COMPUTER SYSTEMS FUNDAMENTALS
(4COSC004W)

Week 1. Part 2 of 2

Contact details

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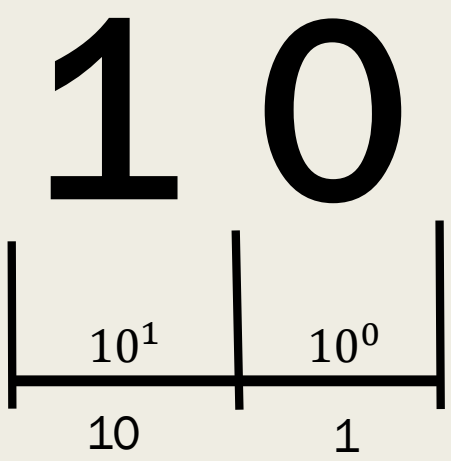
BINARY – BASE 2

Positive Integers

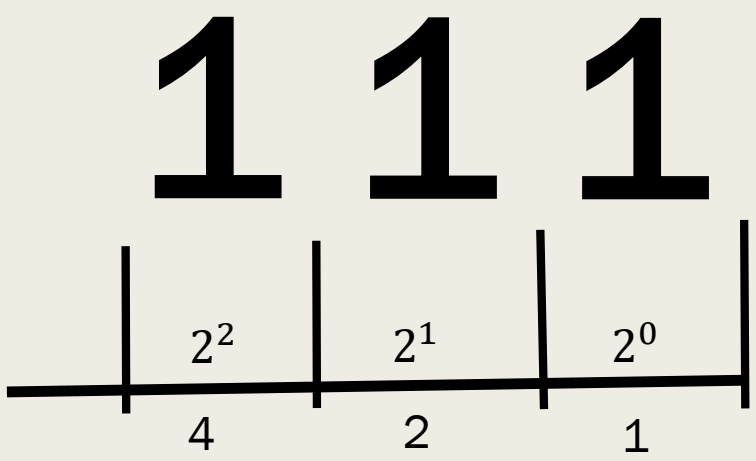
By the end of this video, you will:

- Be able to convert Binary Positive Integers to their Denary values
- Be able to convert Denary Positive Integers to their Binary values
  - *Division by 2 & observation techniques*
- Quick parity check
- The Bit
- The Nibble

