CS222 - Algorithm Design

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Assignment 5 - Multiplication and Repeated Squaring

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Problem Statement

1. (a) Implement a recursive function `multiply(x, y)` that takes two non-negative integers x and y and computes xy using the method given in the class. `https://www.youtube.com/watch?v=WE3J9ptVuA0&list=PL18Wj2fHZoevNaBQ-LK601Gq-9q4InNaG&index=15`

   (b) Implement a recursive function `exponential(a, b)` that takes two positive integers a and b and computes a^b using the *second* repeated squaring method given in the class. `https://www.youtube.com/watch?v=zj12bRq2kvA&list=PL18Wj2fHZoevNaBQ-LK601index=13`

   (c) In the main method, the program takes inputs a, b, c, d from the user and outputs $a^b c^d$. The main method calls the functions `multiply(x, y)` and `exponential(a, b)` described above.

   (d) In the pdf, write a sample output. Also write the time complexity of the functions `multiply(x, y)` and `exponential(a, b)`.

Here is the Sample Input and Output:

```
ation>a.exe
Enter value for a: 3
Enter value for b: 4
Enter value for c: 5
Enter value for d: 6
The required quantity : (a^b)*(c^d) = 1265625
```

- The time complexity of *multiply(x,y)* : $\boldsymbol{O(log(x) \times log(y))}$
- The time complexity of *exponential(a,b)* : $\boldsymbol{O(log\ (b))}$