

Overflow Rules with Binary Representation

Overview of Overflow Rules

Addition Rules

- Adding +ve and -ve operands: No overflow occurs.
- Adding two +ve operands: Overflow occurs if the result sign is **1**.
- Adding two -ve operands: Overflow occurs if the result sign is **0**.

Subtraction Rules

- Subtracting two +ve or two -ve operands: No overflow occurs.
- Subtracting +ve from -ve operand: Overflow occurs if the result sign is **0**.
- Subtracting -ve from +ve operand: Overflow occurs if the result sign is **1**.

Examples for Each Rule (with Binary Representation)

Rule 1: Adding +ve and -ve Operands (No Overflow)

- $5 + (-3) = 2$
- Binary: $00000101 + 11111101 = 00000010$
- Explanation: No overflow, result is within range.

Rule 2: Adding Two +ve Operands (Overflow if Result Sign is 1)

- $127 + 1 = -128$
- Binary: $01111111 + 00000001 = 10000000$
- Explanation: Overflow occurs as the result exceeds the range.

Rule 3: Adding Two –ve Operands (Overflow if Result Sign is 0)

- $-120 + (-10) = 126$
- Binary: $10001000 + 11110110 = 01111110$
- Explanation: Overflow occurs as the result exceeds the range.

Rule 4: Subtracting Two +ve or Two –ve Operands (No Overflow)

- $15 - 5 = 10$
- Binary: $00001111 - 00000101 = 00001010$
- Explanation: No overflow, result is within range.

Rule 5: Subtracting +ve from –ve Operand (Overflow if Result Sign is 0)

- $-10 - 20 = 214$
- Binary: $11110110 - 00010100 = 11010110$
- Explanation: Overflow occurs as the result exceeds the range.

Rule 6: Subtracting –ve from +ve Operand (Overflow if Result Sign is 1)

- $20 - (-10) = -226$
- Binary: $00010100 - 11110110 = 10010110$
- Explanation: Overflow occurs as the result exceeds the range.

Practice Problems

- Solve $50 + (-25)$. Show binary representation and check for overflow.
- Evaluate $120 + 10$ (8-bit signed integers). Does overflow occur?
- Perform $-100 + (-50)$. Write binary representation and check overflow.
- Subtract $15 - 5$. Verify with binary if overflow occurs.
- Solve $-15 - 25$. Check the result for overflow.
- Perform $20 - (-15)$. Show binary and check overflow.

- Compute $70 + 90$ (8-bit signed integers). Verify for overflow.
- Solve $-50 - (-30)$. Include binary and check if overflow occurs.
- Evaluate $100 + 50$. Write binary and verify overflow.
- Compute $50 - (-75)$. Check the result for overflow.

Solutions (Optional)

The binary representations and explanations for these practice problems can be added in this section if required.