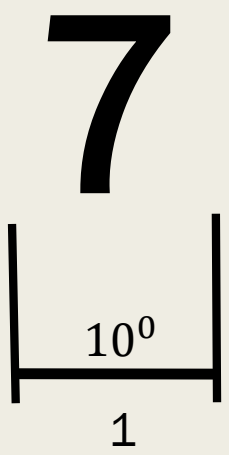
Decimal / Denary – Base 10



Base 2
Binary

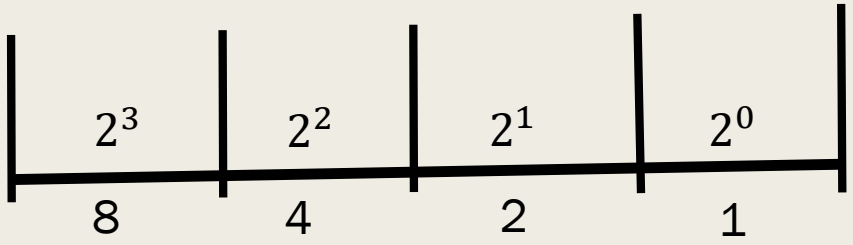


Base 10
Denary



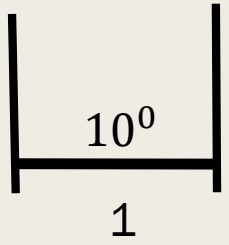
Base 2
Binary

1 0 0 0

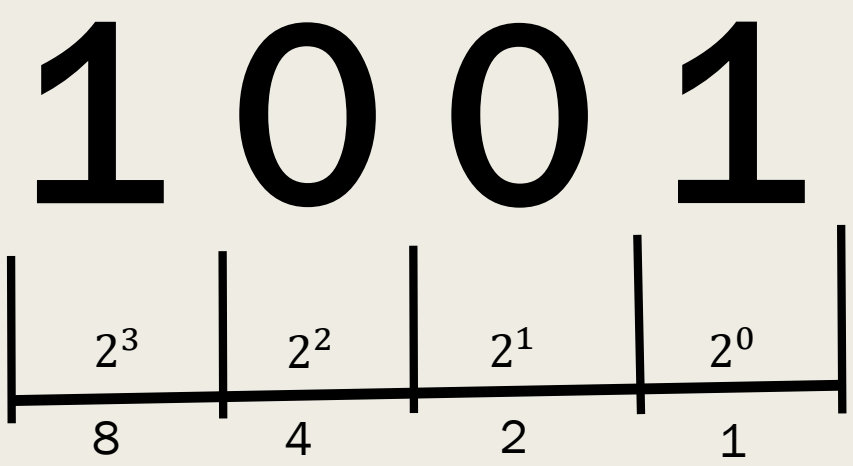


Base 10
Denary

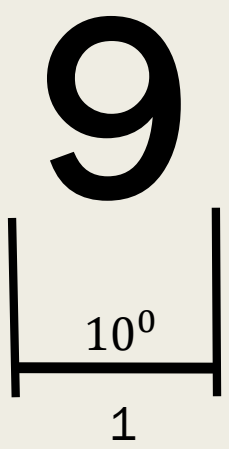
8



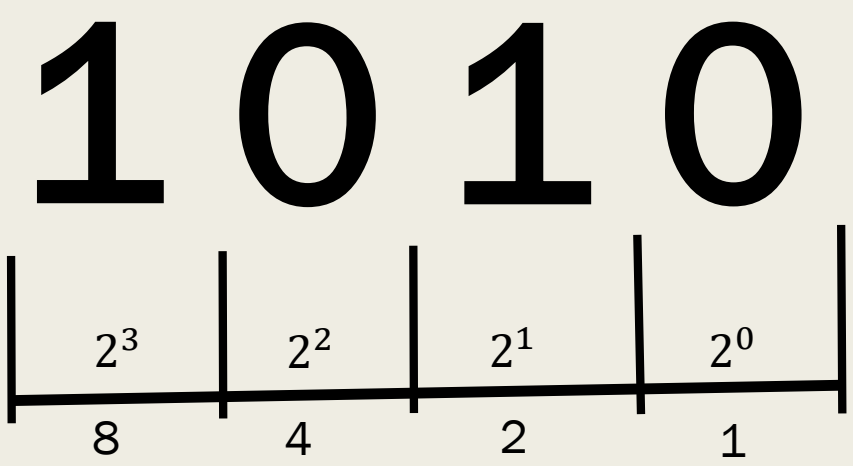
Base 2
Binary



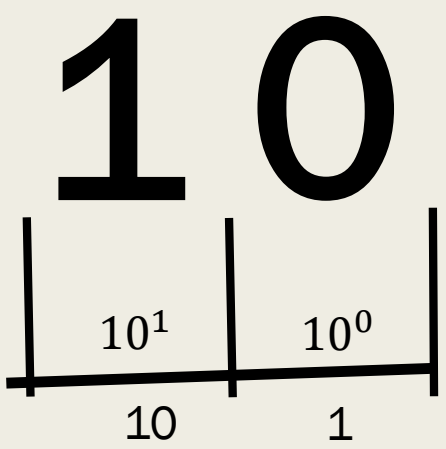
Base 10
Denary



Base 2
Binary

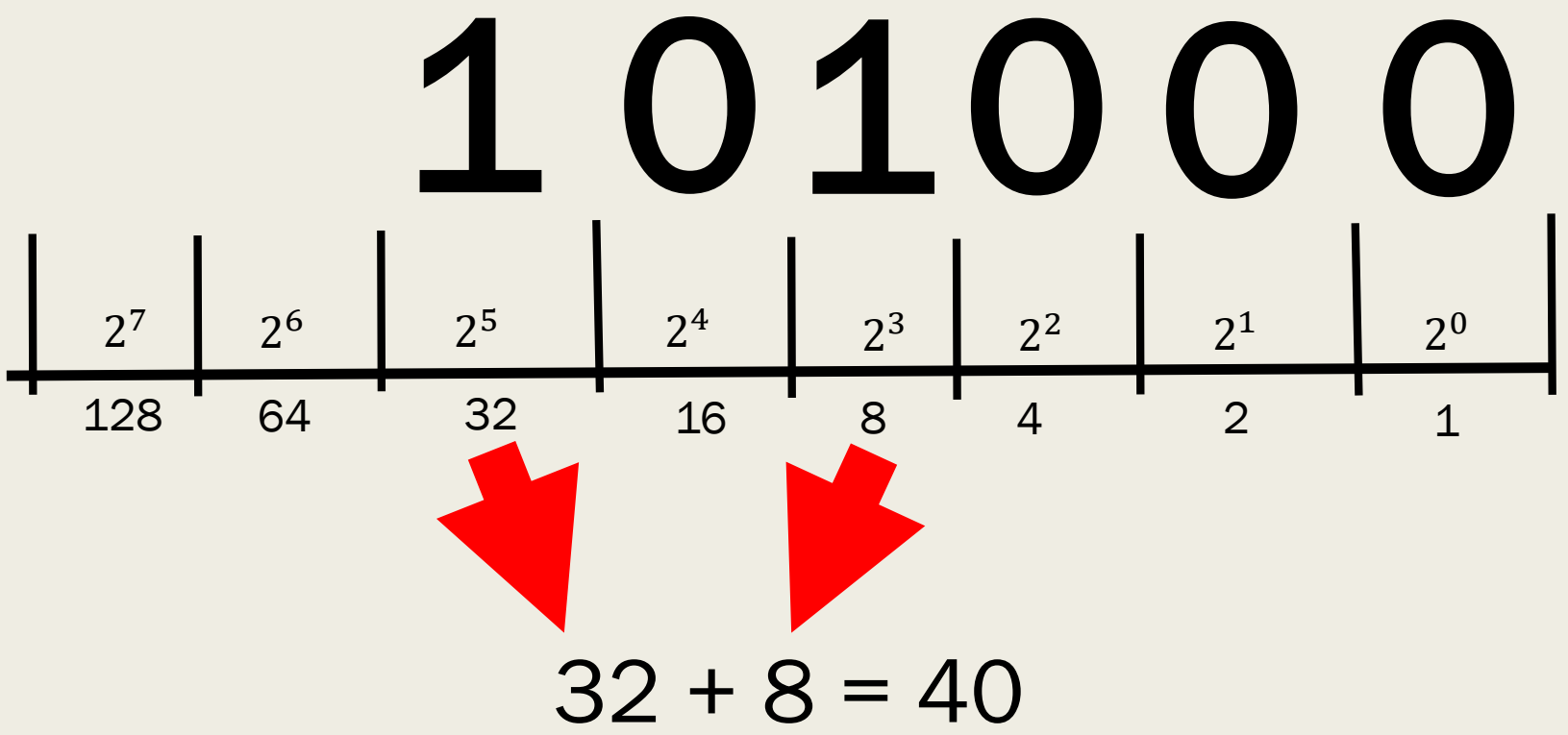


Base 10
Denary



Denary	Binary	Hexadecimal
0	0 0 0 0	0
1	0 0 0 1	1
2	0 0 1 0	2
3	0 0 1 1	3
4	0 1 0 0	4
5	0 1 0 1	5
6	0 1 1 0	6
7	0 1 1 1	7
8	1 0 0 0	8
9	1 0 0 1	9
10	1 0 1 0	A
11	1 0 1 1	B
12	1 1 0 0	C
13	1 1 0 1	D
14	1 1 1 0	E
15	1 1 1 1	F

Converting Binary to Denary



