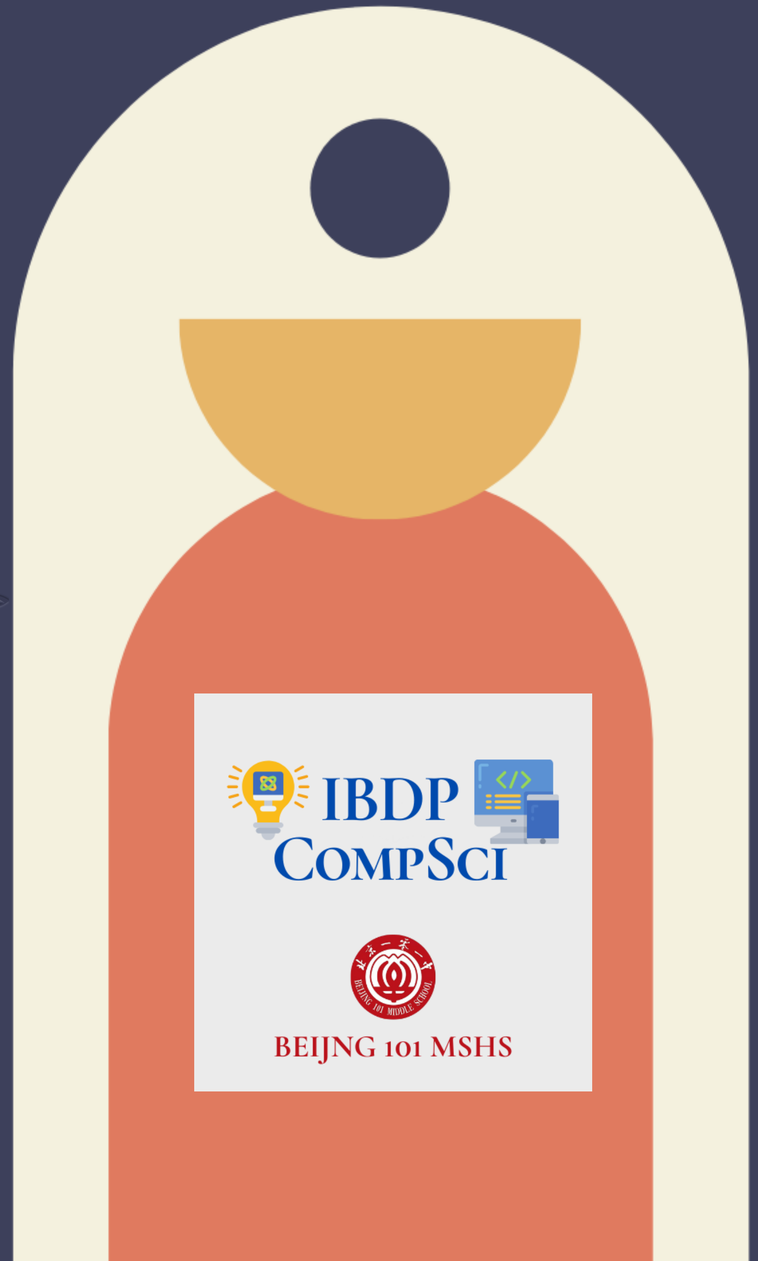
Welcome to Computer Science ***IBDP***

Beijing 101 Middle/High School



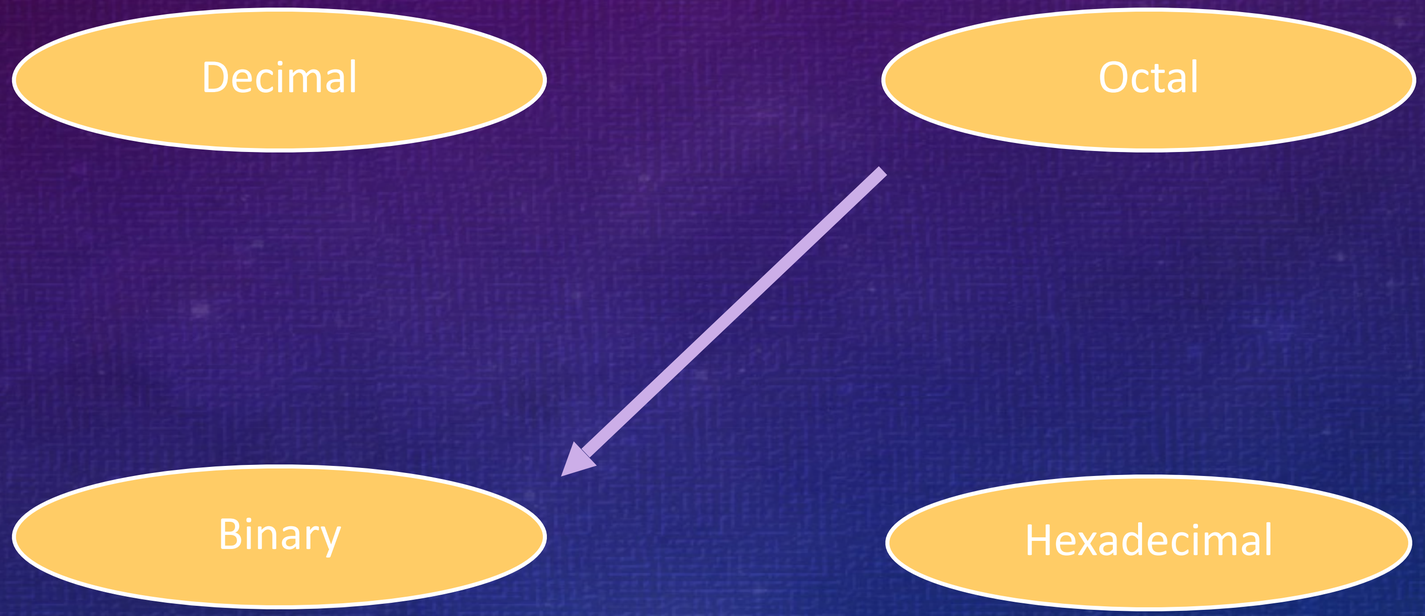
Highlights from Last time

- Identify common features of applications
- Define the terms: bit, byte, binary, denary/ decimal and hexadecimal
- Common Number Systems

