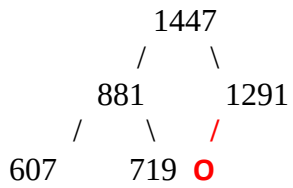
2) (5 pts) ALG (Heaps)

(a) (1 pts) In her computer science courses, Maria has learned some interesting things about prime numbers and data structures. She has decided to store some prime numbers in a Max-Heap using the tree representation of heaps. If Maria has stored 125 prime numbers, how tall would the Heap be?

Height = 6

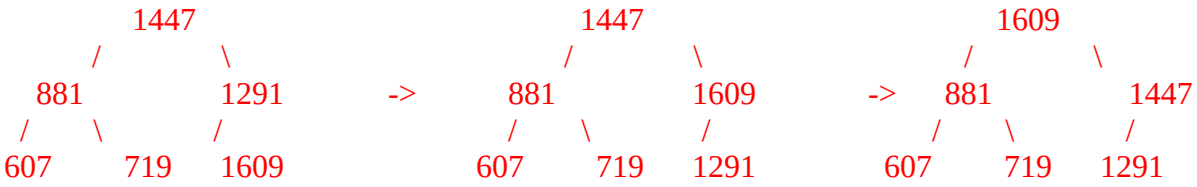
Heaps are complete binary trees, so the height is determined by $\lfloor \log_2 125 \rfloor$. You can also add the "levels" of the tree: 1 + 2 + 4 + 8 + 16 + 32 + 62. 1 pt all or nothing.

(b) (2 pts) Here is the Max-Heap after 5 insertions. Where will the next prime be inserted?



The next node must be added as the left child of 1291. 2 pts all or nothing.

(c) (2 pts) Show each step of inserting 1609 into the Max-Heap.



Students should show both percolate up steps for 1609. 1 point per step. If they don't show the middle step and just have the final picture with 1609 as the root, award 1 point out of 2.