Here are all the quizzes for CSCE 750, Fall 2011.

CSCE 750, Fall 2011, Quiz 1

Show by grouping the sum into blocks that

$$\sum_{n=2}^{\infty} \frac{1}{n(\lg n)^2} < \infty \ .$$

Do *not* use an integral approximation.
Note: You may assume without proof that

$$\sum_{k=1}^{\infty} \frac{1}{k^2} < \infty \ .$$

CSCE 750, Fall 2011, Quiz 2

Give an example of an asymptotically positive, real-valued function f, defined for all sufficiently large integers n, such that $f(n) = o(n)$ but $f(n) = \omega(n^{1-\varepsilon})$ for all constant $\varepsilon > 0$.

You are not required to prove that your answer is correct.

CSCE 750, Fall 2011, Quiz 3

Use the substitution method to show that if

$$T(n) = 6T\left(\left\lfloor \frac{n}{7} \right\rfloor\right) + n,$$

then

$$T = O(n).$$

Only show the inductive step. Don't worry about any base case(s).

CSCE 750, Fall 2011, Quiz 4

Using any method you like, but showing your work, find tight asymptotic bounds on any positive function $T(n)$ satisfying

$$T(n) = 2T(7n/10) + n^2 \ .$$

You may ignore any implicit floors or ceilings.

CSCE 750, Fall 2011, Quiz 5

Let E be the experiment where three fair, 6-sided dice are rolled. On average, how many times must you perform E until the three values showing are all distinct?

Express your answer as simply as possible.

CSCE 750, Fall 2009, Quiz 6

Consider the (binary) max heap

$$A = \langle 50, 47, 45, 10, 20, 40, 25, 9, 1, 15, 16, 0, 17 \rangle.$$

(Indices start at 1.)

1. (5 points) Give the result of the operation Heap-Extract-Max (i.e., DeleteMax) on A.
2. (5 points) Give the result of the operation Max-Heap-Insert$(A, 100)$.

Do *not* do the operations in sequence; each operation is applied to the original unaltered A. Give both answers as lists of numbers (not trees).

(3 points extra credit) For any integer $k \geq 1$, give the minimum and maximum possible sizes of a binary heap with exactly k (nonempty) levels in the tree.

CSCE 750, Fall 2011, Quiz 7

Suppose that you have a "black-box" worst-case linear-time median subroutine

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Median(A, r, s)
```

that finds the median element in $A[r \ldots s]$. Give a simple, linear-time algorithm that solves the selection problem for an arbitrary order statistic. Your answer should fill in the missing portion of the following code:

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Select(A, p, q, i)
// Find the i'th smallest element of A[p..q]
// Precondition: 1 <= i and i <= q-p+1

      (You fill this in.)
```
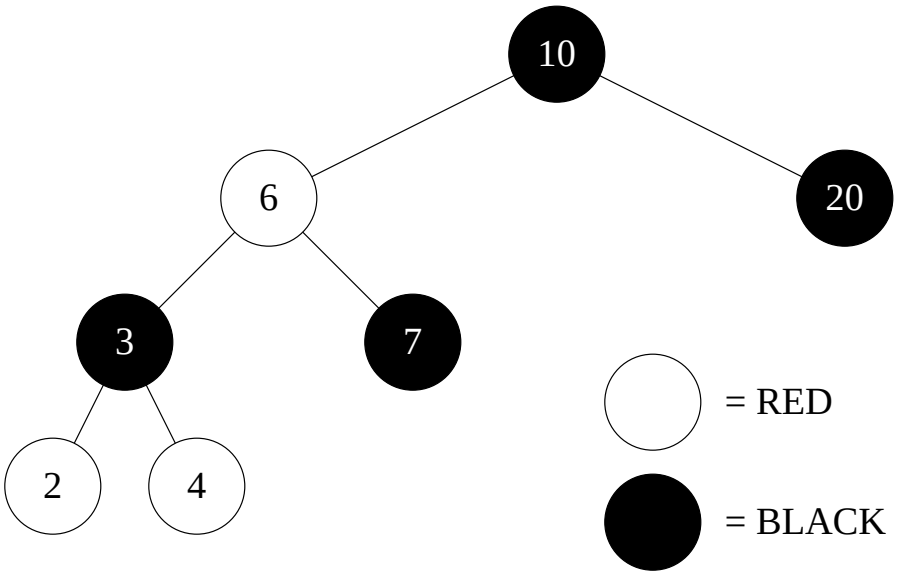

CSCE 750, Fall 2011, Quiz 8

Draw the red-black tree that results from inserting a node with key value 5 into the red-black tree below (leaves not shown):



[Draw only the internal nodes, not the leaves.]

