COMP108 Algorithmic Foundations
Tutorial 1
w/c 3rd February 2014

Name: _____

Hand this in to the demonstrator at the end of the tutorial even if you haven't finished it. You will get feedback in the next tutorial. Tutorial participation contributes to 5% of overall marks.

1. Simplify the following mathematical expressions

   (a) $(x-2)(x+1)+x+2$

   (b) $\sqrt{x^2+2x+1}$

   (c) $\frac{x^2-x-2}{x-2}+\frac{x^2+2x+1}{x+1}$

   (d) $2(\frac{x+3}{3}+\frac{x}{6})$

   (e) $\log_2 32+\log_3 9$

2. Consider the following algorithm.

   input m
   $count = 0$
   $x = 1$
   while $x < m$ **do**
   begin
   $x = x * 2$
   $count = count + 1$
   end
   output *count*

   (a) Give the trace table and the output of the above algorithm for $m = 16$.

   (b) How many times the while loop is executed for input m being a positive power of 2 (i.e., $m = 2, 4, 8, 16, 32, \ldots$)?

3. (a) Rewrite the following while-loop into a for-loop.

```
input m
x = 0
i = 1
while i ≤ m do
begin
    x = x + m
    i = i + 1
end
output x
```

   (b) What does this pseudo code compute?

4. Write a pseudo code of a for-loop to find the sum of all multiples of 3 between x and y inclusively. For example, if $x = 4$ and $y = 12$, then your pseudo code should output 27 (which equals to $6 + 9 + 12$).

5. **[Puzzle]** A farmer is standing on the left side of the river and with him are a wolf, a goat and a box of cabbages. In the river there is a small boat. The farmer wants to cross the river with all the three items that are with him. There are no bridges and in the boat there is only room for the farmer and one item.

   If he leaves the goat with the cabbages alone on one side of the river the goat will eat the cabbages. If he leaves the wolf and the goat on one side the wolf will eat the goat.

   How can the farmer cross the river with all three items, without one eating the other?