2019-09-12 - Pearls of Computer Science - Pearl 001 - D-Test

Study: B-CS Pearls of Computer Science 201700139

Welcome to the digital diagnostic test for Pearl 001 Algorithmics.

- You may use 1 A4 sheet with your own notes for this test, as well as a simple calculator
- Scientific or graphical calculators, laptops, mobile phones, books etc. are not allowed. **Put those in your bag now (with the sound switched off)**
- For *technical* questions (concerning the chromebooks, Remindo etc.): raise your mouse
- For *pearl content* question: raise your hand
- Total number of points: 40

Number of questions: 5

You can score a total of 40 points for this exam, you need 22 points to pass the exam.

1

5 pt.

Question 1a

Suppose that you execute the following assignments in Python:

```
student = ["Al", "Becca", "Charlie"]
grade = [8, 9, 6]
```

student is a list of three students of Pearl 001, whereas *grade* is a list of their corresponding test grades.

Write a Python condition (*not* an entire **if**-statement) that tests whether student number *i* has the highest grade of the three. (You do not know the value of *i*)

2

5 pt.

Question 1b

Suppose that you execute the following assignments in Python:

```
student = ["Al", "Becca", "Charlie"]
grade = [8, 9, 6]
```

student is a list of three students of Pearl 001, whereas *grade* is a list of their corresponding test grades.

Write a Python assignment that assigns to a list *p* the *i*-th elements of *student* and of *grade*.

3

5 pt.

Question 1c

Suppose that you execute the following assignments in Python:

```
student = ["Al", "Becca", "Charlie"]
grade = [8, 9, 6]
```

student is a list of three students of Pearl 001, whereas *grade* is a list of their corresponding test grades.

Write a sequence of assignments that is as short as possible, resulting in a change to *student* after which the student names are ordered from highest to lowest grade. (It is *not* correct to assign an entirely new value to *student;* You must *modify* the list by swapping elements)

4

10 pt.

Question 2

Consider the list

```
[20, -2, 7, -10, 21, 0]
```

Show how merge sort sorts this list, by schematically showing how the list is split and zipped back together.

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5 Question 3

The cards of the game *Magic: The Gathering* can be subdivided into the *commons, uncommons,* and *rares*. You have a huge pile of *Magic: The Gathering* cards and you decide you want to give two rares to your twin nephews. However, to avoid starting a fight you want them to be identical cards. Unfortunately, you have not ordered your cards well (in fact your pile is more like a heap; something your parents tend to call a mess).

10 pt. **a.** (a) Write an algorithm in natural language, with unambiguous, numbered instructions, that finds two identical rares or concludes that you don't have two identical rares, in as few steps as possible. Your instructions may only involve one or two cards at a time, never an arbitrary set of them.

You may assume that you have ample space to arrange the cards in any way you like. The cards do not have to end up where they started.

Do not try to give an answer in Python!

5 pt. **b.** (b) How many steps does your algorithm need in the worst case, as a function of the number of cards, and assuming you in fact have a pair of identical rares? How many does it need in the best case? Explain your answers.

Thank you, your test has been saved. You can check Canvas for the solution of the questions taken from past exams.

Correction model

1.
5 pt.

Correction criterion	Points
Solutions can be found on Exam Sep 2016 Q1a.	5 points
Total points:	*5 points*

2.
5 pt.

Correction criterion	Points
Solutions can be found on Exam Sep 2016 Q1b.	5 points
Total points:	*5 points*

3.
5 pt.

Correction criterion	Points
Solutions can be found on Exam Sep 2016 Q1c.	5 points
Total points:	*5 points*

4.
10 pt.

Correction criterion	Points
Solutions can be found on Exam Sep 2017 Q5.	10 points
Total points:	*10 points*

5.
15 pt.

a.

Correction criterion	Points
Solutions can be found on Exam Sep 2018 Q7a.	10 points
Total points:	*10 points*

b.

Correction criterion	Points
Solutions can be found on Exam Sep 2018 Q7b.	5 points
Total points:	*5 points*

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