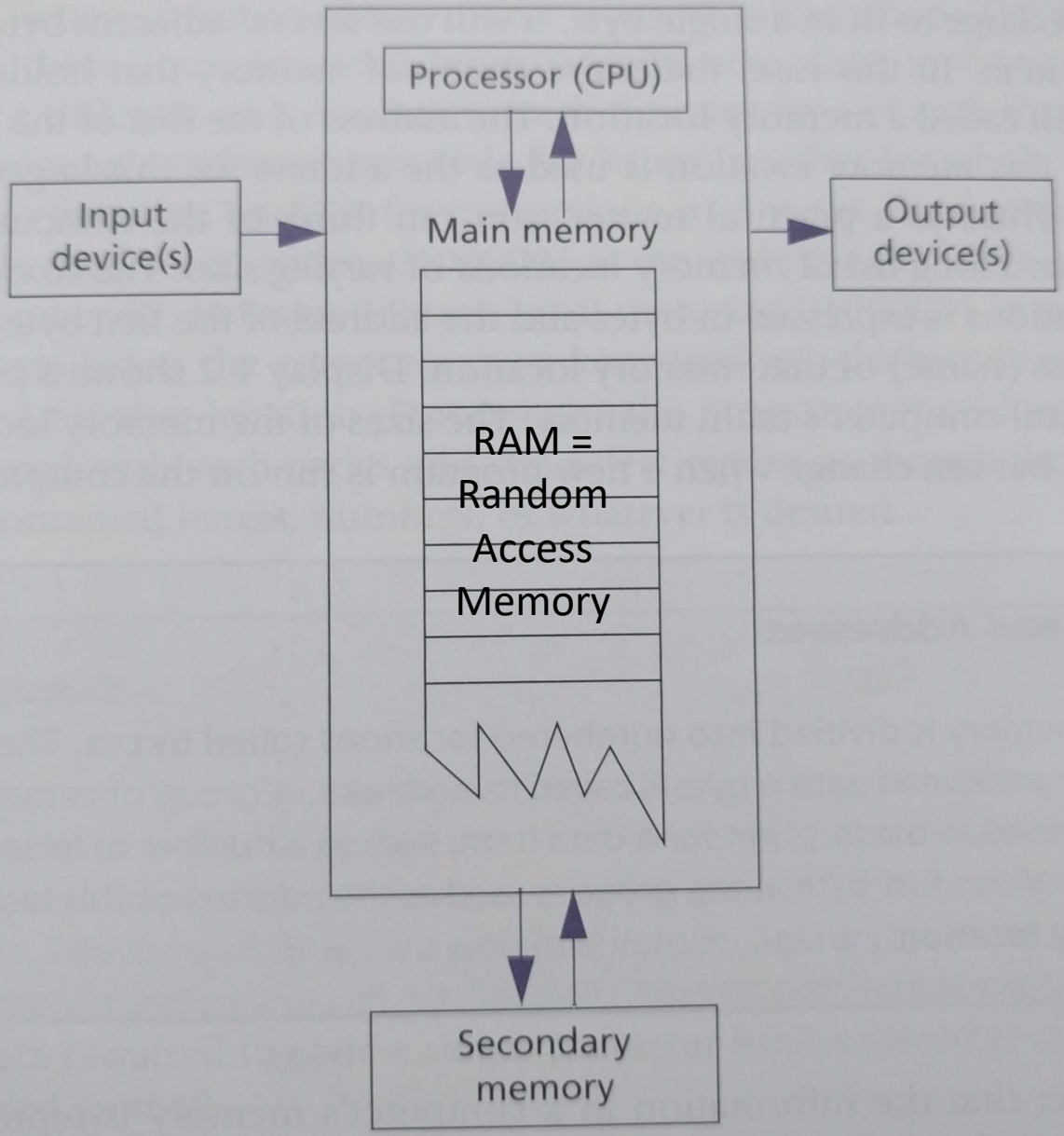
DISPLAY 1.1 Main Components of a Computer



Guts of Computer

- Transistors. Can be *charged*, or *uncharged* – i.e., they are either ON or OFF
- Everything therefore runs on binary “bit”. Charge represents number, either 0 or 1.
- All math is done in base 2 (binary), rather than the base 10 we are used to.
- 8 bits in byte.

