Binary/Decimal/Hexadecimal

Directions: Fill in the questions marks – highlighted in green and answer all the questions at the bottom of the worksheet. Save as yourname-numberconversions and submit

We use base 10 in everyday life. Let’s look at a set of numbers. Think of the “places” you learned in elementary – ones, tens, hundreds.

* The “one’s place” is 100 What is 100 ? (Any number to the 0 power is 1)
* The “ten’s place” is the 101 place (Which is calculated to be 10)
* The “hundred’s place” is the 102 place (Which is ten squared, calculates as 100)
* The “thousand’s place” is the 103 place (Which is ten cubed, calculates as 1000)

**Decimal or Base 10**

100,000 \_ 10,000 1000 \_ 100 \_ 10 \_ 1 “Calculated Values of Places”

105 104 103 102 101 100 Base 10

Example 1 1 1 = (1 \* 100) + (1 \* 10) + (1 \* 1) = **111**

**Binary or Base 2**

32 \_ 16 \_ 8 \_ 4 \_ 2 \_ 1 \_ “Calculated Values of Places”

25 24 23 22 21 20 Base 2

Example 1 1 1 = (1 \* 4) + (1 \* 2) + (1 \* 1) = **7**

So 111 Base 2 = 7 Base 10. This can also be written 1112 = 710

**HEXADECIMAL or Base 16**

4096 256 16 1 “Calculated Values of Places”

163 162 161 160 Base 16

Example 1 1 1 = (1 \* 256) + (1 \* 16) + (1 \* 1) = **273**

**Base 10 Reminder**

100,000 \_ 10,000 1000 \_ 100 \_ 10 \_ 1 “Calculated Values of Places”

105 104 103 102 101 100 Base 10

Example1 1 1 1 = (1 \* 100) + (1 \* 10) + (1 \* 1) = **111**

Example2 1 2 1 = (1 \* 100) + (2 \* 10) + (1 \* 1) = **121**

Example3 1 4 5 = (1 \* 100) + (4 \* 10) + (5 \* 1) = **145**

**Converting Binary/Base 2 to Decimal/Base 10**

32 16 8 4 2 1 “Calculated Values of Places”

25 24 23 22 21 20 Base 2

Example1 1 1 1 = (1 \* 4) + (1 \* 2) + (1 \* 1) = **7**

Example2 1 1 0 = (1 \* 4) + (1 \* 2) + (0 \* 1) = **6**

Example3 1 0 1 = (1 \* 4) + (0 \* 2) + (1 \* 1) = **5**

Example4 1 1 0 0 = (1 \* 8) + (1 \* 4) + (0 \* 2) + (0 \* 1) = **12**

Example5 1 1 1 0 1 = (1 \* 16) + (1 \* 8) + (1 \* 4) + (0 \* 2) + (1 \* 1) = **29**

**Converting Hexadecimal/Base16 to Decimal/Base10**

4096 256 16 1 “Calculated Values of Places”

163 162 161 160 Base 16

Example1 1 1 1 = (1 \* 256) + (1 \* 16) + (1 \* 1) = **273**

Example2 1 0 = (1 \* 16) + (0 \* 1) = **16**

Example3 2 1 = (2 \* 16) + (1 \* 1) = **33**

If you can have 1 – 15 in one Place – how do you represent 10, 11, 12, 13, 14, and 15?

Answer: 10 = A, 11=B, 12=C, 13=D, 14=E, 15=F

Example1 A B = (10 \* 16) + (11 \* 1) = **171**

Example2 1 E = (1 \* 16) + (14 \* 1) = **30**

Example3 1 F = (1 \* 16) + (15 \* 1) = **?**

Example4 B 1 = (? \* 16) + (? \* 1) =**?**

Example5 C A = (? \* 16) + (? \* 1) = **?**

**Show you understand!**

**Add your answers and highlight so I can see them!!**

13 in Base 10 (1310) = in Base 2

110 in Base 10 (11010) = in Base 2

11102 = 10

1012= 10

16010= 16

2010 = 16

3210= 16

A116= 10

1A16= 10