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| **University of Science and Technology of Hanoi**<br>***<br>**Retake Examination**<br>**Subject: Algorithms and Data Structures**<br>**Sheet**: 01 **N° of pages**: 02 |  | ***Intake***: *BI9* ***Academic year***: *2019–2020*<br>***Date***: *05/06/2020* ***Time***: *90 minutes*<br>***Important instructions***<br>*(according to lecturer's decision)*<br>1. Only the course slides and your own exercises' code are allowed in the examination venue.<br>2. Any communication devices are not allowed<br>3. Copy or using Internet will lead to heavy penalty |  |
| **Pathway coordinator** |  | **Lecturer (or Head of Subject)** | **Dr. Đoàn Nhật Quang** |
| **Student name** |  | **Student's ID** |  |

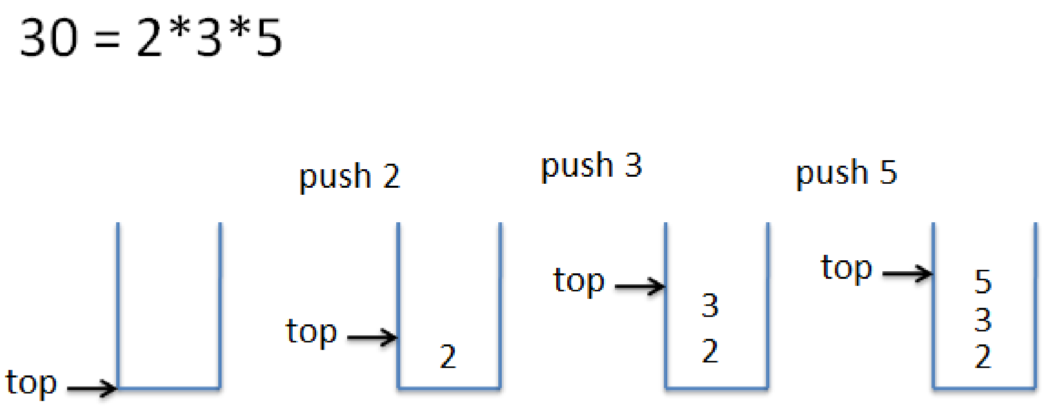
***Follow this instruction:***
*- Create a folder "ADS_YOURNAME_STUDENTID" in the Desktop.*
*- Create the source files **problem1.c** (or cpp) and **problem2.c** for the corresponding problems.*
*- **Remove the executable files** (.exe) and **zip** all your source codes, send it to the address: **doan-nhat.quang@usth.edu.vn**.*
*- Verify your name in the files and mails, un-named or incorrect-name files lead to 0.*

**Problem 1**: (10 pts)

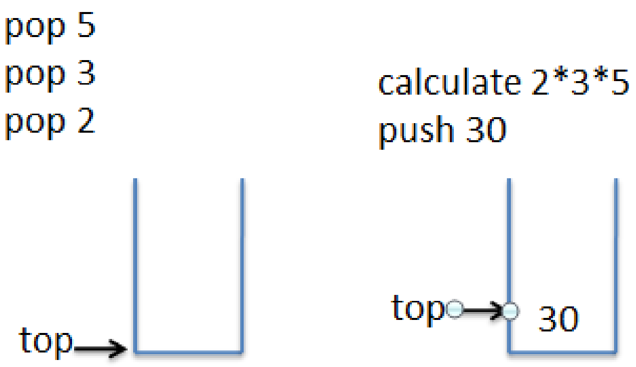
- Write a program to enter a natural number n and find all sphenic numbers from 1 to n using **Recursion (**combined with iteration if necessary**).**
  Note: A sphenic number is a product of p*q*r where p, q, and r are three distinct prime numbers.
  Example: 30 = 2 * 3* 5; 42 = 2*3*7; 66 = 2*3*11.
  30, 42, 66, 70, 78, 102, 105, 110, 114, 130, 138, 154, 165, … are sphenic numbers.
- Calculate the complexity of your program (Best scenario, Worst scenario, Average). Justify your answer. (2pts)

**Problem 2**: (10 pts)

- Write the program to solve Problem 1 using **Linked List ADT with necessary functions and Linked List principle**. (8 pts)
  Note:
  The size of stack is a constant (size = 3) and to use Stack ADT, there should be three steps:
  - Step 1: Find and push every prime numbers that constitute a specific sphenic number in the stack



- Step 2: Pop out all numbers found in the stack and calculate the product of these 3 prime numbers



- Step 3: Display the result in the stack.

▪ Calculate the complexity of your program (Best scenario, Worst scenario, Average). Justify your answer. (2 pts)

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