Today

- Common Number Systems

Octal to Binary



Octal to Binary

- Technique
  - Convert each octal digit to a 3-bit equivalent binary representation

Example

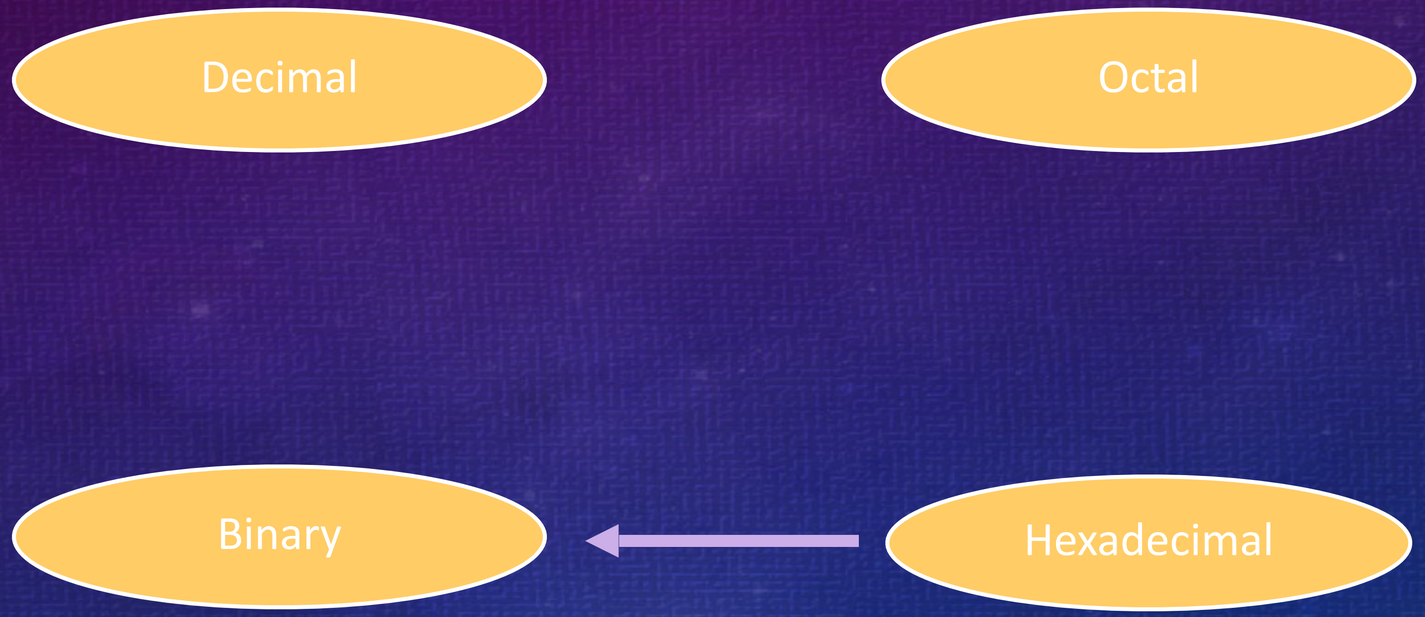
$705_8 = ?_2$

7 0 5

111 000 101

$705_8 = 111000101_2$

Hexadecimal to Binary

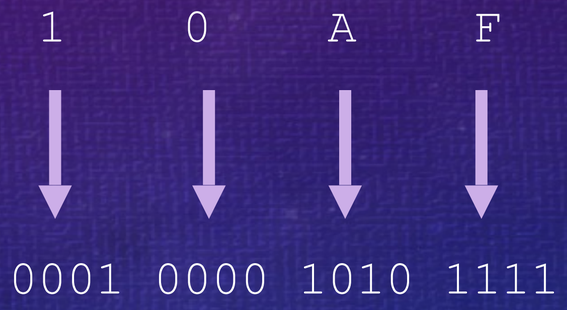


Hexadecimal to Binary

- Technique
  - Convert each hexadecimal digit to a 4-bit equivalent binary representation

