CS 170 HW 0

Due on 2018-08-26, at 10:00 pm

1 Instructions:

You are welcome to form small groups (e.g. of 4 people) to work through the homework, but you **must** write up all solutions by yourself. List your study partners for homework on the first page, or "none" if you had no partners.

If using LaTeX (which we recommend), you may use the homework template linked on this Piazza post to get started.

Begin each problem on a new page. Clearly label where each problem and subproblem begin. The problems must be submitted in order (all of P1 must be before P2, etc). For questions asking you to give an algorithm, respond in what we will refer to as the *four-part format* for algorithms: main idea, pseudocode, proof of correctness, and running time analysis.

Read the Homework FAQ Piazza post on Piazza before doing the homework for more explanation on the four-part format and other clarifications for our homework expectations.

No late homeworks will be accepted. No exceptions. This is not out of a desire to be harsh, but rather out of fairness to all students in this large course. The lowest two homework scores will be dropped.

Extra credit questions We might have some extra credit questions in the homework for people who really enjoy the materials. However, please note that you should do the extra credit problems only if you really enjoy working on these problems and want an extra challenge. It is likely not the most efficient manner in which to maximize your score.

2 (★) Study Group

List the names and SIDs of the members in your study group.

3 (★) Course Policies

(a) What dates and times are the exams for CS170 this semester? Do you have any conflicts? Note that we do not offer any alternate exams.

Solution: 9/18 7-9PM. 10/23 7-9PM. 12/10 3-6PM.

I do not have any conflicts with the course.

(b) We provide 2 homework drops for cases of emergency or technical issues that may arise due to homework submission. If you miss the Gradescope deadline (even by a few minutes) and need to submit the homework, who should you contact?

Solution: The 2 homework drops are provided in case we have last minute issues and miss the Gradescope deadline. Homework extensions are not granted because solutions need to be released immediately after the deadline, and so we do not contact anyone.

(c) What is the primary source of communication for CS170 to reach students? We will email out all important deadlines through this medium, and you are responsible for checking your emails.

Solution: The primary source of communication is Piazza.

(d) Reading the course policies on the website (`http://cs170.org/policies.html`), Homework FAQ (`https://piazza.com/class/jhadltur59wtu?cid=22`) and Piazza etiquette (`https://piazza.com/class/jhadltur59wtu?cid=23`) are required reading for this semester. Please read them, and then copy and sign against the following sentence on your homework submission.

"I have read and understood the course policies, homework FAQs and Piazza etiquette post."

Solution: I have read and understood the course policies, homework FAQs and Piazza etiquette post. -Jane Doe.

4 (★) Understanding Academic Dishonesty

Before you answer any of the following questions, please read over the syllabus carefully. The syllabus is pinned on the Piazza site. For each statement below, write *OK* if it is allowed by the course policies and *Not OK* otherwise.

(a) You ask a friend who took CS 170 previously for her homework solutions, some of which overlap with this semester's problem sets. You look at her solutions, then later write them down in your own words.

Solution: Not OK

(b) You had 5 midterms on the same day and are behind on your homework. You decide to ask your classmate, who's already done the homework, for help. He tells you how to do the first three problems.

   Solution: Not OK.

(c) You look up a problem online to search an algorithm, write it in your words and cite the source.

   Solution: Not OK.

(d) You were looking up Dijkstra's on the internet, and run into a website with a problem very similar to one on your homework. You read it, including the solution, and then you close the website, write up your solution, and cite the website URL in your homework writeup.

   Solution: OK. Given that you'd inadvertently found a resource online, clearly cite it and make sure you write your answer from scratch.

5   (★★★) Asymptotic notation

(a) For each pair of functions $f(n)$ and $g(n)$, state whether $f(n) = O(g(n))$, $f(n) = \Omega(g(n))$, or $f(n) = \Theta(g(n))$. For example, for $f(n) = n^2$ and $g(n) = 2n^2 - n + 3$, write $f(n) = \Theta(g(n))$.

- $f(n) = n$ and $g(n) = n^2 - n$
- $f(n) = n^2$ and $g(n) = n^2 + n$
- $f(n) = 8n$ and $g(n) = n \log n$
- $f(n) = 2^n$ and $g(n) = n^2$
- $f(n) = 3^n$ and $g(n) = 2^{2n}$

(b) For each of the following, state the order of growth using Θ notation, e.g. $f(n) = \Theta(n)$.

- $f(n) = 50$
- $f(n) = n^2 - 2n + 3$
- $f(n) = n + \cdots + 3 + 2 + 1$
- $f(n) = n^{100} + 1.01^n$
- $f(n) = n^{1.1} + n \log n$

   Solution:

(a)
- $f(n) = O(g(n))$
- $f(n) = \Theta(g(n))$
- $f(n) = O(g(n))$
- $f(n) = \Omega(g(n))$

- $f(n) = O(g(n))$

(b)
- $f(n) = \Theta(1)$
- $f(n) = \Theta(n^2)$
- $f(n) = \frac{(n+1)n}{2} = \Theta(n^2)$
- $f(n) = \Theta(1.01^n)$
- $f(n) = \Theta(n^{1.1})$