FRACTIONAL BINARY NUMBER TO OTHER BASE NUMBER SYSTEM

TO CONVERT A FRACTIONAL BINARY NUMBER TO AN OCTAL NUMBER

To convert a fractional binary number to an octal number, you follow a few straightforward steps. Here's a step-by-step guide along with an example:

Steps to Convert Fractional Binary to Octal

1. **Separate the binary number into integer and fractional parts.**
2. **Convert the integer part from binary to octal:**
   - Group the binary digits into sets of three, starting from the binary point (decimal point in binary) and moving outward. For the integer part, group the digits from right to left. For the fractional part, group the digits from left to right.
   - Convert each group of three binary digits into their octal equivalent.
3. **Convert the fractional part from binary to octal:**
   - Group the binary digits into sets of three as described above.
   - Convert each group of three binary digits into their octal equivalent.
   - If there are fewer than three digits in the fractional part, pad with zeros to make a complete group.
4. **Combine the integer and fractional octal parts.**

Example

Let's convert the binary number `1011.101` to octal.

Step 1: Separate the integer and fractional parts

- Integer part: `1011`
- Fractional part: `101`

Step 2: Convert the integer part

1. **Group the binary digits into sets of three:**
   - Starting from the right: `1 011` → Group as `001 011` (adding leading zeros to make full groups)
   - Convert each group to octal:
     - `001` in binary = `1` in octal
     - `011` in binary = `3` in octal

   So, `1011` in binary is `13` in octal.

Step 3: Convert the fractional part

1. **Group the binary digits into sets of three:**
   - Starting from the left: `101` (already a full group of three)
   - Convert this group to octal:
     - `101` in binary = `5` in octal

   So, `101` in binary is `5` in octal.

Step 4: Combine the integer and fractional parts

- Integer part in octal: `13`
- Fractional part in octal: `5`

Therefore, the binary number `1011.101` converts to `13.5` in octal.

TO CONVERT A FRACTIONAL BINARY NUMBER TO A HEXADECIMAL NUMBER

To convert a fractional binary number to a hexadecimal number, you can follow a similar process to the one used for octal conversion, but this time you'll group the binary digits into sets of four (since hexadecimal is base 16 and 2^4 = 16). Here's a step-by-step guide with an example.

Steps to Convert Fractional Binary to Hexadecimal

1. **Separate the binary number into integer and fractional parts.**
2. **Convert the integer part from binary to hexadecimal:**
   - Group the binary digits into sets of four, starting from the binary point (decimal point in binary) and moving outward. For the integer part, group the digits from right to left. For the fractional part, group the digits from left to right.
   - Convert each group of four binary digits into their hexadecimal equivalent.
3. **Convert the fractional part from binary to hexadecimal:**
   - Group the binary digits into sets of four as described above.
   - Convert each group of four binary digits into their hexadecimal equivalent.
   - If there are fewer than four digits in the fractional part, pad with zeros to make a complete group.
4. **Combine the integer and fractional hexadecimal parts.**

Example

Let's convert the binary number `1101.1011` to hexadecimal.

Step 1: Separate the integer and fractional parts

- Integer part: `1101`
- Fractional part: `1011`

Step 2: Convert the integer part

1. **Group the binary digits into sets of four:**
   - `1101` (already a full group of four)
2. **Convert each group to hexadecimal:**
   - `1101` in binary = `D` in hexadecimal

   So, `1101` in binary is `D` in hexadecimal.

Step 3: Convert the fractional part

1. **Group the binary digits into sets of four:**
   - `1011` (already a full group of four)
2. **Convert each group to hexadecimal:**
   - `1011` in binary = `B` in hexadecimal

   So, `1011` in binary is `B` in hexadecimal.

Step 4: Combine the integer and fractional parts

- Integer part in hexadecimal: `D`
- Fractional part in hexadecimal: `B`

Therefore, the binary number `1101.1011` converts to `D.B` in hexadecimal.

TO CONVERT A FRACTIONAL BINARY NUMBER TO DECIMAL NUMBER

To convert a fractional binary number to a decimal number, you'll need to handle both the integer and fractional parts separately and then combine them. Here's a step-by-step guide with an example:

Steps to Convert Fractional Binary to Decimal

1. **Separate the binary number into integer and fractional parts.**
2. **Convert the integer part from binary to decimal:**
   o Each binary digit is multiplied by 2 raised to the power of its position, starting from 0 on the right.
3. **Convert the fractional part from binary to decimal:**
   o Each binary digit is multiplied by 2 raised to the negative power of its position, starting from -1 immediately to the right of the binary point.
4. **Add the results of the integer and fractional parts to get the final decimal number.**

Example

Let's convert the binary number 101.101 to decimal.

