

COMP108 Algorithmic Foundations — Tutorial 1

w/c 6th February 2017

Name: _____

Hand in your answer for the question(s) marked “Do this during tutorial” 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. [**Do this before tutorial**] 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) $2\left(\frac{x+3}{3} + \frac{x}{6}\right)$

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

2. [**Do this before tutorial**] 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 when $m = 32$.
- (b) How many times the while loop is executed for input m being a positive power of 2 (i.e., when $m = 2, 4, 8, 16, 32, 64, \dots$)?

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3. [**Do this during tutorial**] Write a pseudo code of a while-loop to find the sum of all multiples of 3 between x and y inclusively. You can assume that $x \leq y$. For example, if $x = 4$ and $y = 12$, then your pseudo code should output 27 (which equals to $6 + 9 + 12$).

4. [**Puzzle for fun**] 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?