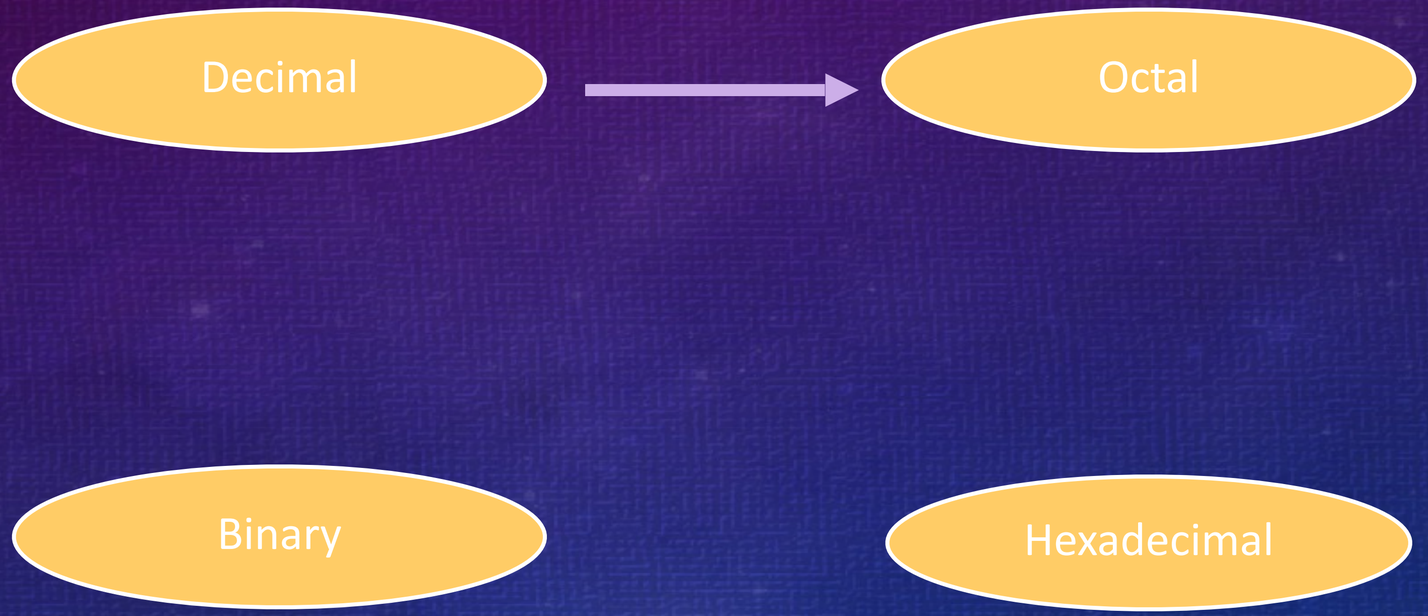
Example

$10AF_{16} = ?_2$



$10AF_{16} = 0001000010101111_2$

Decimal to Octal



Decimal to Octal

- Technique
  - Divide by 8
  - Keep track of the remainder

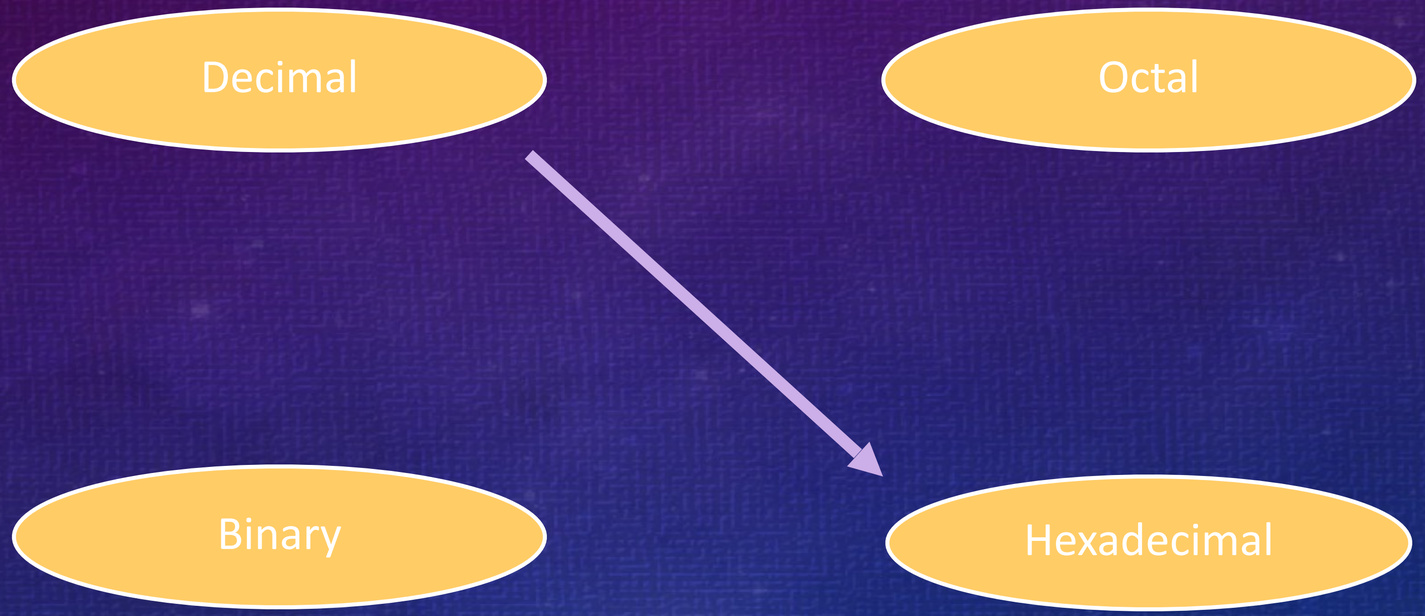
Example

$1234_{10} = ?_{8}$

8	1234	
8	154	2
8	19	2
8	2	3
	0	2

$1234_{10} = 2322_{8}$

Decimal to Hexadecimal



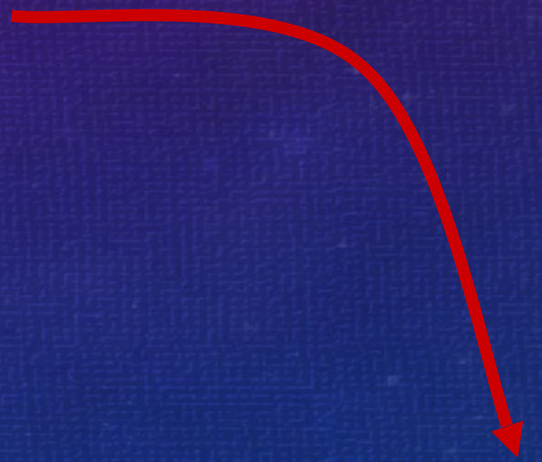
Decimal to Hexadecimal

- Technique
  - Divide by 16
  - Keep track of the remainder

Example

