

Practice 7

1. Consider the following recursive function:

```
int mystery(int number)
{
    if (number == 0)
        return number;
    else
        return (number + mystery(number - 1));
}
```

- Identify the base case.
 - Identify the general case.
 - What valid values can be passed as parameters to the function `mystery`?
 - If `mystery(0)` is a valid call, what is its value? If not, explain why?
 - If `mystery(5)` is a valid call, what is its value? If not, explain why?
 - If `mystery(-3)` is a valid call, what is its value? If not, explain why?
2. Write a function `d2b(int num)` which prints out the binary equivalent of the parameter `num`. Test it with a main program. Use/modify this skeleton code for a start:

```
void d2b(int num)
{
    if (num < 2)
        cout << num; //nothing to convert
    while( num >= 2)
    {
        remainder = num % 2;
        num = num/2;
        . . . . . //you need storage for the
                  //multiple remainders
                  //What are you going to use?
    }
}
```

3. Write a `convert(int num, int base)` routine where `num` is a decimal number and `base` the base number. `base` should be able to accept a number from 2-10.

4. Write a full program to find the greatest common factor using the Euclid's algorithm. Use the recursive function shown below. Does it work all the time?

```
int gcd( int a, int b )
{
    int remainder = a % b;
    if ( remainder != 0 )
        return gcd( b, remainder );
    return b; /* remainder=0, so factor is b */
}
```

5. Write a function which determines if an integer is a prime number. Note: a prime number is one which is divisible only by 1 and by itself.

Before you start writing the function, ask these questions to help you think through your algorithm:

- what should the function return? int, double, bool,...?
- how should the number to be examined be passed in? pass-by-value or pass-by-reference?
- how many parameters are needed in the parameter list of the function?
- How do I make use of the information about prime number (or its definition) to help me write the algorithm in C++ codes?