Binary Numbers

We are used to base 10:

1000s	100s	10s	1s
0	**1**	**3**	**9**

In base 2:

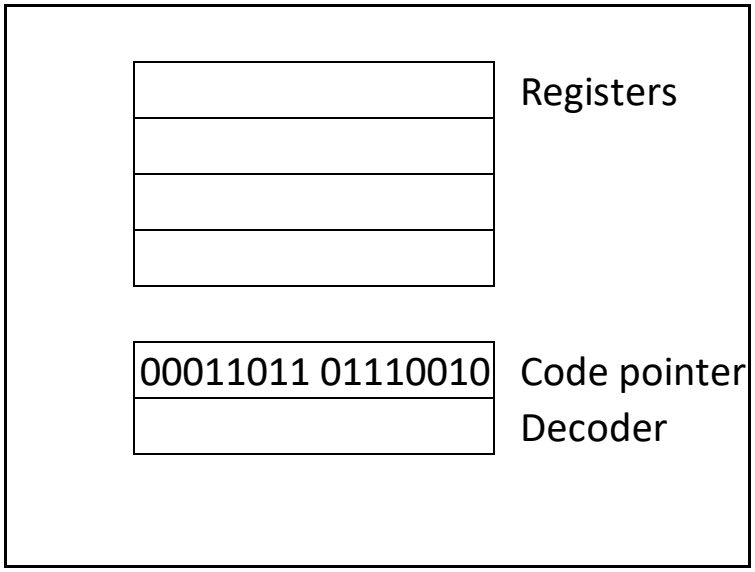
128s	64s	32s	16s	8s	4s	2s	1s
1	**0**	**0**	**0**	**1**	**0**	**1**	**1**

