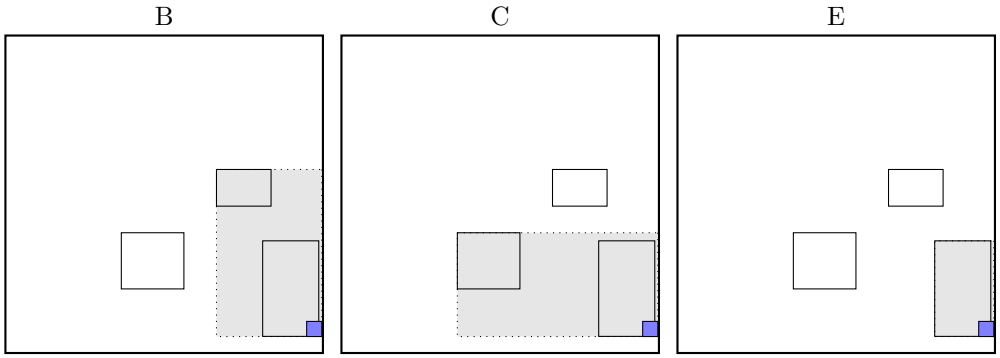
choose among children:




| G | H |
|---|---|
| old area: 5.767296 | old area: 2.4737156 |
| new area: 5.8609195 | new area: 14.01921 |
| extension: 0.09362364 | extension: 11.545494 |

selected G

choose among children:



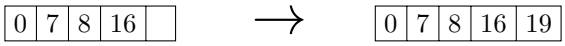

old area: 0.35016975
new area: 3.0785294
extension: 2.7283597

old area: 0.61520404
new area: 3.641196
extension: 3.025992

old area: 0.93788785
new area: 0.9900118
extension: 0.052123964

selected E
a leaf is found: E
return from CHOOSE-LEAF

the leaf E is not full, add the record.



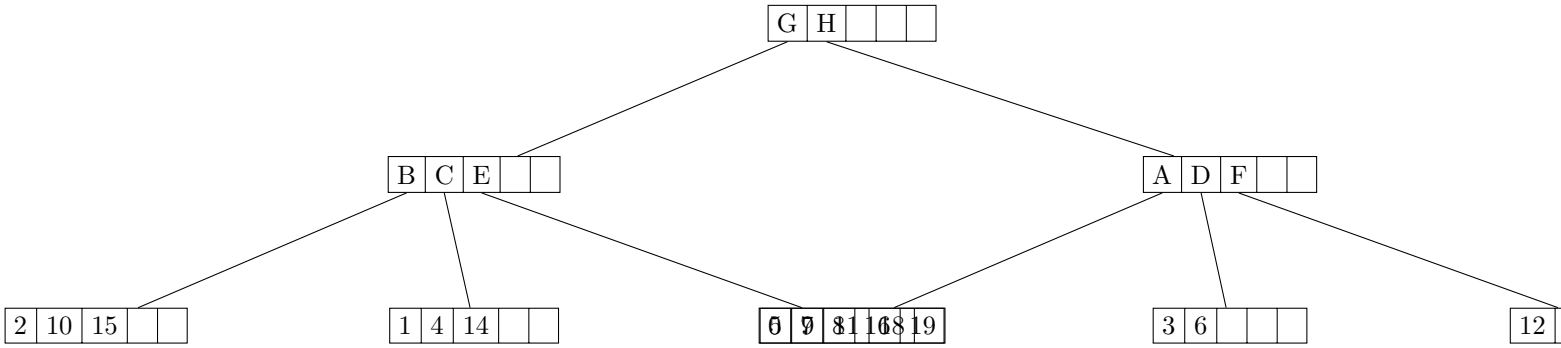

call ADJUST-TREE with $R$, node E
update MBR of node E.
continue by adjusting the parent node G

call ADJUST-TREE with $R$, node G
update MBR of node G.
continue by adjusting the parent node root

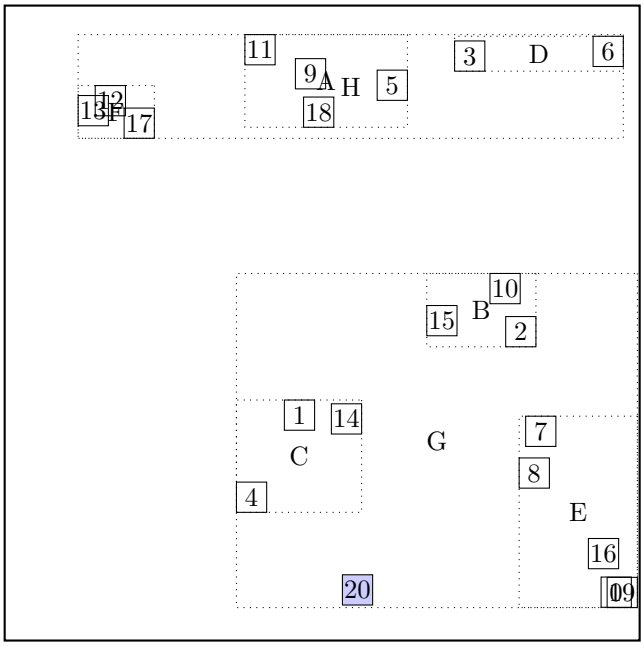
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 1117/500 :Y 47/200)`

structure view:

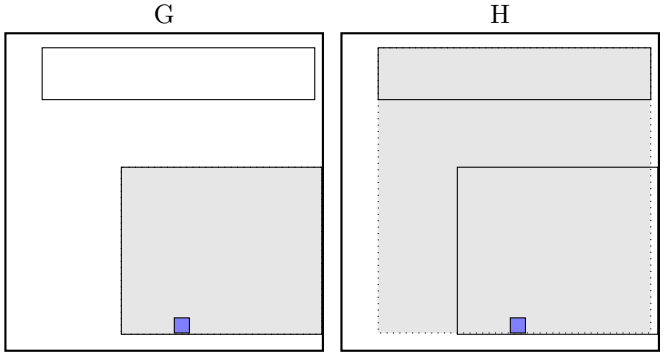



data view:




call CHOOSE-LEAF $R$, 20

choose among children:

