CS2104: Introduction to Problem Solving, Fall 2009
Homework Assignment 5
## Due at 11:00pm on Friday, September 25
30 Points

Here are the problems for Homework 5.

1. Start with the number 147,622,500,000,000. You are allowed to get a second number by multiplying or dividing the number by 60, 90, or 150. (If dividing, the result has to be an integer for the operation to be allowed.) For example, $147,622,500,000,000/90 = 1,640,250,000,000$ and $147,622,500,000,000*60 = 8,857,350,000,000$. By successive application of the above operations, different sequences of numbers can be obtained. Is it possible to generate a sequence that contains the number 1? Be sure to indicate what your series is, and how you determined it.

2. A sequence begins with the number 7 and each successive number is gotten from the previous number by multiplying by 2 and subtracting 1. For example, the second number in the sequence is 7*2-1=13.

   Provide a formula for computing the value of the ith number in the sequence.

3. Start with this graph:

```
      A     B
     /\    /\
    /  \  /  \
   C    D     E
   |    |     |
   |    |     |
   |    |     |
   F----G----H
```
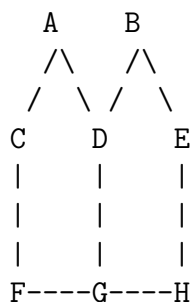
   Each node has a light bulb and a switch. Initially, all lights are off. At any step, you may select a node whose light bulb is off and flip its switch; the light bulb at the node will then be on, and the light bulb of each neighbor of the node will flip, either from off to on or from on to off. Is there a sequence of steps that will result in all of the light bulbs being on? If so, give such a sequence of steps (nodes). If not, explain why there is no such sequence of steps. Be sure to include any diagrams that you use to solve the problem.