### Number Conversion Exercises

Along with the Vector and Matrix classes, your math library will contain a class that encapsulates an RGBA (red, green, blue, alpha) colour, stored as a 4 byte integer where each colour component is stored in a single byte.

The Colour class defines the following variables and functions:

public class Colour

{

public UInt32 colour;

public Colour() {}

public Colour(byte red, byte green, byte blue, byte alpha) {}

public byte GetRed() {}

public void SetRed(byte red) {}

public byte GetGreen() {}

public void SetGreen(byte green) {}

public byte GetBlue() {}

public void SetBlue(byte blue) {}

public byte GetAlpha(){}

public void SetAlpha(byte alpha) {}

}

To guide you through the development and testing of this class, answer the following questions:

1. How many unique colour values can the *colour* variable contain?

**The colour value contains 256 \* 4 or 256^4 unique value.**

1. What is the minimum value, maximum value, and range for each colour component?

**Min value of Red = 0, Max value of Red = 255.**

**Min value of Green = 0, Max value of Green = 255.**

**Min value of Bule = 0, Max value of Blue = 255.**

**Min value of Alpha = 0, Max value of Alpha = 255.**

1. Suppose the *red* component of the RGBA colour is to be stored in an 8-bit integer (char) variable, and is set to the decimal value   
     
   　 char red = 94  
     
   Write this value as a binary number

**Binary code for Red = 01011110.**

1. The byte containing the red value (94) from question 3 is now to be stored in the RGBA colour value (in the left-most byte).

Assuming all other colour bytes are initialized to 0, write the value of the 4-byte colour variable in binary:

|  |  |  |  |
| --- | --- | --- | --- |
| **Red** | **Green** | **Blue** | **Alpha** |
| **01011110** | **00000000** | **00000000** | **00000000** |

1. What is the decimal value of the binary number from question 4?

**Decimal value is 1577058304.**

1. Write the bit shifting operation (in C#) that will move all bits from the ‘R’ position in the colour variable to the ‘G’ position.  
     
   **public uint colour = 0;**

**colour = colour | (uint)(red >> 8);**

1. Our colour value now has the green colour component set, and no red, blue, or alpha colour component values.  
   What are the decimal and binary value of the *colour* variable now?  
   **decimal value is 6160384.**

**Binary value.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Red** | **Green** | **Blue** | **Alpha** |
| **00000000** | **01011110** | **00000000** | **00000000** |

1. After you have created your Colour class and implemented all the functions listed in the class definition above, add at lease 1 new unit test to the unit test program using your answers in this exercise to verify your code.

**NOTE: submit your answers to these exercises with your assessment**