Step 1: Separate the integer and fractional parts

- Integer part: 101
- Fractional part: 101

Step 2: Convert the integer part

1. **Calculate the decimal value for each binary digit:**
   o For 101, the positions from right to left are 0, 1, and 2.
   o Calculate as follows:
     ▪ $1 \times 2^2 = 1 \times 4 = 4$
     ▪ $0 \times 2^1 = 0 \times 2 = 0$
     ▪ $1 \times 2^0 = 1 \times 1 = 1$
   o Sum these values: $4 + 0 + 1 = 5$

So, the integer part 101 in binary is 5 in decimal.

Step 3: Convert the fractional part

1. **Calculate the decimal value for each binary digit:**
   o For 101, the positions from left to right after the binary point are -1, -2, and -3.
   o Calculate as follows:
     ▪ $1 \times 2^{-1} = 1 \times 0.5 = 0.5$
     ▪ $0 \times 2^{-2} = 0 \times 0.25 = 0$
     ▪ $1 \times 2^{-3} = 1 \times 0.125 = 0.125$
   o Sum these values: $0.5 + 0 + 0.125 = 0.625$

So, the fractional part 101 in binary is 0.625 in decimal.

Step 4: Combine the integer and fractional parts

- Integer part in decimal: 5
- Fractional part in decimal: 0.625

Therefore, the binary number 101.101 converts to 5.625 in decimal.

FRACTIONAL DECIMAL NUMBER TO OTHER BASE NUMBER SYSTEM

TO CONVERT A FRACTIONAL DECIMAL NUMBER TO BINARY NUMBER

To convert a fractional decimal number to binary, you'll need to handle both the integer and fractional parts separately. Here's a step-by-step guide with an example:

Steps to Convert Fractional Decimal to Binary

1. **Separate the decimal number into integer and fractional parts.**
2. **Convert the integer part from decimal to binary:**
   - Repeatedly divide the integer part by 2 and record the remainders.
   - The binary representation is the sequence of remainders read in reverse order (from bottom to top).
3. **Convert the fractional part from decimal to binary:**
   - Repeatedly multiply the fractional part by 2 and record the integer part of the result.
   - The binary representation is the sequence of these integer parts.
4. **Combine the integer and fractional binary parts.**

Example

Let's convert the decimal number 13.625 to binary.

Step 1: Separate the integer and fractional parts

- Integer part: 13
- Fractional part: 0.625

Step 2: Convert the integer part

1. **Repeatedly divide the integer part by 2:**
   - $13 \div 2 = 6$ with a remainder of 1
   - $6 \div 2 = 3$ with a remainder of 0
   - $3 \div 2 = 1$ with a remainder of 1
   - $1 \div 2 = 0$ with a remainder of 1
2. **Read the remainders from bottom to top:**
   - The binary representation of 13 is 1101.

Step 3: Convert the fractional part

1. **Repeatedly multiply the fractional part by 2:**
   - $0.625 \times 2 = 1.25 \rightarrow$ Integer part: 1, Fractional part: 0.25
   - $0.25 \times 2 = 0.5 \rightarrow$ Integer part: 0, Fractional part: 0.5
   - $0.5 \times 2 = 1.0 \rightarrow$ Integer part: 1, Fractional part: 0.0
2. **Record the integer parts:**
   - The binary representation of 0.625 is 0.101.

Step 4: Combine the integer and fractional parts

- Integer part in binary: 1101
- Fractional part in binary: 0.101

So, the decimal number 13.625 converts to 1101.101 in binary.

TO CONVERT A FRACTIONAL DECIMAL NUMBER TO AN OCTAL NUMBER

To convert a fractional decimal number to an octal number, you need to handle the integer and fractional parts separately. Here's a detailed step-by-step guide along with an example.

Steps to Convert Fractional Decimal to Octal

1. **Separate the decimal number into integer and fractional parts.**
2. **Convert the integer part from decimal to octal:**
   - Repeatedly divide the integer part by 8 and record the remainders.
   - The octal representation is the sequence of remainders read in reverse order (from bottom to top).
3. **Convert the fractional part from decimal to octal:**
   - Repeatedly multiply the fractional part by 8 and record the integer part of the result.
   - The octal representation is the sequence of these integer parts.
4. **Combine the integer and fractional octal parts.**

Example

Let's convert the decimal number 45.375 to octal.

Step 1: Separate the integer and fractional parts

- Integer part: 45
- Fractional part: 0.375

Step 2: Convert the integer part

1. **Repeatedly divide the integer part by 8:**
   - $45 \div 8 = 5$ with a remainder of 5
   - $5 \div 8 = 0$ with a remainder of 5
2. **Read the remainders from bottom to top:**
   - The octal representation of 45 is 55.

Step 3: Convert the fractional part

1. **Repeatedly multiply the fractional part by 8:**
   - $0.375 \times 8 = 3.0 \rightarrow$ Integer part: 3, Fractional part: 0.0
2. **Record the integer parts:**
   - The octal representation of 0.375 is 0.3.

Step 4: Combine the integer and fractional parts

- Integer part in octal: 55
- Fractional part in octal: 0.3

So, the decimal number 45.375 converts to 55.3 in octal.

TO CONVERT A FRACTIONAL DECIMAL NUMBER TO HEXADECIMAL NUMBER

To convert a fractional decimal number to hexadecimal, you'll handle the integer and fractional parts separately. Here's a step-by-step guide with an example:

Steps to Convert Fractional Decimal to Hexadecimal

1. **Separate the decimal number into integer and fractional parts.**
2. **Convert the integer part from decimal to hexadecimal:**
   - Repeatedly divide the integer part by 16 and record the remainders.
   - The hexadecimal representation is the sequence of remainders read in reverse order (from bottom to top).
3. **Convert the fractional part from decimal to hexadecimal:**
   - Repeatedly multiply the fractional part by 16 and record the integer part of the result.
   - The hexadecimal representation is the sequence of these integer parts.
4. **Combine the integer and fractional hexadecimal parts.**

Example

Let's convert the decimal number 123.6875 to hexadecimal.

Step 1: Convert the Integer Part

1. **Repeatedly divide the integer part by 16:**
   - **Division 1:**
     - $123 \div 16 = 7$ with a remainder of 11
     - 11 in hexadecimal is B
   - **Division 2:**
     - $7 \div 16 = 0$ with a remainder of 7
   - Read the remainders from bottom to top: 7B

So, 123 in decimal is 7B in hexadecimal.

Step 2: Convert the Fractional Part

1. **Repeatedly multiply the fractional part by 16:**
   - **Multiplication 1:**
     - $0.6875 \times 16 = 11.0$
     - Integer part: 11 (which is B in hexadecimal)
     - Fractional part: 0.0
   - Since the fractional part becomes 0, the process stops here.

So, 0.6875 in decimal is 0.B in hexadecimal.

Step 3: Combine the Integer and Fractional Parts

- Integer part in hexadecimal: 7B
- Fractional part in hexadecimal: 0.B

Therefore, the decimal number 123.6875 converts to 7B.B in hexadecimal.

FRACTIONAL OCTAL NUMBER TO OTHER BASE NUMBER SYSTEM

TO CONVERT A FRACTIONAL OCTAL NUMBER TO BINARY NUMBER

To convert a fractional octal number to binary, you'll handle both the integer and fractional parts separately. Here's a step-by-step guide with an example:

Steps to Convert Fractional Octal to Binary

1. **Separate the octal number into integer and fractional parts.**
2. **Convert the integer part from octal to binary:**
   o Convert each octal digit to its 3-bit binary equivalent.
3. **Convert the fractional part from octal to binary:**
   o Convert each octal digit to its 3-bit binary equivalent.
4. **Combine the integer and fractional binary parts.**

Example

Let's convert the octal number 45.36 to binary.

Step 1: Separate the integer and fractional parts

- Integer part: 45
- Fractional part: 36

Step 2: Convert the integer part

1. **Convert each octal digit to binary:**
   o 4 in octal = 100 in binary
   o 5 in octal = 101 in binary

Combine these binary digits: 45 in octal is 100101 in binary.

Step 3: Convert the fractional part

1. **Convert each octal digit to binary:**
   o 3 in octal = 011 in binary
   o 6 in octal = 110 in binary

Combine these binary digits: 36 in octal is 011110 in binary.

Step 4: Combine the integer and fractional parts

- Integer part in binary: 100101
- Fractional part in binary: 011110

Therefore, the octal number 45.36 converts to 100101.011110 in binary.