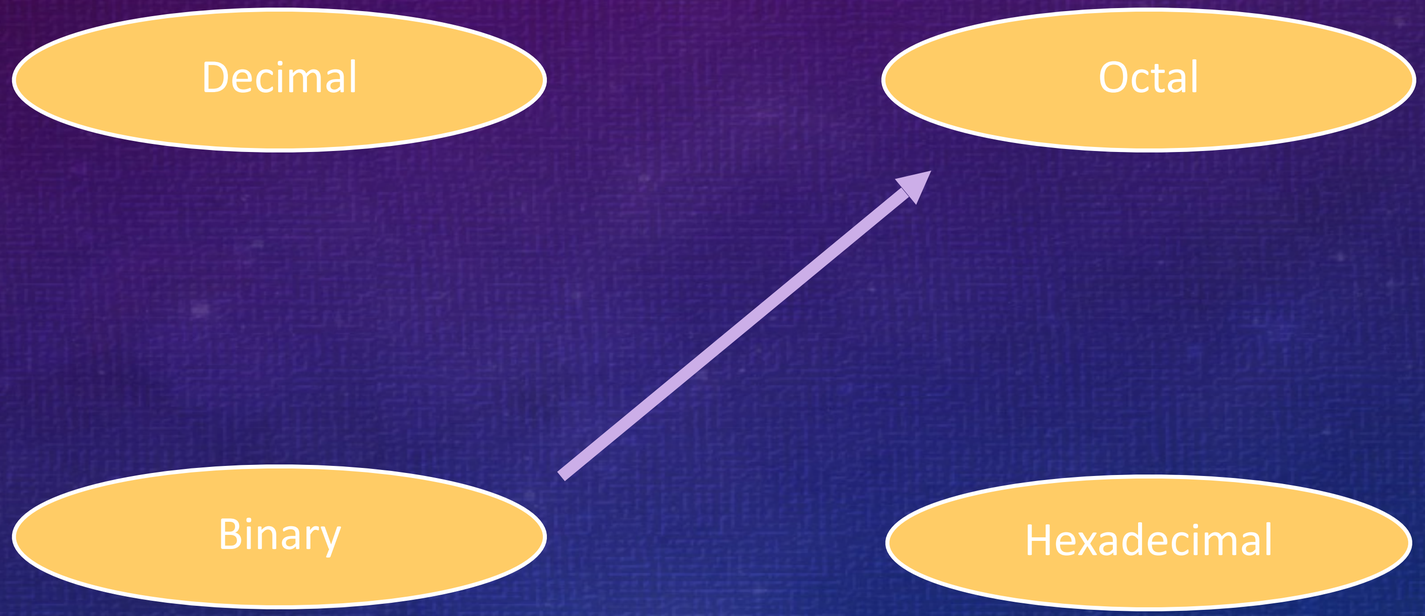
$1234_{10} = ?_{16}$

16	1234	
16	77	2
16	4	13 = D
	0	4



$1234_{10} = 4D2_{16}$

Binary to Octal



Binary to Octal

- Technique
  - Group bits in threes, starting on right
  - Convert to octal digits

Example

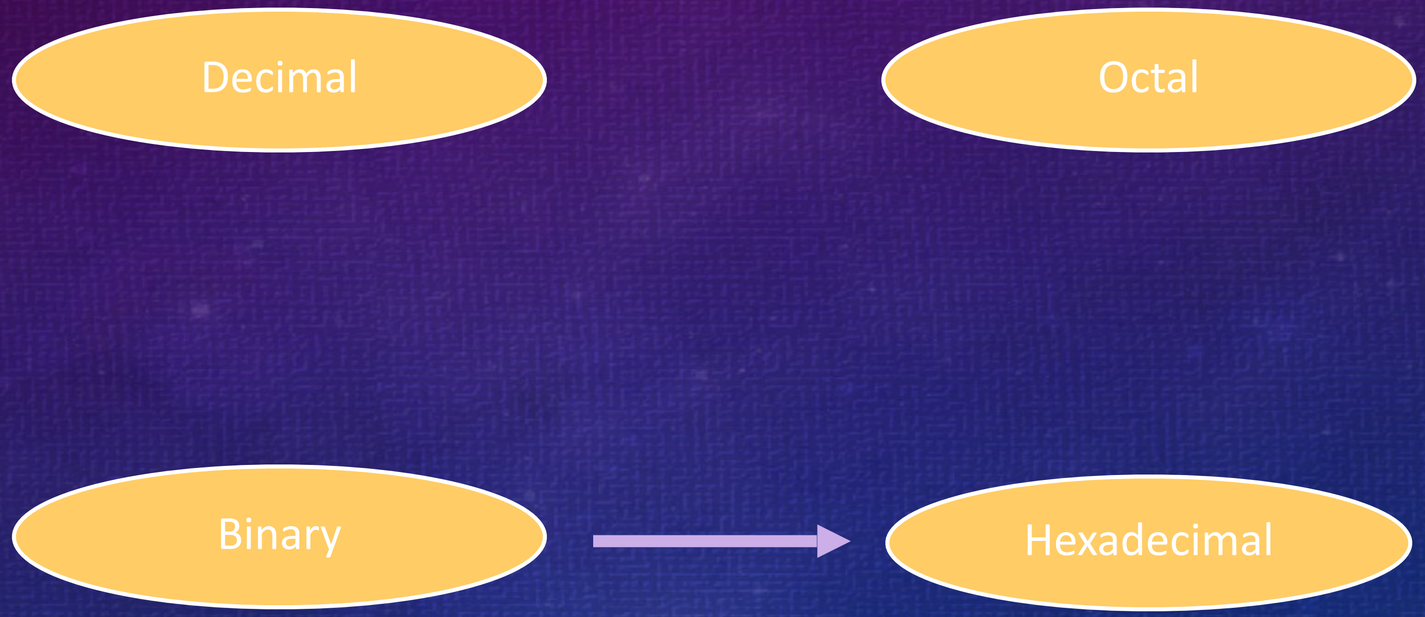
$1011010111_2 = ?_8$

1 011 010 111

1 3 2 7

$1011010111_2 = 1327_8$

Binary to Hexadecimal



Binary to Hexadecimal

- Technique
  - Group bits in fours, starting on right
  - Convert to hexadecimal digits

Example

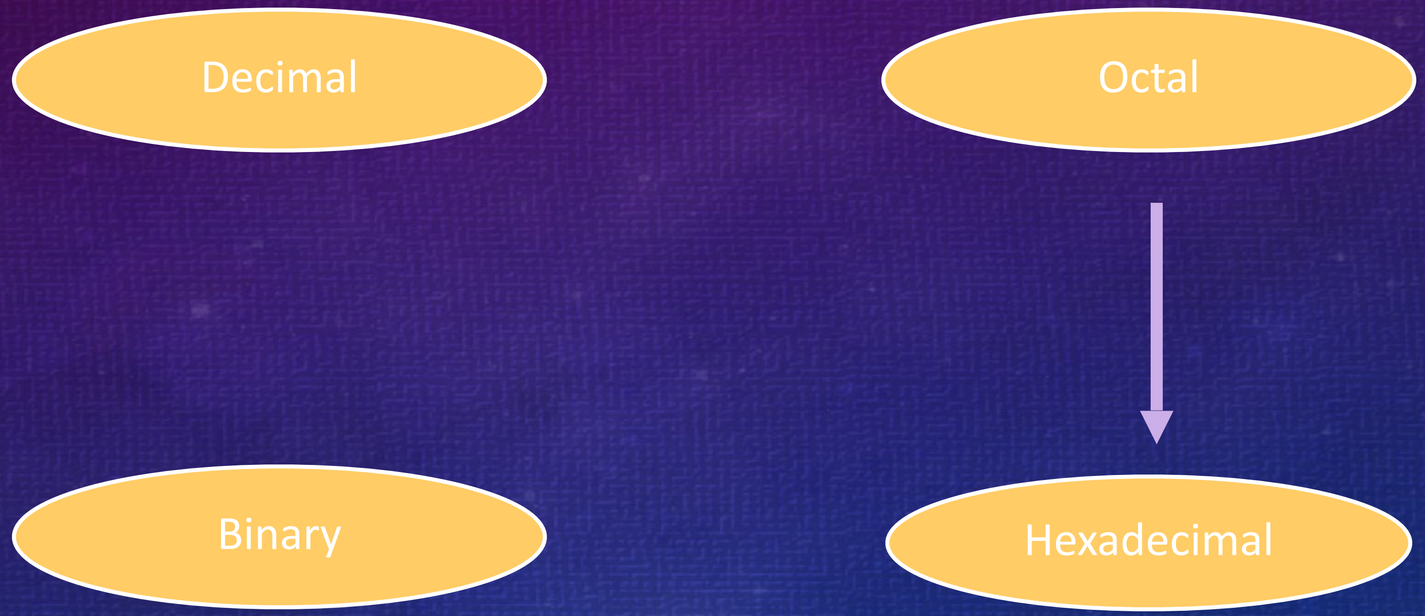
$1010111011_2 = ?_{16}$

10 1011 1011

2. B B

$1010111011_2 = 2BB_{16}$

Octal to Hexadecimal

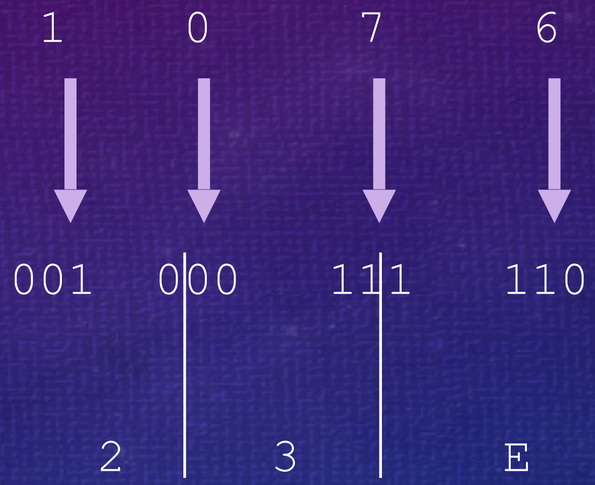


Octal to Hexadecimal

- Technique
  - Use binary as an intermediary

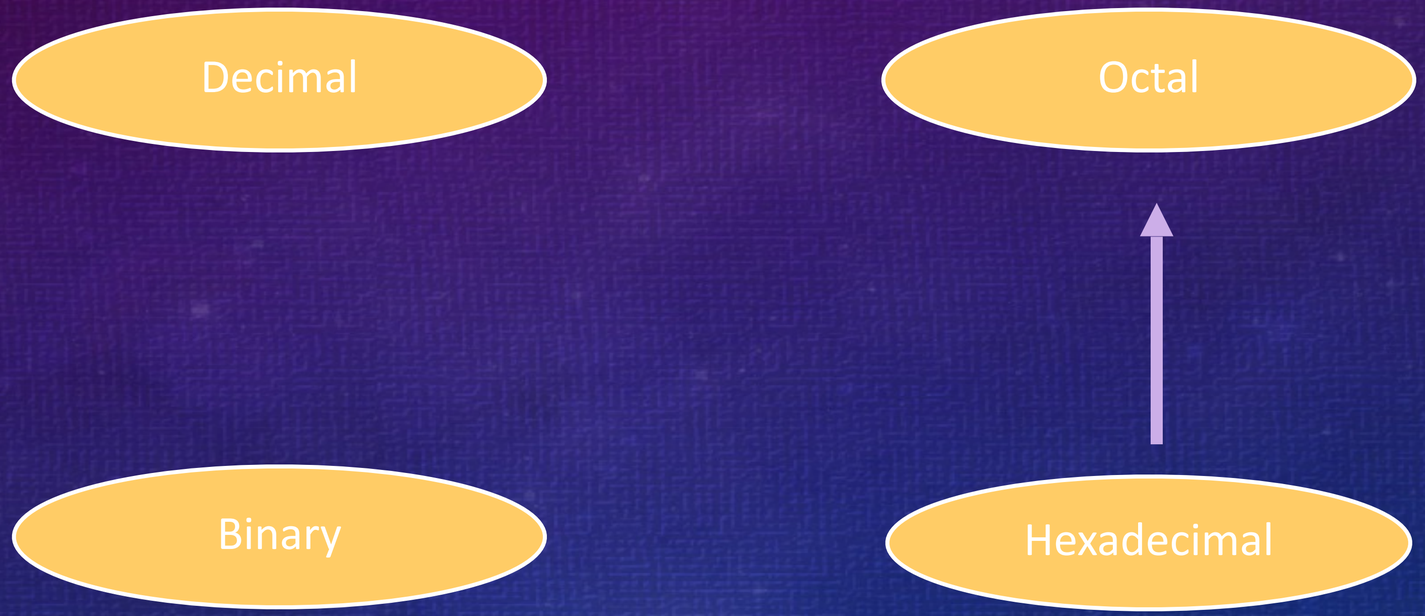
Example

$1076_8 = ?_{16}$



$1076_8 = 23E_{16}$

Hexadecimal to Octal

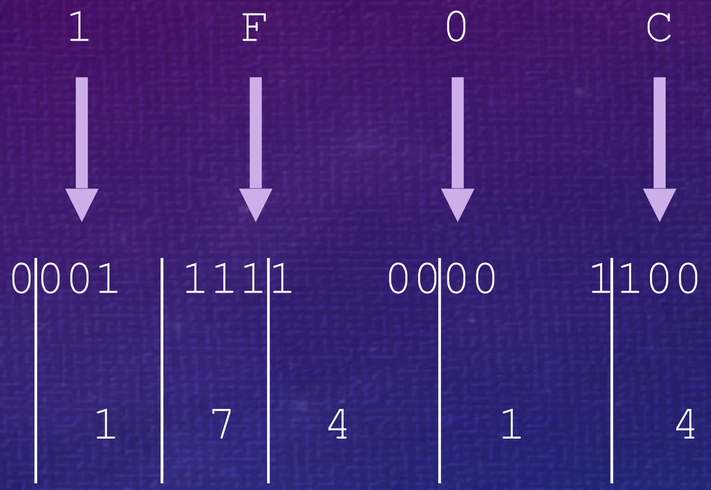


