convert 42.75 in b inary and how it works for decimal explain

Let's break down **how to represent 42.75 in binary**, and **how fractional (decimal) parts are converted to binary**.

1. Convert the Integer Part (42) to Binary

- Divide by 2, write the remainder, continue with the quotient until 0.
- 42 divided by 2:

Step	Quotient	Remainder
1	21	0
2	10	1
3	5	0
4	2	1
5	1	0
6	0	1

Write remainders bottom to top:
42 = 101010$_2$

2. Convert the Fractional Part (0.75) to Binary

Algorithm (for base 2 fractions):

- Multiply the fraction by 2.
- The result's **integer part** is the next binary digit.
- Continue with the new fractional part until it becomes 0 or until desired precision.

Steps for 0.75:

1. 0.75 × 2 = **1.5** → integer part: **1**; new fraction: 0.5
2. 0.5 × 2 = **1.0** → integer part: **1**; new fraction: 0.0

When the fraction reaches 0, we stop.
So, **0.75$_{10}$ = .11$_2$**

3. Combine Integer and Fractional Parts

- **42 = 101010**
- **0.75 = .11**

Thus,

> **42.75_{10} = 101010.11_2**

4. How Binary Fractions Work (How Decimals Convert)

- Place values after the point are powers of 2, just like before the point, but negative:
  - Binary point places:
    1st: 1/2 (2^{-1}), 2nd: 1/4 (2^{-2}), 3rd: 1/8 (2^{-3}), etc.
- So, `101010.11`$_2$ equals:
  - `101010` = 32 + 8 + 2 = 42
  - `.1` (first bit after point): 1 × 1/2 = 0.5
  - `.1` (second bit): 1 × 1/4 = 0.25
  - `.11` = 0.5 + 0.25 = 0.75

So, total = **42 + 0.75 = 42.75**

5. Summary Table

Decimal	Binary
42	101010
0.75	.11
42.75	**101010.11**

In Short:

- Convert the integer part to binary as usual.
- For the fractional part, repeatedly multiply by 2, writing down the integer portion each time.
- Combine both for the binary result.

Let me know if you want more examples, or the IEEE 754 binary (machine-level) form!