ALGORITHMS AND PROGRAMMING
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Problem Set 2

1. We require a C function int Power ( int x, y) which will return the integer value $x^y$, $x > 0$, $y \geq 0$. Write the function Power using (i) iteration, (ii) recursion.

2. What are the digits of the base 3 number system? Show the representation of the decimal value 75 in the base 3 number system.

3. What is minimum number of bits required to represent the unsigned decimal integer value 1234?

4. What is the range of signed integer values (in decimal) that can be represented in 4 bits using the 2s complement representation?

5. Prove that for an unsigned integer x, x >> 1 is equivalent to x / 2.

6. What is the size in bytes of the C array BigArray whose declaration is shown below? Assume that float values are represented using the 32b IEEE floating point representation.

```
struct complex {
        float Re, Im;
} BigArray[1024][1024];
```

7. Given the C array declaration

```
int SmallArray [12] [8];
```

   what is the memory address of the array element SmallArray [2] [ 1]? Assume that sizeof int is 4 Bytes and the base memory address of SmallArray is $72_{ten}$.

8. Draw all the distinct binary trees of 4 nodes, ignoring their node values.

9. Consider binary trees containing *n* internal (non-leaf) nodes. Derive expressions for the minimum and maximum possible heights of these trees.

10. Write a non-recursive function for the Pre-order traversal of a binary tree.