Hexadecimal to Octal

- Technique
  - Use binary as an intermediary

Example

$1F0C_{16} = ?_{8}$



$1F0C_{16} = 17414_{8}$

Exercise – Convert …

Decimal	Binary	Octal	Hexa-decimal
33			
	1110101		
		703	
			1AF

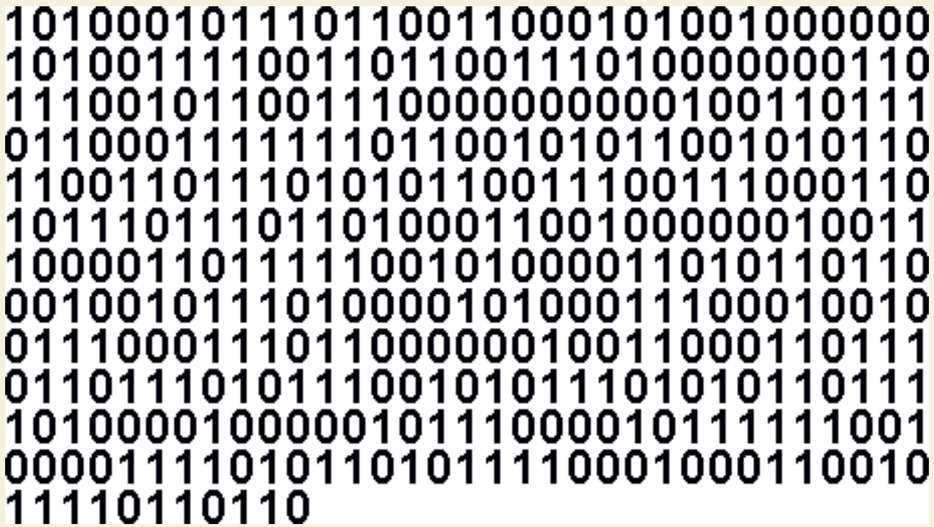
Don’t use a calculator!

Exercise – Convert …

Answer

Decimal	Binary	Octal	Hexa-decimal
33	100001	41	21
117	1110101	165	75
451	111000011	703	1C3
431	110101111	657	1AF

