CS5200 Homework 2 Dynamic Programming

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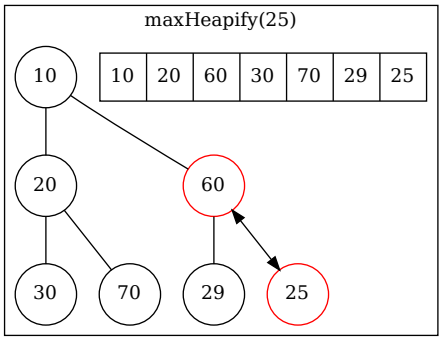
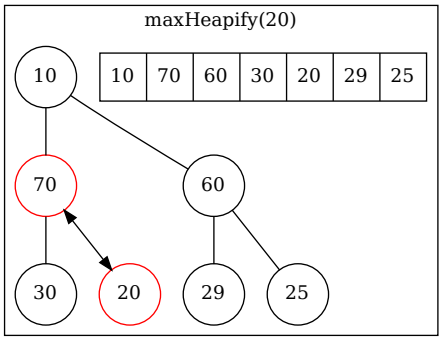
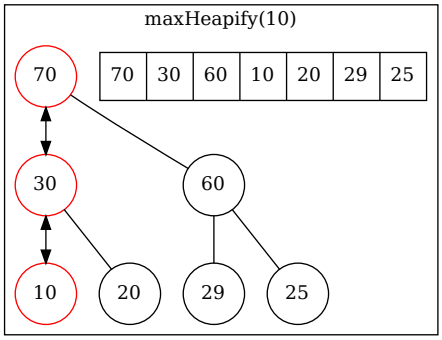
1) max heapify

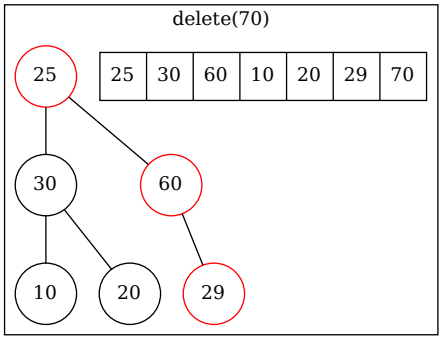
Call max heapify on all the internal nodes starting at the bottom

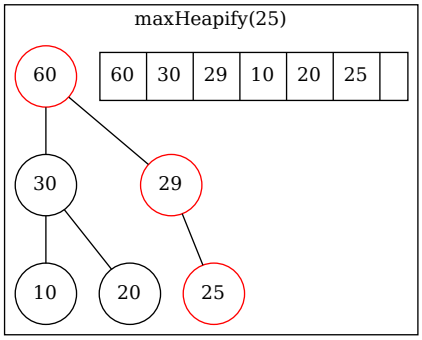
maxHeapify(25)

