

Number Representation 3 - Negative Numbers

1. Express the following decimal numbers in an 8-bit binary register using sign and magnitude

- a) -20
- b) 50
- c) -68

Answers

- a) 10010100
- b) 00110010
- c) 11000100

2. Assuming you have 8-bits to represent a number and you are working in two's complement, find the binary expression of:

- a) -55
- b) -14
- c) 94

Answers

- a) 11001001 $(-128+64+8+1)$
- b) 11110010 $(-128+64+32+16+2)$
- c) 01011110 $(+64+16+8+4+2)$

3. Perform the following calculations using two's complement arithmetic. All numbers are represented in an 8-bit register.

- a) $99 - 56$
- b) $85 - 106$
- c) $-25 - 30$

Answers

- a) 00101011
- b) 11101011
- c) 11001001

4. Write the decimal value of the following numbers expressed in two's complement:

- a) 10010011
- b) 00110110

Answers

- a) -109
- b) 54

5. Given a 6-bit register, work out the possible ranges of decimal numbers for each of the following representations

- a) Unsigned binary
- b) Sign and Magnitude binary

c) Two's Complement binary

Answers

a) From 0 to 63

b) From -31 to 31

c) From -32 to 31