Problem Solving Contest for Aspiring Engineers

Job of Engineers

An important responsibility of Engineers is to apply the knowledge and skills acquired to solve problems. For example, *"Cholera is a major health problem in African villages. Engineers devise a water filtration system that not only stops the spread of the disease but is cheap and easy to use…"* (http://www.engineeringmessages.org/25301.aspx)
Further, Contribution of Engineers can at times be very powerful and can change our lives in a positive way e.g. *contribution of Google Engineers.*

The contest

GCET is organizing a problem solving contest for students; the aspiring Engineers. This will give them an opportunity to (i) sharpen their skills (ii) showcase their talent and (iii) achieve their true potential. Submission guidelines are given at the end.

Problem Scenarios

Interesting problems are given below. Students are expected to read and understand the problems before attempting to develop solutions.

1. Multiplication shortcut
   (method is similar to Vedic Maths.)

An easy way to multiply any number by 5 (similar to Vedic math techniques) is to divide the number by two and put a zero as units digit e.g. if number is 452 then, 452/2 = 226 and after putting a zero as units digit the result is 2260.
Constraint is that it will only work for even numbers. The method for odd numbers is slightly different. Try to work out similar solution for odd numbers.

Task -Develop a program to implement this method of multiplication of any number by 5.

Efficiency – compare this with the direct method of multiplication, point out which is more efficient for computers.

2. Iteration without using loops

Develop a program/algorithm to display numbers from 1 to 100 without using any loop.
Constraint –Loop should not be used for getting the output.
Efficiency –After completing the task check if the method is efficient and is there any scope for improving the efficiency of the program/algorithm developed.

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3. Multiplication without using * operator

Develop a program or algorithm to multiply any two numbers without using the Multiplication operator.
Constraint –Operator * should not be used for getting the output.
Efficiency –After completing the task comment if your method for multiplication is efficient.

4. Jail Break story
(Adapted from https://plus.maths.org/content/jail-break)

There are 100 prisoners in 100 separate locked cells. At night the jailor visits the cells, in the first round he visits every cell and opens the door of each cell. In the next round he visits every 2nd cell (2, 4, 6 etc.). In the third round he visits every 3rd cell (3, 6, 9 etc.) and in next round visits every fourth cell. The jailor continues like this until he visits the 100th cell in round hundred. During each visit he opens the door if it is closed or locks it if it is open. In the morning how many doors are open and how many closed?
Constraint – no specific constraint
Efficiency – not a priority in this problem.
Expected solution – manual solution is acceptable. However, coding solution is desirable.

5. Implement the math library function for square root calculation

The square root of a number needs to be calculated in a C program but unfortunately the math library is found to be corrupt. There is no time to reinstall the math library. Develop a program/algorithm that accepts a number and displays the square root.

Constraint is stated above viz. the program should not use math library

Efficiency is not priority in this situation, only reasonable efficiency is expected.

Guidelines

a. This is an open contest. Any GCET student can participate.
b. **First three** participants will be given awards.
c. Top **50 participants'** Names will be displayed on College **website**

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d. Students may submit solutions for **any One or more** of the given problems. Points will be awarded accordingly.
e. There is No negative marking.
f. Last date for submission is 11th Oct., 2018.
g. Solution should be written on paper and submitted to
   Prof. K R Rao/Prof Ashok Sharma, Block 1, IIIrd Floor, Computer Science &Engineering Department. Name, Year, Section, Branch and Roll Number of the student/participant should be written on the solution sheet.

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