Changing base 2 to base 4:

A. This method works because $2^2 = 4$.

    1. Since $2^2 = 4$, we separate the numbers into groups of 2's starting from the right working to the left.

    2. Find the number each pair would be equal to in base 10 and write them down in order. See the table below:

Base 2	Base 10
00	0
01	1
10	2
11	3

    3. There is no need to memorize these since they can be evaluated easily. See *base b to 10*.

B. Examples:

    Ex [1] $110011011_2 = $_____$_4$.

        a. Separate the number into pairs: 1 10 01 10 11. *Notice that the first number doesn't have a pair. This is because there is an odd number of digits.

        b. Evaluating each pair we get: 1 2 1 2 3.

        c. The answer is 12123.

    Ex [2] $1000101_2 = $_____$_4$.

        a. Separate the number into pairs: 1 00 01 01.

        b. Evaluating each pair we get: 1 0 1 1.

        c. The answer is 1011.

C. Notice if you are asked to go from base 4 to base 2, the method would be simple:

    1. Simply take each digit and write its base 2 equivalent. Refer to the table above.

Ex [1] $3120_4 =$ _____$_2$.

    a. Using the table above we know that $3 = 11$, $1 = 01$, $2 = 10$, and $0 = 00$.

    b. The answer is 11011000.

Ex [2] $132_4 =$ _____$_2$.

    a. Using the table above we know that $1 = 01$, $3 = 11$, and $2 = 10$.

    b. Since the first set of numbers is 01, we only write 1, since no numbers (regardless of the base) start with 0.

    c. The answer is 11110.