CSCE 750, Fall 2011, Quiz 9

For $i = 1, 2, \ldots, 10$, find the maximum revenue obtainable by cutting an i-inch rod given the following table of prices:

i	1	2	3	4	5	6	7	8	9	10
p_i	1	3	5	8	8	10	10	15	18	18

Express your answer as an array $R[1..10]$. You may use any method you like.

4 points EXTRA CREDIT: Describe a series of cuts that gives the maximum revenue for a 10-inch rod.

CSCE 750, Fall 2011, Quiz 10

Describe the greedy algorithm that makes change for n cents using the fewest possible coins drawn from the following denominations:

COIN	penny	sickle	mime	porter
VALUE (cents)	1	3	7	15

(2 points **extra credit**) Give a value of $n \leq 50$ where the greedy algorithm does *not* give an optimal solution, if instead the values are

COIN	penny	sickle	mime	porter
VALUE (cents)	1	4	9	16

CSCE 750, Fall 2011, Quiz 11

Suppose we perform a sequence of n operations on a data structure in which the ith operation costs $\sqrt{i}$ if i is a perfect square, and 1 otherwise. Using either aggregate analysis or the potential method (your choice), show that the amortized cost per operation is $O(1)$.

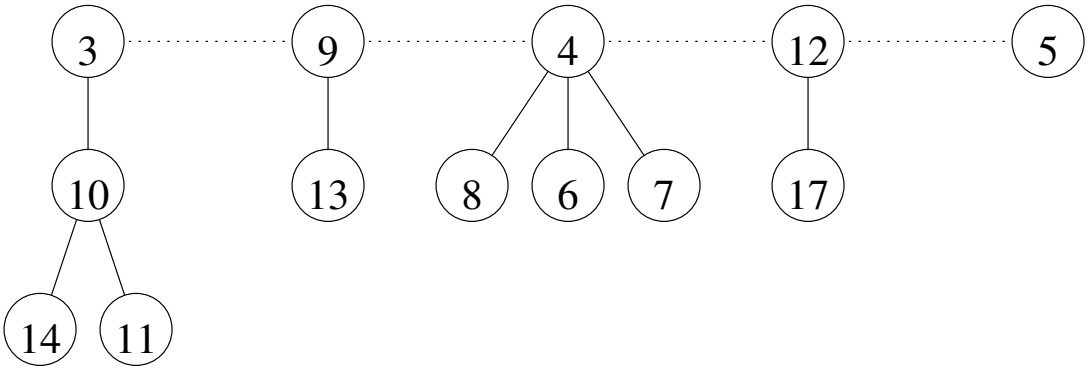
3 points extra credit for using both methods.

Hint: For the potential method, observe that

$$(k+1)^2 - k^2 = 2k + 1 = \Theta(k) \ .$$

CSCE 750, Fall 2011, Quiz 12

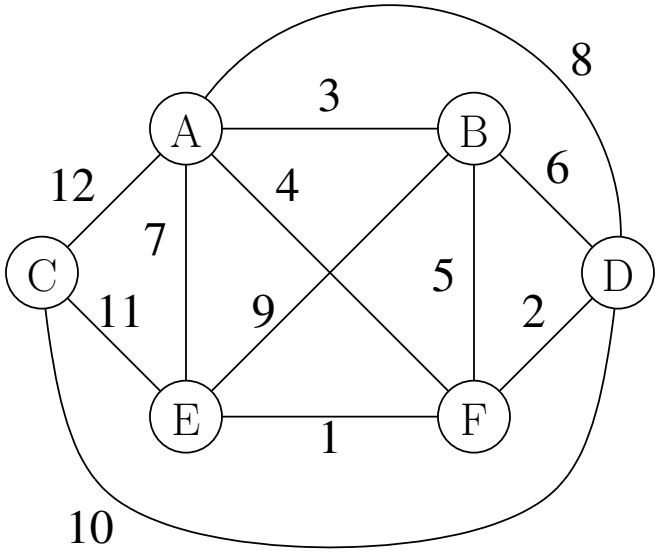
Show the result of extracting the minimum from the following Fibonacci heap:



Give the resulting trees in order of increasing root degree. What is the new minimum?

CSCE 750, Fall 2011, Quiz 13

Give the order in which edges are added to the minimum spanning tree when running Kruskal's algorithm on the graph below:



[List only the edges that are added to the tree.]