CS2040S Tutorial 11

AY 24/25 Sem 2 — github/omgeta

Q1. (a.) Time: $O(\phi^2)$

(b.) Time: $O(i)$, Space: $O(i)$

(c.)
```
int fib(int i) {
  int x = 0;
  int y = 1;
  int tmp;

  for (int j = 0; j < i; j++) {
    tmp = x;
    x = y;
    y = tmp + x;
  }

  return x;
}
```

Q2. (a.) Let $k = 2$, and paintings (h_i, w_i) be $(1, 1), (5, 1), (5, 1)$. Greedy algorithm would set total height 10 by allocating the first two painting together where the optimal solution is height 6.

(b.) $dp(i) = \min_{r=j}^{i}(dp(r-1) + \max_{q=r}^{i} h_q)$

(c.) Time: $O(n^2)$, Space: $O(n)$

```
int dp(int i) {
  if (i == 0) return 0;

  int min_building_height = MAX_INT;
  int total_width = 0;
  int max_painting_height = 0;

  for (int r = i; r >= 1; r--) {
    total_width += w[r];
    if (total_width > k) break;
    max_painting_height = max(max_painting_height, h[r]);
    min_building_height = min(min_building_height, dp(r - 1) +
   max_painting_height);
  }

  return min_building_height;
}
```