Maths for Games

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| **Assessment Task Number:** Part 2 – Number Conversion Problems | |
| **Unit Code(s):** | **Unit Title(s):** |
| PGDMTH6005 | Apply fundamental games programming mathematics skills |
| CUADIG511 | Coordinate testing of interactive media products |
| **Instructions to Learners:** | |

Complete all written questions in a Word or PDF document. You may answer and submit questions 1-7 in this document.

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?

256

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

0, 255, 256

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

94

47

23

11

5

2

1

0101 1110

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:

0101 1110 0000 0000 0000 0000 0000 0000

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

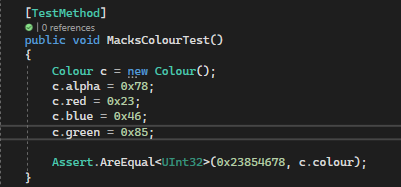
1,577,058,304

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.  
   colour = colour >> 8;
2. 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?

0000 0000 0101 1110 0000 0000 0000 0000

6,160,384

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



The colour test shown above has been uploaded inside of the “maths for games task 1” assignment and has been attached in the provided folder.

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| **Items to Submit** | | **Evidence Criteria and Assessment Decision-Making Rules** |
| 1. | Question 1 | How many unique colour values can the *colour* variable contain? |
| 2. | Question 2 | What is the minimum value, maximum value, and range for each colour component? |
| 3. | Question 3 | 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 |
| 4. | Question 4 | 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 |
| 5. | Question 5 | What is the decimal value of the binary number from question 4? |
| 6. | Question 6 | Write the bit shifting operation (in C#) that will move all bits from the ‘R’ position in the colour variable to the ‘G’ position. |
| 7. | Question 7 | 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? |
| 8. | Custom Unit Test | After you have created your Colour class and implemented all the functions listed in the brief given in *Assessment Task 1*, add at least 1 new unit test to the unit test program using your answers from this assessment task to verify your code.  Required evidence is at least one unit test added to the Unit Testing Project, unit test(s) are written on the custom Color type, are written as correct and accurate test(s), and the custom data type passes the unit test(s). |
| **Submission Requirements:** | | |
| You will need to submit the following:   * Answers to all written questions, in MS Word or PDF format * All source code * Your complete Visual Studio project   Be sure to remove any temporary build folders (i.e., the Debug and Release folders). Only project files, source code files, and any resource files used should be included in your submission.  Package all files in a single compressed archive file (.zip, .7z, or .rar) | | |