## Unit 01\_010 - Arithmetic and Data Representation

The following is a cheatsheet for some of the material covered in the video. You may use this sheet on the quiz. You will get this sheet on the exam. You will need to be fill in the "Binary" column of the second table. I suggest that you use 4 binary digits with zero padding on the left.

I expect everyone to be able to do the following arithmetic without a calculator. We will only be using integers

- Addition and subtraction of multi-digit numbers
- Multiply and divide any number by 2
- Multiply and divide any number by 10
- Multiply any integer by 16 with the assistance of the second table on page 2.
- Divide any integer by 16 with the assistance of the second table on page 2.
- Find the remainder when dividing by 16 with the assistance of the second table on page 2.

n	$2^n$	Other
0	1	$8^0$ and $16^0$
1	2	
2	4	
3	8	
4	16	$16^{1}$
5	32	
6	64	
7	128	
8	256	$16^{2}$
9	512	
10	1024	1 Kilobyte
11	2048	
12	4096	$16^{3}$
13	8092	
14	16,384	
15	32,768	
16	65,536	$16^{4}$
17	131,082	
18	262,144	
19	524,288	
20	1,048,576	$16^5$ 1 Megabyte

IT professionals will usually recognize many of the powers of 2. Non-IT professionals often recognize some powers of 2 as "computer numbers." The numbers that are shown in light gray are not as commonly recognized. The "Other" column shows some other useful equivalents.

Decimal	Hexadecimal	Binary
0	0	0000
1	1	0001
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	A	
11	В	
12	С	
13	D	
14	Е	
15	F	

You will need to count to 15 in binary.

Multiplication	Result
$16 \cdot 0$	0
$16 \cdot 1$	16
$16 \cdot 2$	32
$16 \cdot 3$	48
$16 \cdot 4$	64
$16 \cdot 5$	80
$16 \cdot 6$	96
$16 \cdot 7$	112
$16 \cdot 8$	128
$16 \cdot 9$	144
$16 \cdot 10(a)$	160
$16 \cdot 11(b)$	176
16 · 12 (c)	192
16 · 13 (d)	208
16 · 14 (e)	224
16 · 15 (f)	240
$16 \cdot 16$	256

x86\_64 Registers Map

x86_64				
1204 / 104				
	: 8086			
rax	eax ah al			
rbx	ebx bx bi			
rcx	ecx cx cx			
rdx				
	edx dk dl			
rbp	ebp bp bpl			
rsl	esl si sil			
rdi	edl di dil			
rsp	esp sp spl			
r8	r8d r8w r8b			
r9	r9d r9w r9b			
r10	r10d r10w r10b			
rii	riid rilw riib			
r12	r12d r12w r12b			
r13	r13d r13w r13b			
r14	r14d r14w r14b			
r15	r15d r15w r15b			