

## Experiment 1.2

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**Branch:** Computer Science  
**Semester:** 5<sup>th</sup>  
**Subject Code:** 20CSP-312

**UID:** 20BCS5082  
**Section/Group :** 607 B  
**Subject Name:** DAA

### 1. Aim/Overview of the practical:

Code and implement power function in  $O(\log n)$  time complexity.

### 2. Which logistics were used:

Given two integers  $x$  and  $y$ , write a function to compute  $x^y$ . We may assume that  $x$  and  $y$  are small and overflow doesn't happen - GDB Compiler.

### 3. Algorithm/Flowchart:

- First take the input in form of an array.
- In function Power the  $x^n$ 
  - Check if  $n$  is 1, then return  $x$
  - Recursively call power pass  $x$  and  $n/2$  and store its result in a variable  $sq$ .
  - Check if dividing  $n$  by 2 leaves a remainder 0; if so then return the results obtained from  $cmul(sq, sq)$
  - Check if dividing  $n$  by 2 does not leave a remainder 0; if so, return the results obtained from  $cmul(x, cmul(sq, sq))$ .
- In function  $cmul()$ .
  - Check if  $x1 = a+bi$  and  $x2 = x+di$ , then  $x1 * x2 = (a*c-b*d)+(b*c+d*a)i$ .
- Return and print the results obtained.

#### 4. Code:

```
#include<iostream>
using namespace std;
class power
{
public:
int pow(int x, unsigned int y)
{
int temp;
if( y == 0)s
return 1;
temp = pow(x, y / 2);
if (y % 2 == 0)
return temp * temp;
else
return x * temp * temp;
}
};
int main()
{
power p;
int x;
unsigned int y;
cout << "Value of X = " << endl;
cin >> x;
cout << "Value of Y = " << endl;
cin >> y;
cout << "Ans is = "<<p.pow(x, y)<<endl;
cout << "Upasna Bijlani 21BCS8896";
return 0;
}
```

#### 5. Observation:

Time Complexity:  $O(n)$

Space Complexity:  $O(1)$

Algorithmic Paradigm: Divide and conquer.

## 6. Code Visualization (Code & Output) :

```
#include<iostream>
using namespace std;
class power
{
public:
int pow(int x, unsigned int y)
{
int temp;
if( y == 0)
return 1;
temp = pow(x, y / 2);
if (y % 2 == 0)
return temp * temp;
else
return x * temp * temp;
}
};
int main()
{
power p;
int x;
unsigned int y;
cout << "Value of X = " << endl;
cin >> x;
cout << "Value of Y = " << endl;
cin >> y;
cout << "Ans is = "<<p.pow(x, y)<<endl;
cout << "Upasna Bijlani 21BCS8896";
return 0;
}
```

```
Value of X =
6
Value of Y =
3
Ans is = 216
Upasna Bijlani 21BCS8896

...Program finished with exit code 0
Press ENTER to exit console.
```

## 8. Learning outcomes (What I have learned):

1. Learned about implementing power function in  $O(\log n)$  time complexity.
2. Learned different logic for finding the square of a number.
3. Learned more about data structures and algorithms.

**Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):**

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			