TO CONVERT A FRACTIONAL OCTAL NUMBER TO DECIMAL NUMBER

To convert a fractional octal number to a decimal number, follow these steps:

1. Separate the Number

Split the octal number into two parts: the integer part and the fractional part.

2. Convert the Integer Part

Convert the integer part from octal to decimal using the following method:

- Each digit in the integer part is multiplied by 888 raised to the power of its position index, starting from 0 on the right.
- Sum these values to get the decimal equivalent.

3. Convert the Fractional Part

Convert the fractional part from octal to decimal using the following method:

- Each digit in the fractional part is multiplied by 888 raised to the negative power of its position index, starting from -1 on the left of the decimal point.
- Sum these values to get the decimal equivalent.

4. Combine the Results

- Add the decimal values of the integer and fractional parts together to get the final decimal result.

FRACTIONAL HEXADECIMAL NUMBER TO OTHER BASE NUMBER SYSTEM

TO CONVERT A FRACTIONAL HEXADECIMAL NUMBER TO BINARY NUMBER

To convert a fractional hexadecimal number to a binary number, follow these steps:

Steps to Convert a Fractional Hexadecimal Number to Binary:

1. Separate the Hexadecimal Number

Split the hexadecimal number into its integer part and fractional part.

2. Convert the Integer Part from Hexadecimal to Binary

Convert each hexadecimal digit to its 4-bit binary equivalent

3. Convert the Fractional Part from Hexadecimal to Binary

Convert each hexadecimal digit to its 4-bit binary equivalent.

4. Combine the Integer and Fractional Parts

Concatenate the binary representations of the integer and fractional parts.

TO CONVERT A FRACTIONAL HEXADECIMAL NUMBER TO OCTAL NUMBER

To convert a fractional hexadecimal number to an octal number, follow these steps:

1. **Convert the Hexadecimal Number to Binary**
   - Convert both the integer and fractional parts of the hexadecimal number to binary.
2. **Group the Binary Digits into Sets of Three**
   - For the integer part, group binary digits into sets of three from right to left.
   - For the fractional part, group binary digits into sets of three from left to right, padding with zeros if necessary.
3. **Convert Each Group of Three Binary Digits to Octal**
   - Convert each group of three binary digits to its octal equivalent.
4. **Combine the Octal Results**
   - Combine the octal digits from the integer and fractional parts to form the final octal number.

TO CONVERT A FRACTIONAL HEXADECIMAL NUMBER TO OCTAL NUMBER

To convert a fractional hexadecimal number to a decimal number, follow these steps:

1. **Separate the Hexadecimal Number**
   - Split the hexadecimal number into its integer part and fractional part.
2. **Convert the Integer Part to Decimal**
   - Convert each hexadecimal digit to decimal and multiply it by 16 raised to the power of its position index, starting from 0 on the right.
3. **Convert the Fractional Part to Decimal**
   - Convert each hexadecimal digit to decimal and multiply it by 16 raised to the negative power of its position index, starting from -1 on the left of the decimal point.
4. **Combine the Results**
   - Add the decimal values of the integer part and fractional part to get the final decimal number.

TO CONVERT A FRACTIONAL OCTAL NUMBER TO HEXADECIMAL NUMBER

To convert a fractional octal number to a hexadecimal number, follow these steps:

1. Convert the Octal Number to Decimal

Step 1.1: Convert the Integer Part from Octal to Decimal
- Convert each digit of the octal integer part to decimal.
- Multiply each digit by 888 raised to the power of its position index, starting from 0 on the right

Step 1.2: Convert the Fractional Part from Octal to Decimal
- Convert each digit of the octal fractional part to decimal.
- Multiply each digit by 888 raised to the negative power of its position index, starting from -1 on the left of the decimal point.

Combine Integer and Fractional Parts:

2. Convert the Decimal Number to Hexadecimal

Step 2.1: Convert the Integer Part from Decimal to Hexadecimal
- Divide the decimal integer part by 16 and keep track of the remainders.
- Convert the remainders to their hexadecimal equivalents (0-9 and A-F).

Step 2.2: Convert the Fractional Part from Decimal to Hexadecimal
- Multiply the decimal fractional part by 16 and take note of the integer part of the result.
- Repeat this process with the fractional part of the result until you reach the desired precision or the fraction becomes zero.

Combine Integer and Fractional Parts: