COMP333: Assignment 2

James Ridey
44805632

QUESTION 1

1) A
2) A
3) A

QUESTION 2

1) A
2) A
3) A

QUESTION 3

1) A
2) A
3) A

QUESTION 4

1) Loop invariant: TODO For this algorithm it runs until b is zero and for every iteration of the loop we divide b by 2. So this loop runs at least $log_2(b)$ times. During the loop operation we do 2 multiplications and 2 divisions, while 1 of the multiplications and 1 of the divisions is behind an if statement in the worse case scenario (Big-Oh), if a number was simply a 1 bit repeated it would always trigger the if statement.
   So for the worse case scenario we have

$$
\begin{aligned}
&= log_2(b)(2mul + 2div) \\
&= log_2(b)(2(L(a)L(b)) + 2(L(a)(L(a) - L(b) + 1))) \\
&= log_2(b)(2(L(a)(L(a) + 1)))
\end{aligned}
$$

2) A
3) A

QUESTION 5

- time complexity karatsuba - In what circumstance would you expect Karatsuba's algorithm to be more efficient than the classical one?