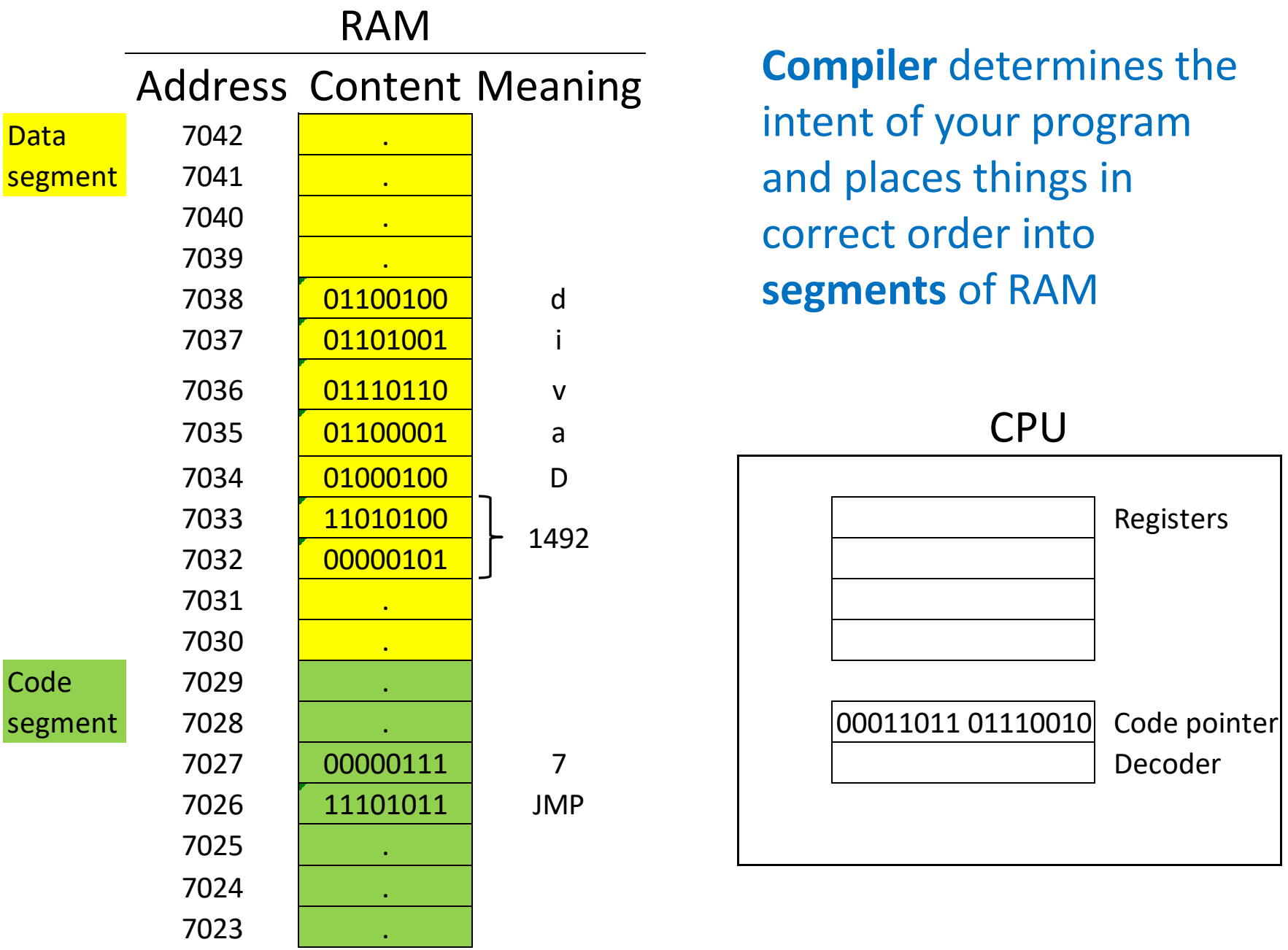
RAM

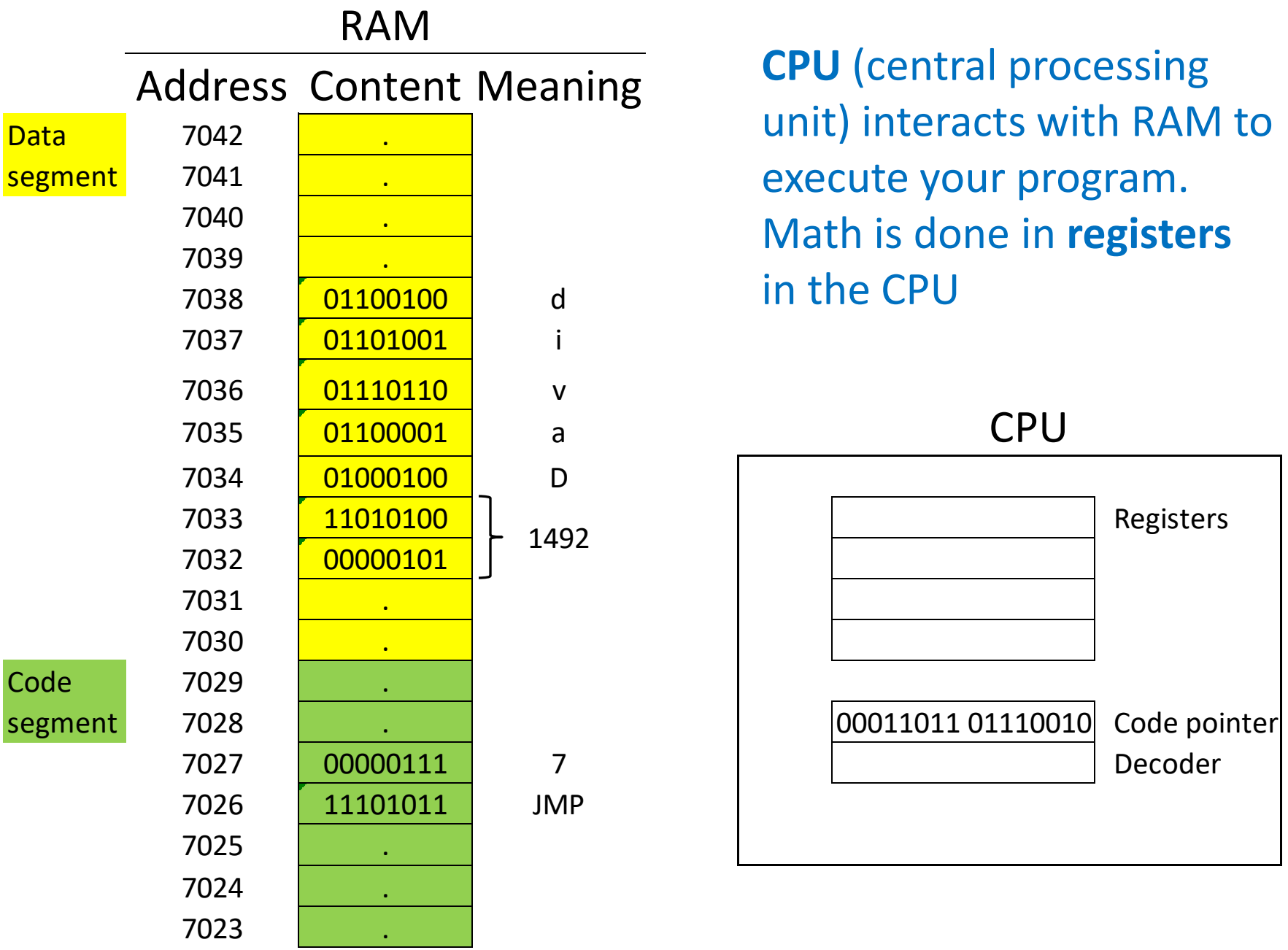
Address	Content	Meaning
7042	.	
7041	.	
7040	.	
7039	.	
7038	01100100	
7037	01101001	
7036	01110110	
7035	01100001	
7034	01000100	
7033	11010100	
7032	00000101	
7031	.	
7030	.	
7029	.	
7028	.	
7027	00000111	
7026	11101011	
7025	.	
7024	.	
7023	.	

