

Binary and BCD Addition



Using binary arithmetic rules solve
 $(11110000) + (00001111)$

Using BCD arithmetic rules solve
 $(58)_{10} + (12)_{10}$

Solve these two questions in a teacher like way simply and short



Binary Arithmetic

To solve $(11110000)_2 + (00001111)_2$, follow binary addition rules:

1. Align the numbers:

```
11110000
```

- 00001111

2. Add bit by bit from right to left:

- $0 + 1 = 1$
- $0 + 1 = 1$
- $0 + 1 = 1$
- $0 + 1 = 1$
- $1 + 0 = 1$
- $1 + 0 = 1$
- $1 + 0 = 1$
- $1 + 0 = 1$

3. Result:

$(11111111)_2$ or 255 in decimal.

BCD (Binary-Coded Decimal) Arithmetic

To solve $58_{10} + 12_{10}$ using BCD:

1. Represent 58 and 12 in BCD:

- $58 = 0101\ 1000$
- $12 = 0001\ 0010$

2. Add the BCD values:

```
yaml
```

```
0101 1000
```

• **0001 0010**

```
0110 1010
```

3. Check if any nibble (group of 4 bits) exceeds 9 (invalid in BCD):

- The second nibble 1010 equals 10_{10} , which is invalid in BCD.

4. Correct using BCD adjustment (add 0110 to invalid nibbles):

```
yaml
```

```
0110 1010
```

• **0000 0110**

```
0111 0000
```

5. Final result in BCD: $0111\ 0000$, which equals 70_{10} .

Final Answers:

1. Binary: $(11110000)_2 + (00001111)_2 = (11111111)_2$.
2. BCD: $(58)_{10} + (12)_{10} = (70)_{10}$.



Solve using 2s complement method
 $(12)_{10} - (22)_{10}$



Solving $(12)_{10} - (22)_{10}$ Using 2's Complement

Step 1: Represent 12 and 22 in 8-bit binary

- $12 = 00001100_2$
- $22 = 00010110_2$

Step 2: Find the 2's complement of 22

1. Write 22 in binary: 00010110_2 .
2. Find the 1's complement (invert the bits): 11101001_2 .
3. Add 1 to the 1's complement:

```
11101001
```

- markdown

```
1
```

```
11101010
```

The 2's complement of 22 is 11101010_2 .

Step 3: Add 12 to -22

Add 00001100_2 (binary for 12) to 11101010_2 (2's complement of 22):

```
diff
```

```
00001100
+ 11101010
-----
11110110
```

Step 4: Interpret the result

The sum is 11110110_2 . Since the most significant bit (MSB) is 1, the result is negative.

1. Find the 2's complement of 11110110_2 to determine the magnitude:
 - Invert the bits: 00001001_2 .
 - Add 1:

```
00001001
```

- markdown

```
1
```

```
00001010
```

```
csharp
```

```
- The magnitude is \(10_{10}\).
```

2. Therefore, the result is -10 .

Final Answer:

$$(12)_{10} - (22)_{10} = -10_{10}.$$

Is this conversation helpful so far?