CS 210 **November 29, 2016**
Day 22

More Recursion

Review -

Write two recursive functions. The first is called *SumOfDigits*. It accepts a single integer and returns the sum of the digits in the integer. For example if the argment is 2345 *SumOfDigits* will return 2+3+4+5 = 14. The second function is called *PowerOfTwo*. This function accepts an integer argument *n* and returns an integer equal to 2^n

SOLUTION

```
int SumOfDigits(int n)
{
    if(n < 10)
       return n;
     return (n % 10) + SumOfDigits(n/10);
}
int PowerOfTwo(int n)
{
    if(n == 0)
       return 1;
    return 2*PowerOfTwo(n-1);
}
```

Recursive Examples

1. Write a recursive function to print a row of characters. For example `PrintRow(5, '*')` will print `*****`

2. Use `PrintRow` developed above to create a function called `PrintTriangle` that is also recursive. For example `PrintTriangle(5, '*')` will print

```
*****
****
***
**
*
```

3. Use `PrintRow` developed above to create a function called `PrintTriangle2` that is also recursive but prints the triangle upside down. For example `PrintTriangle2(5, '*')` will print:

```
*
**
***
****
*****
```

4. Write a function to print a "tree" consisting of n characters in the first line and n lines. For example `PrintTree(6, '*', 6)` prints:

```
     *
    ***
   *****
  *******
 *********
***********
```

5. Write a program to input a string of characters ending with '\n' that recursively prints the string backwards. If the input is "Hello Mom!" your program will print "!moM olleH".

Introduction to the Tower of Hanoi

Towers of Hanoi

Classic Case Study in Recursion

Problem

- Move n disks from Peg A to peg C using peg B as needed.
- The following conditions apply:
  1. Only one disk at a time may be moved, and this disk must be the top disk on a peg.
  2. A larger disk can never be placed on top of a smaller disk.

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Recursive Functions

1. Write a recursive function which will accept an integer and print the digits in the integer vertically. For example `WriteVertical(2345)` will print:

2
3
4
5