Contents of RAM can represent characters, numbers, instructions, colors, other things.

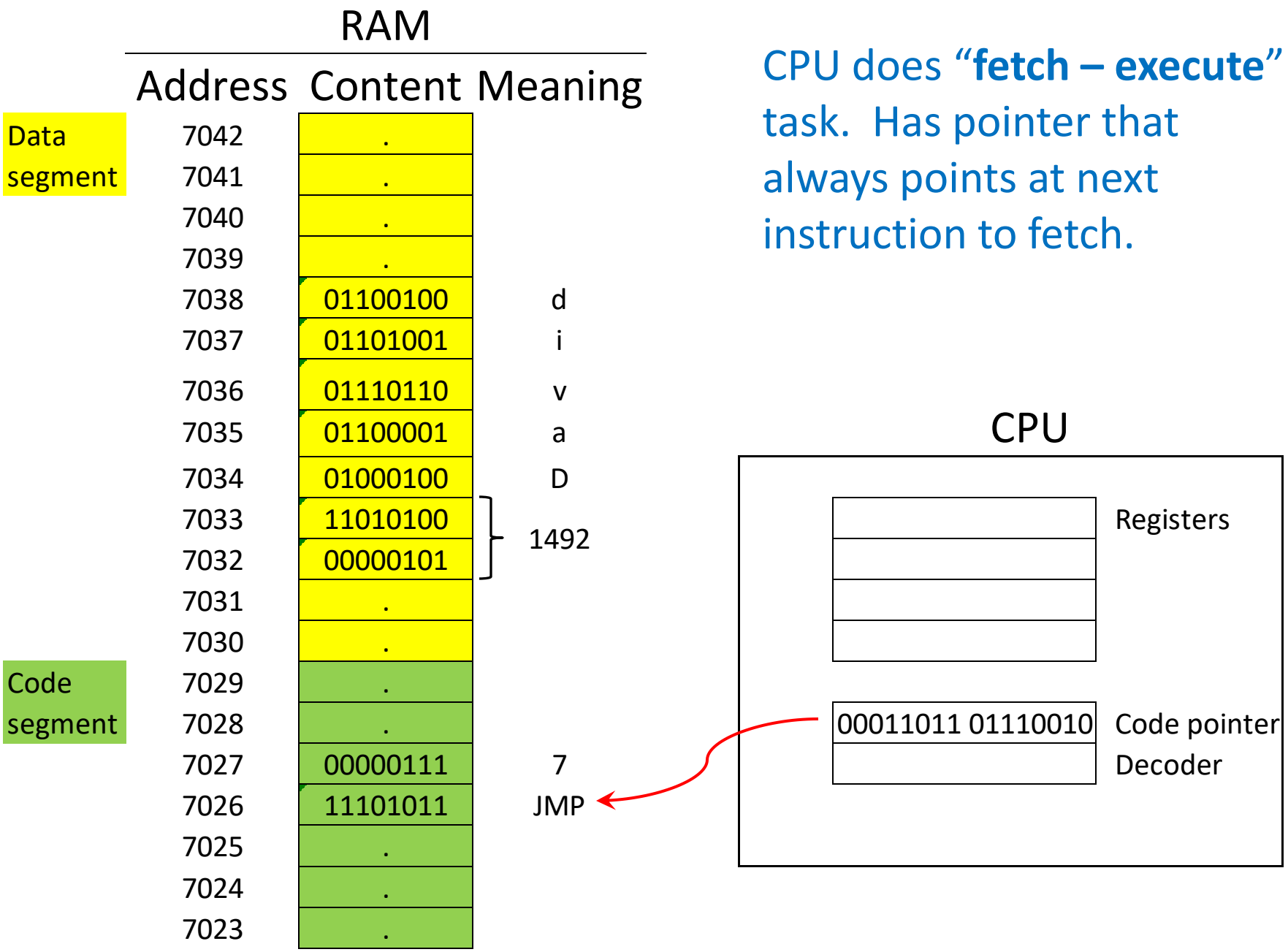
CPU



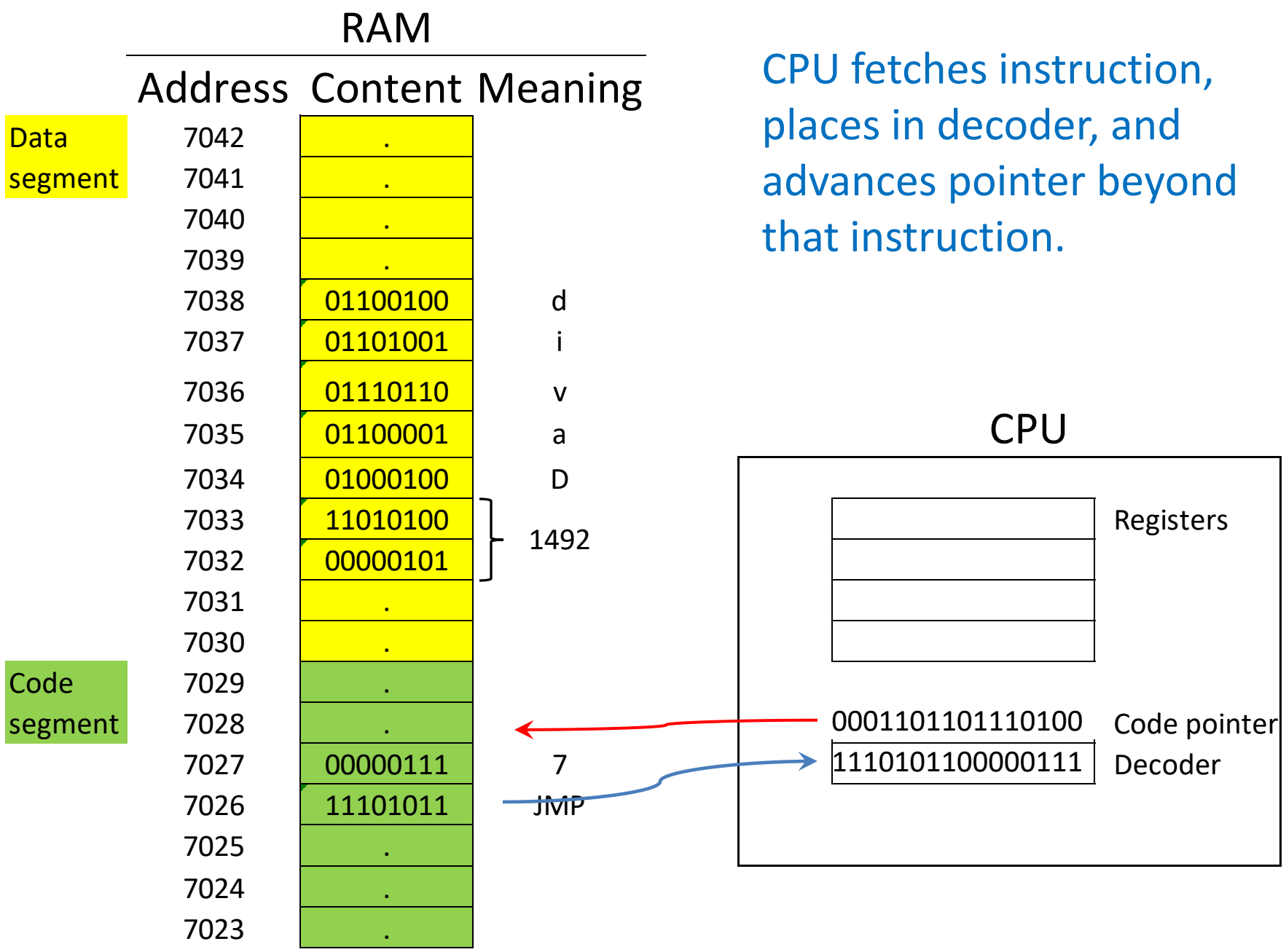

RAM
Address
Content
Meaning
Data segment
7042
7041
7040
7039
7038
01100100
d
7037
01101001
i
7036
01110110
v
7035
01100001
a
7034
01000100
D
7033
11010100
7032
00000101
1492
7031
7030
Code segment
7029
7028
7027
00000111
7
7026
11101011
JMP
7025
7024
7023
Compiler determines the intent of your program and places things in correct order into segments of RAM
CPU
Registers
00011011 01110010
Code pointer
Decoder

