Other way to convert between decimal and binary by understanding the following

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2^7 | 2^6 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

For fraction use the following

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2^-1 | 2^-2 | 2^-3 | 2^-4 | 2^-5 | 2^-6 | 2^-7 |
| 0.5 | 0.25 | 0.125 | 0.0625 | 0.03125 | 0.015625 | 0.007813 |

Convert 83.84375 from decimal to binary

Let’s look for **83** first to make 83 we can add the biggest number that fits first and keep going

So we will pick 64 since 64 is the biggest we can fit in 83 now the reminder of 83 will be (83-64)= 19

The biggest number we can pick to fit in 19 will be **16. The reminder of 19 will be (19-16)=3**

The biggest number we can pick to fit in 3 will be 2**. The reminder of 3 will be (3-2)=1**

The biggest number we can pick to fit in 1 will be 1**. The reminder of 1 will be (1-1)=0**

**We picked the following numbers 64,16,2 and 1 so we will fill one under the numbers we picked and zeros for we did not use.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2^7 | 2^6 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |

The binary number for 83 is 01010011

Using the same strategy to convert 0.84375 from decimal to binary

The biggest number that can fit first in 0.84375 is **0.5** The reminder will be (0.84375- 0.5) = 0.34375

The biggest number that can fit first in 0. 0.34375 is **0.25** The reminder will be (0. 34375 - 0.25) = 0.09375

The biggest number that can fit first in 0.09375 is **0.0625.** The reminder will be (0.09375 - 0.0625) = 0.03125

The biggest number that can fit first in 0.03125 is **0.03125** The reminder will be ( 0.03125- 0.03125) = 0

**We picked the following numbers 0.5,0.25,0.0625 and 0.0125 so we will fill one under the numbers we picked and zeros for we did not use.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2^-1 | 2^-2 | 2^-3 | 2^-4 | 2^-5 | 2^-6 | 2^-7 |
| 0.5 | 0.25 | 0.125 | 0.0625 | 0.03125 | 0.015625 | 0.007813 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 |

**0.1101100**

Now we can answer the question for binary number for 83.84375 which is **01010011.1101100**