Binary Numbers

1010
$2^3 \times 1 + 2^2 \times 0 + 2^1 \times 1 + 2^0 \times 0$
$8 + 2 = \boxed{10}$

100100
$2^0 \times 0 + 2^1 \times 0 + 2^2 \times 1 + 2^3 \times 0 + 2^4 \times 0 + 2^5 \times 1$
$0 + 0 + 4 + 0 + 0 + 32 = \boxed{36}$

$7\,6\,5\,4\,3\,2\,1\,0$
11010 1000
$2^7 \times 1 + 2^5 \times 1 + 2^3 \times 1 =$
$128 + 32 + 8 = 128 + 40 = \boxed{168}$

$7\,6\,5\,4\,3\,2\,1\,0$
0010.1011
$2^0 \times 1 + 2^1 \times 1 + 2^3 \times 1 + 2^{-1} \times 1 + 2^{-5} \times 1$
$1 + 2 + 8 + 4 + 32 = \boxed{43}$

Exerceise 2 and 3

$$8\ 4\ 2\ 1\ \ .5\ .25$$
1) $1\ 0\ 1\ 1\ .\ 0\ 1$

$8 + 2 + 1 + .25 = \boxed{11.25}$

$$32\ 16\ 8\ 4\ 2\ 1$$
2) $1\ 0\ 1\ 1\ 0\ 1\ .\ 0\ 0$

$32 + 8 + 4 + 1 = \boxed{45}$

$$128\ 64\ 32\ 16\ 8\ 4\ 2\ 1\ .5$$
3) $1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ .\ 1\ 0$

$128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 + .5 = \boxed{255.5}$

$$128\ 64\ 32\ 16\ 8\ 4\ 2\ 1\ .5\ .25\ .125$$
4) $1\ 0\ 1\ 0\ 1\ 0\ 1\ 1\ .\ 1\ 1\ 1$

$128 + 32 + 8 + 2 + 1 + .5 + .25 + .125$

$148 + 2 + 1 . + .875$

$\boxed{151 . .875}$

Exercise 3

$17/2 = 8\ r1$
$8/2 = 4\ r0$
$4/2 = 2\ r0$
$2/2 = 1\ r0$
$1/2 = 0\ r1$

1) $\boxed{10001}$

$34/2 = 17\ r0$
$17/2 = 8\ r1$
$8/2 = 4\ r0$
$4/2 = 2\ r0$
$2/2 = 1\ r0$
$1/2 = 0\ r1$

2) $\boxed{100010}$

$66/2 = 33\ r0$
$33/2 = 16\ r1$
$16/2 = 8\ r0$
$8/2 = 4\ r0$
$4/2 = 2\ r0$
$2/2 = 1\ r0$
$1/2 = 0\ r1$

3) $\boxed{1000010}$

$135/2 = 67\ r1$
$67/2 = 33\ r1$
$33/2 = 16\ r1$
$16/2 = 8\ r0$
$8/2 = 4\ r0$
$4/2 = 2\ r0$
$2/2 = 1\ r0$
$1/2 = 0\ r1$

4) $\boxed{10000111}$

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```
1   void setup()
2   {
3     Serial.begin(9600);
4   }
5
6   void loop()
7   {
8     Serial.println("***************");
9     Serial.print(" DEC");
10    Serial.print("\t");
11    Serial.print(" BIN");
12    Serial.println("\t");
13    Serial.println("***************");
14
15    for (int x = 0; x < 64; x++) {
16      Serial.print(x, DEC);
17      Serial.print("\t");
18      Serial.println(x, BIN);
19      delay(400);
20    }
21  }
```

Serial Monitor

```
43      101011
***************
 DEC    BIN
***************
0       0
1       1
2       10
3       11
```

Send   Clear

Exercsie 5

Text


```
1    byte counter;
2
3    void setup(){
4      Serial.begin(9600);
5      for(int i=2;i<10;i++)  {
6         pinMode(i,OUTPUT);
7         digitalWrite(i,LOW);
8      }
9    }
10
11   void loop(){
12     for (int i=0;i<8;i++) {
13        if (bitRead(counter,i)==1) {
14           digitalWrite(i,HIGH);
15        }
16        else {
17           digitalWrite(i, LOW);
18        }
19     }
20     delay (300);
21     counter=counter+1;//count the counter up by one. ("counter++;")
22     Serial.print(counter); //send the counter value.
23     Serial.print(" as binary number: "); //send this string.
24     Serial.println(counter,BIN);
25     }
```

Serial Monitor

```
36 as binary number: 100100
37 as binary number: 100101
38 as binary number: 100110
39 as binary number: 100111
40 as binary number: 101000
41 as binary number: 101001
42 as binary number: 101010
43 as binary number: 101011
```

Send   Clear