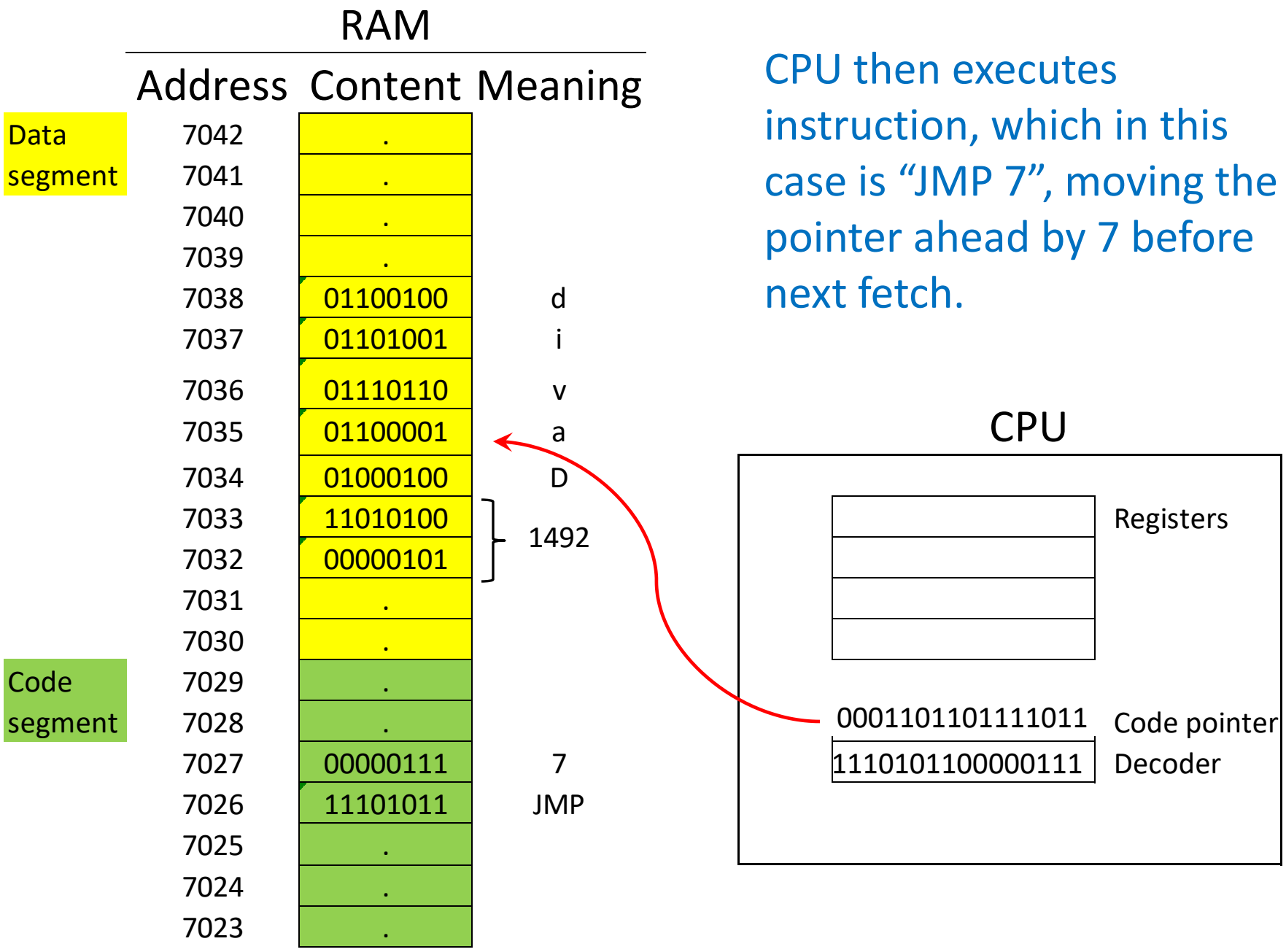


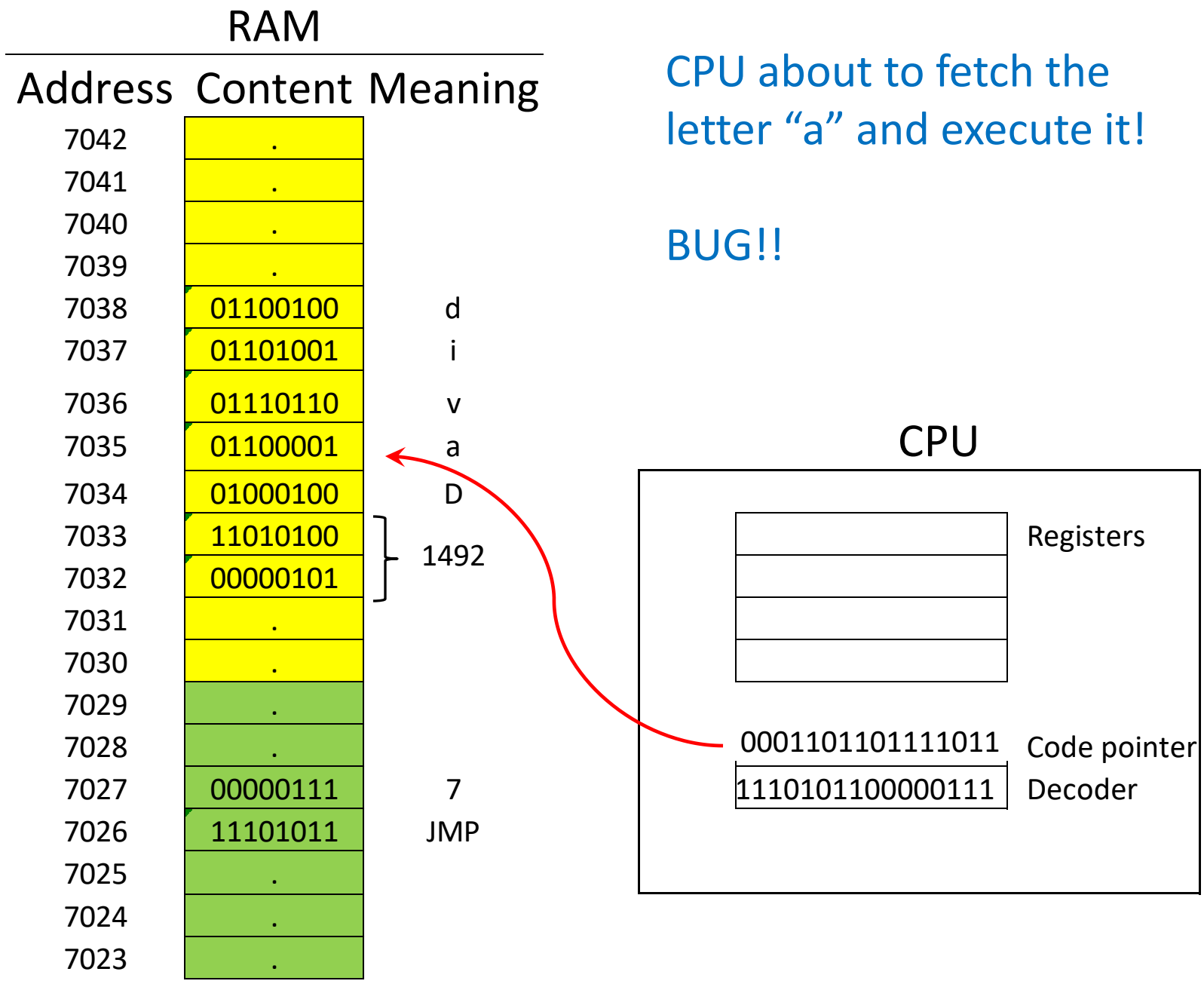
CPU (central processing unit) interacts with RAM to execute your program. Math is done in **registers** in the CPU



CPU does "**fetch – execute**" task. Has pointer that always points at next instruction to fetch.


RAM
Address
Content
Meaning
Data segment
Code segment
7042
7041
7040
7039
7038
7037
7036
7035
7034
7033
7032
7031
7030
7029
7028
7027
7026
7025
7024
7023
.
01100100
01101001
01110110
01100001
01000100
11010100
00000101
00000111
11101011
d
i
v
a
D
1492
7
JMP
CPU
Registers
0001101101110100
Code pointer
1110101100000111
Decoder
CPU fetches instruction, places in decoder, and advances pointer beyond that instruction.


RAM
Address
Content
Meaning
Data segment
Code segment
7042
7041
7040
7039
7038
7037
7036
7035
7034
7033
7032
7031
7030
7029
7028
7027
7026
7025
7024
7023
.
01100100
01101001
01110110
01100001
01000100
11010100
00000101
00000111
11101011
d
i
v
a
D
1492
7
JMP
CPU then executes instruction, which in this case is “JMP 7”, moving the pointer ahead by 7 before next fetch.
CPU
Registers
0001101101111011
Code pointer
1110101100000111
Decoder


RAM
Address
Content
Meaning
7042
7041
7040
7039
7038
01100100
d
7037
01101001
i
7036
01110110
v
7035
01100001
a
7034
01000100
D
7033
11010100
1492
7032
00000101
7031
7030
7029
7028
7027
00000111
7
7026
11101011
JMP
7025
7024
7023
CPU about to fetch the letter “a” and execute it!
BUG!!
CPU
Registers
0001101101111011
Code pointer
1110101100000111
Decoder