**COP1000 – NUMBER SYSTEMS – FOR QUIZ 2**

We use the base-10, or **decimal** system for numbers because we have 10 digits on our hands, but it’s also important to know base-2 **binary** and base-16 **hexadecimal** in IT.

**UNDERSTANDING BASE-10**

Consider the base-10 number 6347. What does it mean?

6347 = 6 x 1000 + 3 x 100 + 4 x 10 + 7 x 1

Okay, but a better way to express it that helps with understanding the other bases is…

6347 = 6 x 10**3** + 3 x 10**2** + 4 x 10**1** + 7 x 10**0**(any positive base to the power zero = 1)

NOTE the **descending powers** of the base 10. This same pattern **applies to all bases**.

**UNDERSTANDING BASE-2**

Example 1: What does the binary number 11011 mean in base-10?

11011 = 1 x 2**4** + 1 x 2**3** + 0 x 2**2** + 1 x 2**1** + 1 x 2**0**

= 16 + 8 + 0 + 2 + 1

= 27 in base-10

Example 2: What does the binary number 10111101 mean in base-10?

10111101 = 1 x 2**7** + 0 x 2**6** + 1 x 2**5** + 1 x 2**4** + 1 x 2**3** + 1 x 2**2** + 0 x 2**1** + 1 x 2**0**

= 128 + 0 + 32 + 16 + 8 + 4 + 0 + 1

= 189 in base-10

**UNDERSTANDING BASE-16 (hexadecimal or hex)**

The descending powers pattern applies here too, but you have to remember that in **hex the digits for 10, 11, 12, 13, 14, and 15 are A, B, C, D, E, and F, respectively**.

Example 1: What does the hex number B7D mean in base-10?

Firstly, B = 11 and D = 13

B7D = 11 x 16**2** + 7 x 16**1** + 13 x 16**0**

= 11 x 256 + 112 + 13

= 2,941 in base-10 **NOTE**: only **two-digit hex numbers** will be tested in this course.

Example 2: What does the hex number FF mean in base-10?

Firstly, F = 15

FF = 15 x 16**1** + 15 x 16**0**

= 240 + 15

= 255 in base=10

**NOTE**: 255 is **1111:1111** in binary. This is the **highest** number possible with **1 byte**.