Divide & Conquer & Dynamic Programming CLICKER QUIZ
1. The rod-cutting problem in the book is an example of a dynamic programming problem where we want to maximize the profit from cutting up the rod and selling the parts. Assume we have a rod of length $n$, and we will make a cut at location $i$ along it. What is the recurrence relation for the Profit() operation?

A. $\text{Profit}(n) = \max(\text{price}[i], \text{Profit}(n-i))$

B. $\text{Profit}(n) = \begin{cases} 
0 & \text{n} = 0 \\
\max \left( \text{price}[i] + \text{Profit}(n-i) \right) & \text{1} \leq i \leq n \\
\text{maxSoFar} & \text{n} > 0 
\end{cases}$

C. $\text{Profit}(n) = \maxSoFar + \text{price}[i] + \text{Profit}(i)$

D. $\text{Profit}(n) = \begin{cases} 
0 & \text{n} = 0 \\
\max(\maxSoFar, \text{price}[i]) & 1 \leq i \leq n 
\end{cases}$

E. None of the above
2. A solution using divide and conquer is created by:

A. Recursing the subproblems

B. Solving the subproblems optimally

C. Creating a matrix that contains answers to the subproblems and then using this to create the solution to the overall problem

D. Solving the subproblems recursively and then combining them into a solution for the original problem
3. A recurrence describing the answer to a problem consists of:

A. Multiple calls to the same problem
B. Calling itself
C. A recursive case that gets smaller each time
D. A base case answer and recursive cases that list the recursive calls
E. Base case answer(s) and a recursive case of smaller instances of the same problem leading to the base case
4. What is the solution to the following recurrence?

\[ T(n) = 2T(n/4) + \sqrt{n} \]

A. \( \Theta(\sqrt{n}) \)

B. \( \Theta(\sqrt{n} \log n) \)

C. \( \Theta(\log n) \)

D. None of the above

E. This recurrence can’t be solved using the Master Theorem
5. What is the solution to the following recurrence?

\[ T(n) = 2T(n/4) + 1 \]

A. \( \Theta(\sqrt{n}) \)

B. \( \Theta(\sqrt{n} \log n) \)

C. \( \Theta(\log n) \)

D. None of the above

E. This recurrence can’t be solved using the Master Theorem
Answers:

1. B
2. D
3. E
4. B
5. A