

CS Basics - Exercises

Other exercises with bases

SOLUTIONS

E. Benoist

Fall Term 2018-19

1 Additions

Execute the following additions in hexadecimal

- $A67BH + FFFFFH = 10A67AH$
- $AFFFH + 1001H = C000H$
- $BF12H + 12BFH = D1D1H$
- $1234H + FEDCH = 11110H$
- $FFEEH + FFEEH = 1FFEDH$
- $FFEEH + FFEEH + FFEEH = 2FFCAH$
- $FFEEH * 4 = 3FFB8H$

2 Multiplication

Exercise 1 *Execute the following multiplications in hexadecimal*

- $A123H * 50H$

```
  A123 H
X   50 H
-----
 325AF0 H
```

- $1E3E4EH * EEEH$

```

    1E3E4E H
  X   EEE H
-----
    1A76844
+ 1A76844-
+1A76844--
-----
    1C3863084 H

```

- $FFFH * 3H$

```

    FFF H
  X  3 H
-----
    2FFD H

```

- $C123CH * CCCH$

```

    C123C H
  X   CCC H
-----
    90DAD0
+ 90DAD0-
+90DAD0--
-----
    9A7957D0 H

```

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

1. $1001\ 1110B\ \text{AND}\ 0011\ 1001B = 0001\ 1000\ B$
2. $0111\ 1101B\ \text{AND}\ 1111\ 0000B = 0111\ 0000\ B$
3. $1100\ 1001B\ \text{AND}\ 1111\ 0010B = 1100\ 0000\ B$

4. $1111\ 1001B\ \text{AND}\ 1011\ 0100B = 1011\ 0000\ B$
5. $0000\ 1000B\ \text{AND}\ 1101\ 1000B = 0000\ 1000\ B$
6. $1001\ 1110B\ \text{OR}\ 0011\ 1001B = 1011\ 1111\ B$
7. $0111\ 1101B\ \text{OR}\ 1111\ 0000B = 1111\ 1101\ B$
8. $1100\ 1001B\ \text{OR}\ 1111\ 0010B = 1111\ 1011\ B$
9. $1111\ 1001B\ \text{OR}\ 1011\ 0100B = 1111\ 1101\ B$
10. $0000\ 1000B\ \text{OR}\ 1101\ 1000B = 1101\ 1000\ B$
11. $1001\ 1110B\ \text{XOR}\ 0011\ 1001B = 1010\ 0111\ B$
12. $0111\ 1101B\ \text{XOR}\ 1111\ 0000B = 1000\ 1101\ B$
13. $1100\ 1001B\ \text{XOR}\ 1111\ 0010B = 0011\ 1011\ B$
14. $1111\ 1001B\ \text{XOR}\ 1011\ 0100B = 0100\ 1101\ B$
15. $0000\ 1000B\ \text{XOR}\ 1101\ 1000B = 1101\ 0000\ B$
16. $\text{NOT}\ 0000\ 1010B = 1111\ 0101\ B$
17. $\text{NOT}\ 1010\ 1110B = 0101\ 0001\ B$
18. $\text{NOT}\ 0001\ 1110B = 1110\ 0001\ B$
19. $\text{NOT}\ 1111\ 0000B = 0000\ 1111\ B$

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.*

For the following exercise, we need a table of conversion between hexa and binary. This table has to be learnt.

0H	0000B
1H	0001B
2H	0010B
3H	0011B
4H	0100B
5H	0101B
6H	0110B
7H	0111B
8H	1000B
9H	1001B
AH	1010B
BH	1011B
CH	1100B
DH	1101B
EH	1110B
FH	1111B

- $A1H \text{ AND } 0011\ 1001B = 21B$
- $AAH \text{ AND } 1111\ 0000B = A0H$
- $ACH \text{ AND } FFH = ACH$
- $10H \text{ AND } 35H = 10H$
- $5CH \text{ AND } 3FH = 1CH$
- $EEH \text{ OR } 0011\ 1001B = FFH$
- $E0H \text{ OR } 1111\ 0000B = F0H$
- $FCH \text{ OR } 00H = FCH$
- $CFH \text{ OR } D0H = DFH$
- $35H \text{ OR } 57H = 77H$
- $DFH \text{ XOR } 0011\ 1001B = 1110\ 0110\ B = E6H$
- $D1H \text{ XOR } 1111\ 0000B = 0010\ 0001\ B = 21H$
- $EDH \text{ XOR } 00H = EDH$
- $B0H \text{ XOR } D0H = 60H$
- $26H \text{ XOR } 57H = 71H$
- $\text{NOT } 29H = D6H$
- $\text{NOT } 09H = F6H$
- $\text{NOT } FFH = 00H$
- $\text{NOT } 01H = FEH$

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).

- “a”: 61H
- “à”: C3H A0H,
- “ä”: C3H A4H,
- “ü”: C3H BCH,
- chinese character 4E01 (looks like a T). E4H B8H 81H

- *Student* : 53H 74H 75H 64H 65H 6EH 74H
- *Biel/Bienne et/und Bern(e)* : 42H 69H 65H 6CH 2FH 42H 69H 6EH 6EH 65H 20H 65H 74H 2FH 75H 6EH 64H 20H 42H 65H 72H 6EH 28H 65H 29H
- *50 étudiants sont à l'école!* : 35H 30H 20H C3H A9H 74H 75H 64H 69H 61H 6EH 74H 73H 20H 73H 6FH 6EH 74H 20H C3H A0H 20H 6CH 27H C3H A9H 63H 6F 6C 65H 21H
- *Die Häuser sind schön und hübsch.* : 44H 69H 65H 20H 48H C3H A4H 75H 73H 65H 72H 20H 73H 69H 6EH 64H 20H 73H 63H 68H C3H B6H 6EH 20H 75H 6EH 64H20H 68HC3H BCH 62H 73H 68H 2EH
- *Die Schüler sind tüchtig. Sie können UTF-8!* : 44H 69H 65H 20H 53H 63H 68H C3H BCH 6CH 65H 72H 20H 73H 69H 6EH 64H 20H 74H C3H BCH 63H 68H 74H 69H 67H 2EH 20H 53H 69H 65H 20H 6BH C3H B6H 6EH 6EH 65H 6EH 20H 55H 54H 46H 2DH 38H 21H

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 : L'école à Bienne c'est super!
- 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 : Sie müssen UTF-8 können.