Exercise 5

Suppose that ​A = 45​ and ​B = -13​, ​C = 0 ​and ​D​ is a given number.

Notice: The placeholder for A, B, C and D is one byte (8 bits).​D​ is ​unknown​ and can be any number between ​0​ and ​255​.

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| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | ---------------------------------------------------

1.Convert A, B and C to ​binary ​and ​hexadecimal

var bin hex

A=45 00101101 0x2D

B=-13 00001101

=>11110010

=>11110011 0xF3

C=0 00000000 0x00

2.Calculate A + B, A - B, C - A and B - A.

A+B = 45-13 = 32

00100000

0x20

A-B = 45+13 = 58

00111010

0x3A

C-A = 0-45 = -45

00101101

=>11010010

=>11010011

0xD3

B-A = -13-45=-58

00111010

=>11000101

=>11000110

0xC6

3.Perform the following operations.

a.A | B

00101101

| 11110011

= 11111111

b.A & B

00101101

& 11110011

= 00100001

c.A ^ B

00101101

| 11110011

= 11011110

d.A << 3

00101101

<<3

= 01101000

e.B >> 2

11110011

>>2

= 00111100

f.C >> 5

00000000

>>5

= 00000000

g.(A << 3) >> 3

00101101

<<3

= 01101000

>>3

= 00001101

h.(~A & B) ^ (~C | A)

~00101101 ^ ~00000000

&00111010 |00101101

= 00010010 ^ 11111111

= 11101101

4.Using bitwise operators and masks

a.Set the first and last bits of A

A = A | 0x81

Or

A = A | 0b10000001

b.Toggle (Flip) the third bit of B

B = B ^ 0x04

Or

B = B ^ 0b00000100

c.Read the value of 3rd and 4th bits of D (D2 and D3)

D3 = D & 0b00001000

D2 = D & 0b00000100

d.Change the 3rd and 4th bits of D to ​10​ (D3 to ​1​ and D2 to ​0​)

D = (D | 0b00001000) & 0b11111011

Or

D = D & 0b11111011 | 0b00001000