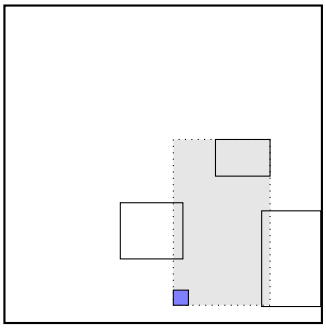



| G | H |
|---|---|
| old area: 5.8609195 | old area: 2.4737156 |
| new area: 5.8609195 | new area: 13.605438 |
| extension: 0.0 | extension: 11.131722 |

selected G

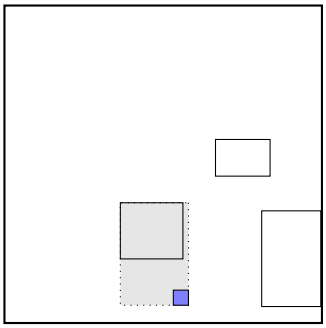
choose among children:

B



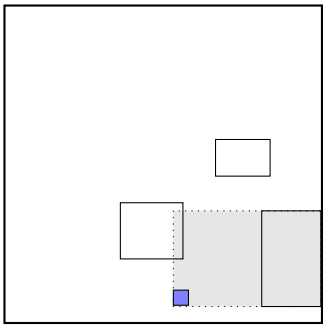
old area: 0.35016975
new area: 2.8070393
extension: 2.4568696

C



old area: 0.61520404
new area: 1.221756
extension: 0.60655195

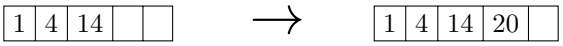
E



old area: 0.9900118
new area: 2.469966
extension: 1.4799541

selected C
a leaf is found: C
return from CHOOSE-LEAF

the leaf C is not full, add the record.



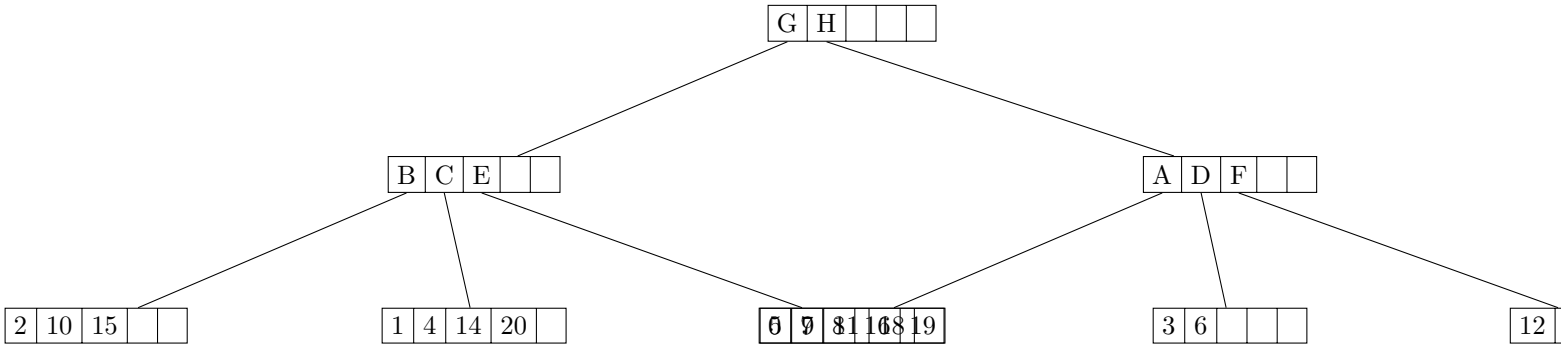

call ADJUST-TREE with $R$, node C
update MBR of node C.
continue by adjusting the parent node G

call ADJUST-TREE with $R$, node G
update MBR of node G.
continue by adjusting the parent node root

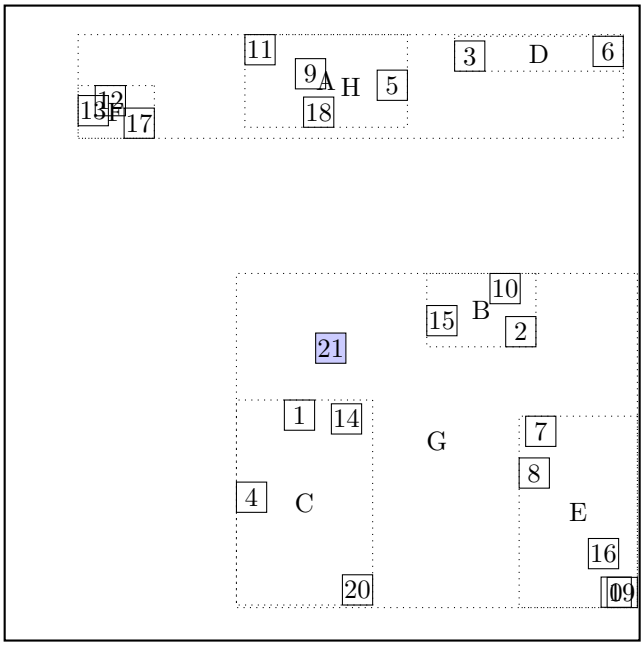
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 2057/1000 :Y 917/500)`

structure view:

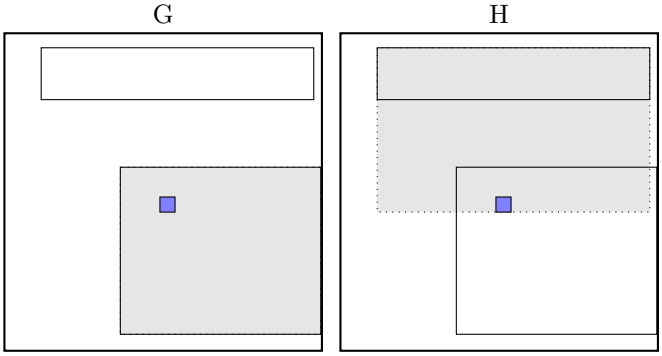



data view:




call CHOOSE-LEAF $R$, 21

choose among children:



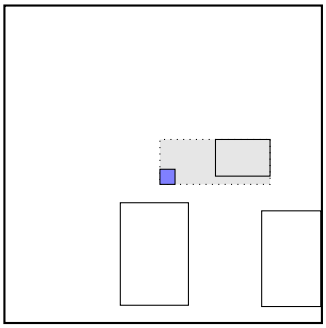

old area: 5.8609195
new area: 5.8609195
extension: 0.0

old area: 2.4737156
new area: 7.839444
extension: 5.3657284

selected G

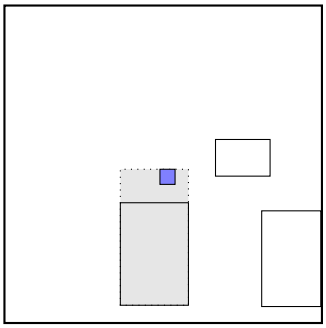
choose among children:

B



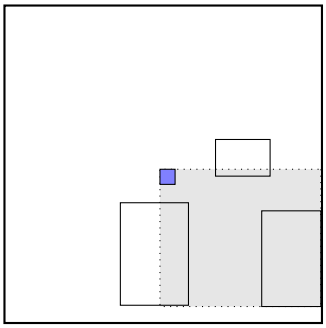
old area: 0.35016975
new area: 0.8654577
extension: 0.515288

C



old area: 1.221756
new area: 1.6208989
extension: 0.39914286

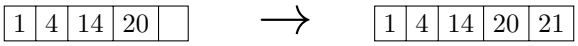
E



old area: 0.9900118
new area: 3.8644486
extension: 2.8744369

selected C
a leaf is found: C
return from CHOOSE-LEAF

the leaf C is not full, add the record.



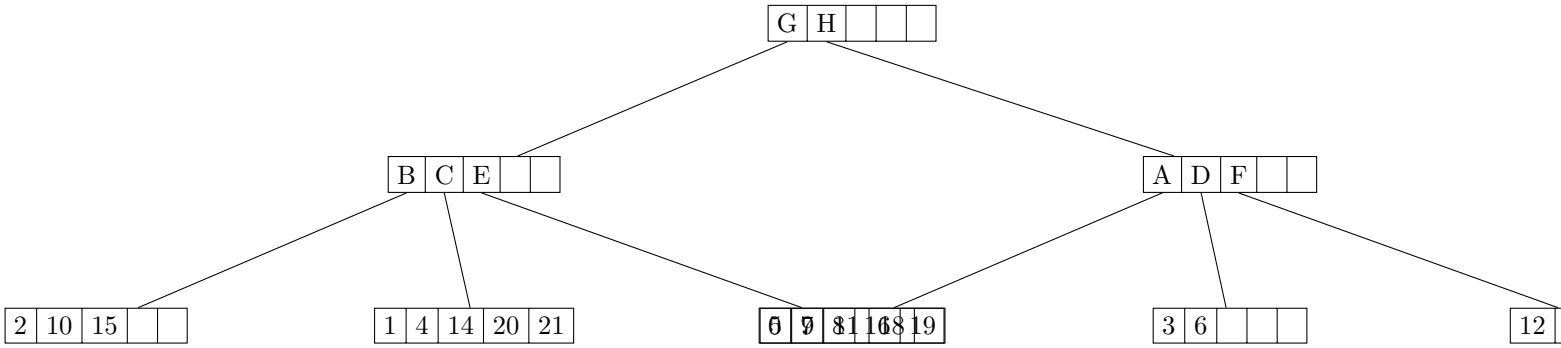

call ADJUST-TREE with $R$, node C
update MBR of node C.
continue by adjusting the parent node G

call ADJUST-TREE with $R$, node G
update MBR of node G.
continue by adjusting the parent node root

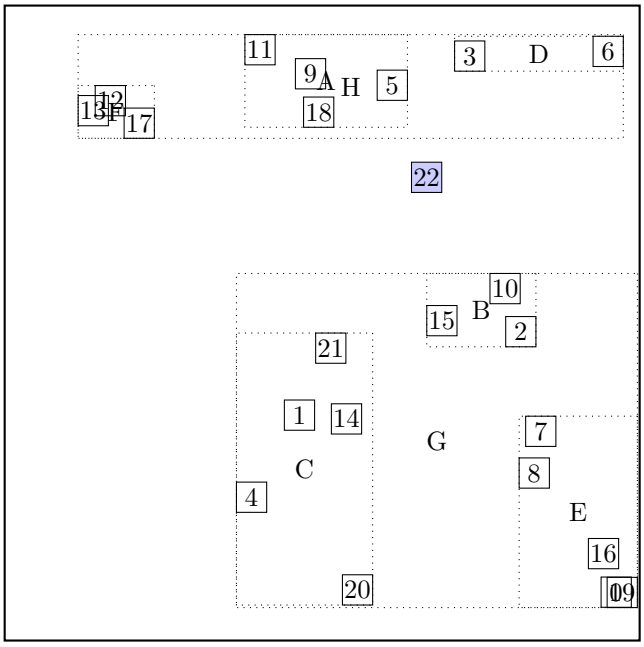
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 2691/1000 :Y 741/250)`

structure view:

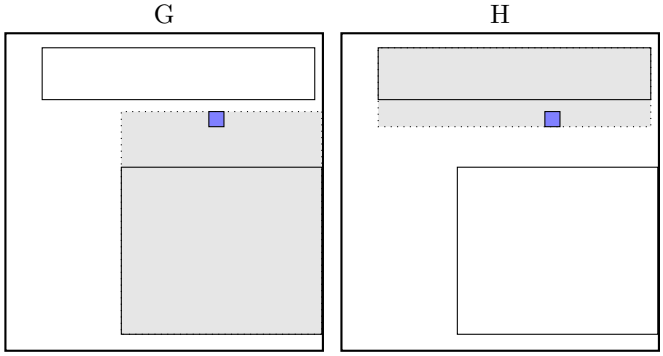



data view:




call CHOOSE-LEAF $R$, 22

choose among children:

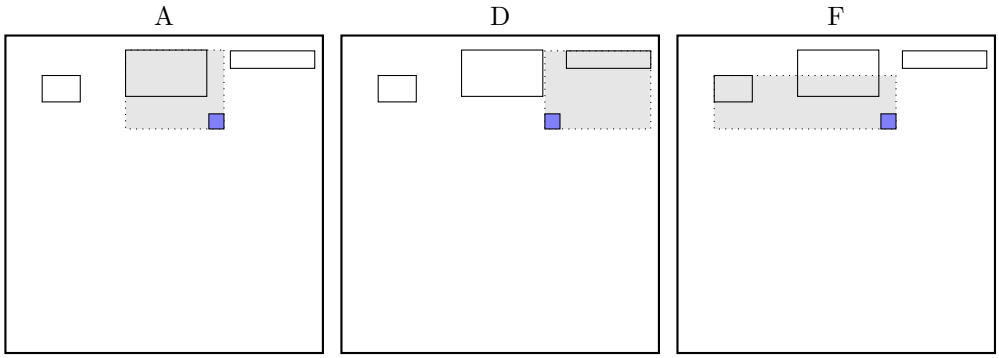



old area: 5.8609195
new area: 7.8127914
extension: 1.9518719

old area: 2.4737156
new area: 3.7646637
extension: 1.2909482

selected H

choose among children:



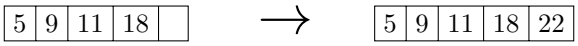

old area: 0.6589749
new area: 1.3592879
extension: 0.700313

old area: 0.2577956
new area: 1.4472325
extension: 1.1894369

old area: 0.17589589
new area: 1.7003344
extension: 1.5244385

selected A
a leaf is found: A
return from CHOOSE-LEAF

the leaf A is not full, add the record.



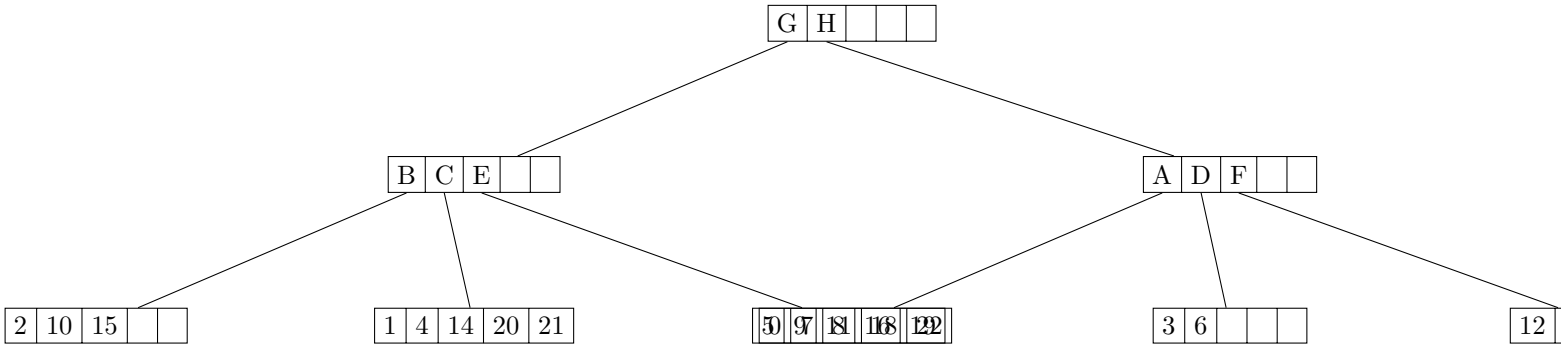

call ADJUST-TREE with $R$, node A
update MBR of node A.
continue by adjusting the parent node H

call ADJUST-TREE with $R$, node H
update MBR of node H.
continue by adjusting the parent node root

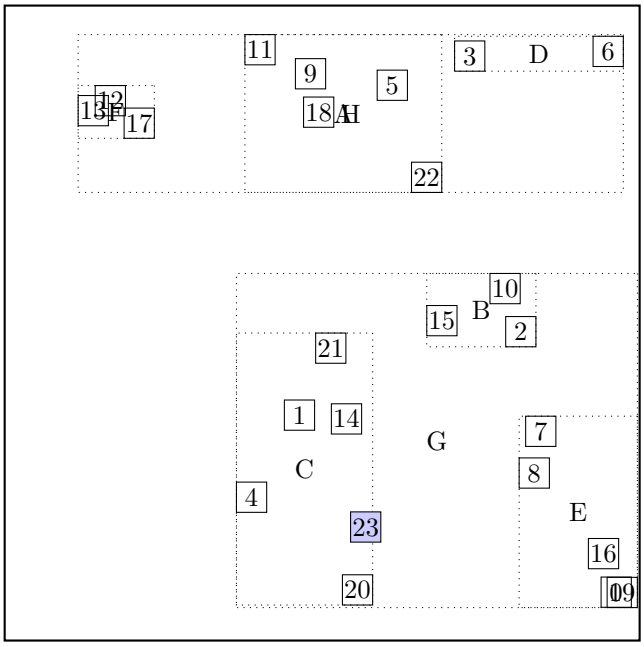
call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 286/125 :Y 651/1000)`

structure view:

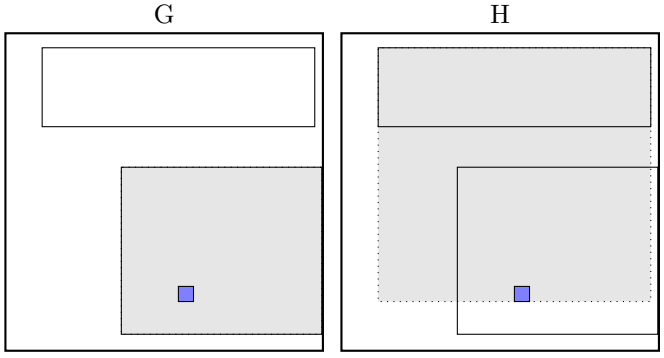



data view:




call CHOOSE-LEAF $R$, 23

choose among children:

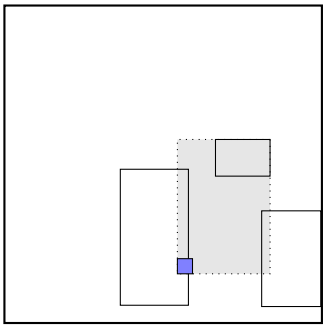



| G | H |
|---|---|
| old area: 5.8609195 | old area: 3.7646637 |
| new area: 5.8609195 | new area: 12.105341 |
| extension: 0.0 | extension: 8.340677 |

selected G

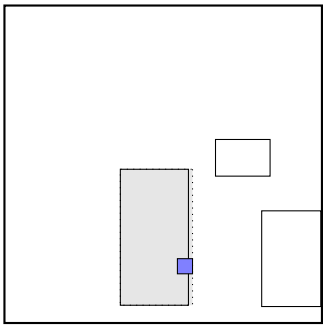
choose among children:

B



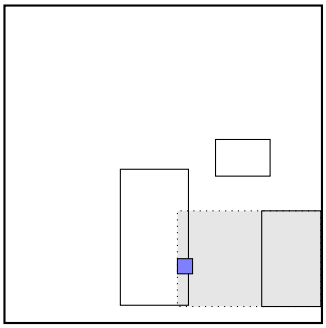
old area: 0.35016975
new area: 2.178601
extension: 1.8284313

C



old area: 1.6208989
new area: 1.7180451
extension: 0.09714627

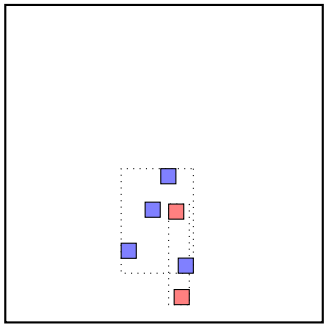
E



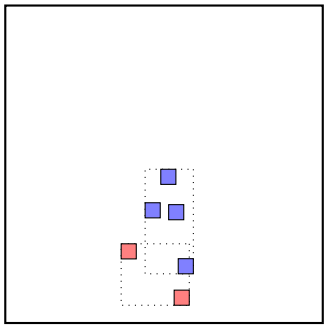
old area: 0.9900118
new area: 2.4016018
extension: 1.41159

selected C
a leaf is found: C
return from CHOOSE-LEAF

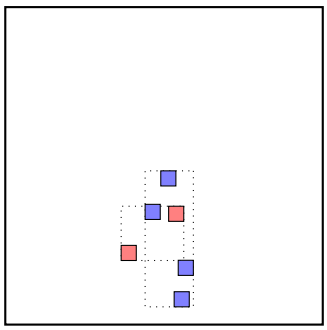
call SPLIT-NODE (bruteforce)
23 1 4 21 — 20 14



$S = 1.6841277$
23 1 14 21 — 20 4

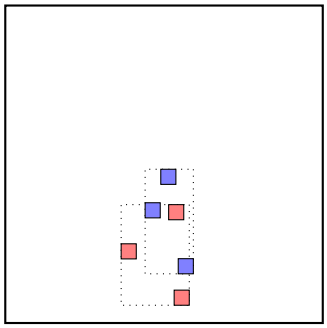


$S = 1.614867$
23 1 20 21 — 14 4



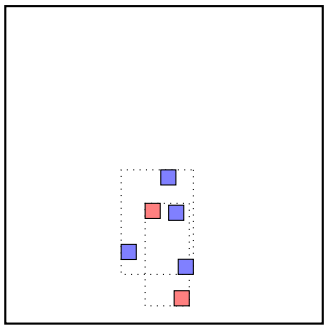
$S = 1.7422662$

23 1 21 — 20 14 4



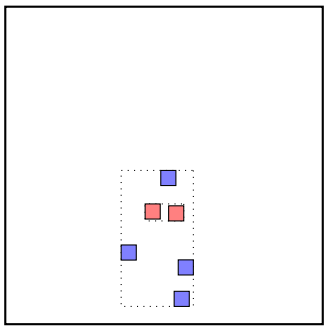
$S = 2.081585$

23 4 14 21 — 20 1



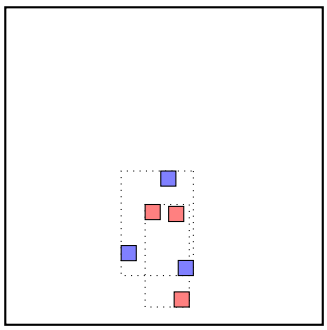
$S = 2.112669$

23 4 20 21 — 14 1



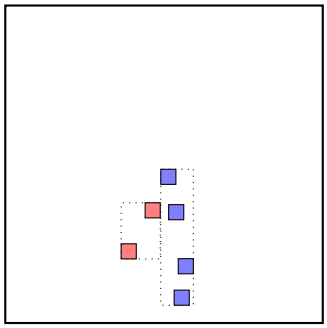
$S = 1.8330201$

23 4 21 — 20 14 1



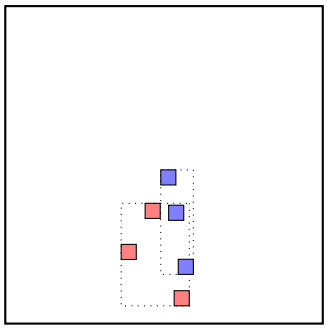
$S = 2.112669$

23 14 20 21 — 4 1



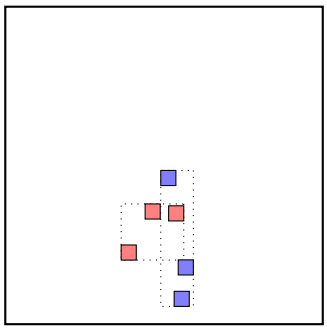
$S = 1.1595004$

23 14 21 — 20 4 1



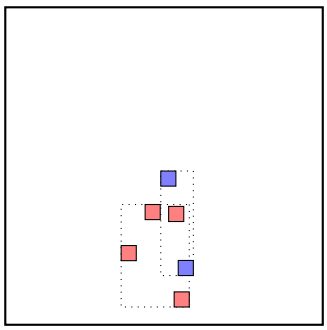
$S = 1.8178291$

23 20 21 — 14 4 1



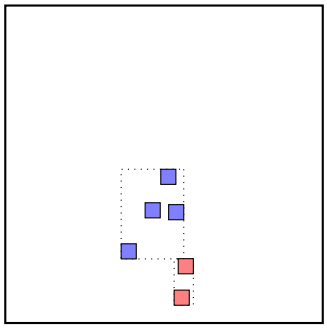
$S = 1.3905733$

23 21 — 20 14 4 1



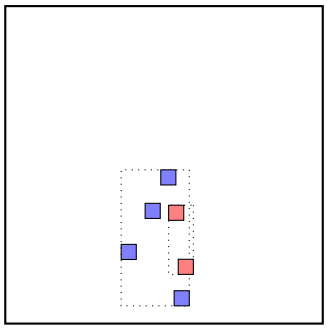
$S = 1.8178291$

1 4 14 21 — 20 23



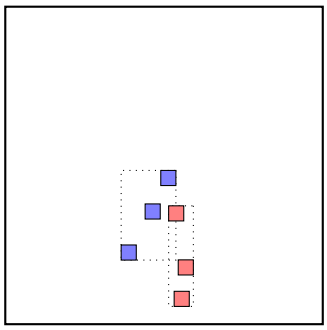
$S = 1.1384721$

1 4 20 21 — 14 23



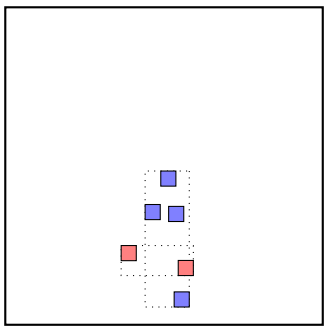
$S = 1.9201038$

1 4 21 — 20 14 23



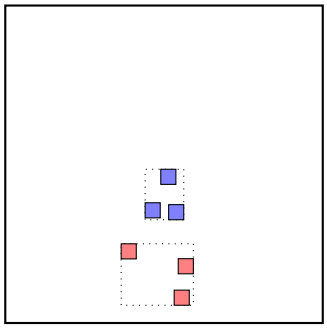
$S = 1.2939009$

1 14 20 21 — 4 23



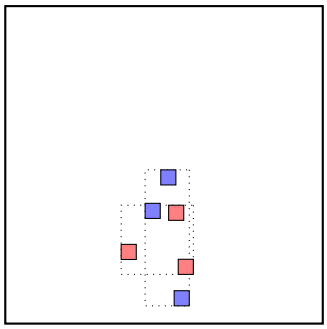
$S = 1.4297508$

1 14 21 — 20 4 23



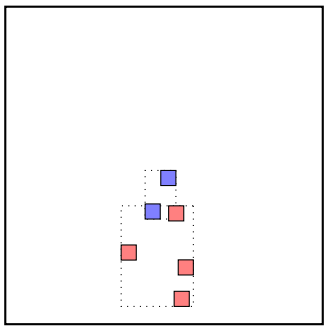
$S = 1.117763$

1 20 21 — 14 4 23



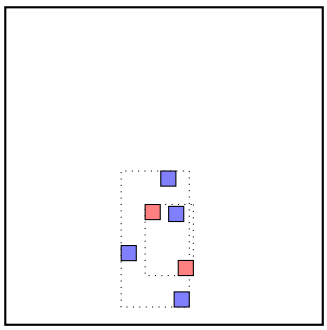
$S = 1.9244409$

1 21 — 20 14 4 23



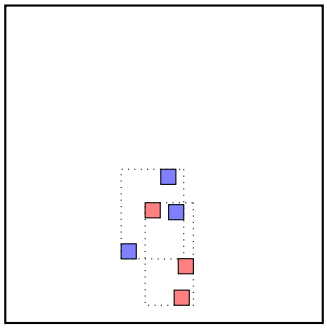
$S = 1.532806$

4 14 20 21 — 1 23



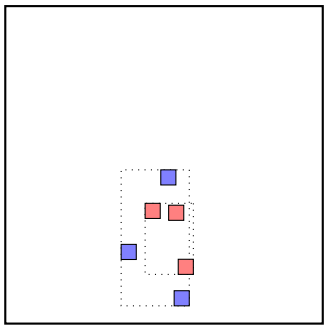
$S = 2.220619$

4 14 21 — 20 1 23



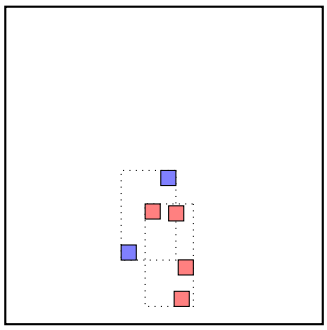
$S = 1.847136$

4 20 21 — 14 1 23



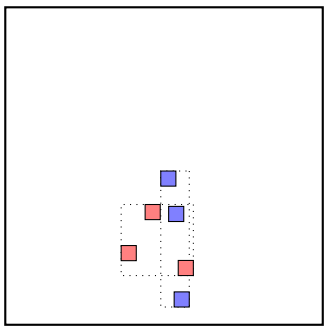
$S = 2.220619$

4 21 — 20 14 1 23



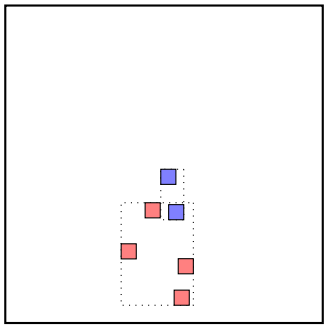
$S = 1.723792$

14 20 21 — 4 1 23



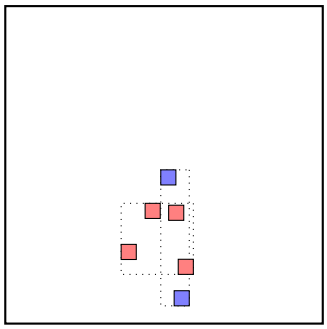
$S = 1.575923$

14 21 — 20 4 1 23



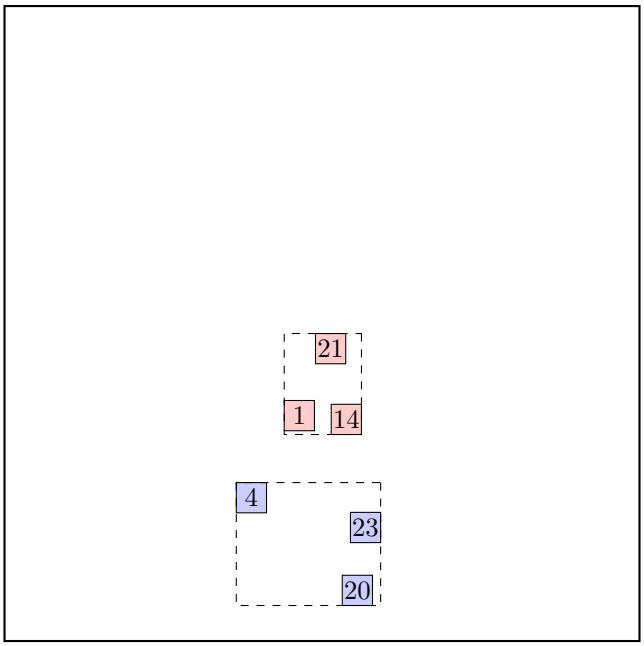
$S = 1.4980521$

20 21 — 14 4 1 23



$S = 1.575923$

. . . the final split is:




return from SPLIT-NODE

call ADJUST-TREE with $R$, node C and the new node
update MBR of node C.
add the new node to the parent node G

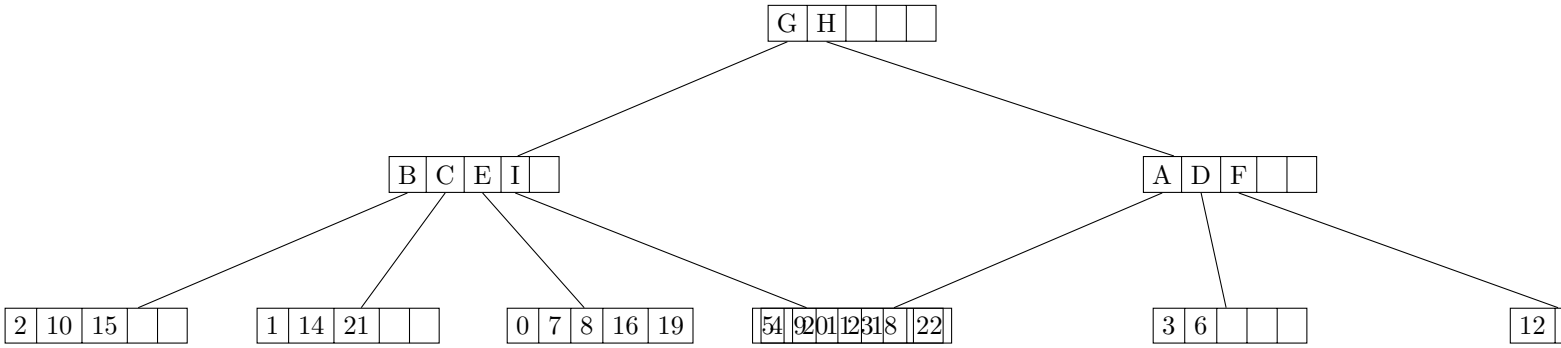
call ADJUST-TREE with $R$, node G
update MBR of node G.
continue by adjusting the parent node root

call ADJUST-TREE with $R$, node root

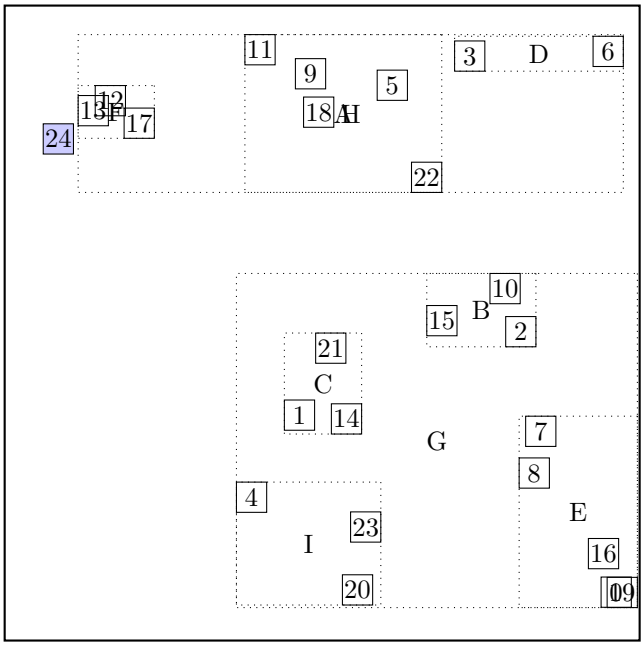
we are at the root
return from ADJUST-TREE

call INSERT $R$, `#S(P :X 51/200 :Y 1609/500)`

structure view:

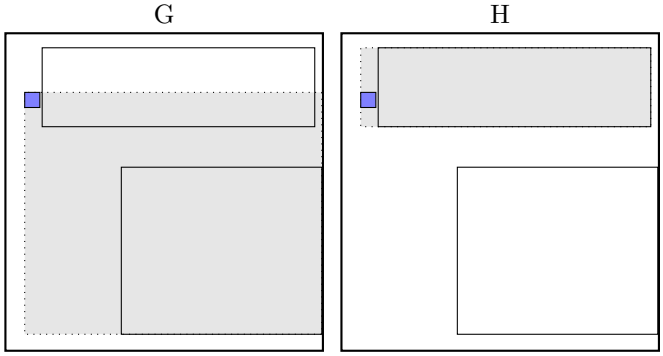



data view:




call CHOOSE-LEAF $R$, 24

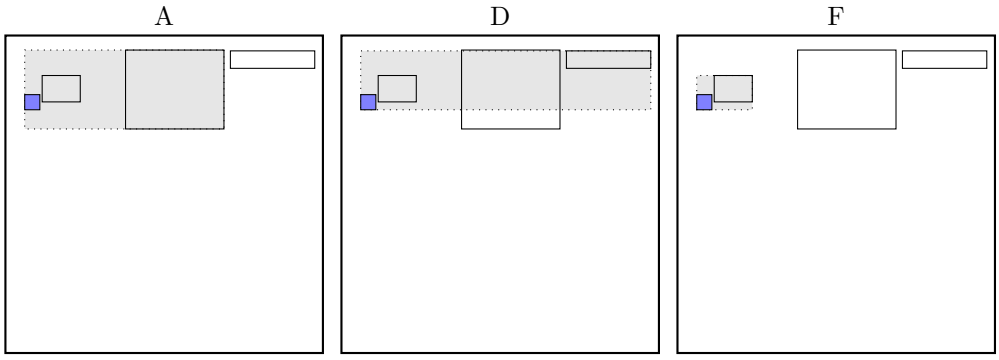
choose among children:




| G | H |
|---|---|
| old area: 5.8609195 | old area: 3.7646637 |
| new area: 12.575999 | new area: 4.0058274 |
| extension: 6.71508 | extension: 0.24116373 |

selected H

choose among children:



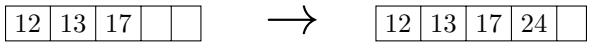

old area: 1.3592879
new area: 2.7519837
extension: 1.3926958

old area: 0.2577956
new area: 2.9890223
extension: 2.7312267

old area: 0.17589589
new area: 0.33295488
extension: 0.157059

selected F
a leaf is found: F
return from CHOOSE-LEAF

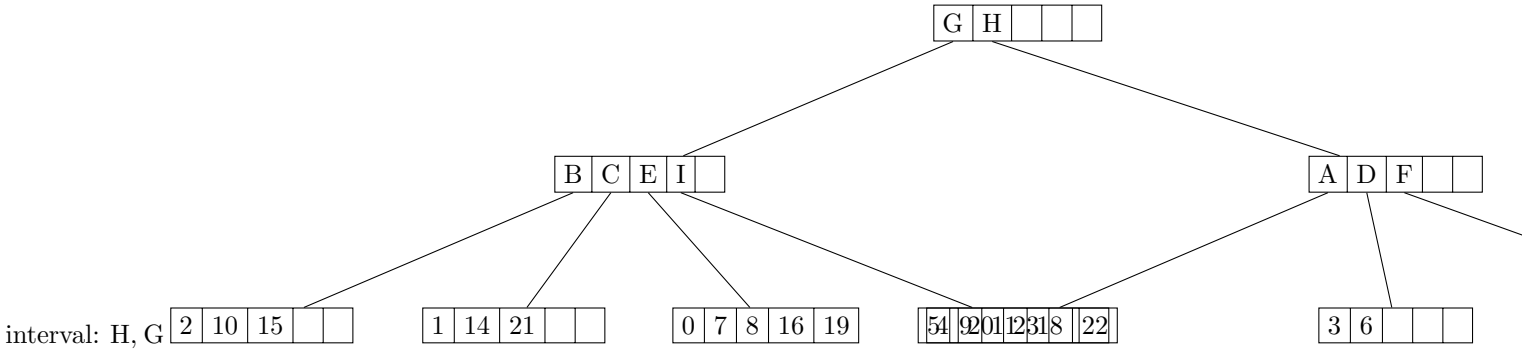
the leaf F is not full, add the record.




call ADJUST-TREE with $R$, node F
update MBR of node F.
continue by adjusting the parent node H

call ADJUST-TREE with $R$, node H
update MBR of node H.
continue by adjusting the parent node root

call ADJUST-TREE with $R$, node root
we are at the root
return from ADJUST-TREE


G H
B C E I
A D F
interval: H, G
2 10 15
1 14 21
0 7 8 16 19
54 92 01 12 31 8 22
3 6