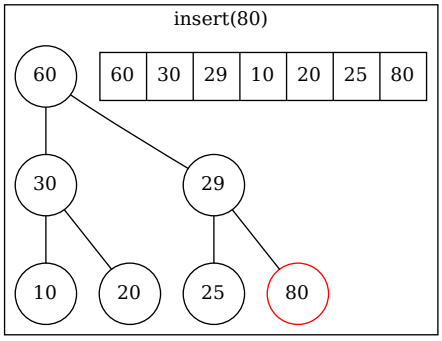


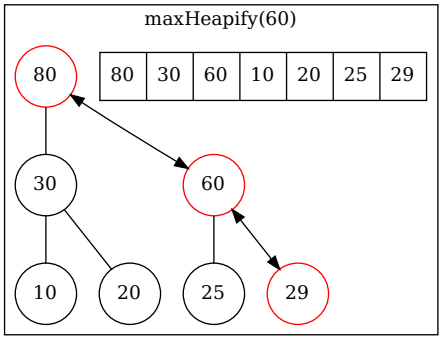


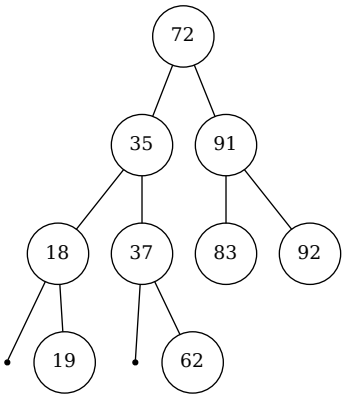

maxHeapify(10)
70
70 30 60 10 20 29 25
30
60
10
20
29
25


delete(70)
25
25 30 60 10 20 29 70
30
60
10
20
29


maxHeapify(25)
60
60 30 29 10 20 25
30
29
10
20
25



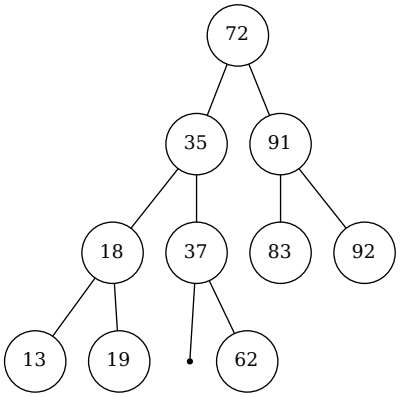




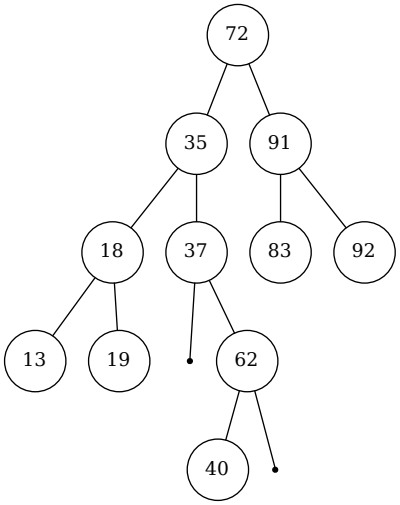
2)

Pre-order: 72 35 18 19 37 62 91 83 92

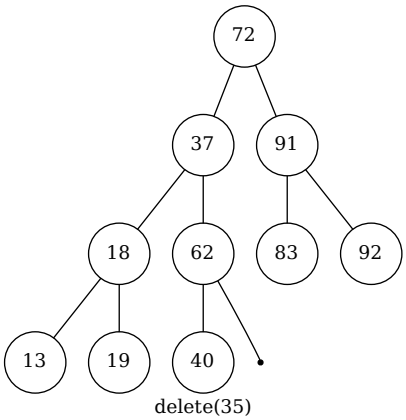
In-order: 18 19 35 37 62 72 83 91 92
Post-order: 19 18 62 37 35 83 92 91 72



insert(13)



insert(40)



3) $p_0 = 4$ $p_1 = 10$ $p_2 = 3$ $p_3 = 12$ $p_4 = 7$

	1	2	3	4
4	0	0	252	0
3	0	360	0	
2	120	0		
1	0			

	1	2	3	4
4			3	0
3		2	0	
2	1	0		
1	0			

m(1, 3) i=1 j=3

k=1

m(1, 1) + m(2, 3) + p_0 p_1 p_3

0 + 360 + 4*10*12 = 840

k=2

m(1, 2) + m(3, 3) + p_0 p_2 p_3

120 + 0 + 4*3*12 = 264

m(2, 4) i=2 j=4

k=2

m(2, 2) + m(3, 4) + p_1 p_2 p_4

0 + 252 + 10*3*7 = 462

k=3

m(2, 3) + m(4, 4) + p_1 p_3 p_4

120 + 0 + 10*12*7 = 462

	1	2	3	4
4	0	462	252	0
3	264	360	0	
2	120	0		
1	0			

	1	2	3	4
4		2	3	0
3	2	2	0	
2	1	0		
1	0			

m(1, 4) i=1 j=4

k=1

m(1, 1) + m(2, 4) + p_0 p_1 p_4

0 + 462 + 4*10*7 = 742

k=2

m(1, 2) + m(3, 4) + p_0 p_2 p_4

120 + 252 + 4*3*7 = 456

k=3

m(1, 3) + m(4, 4) + p_1 p_3 p_4

264 + 0 + 4*12*7 = 600

	1	2	3	4
4	456	462	252	0
3	264	360	0	
2	120	0		
1	0			

	1	2	3	4
4	2	2	3	0
3	2	2	0	
2	1	0		
1	0			

(A_1 A_2) (A_3 A_4)

4)

			CACMYCCA								
		_	C	A	C	M	Y	C	C	A	
	_	↖0	←0	←0	←0	←0	←0	←0	←0	←0	
MCMAMYCCMAY	M	↑0	←0	←0	←0	↖1	←1	←1	←1	←1	
	C	↑0	↖1	←1	←1	←1	←1	↖2	←2	←2	
	M	↑0	↑1	←1	←1	↖2	←2	←2	←2	←2	
	A	↑0	↑1	↖2	←2	←2	←2	←2	←2	↖3	
	M	↑0	↑1	↑2	←2	↖3	←3	←3	←3	←3	
	Y	↑0	↑1	↑2	←2	↑3	↖4	←4	←4	←4	
	C	↑0	↑1	↑2	↑3	←3	↑4	↖5	←5	←5	
	C	↑0	↑1	↑2	↑3	←3	↑4	↑5	↖6	←6	
	M	↑0	↑1	↑2	↑3	↖4	←4	↑5	↑6	←6	
	A	↑0	↑1	↑2	↑3	↑4	←4	↑5	↑6	↖7	
	Y	↑0	↑1	↑2	↑3	↑4	↖5	↑5	↑6	↑7	CAMYCCA

			CACMYCCA								
		_	C	A	C	M	Y	C	C	A	
	_	0	0	0	0	0	0	0	0	0	
MCMAMYCCMAY	M	0	0	0	0	1	0	0	0	0	
	C	0	1	0	1	0	0	1	1	0	
	M	0	0	0	0	2	0	0	0	0	
	A	0	0	1	0	0	0	0	0	1	
	M	0	0	0	0	1	0	0	0	0	
	Y	0	0	0	0	0	2	0	0	0	
	C	0	1	0	1	0	0	3	1	0	
	C	0	1	0	1	0	0	1	4	0	
	M	0	0	0	0	2	0	0	0	0	
	A	0	0	1	0	0	0	0	0	1	
	Y	0	0	0	0	0	1	0	0	0	MYCC

5)

i	0	1	2	3	4
p_i	0	0.05	0.12	0.3	0.2
q_i	0.07	0.07	0.07	0.06	0.06

$$w[i, j] = w[i, j-1] + p_j + q_j$$

$w[1, 1] = w[1, 0] + p_1 + q_1 = 0.07 + 0.05 + 0.07 = 0.19$
$w[3, 2] = w[3, 1] + p_2 + q_2 = 0.26 + 0.30 + 0.06 = 0.62$
$w[4, 4] = w[4, 3] + p_4 + q_4 = 0.06 + 0.20 + 0.06 = 0.32$

w	1	2	3	4	5
4	1.00	0.88	0.69	0.32	0.06
3	0.74	0.62	0.43	0.06	
2	0.52	0.26	0.07		
1	0.19	0.07			
0	0.07				

r is from i to j

save the lowest r to root table and record the lowest value in the c table
c[i, j] = c[i, r-1] + c[r+1, j] + w[i, j]

r = 1
c[1, 1] = c[1, 0] + c[2, 1] + w[1, 1] = 0.07 + 0.07 + 0.19 = 0.33

r = 1
c[1, 2] = c[1, 0] + c[2, 2] + w[1, 2] = 0.07 + 0.40 + 0.52 = 0.99
r = 2
c[1, 2] = c[1, 1] + c[3, 2] + w[1, 2] = 0.33 + 0.07 + 0.52 = 0.92

c	1	2	3	4	5
4	2.36	1.76	1.20	0.44	0.06
3	1.63	1.08	0.56	0.06	
2	0.92	0.40	0.07		
1	0.33	0.07			
0	0.07				

root	1	2	3	4
4	3	3	3	4
3	2	3	3	
2	2	2		
1	1			

Bonus: