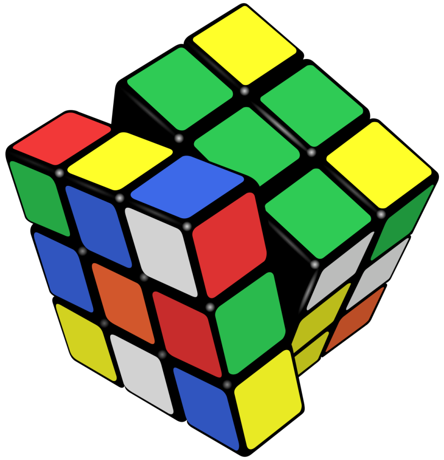
Quiz 1

Section 1 (LEC0101, LEC2003)



CSC263
Sep 27 – 2017

Question 1

Assume that algorithm A is asymptotically more efficient than B. Which statement is true?

Players correct: 58%

A) A will be a better choice for all inputs

B) B will be a better choice for small inputs

C) A will be a better choice for all inputs except large inputs

D) A will be a better choice for all inputs except small inputs

Question 1

Assume that algorithm A is asymptotically more efficient than B. Which statement is true?

Players correct: 58%

A) A will be a better choice for all inputs

B) B will be a better choice for small inputs

C) A will be a better choice for all inputs except large inputs

D) A will be a better choice for all inputs except small inputs

Question 2

Let $T_W(n)$ be the worst-case and $T_A(n)$ be the average-case running time of an algorithm. Which one is always true?

Players correct: 40%

A) $T_W(n) = O(T_A(n))$

B) $T_W(n) = \Omega(T_A(n))$

C) $T_W(n) = \Theta(T_A(n))$

D) $T_W(n) = o(T_A(n))$

Question 2

Let $T_W(n)$ be the worst-case and $T_A(n)$ be the average-case running time of an algorithm. Which one is always true?

Players correct: 40%

A) $T_W(n) = O(T_A(n))$

B) $T_W(n) = \Omega(T_A(n))$

C) $T_W(n) = \Theta(T_A(n))$

D) $T_W(n) = o(T_A(n))$

Question 3

There are three possible procedures A, B, C for running an application. Procedure A takes 2 seconds, procedure B takes 3 seconds and procedure C takes 4 seconds to run. This application to be run chooses algorithm A with the probabilty of 0.30, the algorithm B with the probabilty of 0.20 and C with probabilty of 0.50. What is the average case running time of the application?

Players correct: 84%

A) 2 B) 4.5 C) 3.2 D)3

Question 3

There are three possible procedures A, B, C for running an application. Procedure A takes 2 seconds, procedure B takes 3 seconds and procedure C takes 4 seconds to run. This application to be run chooses algorithm A with the probabilty of 0.30, the algorithm B with the probabilty of 0.20 and C with probabilty of 0.50. What is the average case running time of the application?

Players correct: 84%

$A)$ 2 $\quad B)$ 4.5 $\quad$ C) 3.2 $\quad D)$3

Average-case running time = $\sum x\, p(x) = 2 * 0.3 + 4 * 0.2 + 4 * 0.5$ = 3.2

Question 4

What is the minimum number of comparisons required to find a minimum value stored in a max heap?

Players correct: 24%

$A)\ n$ $B)\ n/2$ C) $O(\log n)$ $D)\ \frac{n}{2} - 1$

Question 4

What is the minimum number of comparisons required to find a minimum value stored in a max heap?

Players correct: 24%

$A)\ n$ $B)\ n/2$ C) $O(\log n)$ $D)\ \frac{n}{2} - 1$

Answer: The minimum element in a max-heap can be anywhere in the leaves of the heap. (why?)

There are up to n/2 elements in the leaves, so finding the minimum needs n/2 times.

Question 5

What is time complexity of increasing and decreasing a value of an element in a max heap?

Players correct: 71%

A)O(n), O(n)

B)O(log n), O(n)

C) $O(\log n)$, $O(\log n)$

D) $O(n)O(logn)$

Question 5

What is time complexity of increasing and decreasing a value of an element in a max heap?

Players correct: 71%

A)O(n), O(n) B)O(log n), O(n) C) $O(\log n)$, $O(\log n)$ D) $O(n)O(logn)$

Answer:

- Increasing a value need a max-heapify-up operation
- Decreasing a value needs a max-heapify-down operation

Both operations are in $O(\log n)$ since needs to traverse the height of the tree in the worst case.

Question 6

In a heap of height h, what is the minimum number of elements?

(Assume the height of the root is zero).

Players correct: 25%

A) $2^{(h+1)} - 1$

B) 2^h

C) $2^{(h-1)}$

D) $2^{(h+1)}$

Question 6

In a heap of height h, what is the minimum number of elements?

(Assume the height of the root is zero).

Players correct: 25%

A) $2^{(h+1)} - 1$

B) 2^h

C) $2^{(h-1)}$

D) $2^{(h+1)}$

Heap is a complete binary tree, so it is full at all level bottom level which has at least 1 node. The number of nodes at level 0 is $1 = 2^0$, at level 1 is $2 = 2^1$, … , at level $h - 1$ is 2^{h-1} and at level h is 1.
Total number of nodes: $(1 + 2 + 2^2 \ \ldots + 2^{h-1}) + 1 = (2^h - 1) + 1 = 2^h$.

Question 7

Given four numeric values $a < b < c < d$ as the elements' priorities, how many possible max heaps would be possible to build?

Players correct: 40%

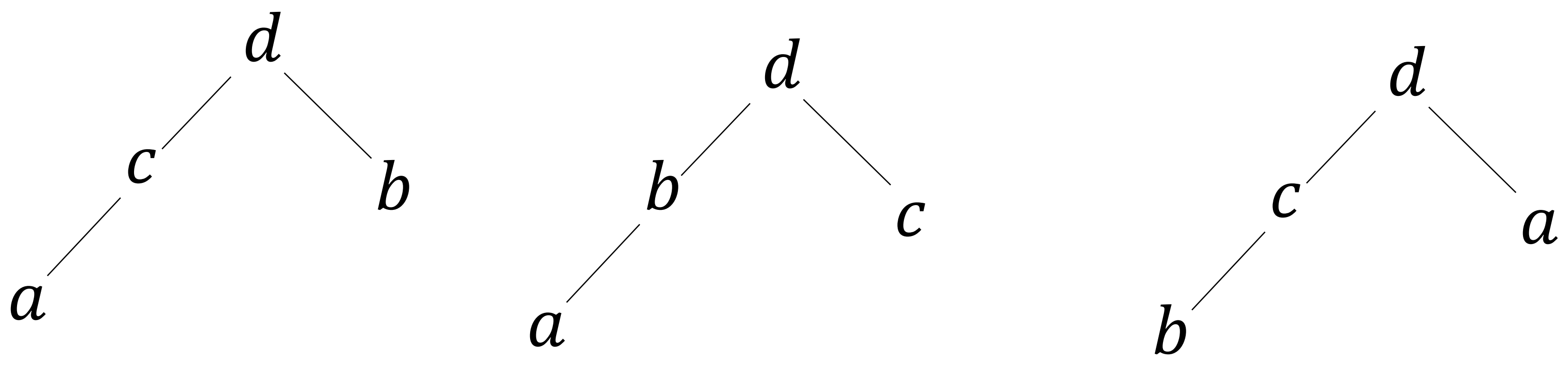
$A)2$ $B)3$ C) 4 $D)$ 5

Question 7

Given four numeric values $a < b < c < d$ as the elements' priorities, how many possible max heaps would be possible to build?

Players correct: 40%

A)2 B)3 C) 4 D) 5



Question 8

Assume that the root of a heap lies on level 1, the immediate children of the root lies on level 2. Then, k^{th} largest element in the max-heap lies always on the k level of the heap.

Players correct: 79%

A) True

B) False

Question 8

Assume that the root of a heap lies on level 1, the immediate children of the root lies on level 2. Then, k^{th} largest element in the max-heap lies always on the k level of the heap.

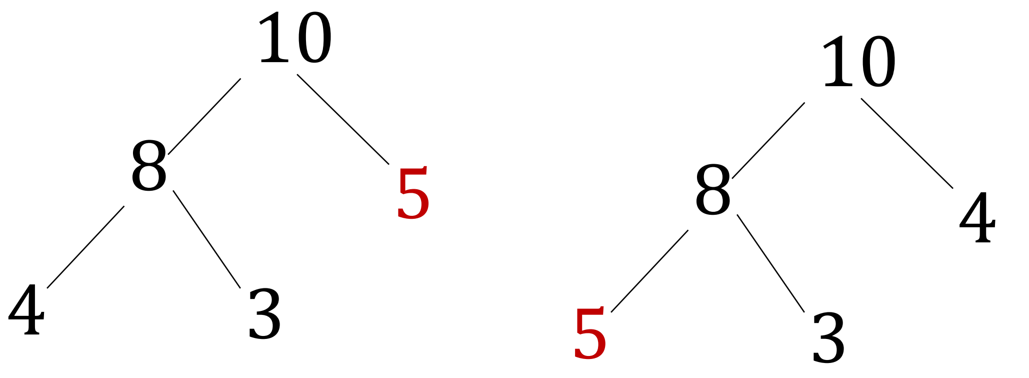
Players correct: 79%

A) True

B) False

For values of $k > 2$ it is not always true.

Counter example:



Question 9

A **ternary** max heap is defined similar to a **binary** max heap but each node has at most 3 **children** instead of 2 **children**. Let $A = \{15, 6, 8, 14, 3, 2\}$ be a ternary max heap with starting index at zero. We insert a new element 11. What is the index of 11 after being inserted to A. (A must remain a ternary max heap.)

A)1 B)2 C) 3 D) 4

Players correct: 44%

Question 9

A **ternary** max heap is defined similar to a **binary** max heap but each node has at most **3 children** instead of **2 children**.
Let $A = \{\,20, 16, 17, 19,\ 8,\ 2, 14\}$ be a ternary max heap with starting index at zero. We insert a new element 18. What is the index of 18 after being inserted to A. (A must remain a ternary max heap.)

$A)$1 $\quad B)$ 2 $\quad$ C) 3 $\quad D)$ 4

Players correct: 44%