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Decimal to Binary (Convert Decimal to Binary):
Convert then show your work by using the expanded form to verify your answer. Also note how many binary digits are required to represent the decimal number.

Ex: 8 (dec) => 1000 (bin); verify: 1*2^3 + 0*2^2 + 0*2^1 + 0*2^0 = 8 + 0 + 0 +0 = 8
8 requires 4 binary digits.

1. Convert 14 to binary. => 1110: =>1*2^3 + 1*2^2 + 1*2^1 + 0*2^0 =8+4+2+0 =>1110
2. Convert 25 to binary. => 1*2^4 + 1*2^3 + 0*2^2 + 0*2^1 + 1*2^0 =16+8+0+0+1 => 11001
3. Convert 39 to binary. => 1*2^5 + 0*2^4 + 0*2^3 + 1*2^2 + 1*2^1 + 1*2^0 =32+0+0+4+2+1 => 100111
4. Convert 56 to binary. =>1*2^5 + 1*2^4 + 1*2^3 + 0*2^2 + 0*2^1 + 0*2^0 =32+16+8+0+0+0 => 111000

5. Convert 16 to binary. =>1*2^4+ 0*2^3 + 0*2^2 + 0*2^1 + 0*2^0 =16+0+0+0+0 =>10000

Binary to Decimal (Convert Binary to Decimal):
You can just use the expanded form to convert binary to decimal.

1. Convert 1101 to decimal. = 1*2^3 + 1*2^2 + 0*2^1 + 1*2^0 =8+4+0+1=13
2. Convert 10101 to decimal. = 1*2^4 + 0*2^3 + 1*2^2 + 0*2^1 + 1*2^0 =16+0+4+0+1=21
3. Convert 111001 to decimal. = 1*2^5 +1*2^4 + 1*2^3 + 0*2^2 + 0*2^1 + 1*2^0 =32+16+8+0+0+1=57
4. Convert 100110 to decimal. =1*2^5 +0*2^4 + 0*2^3 + 1*2^2 + 1*2^1 + 1*2^0 =

32+0+0+4+2+0= 38

5. Convert 1100101 to decimal. =1*2^6 + 1*2^5+0*2^4 + 0*2^3 + 1*2^2 + 0*2^1 + 1*2^0 = 64+32+0+0+4+0+1= 101

6. Convert 101010 to decimal. = 1*2^5 + 0*2^4 + 1*2^3 + 0*2^2 + 1*2^1 + 0*2^0 = 32+0+8+0+2+0 = 42

7. Convert 1111 to decimal. = 1*2^3 + 1*2^2 + 1*2^1 + 1*2^0 = 8+4+2+1 =15

8. Convert 1001 to decimal. = 1*2^3 + 0*2^2 + 0*2^1 + 1*2^0 = 8+0+0+1 = 9

9. Convert 1101101 to decimal. = 1*2^6 + 1*2^5+0*2^4 + 1*2^3 + 1*2^2 + 0*2^1 + 1*2^0 = 64+32+0+8+4+0+1 = 109

10. Convert 1000001 to decimal. = 1*2^6 + 0*2^5+0*2^4 + 0*2^3 + 0*2^2 + 0*2^1 + 1*2^0 = 64+0+0+0+0+0+1 =65

Range of number:

1. Given 4 binary digits, what is the number range I can represent with these digits?

A. The range is 0 to 2^n-1 = >2^4 -1 =>16-1=>15 .so range is (0 to15)

For Signed The range is from [-2^(n-1), 2^(n-1) -1] => [-2^(4-1) , 2^(4-1) -1] => [-2^(3), 2^(3) -1] => [-8, 7]

2. Given 7 binary digits?

A. The range is 0 to 2^n-1 = >2^7 => 128-1 => 127 .so range is (0 to 127)

For Signed The range is from [-2^(n-1), 2^(n-1) -1] => [-2^(7-1) , 2^(7-1) -1] => [-2^(6), 2^(6) -1] => [-64 to 63]

3. Given 8 binary digits? =>

A.The range is 0 to 2^n-1 = 2^8 - 1=> 256-1=> 255. So range is (0 to 255)

For Signed The range is from [-2^(n-1), 2^(n-1) -1] => [-2^(8-1) , 2^(8-1) -1] =>

[-2^(7), 2^(7) -1] => [-128, 127]

4. Given 16 binary digits?

A.The range is 0 to 2^n-1 = 2^16 -1 => 65536 -1 =>65535=> so range is (0 to 65535)

For Signed The range is from [-2^(n-1), 2^(n-1) -1] => [-2^(16-1) , 2^(16-1) -1] => [-2^(15), 2^(15) -1] => [-32768 to 32767]