1 Binary to Decimal and Back Conversion

Title: Binary (101101) to Decimal and Back Conversion

Description: In this activity, students will learn how to convert a **Binary number to a Decimal number**, and then convert the resulting **Decimal number back to Binary** using step-by-step logic. This will help them understand the **concept of place values** and how **binary (base-2)** and **decimal (base-10)** systems are related.

Purpose: To help students:

- Understand how binary numbers work.
- Strengthen their ability to perform base conversions.
- Practice logical reasoning with number systems.

Part A: Convert Binary 101101 to Decimal

Steps:

1. **Write down the binary number:**

1	0	1	1	0	1

2. **Assign powers of 2** from right to left (starting at 0)**:**

2^5	2^4	2^3	2^2	2^1	2^0

Which equals:

32	16	8	4	2	1

3. **Multiply each binary digit by its power of 2. Also add them**:

Step-by-Step Explanation (with Visual Aid):

```
Binary Digits:     1     0     1     1     0     1
                   ↓     ↓     ↓     ↓     ↓     ↓
Powers of 2:      32    16     8     4     2     1
                   ↓     ↓     ↓     ↓     ↓     ↓
Multiplication:  1x32  0x16  1x8   1x4   0x2   1x1
                   ↓     ↓     ↓     ↓     ↓     ↓
Results:          32  +  0  +  8  +  4  +  0  +  1  = 45
```

✅ So, **Binary 101101 = Decimal 45**

Part B: Convert Decimal 45 to Binary

Steps:

1. **Take the decimal number: 45**
2. **Divide the number by 2** and record the **remainder.**
3. **Repeat** until the quotient is 0.
4. **Read the remainder in reverse order (bottom to up).**

Step-by-Step Explanation (with visual Aid):

Division Step	Quotient	Remainder
45 ÷ 2	22	1
22 ÷ 2	11	0
11 ÷ 2	5	1
5 ÷ 2	2	1
2 ÷ 2	1	0
1 ÷ 2	0	1

👉 Write the remainders **from bottom to top: 1 0 1 1 0 1**

✅ So, **Decimal 45 = Binary 101101**

🧠 Conclusion:

✓ This proves that binary and decimal conversions are **reversible** when done correctly.
✓ This process also reinforces how **place values** and **division by base** are essential concepts in computer math.