CSC 317 & INF 307

Lab 1 – Discussion of Problem Analysis Tasks

Discuss and solve the following task in Java (for IT students) and Python (for CS students)

1. **Find the maximum and minimum sum (of 2 numbers) among an array of given numbers.**

   Discussion

   Assuming we have the array [18, 7, 0, 1, 15, 25, 5], which sum of any two numbers gives us the minimum value; and which gives us the maximum.

   Looking at the values in the array, we would identify "0+1=1" as the minimum sum while "18+25=43" as the maximum value.

   Now, assuming we have an array of N unknown numbers, how will we go about this? Of course, everything become easier when the array is sorted. How does sorting help in this exercise?

   Solution (Logical steps)

   a. Sort the array in ascending order (use bubble sort in the class, but any sorting algorithm works)
   b. Sum the first two elements to get the minimum sum, and sum the last two to get the maximum sum.

2. **Write a function that inputs a number of minutes and outputs the equivalent number of years, months, days, hours, and minutes. For example. An input of 12345 would output 0 years, 0 months, 8 days, 13 hours, 45 minutes. Assume every month has 31 days.**

   Discussion

   100 minutes = 1 hour, 40 minutes

   1000 minutes = ???

   In this exercise, you simply work from the least unit upwards. Starting from minutes, we find out how many whole hours we can get from the amount of minutes. We also keep note of the remaining minutes that do not make up an hour. We do the same for the hours, finding out the number of complete days and the surplus hours. We do this repeatedly until we can no longer break a value down further.

Solution (Logical steps)

a. If the number of minutes > 60, find out how many hours can be extracted (minutes/60) and how many minutes are surplus (minutes%60).
b. If the number of hours > 24, find out how many days can be extracted (hours/24) and how many hours are surplus (hours%24).
c. Do the same for months upwards until years

3. Write a function that calculates the difference between two dates and outputs the result in the form: A years B months C days.
Assumptions:

a. Input: day1, month1, year1, day2, month2, year2,
b. Every month has 31 days
c. Date2 is always greater or equal to Date1

Discussion

Assuming date1 is 06 March 1957 and date2 is 26 January 2023, what is the difference between the two dates?

Can we use simple subtraction from primary school? Like below:

```
         26  01  2023

   -     06  03  1957
_____________________

_____________________
```

And what order is best? “Year month day” vs “day month year”?

```
         2023  01  26

   -     1957  03  06
_____________________

_____________________
```

“Year month day” seems to be best because we can easily carry over from the months to the day column, and from the year to the month column

```
         2023  01  26

   -     1957  03  06
_____________________
   =       65  10  20
_____________________
```

Solution (Logical steps)

a. Find the difference between the days (day2 – day1).
    i. If day2 is less than day1, borrow one month (31 days) from month2, and reduce month2 by 1.
b. Find the difference between the months (month2 – month1). Keep track of any reduction of the month value from the previous step
    i. If month2 is less than month1, borrow one year (12 months) from year2, and reduce year2 by 1.
c. Find the difference between the years (day2 – day1).
d. Output your result