Topic 2.1.10
Outline the way in which data is represented in the computer

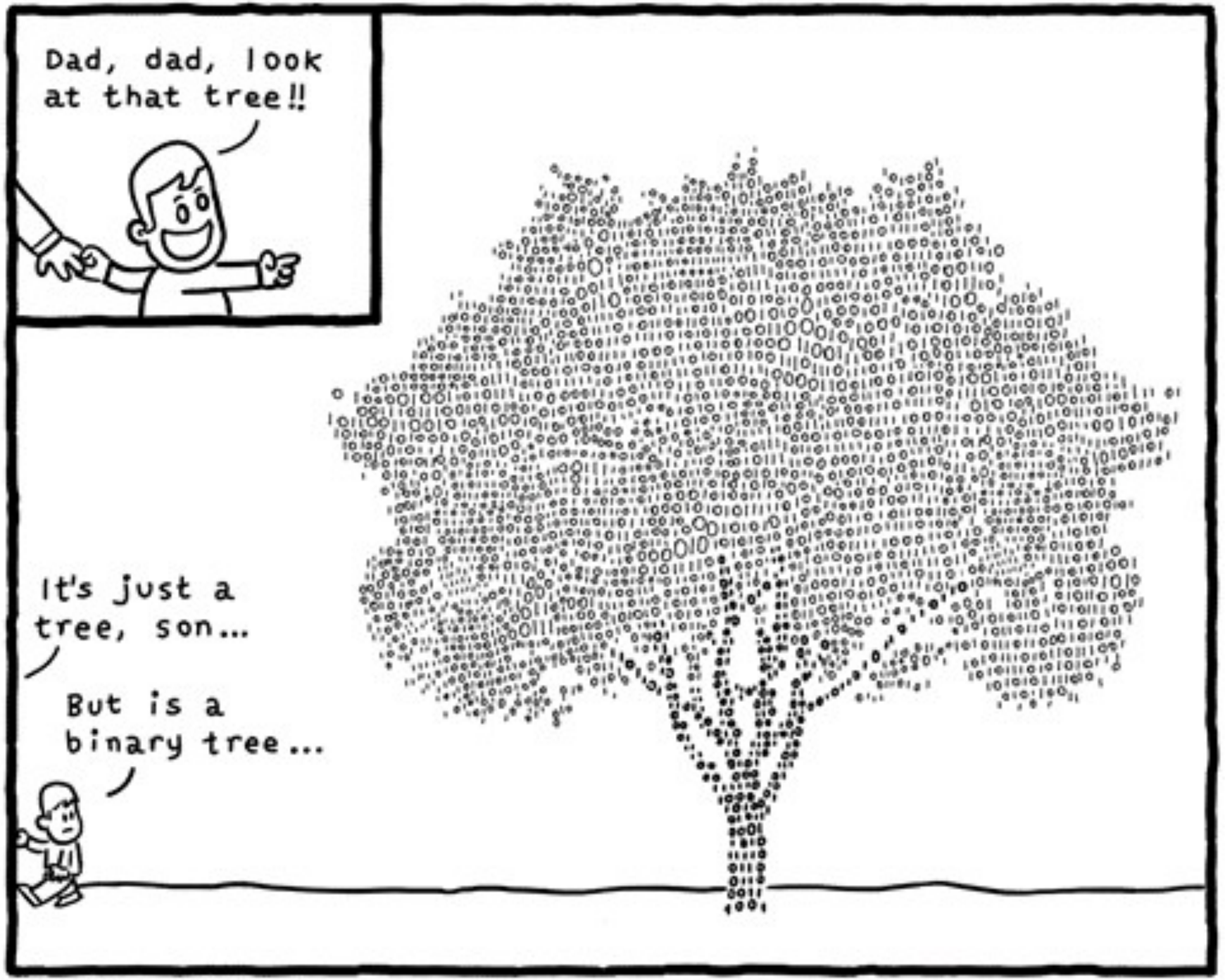


Many different representations:

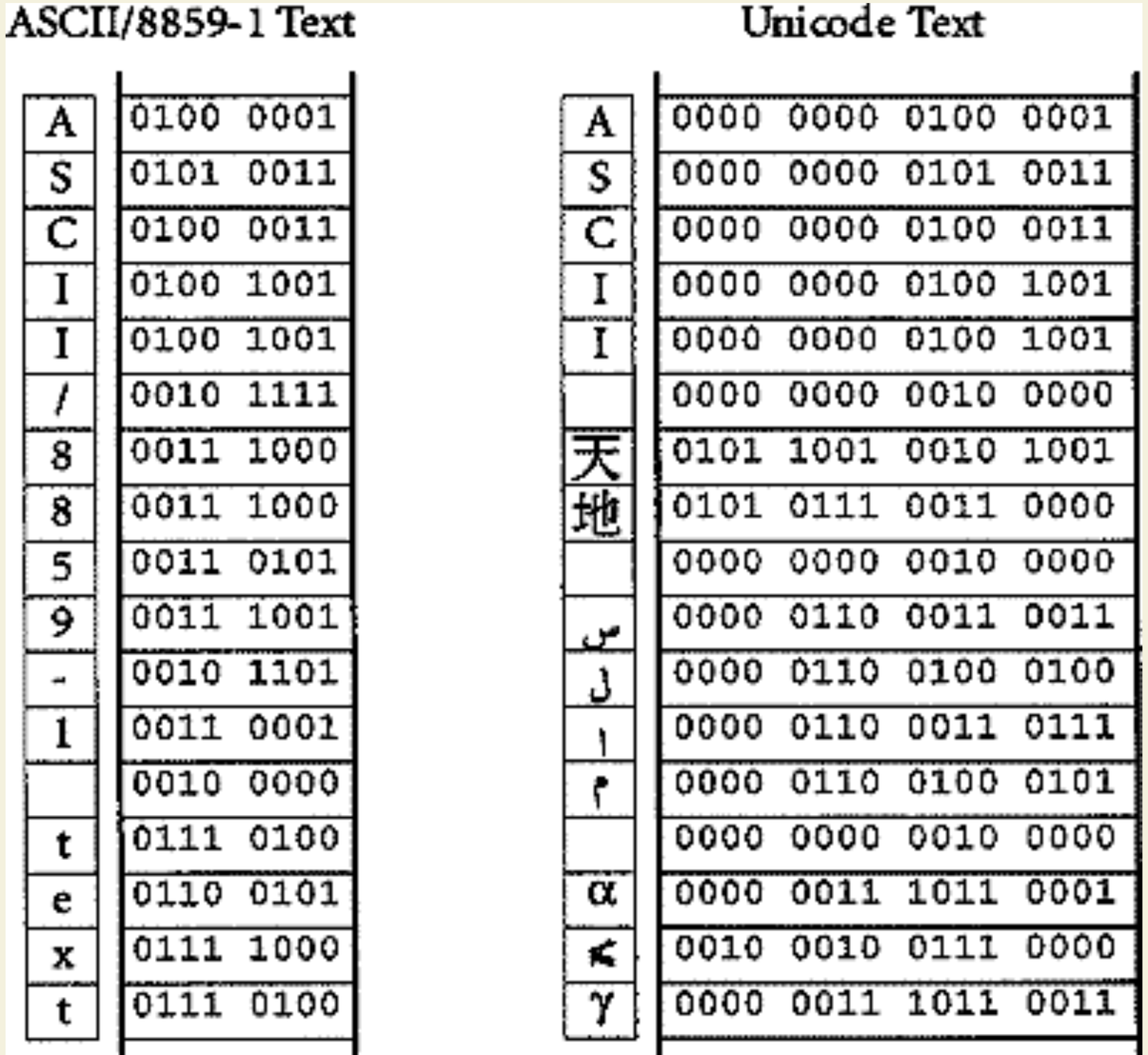
- String (“I love Java”)
- Integer (12, 34, 3345…)
- Characters (ASCII vs Unicode)
- Colours (Hex)

What is 10101111?

- Is it a number (integer)?
- Is a character?
- If it is a character, what table am I going to use look up the character? ASCII? Unicode?
- Does it refer to a colour?
- Is it part of a picture?


Dad, dad, look at that tree!!
It's just a tree, son...
But is a binary tree...
Daniel Stori (turnoff.us)

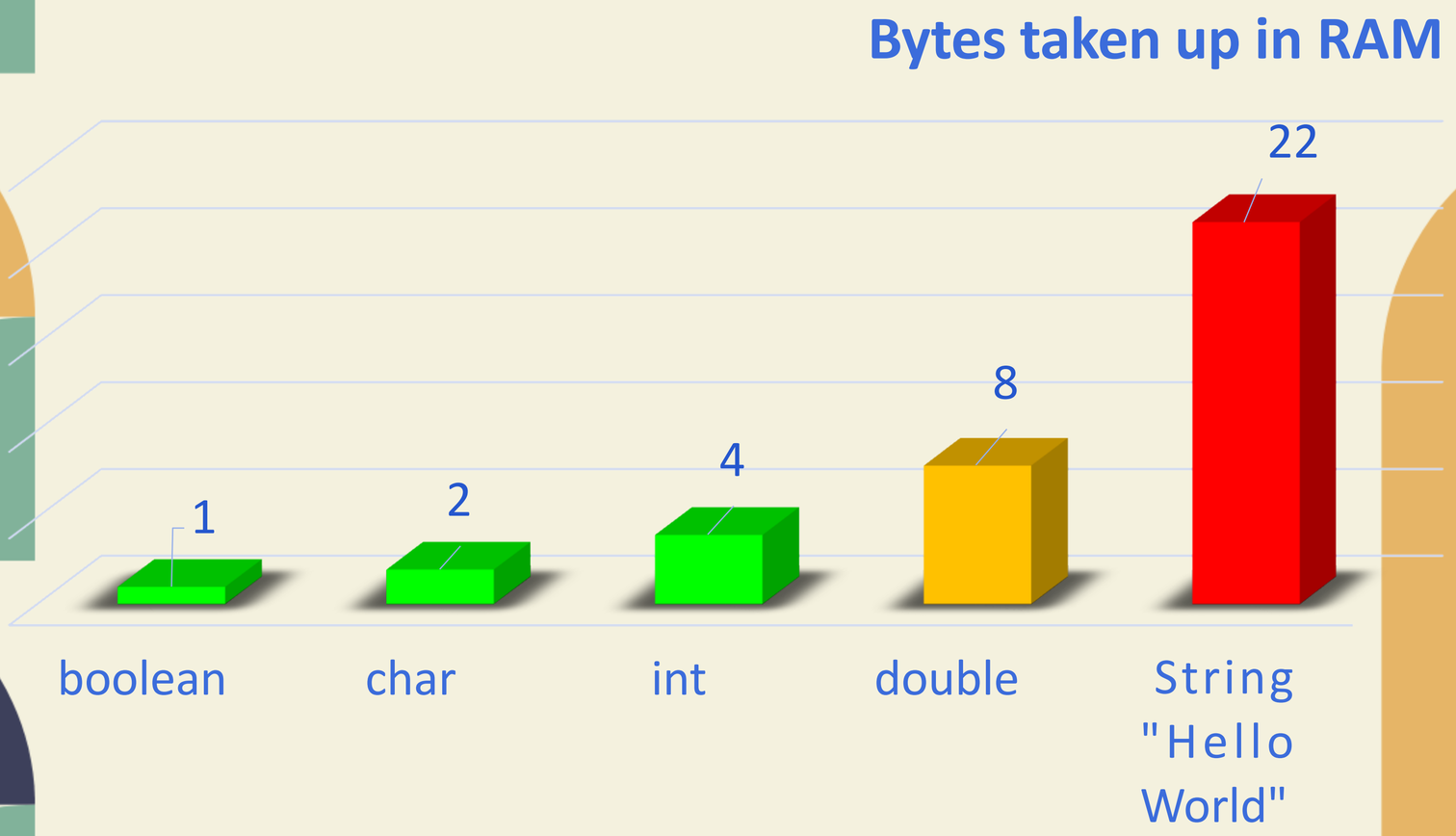
ASCII vs Unicode



ASCII/8859-1 Text	
A	0100 0001
S	0101 0011
C	0100 0011
I	0100 1001
I	0100 1001
/	0010 1111
8	0011 1000
8	0011 1000
5	0011 0101
9	0011 1001
-	0010 1101
1	0011 0001
	0010 0000
t	0111 0100
e	0110 0101
x	0111 1000
t	0111 0100

Unicode Text	
A	0000 0000 0100 0001
S	0000 0000 0101 0011
C	0000 0000 0100 0011
I	0000 0000 0100 1001
I	0000 0000 0100 1001
	0000 0000 0010 0000
天	0101 1001 0010 1001
地	0101 0111 0011 0000
	0000 0000 0010 0000
س	0000 0110 0011 0011
ل	0000 0110 0100 0100
ا	0000 0110 0011 0111
م	0000 0110 0100 0101
	0000 0000 0010 0000
α	0000 0011 1011 0001
≤	0010 0010 0111 0000
γ	0000 0011 1011 0011

Different data types take up more space



Colours as HEX numbers

Color Name	RGB Triplet	Hexadecimal	Color Name	RGB Triplet	Hexadecimal
Aqua	(0,255,255)	00FFFF	Navy	(0,0,128)	000080
Black	(0,0,0)	000000	Olive	(128,128,0)	808000
Blue	(0,0,255)	0000FF	Purple	(128,0,128)	800080
Fuchsia	(255,0,255)	FF00FF	Red	(255,0,0)	FF0000
Gray	(128,128,128)	808080	Silver	(192,192,192)	C0C0C0
Green	(0,128,0)	008000	Teal	(0,128,128)	008080
Lime	(0,255,0)	00FF00	White	(255,255,255)	FFFFFF
Maroon	(128,0,0)	800000	Yellow	(255,255,0)	FFFF00

Unit Test

- Tomorrow-27th September, Monday
- Unit Test-Topic 2
- Everything we have done in Topic 2 so far
- Easy and 50 minutes
- 40 marks scaled into 100 marks
- Counted as summative

Thank you and see you next time.