

CS Basics - Exercises

Play with different bases

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1 Additions

Execute the following additions in hexadecimal

- $A67BH + FFFFFFFH$
- $AFFFFH + 1001H$
- $BF12H + 12BFH$
- $1234H + FEDCH$
- $FFEEH + FFEEH$
- $FFEEH + FFEEH + FFEEH$
- $FFEEH * 4$

2 Multiplication

Exercise 1 *Execute the following multiplications in hexadecimal. You could make use of the following table.*

Table for Hexadecimal Multiplication

X	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	0	2	4	6	8	A	C	E	10	12	14	16	18	1A	1C	1E
3	0	3	6	9	C	F	12	15	18	1B	1E	21	24	27	2A	2D
4	0	4	8	C	10	14	18	1C	20	24	28	2C	30	34	38	3C
5	0	5	A	F	14	19	1E	23	28	2D	32	37	3C	41	46	4B
6	0	6	C	12	18	1E	24	2A	30	36	3C	42	48	4E	54	5A
7	0	7	E	15	1C	23	2A	31	38	3F	46	4D	54	5B	62	69
8	0	8	10	18	20	28	30	38	40	48	50	58	60	68	70	78
9	0	9	12	1B	24	2D	36	3F	48	51	5A	63	6C	75	7E	87
A	0	A	14	1E	28	32	3C	46	50	5A	64	6E	78	82	8C	96
B	0	B	16	21	2C	37	42	4D	58	63	6E	79	84	8F	9A	A5
C	0	C	18	24	30	3C	48	54	60	6C	78	84	90	9C	A8	B4
D	0	D	1A	27	34	41	4E	5B	68	75	82	8F	9C	A9	B6	C3
E	0	E	1C	2A	38	46	54	62	70	7E	8C	9A	A8	B6	C4	D2
F	0	F	1E	2D	3C	4B	5A	69	78	87	96	A5	B4	C3	D2	E1

- $A123H * 50H$
- $1E3E4EH * EEEH$
- $FFFH * 3H$
- $C123CH * CCCH$

3 Logical operations

In programming, we will extend the logical operations AND, OR, XOR to arrays of bits.
For instance the AND operator :

```

1011 0101B
AND 1110 1110B
-----
1010 0100B

```

Exercise 2 Compute the following results using the logical operators on arrays of bits

- $1001\ 1110B\ \text{AND}\ 0011\ 1001B =$
- $0111\ 1101B\ \text{AND}\ 1111\ 0000B =$
- $1100\ 1001B\ \text{AND}\ 1111\ 0010B =$
- $1111\ 1001B\ \text{AND}\ 1011\ 0100B =$
- $0000\ 1000B\ \text{AND}\ 1101\ 1000B =$

- $1001\ 1110B\ OR\ 0011\ 1001B =$
- $0111\ 1101B\ OR\ 1111\ 0000B =$
- $1100\ 1001B\ OR\ 1111\ 0010B =$
- $1111\ 1001B\ OR\ 1011\ 0100B =$
- $0000\ 1000B\ OR\ 1101\ 1000B =$
- $1001\ 1110B\ XOR\ 0011\ 1001B =$
- $0111\ 1101B\ XOR\ 1111\ 0000B =$
- $1100\ 1001B\ XOR\ 1111\ 0010B =$
- $1111\ 1001B\ XOR\ 1011\ 0100B =$
- $0000\ 1000B\ XOR\ 1101\ 1000B =$
- $NOT\ 0000\ 1010B =$
- $NOT\ 1010\ 1110B =$
- $NOT\ 0001\ 1110B =$
- $NOT\ 1111\ 0000B =$

Exercise 3 *The following exercise is the same as the previous one, using binary operators on hexadecimal numbers. They must be seen as arrays of bits.*

- $A1H\ AND\ 0011\ 1001B =$
- $AAH\ AND\ 1111\ 0000B =$
- $ACH\ AND\ FFH =$
- $10H\ AND\ 35H =$
- $5CH\ AND\ 3FH =$
- $EEH\ OR\ 0011\ 1001B =$
- $E0H\ OR\ 1111\ 0000B =$
- $FCH\ OR\ 00H =$
- $CFH\ OR\ D0H =$
- $35H\ OR\ 57H =$
- $DFH\ XOR\ 0011\ 1001B =$

- $D1H \text{ XOR } 1111\ 0000B =$
- $EDH \text{ XOR } 00H =$
- $B0H \text{ XOR } D0H =$
- $26H \text{ XOR } 57H =$
- $\text{NOT } 29H =$
- $\text{NOT } 09H =$
- $\text{NOT } FFH =$
- $\text{NOT } 01H =$

4 UTF8 encoding

You may download the two documents `U0000.pdf` and `U0080.pdf` from the Moodle Server.

Exercise 4 Write the following sentences in UTF-8 encoding. You write all the bytes with the corresponding hexadecimal codes (do not forget spaces and special characters).

- *Student*
- *Biel/Bienne et/und Bern(e)*
- *50 étudiants sont à l'école!*
- *Die Häuser sind schön und hübsch.*
- *Die Schüler sind tüchtig. Sie können UTF-8!*

Exercise 5 Write in text the following UTF-8 encoded sentences:

- $4CH\ 27H\ C3H\ A9H\ 63H\ 6FH\ 6CH\ 65H\ 20H\ C3H\ A0H\ 20H\ 42H\ 69H\ 65H\ 6EH\ 6EH\ 65H\ 20H\ 63H\ 27H\ 65H\ 73H\ 74H\ 20H\ 73H\ 75H\ 70H\ 65H\ 72H\ 21H\ 0AH$
- $53H\ 69H\ 65H\ 20H\ 6DH\ C3H\ BCH\ 73H\ 73H\ 65H\ 6EH\ 20H\ 55H\ 54H\ 46H\ 2DH\ 38H\ 20H\ 6bH\ C3H\ B6H\ 6EH\ 6EH\ 65H\ 6EH\ 2EH\ 0AH$