|  |
| --- |
| Computer Programming Language |

【Fall, 2015】

**Computer Programming Problem Set for Hand-on Examination**

1. Design a program to calculate the parking fee based on the parking time (in minutes) input by the user. The rate of parking fee is 20 NT dollars per 30 minutes. One minute to 30 minutes are considered as a 30-minute unit for 20 NT dollars. Parking time no more than 30 minute is free of charge. The maximum parking fee for a whole day is 240 NT dollars. The input of this program is the parking time in minutes from 0 to 2000 minutes. The output of the program is the parking fee.
2. Applying the following equation to calculate the value of π for *n* = 50. Display your result on the computer screen.



1. Design a function that receives a string and processes the characters in that string into reverse order. For example: change string “HOW ARE YOU TODAY?” to “?YADOT UOY ERA WOH”. Use a main function to call this function and repeatedly ask user to input different strings until the user responses with a CTRL-Z key to exit the program.
2. Write a program to calculate the first 20 terms of Fibonacci sequence (0, 1, 1, 2, 3, 5, 8, 13, 21, 34,…). Output your result in a format that each line contains 5 numbers.
3. Design a function that estimates the value of *ex* by using the following formula for *n* = 20. Use a main function to call this function and compute the values of *e*1, *e*2, *e*3, *e*4, … , *e*10. Display your results on the computer screen.



1. Design a function that calculates the greatest common divisor (GCD) and the least common multiple (LCM) of two positive integers. Use a main function to call this function. The main function needs to ask the user to input the two integers repeatedly until the user responses to end the program.
2. Design a program that computes the roots of a quadratic equations with one unknown:



The user inputs are the coefficients of the equation: *a*, *b*, and *c*. The program needs to give the root or roots of the equation based on the value of *b*2 – 4*ac.*

1. A prime integer number is one that has exactly two different divisors, namely 1 and the number itself. Write, run, and test a C++ program that finds and displays all the prime numbers less than *N*. *N* is input by the user.
2. Design a function that can sort an array of integers. Also write a main program to call the function and sort the following integer array in ascending order. Display the integer array before and after sorting.

{3, 8, 10, 30, 2, 16, 27, 13, 22, 17, 42, 33, 38, 29, 14}

1. Write a program that simulates the rolling of single dice. Your program should roll the dice 10000 times. Use a one-dimensional array to tally the numbers of times each possible value from 1 to 6, and display the results on the screen.
2. A narcissistic number is a positive integer which is equal to its digits sum raised to the number of digits in the integer. For example, the integer 153 is a narcissistic number because 153=13＋53＋33. Write a program to find all the narcissistic numbers between 100 to 99999.
3. Design a function for matrix multiplication. The two input matrices are A (M×L) and B (L×N), and the result is matrix C (M×N, C = A × B). You need to use dynamic memory allocation approach (pointer) to solve this problem. Also write a main program to test your function.

Time and Venue of the Hand-on Examination:

|  |  |  |
| --- | --- | --- |
| **Sessions** | **Date** | **Time** |
| Session I | Dec. 24, 2014 (Thu) | 16:30~16:55 |
| Session II | Dec. 24, 2014 (Thu) | 17:00~17:25 |

1. Students with course ID from 001~040 will take the exam in session I. The rest students will take the exam in session II.
2. Venue: Room 212 of the Computer and Information Networking Center, NTU.