Activity 1.7

1 Using software on your computer (for example, text colour option in *Word*), find out what colours would be represented by the following RGB denary value combinations:

a	Red	53	b	Red	201	c	Red	12
	Green	55		Green	122		Green	111
	Blue	139		Blue	204		Blue	81

2 Convert each of the above denary numbers into hexadecimal.

1.1.4 Addition of binary numbers

This section will look at the addition of two 8-bit positive binary numbers.

Note the following key facts when carrying out ***addition*** of two binary digits:

binary addition	carry	sum
0+0	0	0
0+1	0	1
1+0	0	1
1+1	1	0

This can then be extended to consider the addition of three binary digits:

binary digit	carry	sum
0+0+0	0	0
0+0+1	0	1
0+1+0	0	1
0+1+1	1	0
1+0+0	0	1
1+0+1	1	0
1+1+0	1	0
1+1+1	1	1

For comparison: if we add 7 and 9 in denary the result is: carry = 1 and sum = 6; if we add 7, 9 and 8 the result is: carry = 2 and sum = 4, and so on.

Advice

Here's a quick recap on the role of carry and sum. If we want to add the numbers 97 and 64 in decimal, we:

- add the numbers in the right hand column first
- if the sum is greater than 9 then we carry a value to the next column
- we continue moving left, adding any carry values to each column until we are finished.

For instance:

```
  9 7
+ 6 4
  1 1   CARRY VALUES
1 6 1   SUM VALUES
```

Adding in binary follows the same rules except that we carry whenever the sum is greater than 1.

Example 1

Add 00100111 + 01001010

We will set this out showing carry and sum values:

```
  0 0 1 0 0 1 1 1
+ 0 1 0 0 1 0 1 0
  -----------------
    1 1 1          <-- carry values
  -----------------
  0 1 1 1 0 0 0 1  <-- sum values
```

Answer: **01110001**

column 1: 1 + 0 = 1 no carry
column 2: 1 + 1 = 0 carry 1
column 3: 1 + 0 + 1 = 0 carry 1
column 4: 0 + 1 + 1 = 0 carry 1
column 5: 0 + 0 + 1 = 1 no carry
column 6: 1 + 0 = 1 no carry
column 7: 0 + 1 = 1 no carry
column 8: 0 + 0 = 0 no carry

Example 2

a Convert 126 and 62 into binary.
b Add the two binary values in part a and check the result matches the addition of the two denary numbers

a 126 = 0 1 1 1 1 1 1 0 and 62 = 0 0 1 1 1 1 1 0

b

```
  0 1 1 1 1 1 1 0
+ 0 0 1 1 1 1 1 0
  -----------------
    1 1 1 1 1 1    <-- carry values
  -----------------
  1 0 1 1 1 1 0 0  <-- sum values
```

Answer: **10111100**

column 1: 0 + 0 = 0 no carry
column 2: 1 + 1 = 0 carry 1
column 3: 1 + 1 + 1 = 1 carry 1
column 4: 1 + 1 + 1 = 1 carry 1
column 5: 1 + 1 + 1 = 1 carry 1
column 6: 1 + 1 + 1 = 1 carry 1
column 7: 1 + 0 + 1 = 0 carry 1
column 8: 0 + 0 + 1 = 1 no carry

1 0 1 1 1 1 0 0 has the equivalent denary value of 128 + 32 + 16 + 8 + 4 = 188 which is the same as 126 + 62.

Activity 1.8

Carry out the following binary additions:

a 0 0 0 1 1 1 0 1 + 0 1 1 0 0 1 1 0
b 0 0 1 0 0 1 1 1 + 0 0 1 1 1 1 1 1
c 0 0 1 0 1 1 1 0 + 0 1 0 0 1 1 0 1
d 0 1 1 1 0 1 1 1 + 0 0 1 1 1 1 1 1
e 0 0 1 1 1 1 0 0 + 0 0 1 1 0 0 1 1
f 0 0 1 1 1 1 0 0 + 0 1 1 1 1 0 1 1
g 0 0 1 1 1 1 1 1 + 0 0 1 1 1 1 1 1
h 0 0 1 1 0 0 0 1 + 0 0 1 1 1 1 1 1
i 0 1 1 1 1 1 1 1 + 0 1 1 1 1 1 1 1
j 1 0 1 0 0 0 1 0 + 0 0 1 1 1 0 1 1

Activity 1.9

Convert the following denary numbers into binary and then carry out the binary addition of the two numbers and check your answer against the equivalent denary sum:

a 98 + 15
b 29 + 88
c 49 + 100
d 51 + 171
e 82 + 69
f 100 + 140
g 19 + 139
h 203 + 30
i 66 + 166
j 211 + 35