Converting Binary to Denary

1	1	0	1	1	1	1	1
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1

$$128 + 64 + 16 + 8 + 4 + 2 + 1 = 223$$

Converting Denary to Binary

40 / 2 = 20 remainder 0
20 / 2 = 10 remainder 0
10 / 2 = 5 remainder 0
5 / 2 = 2 remainder 1
2 / 2 = 1 remainder 0
1 / 2 = 0 remainder 1

1 0 1 0 0 0

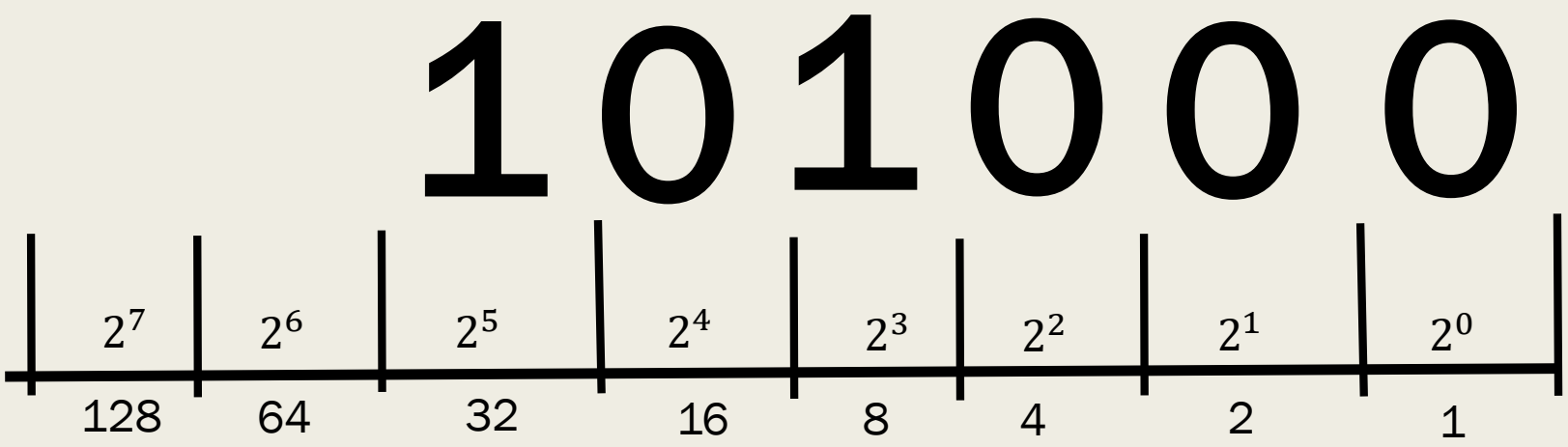
Converting Denary to Binary

Denary 40:

Which is the largest power of 2 which fits in 40?

Now subtract the 32 from the original 40

Which is the largest power of 2 which fits in 8?



Converting Denary to Binary

43 / 2 = 21 remainder 1
21 / 2 = 10 remainder 1
10 / 2 = 5 remainder 0
5 / 2 = 2 remainder 1
2 / 2 = 1 remainder 0
1 / 2 = 0 remainder 1

1 0 1 0 1 1

Converting Denary to Binary

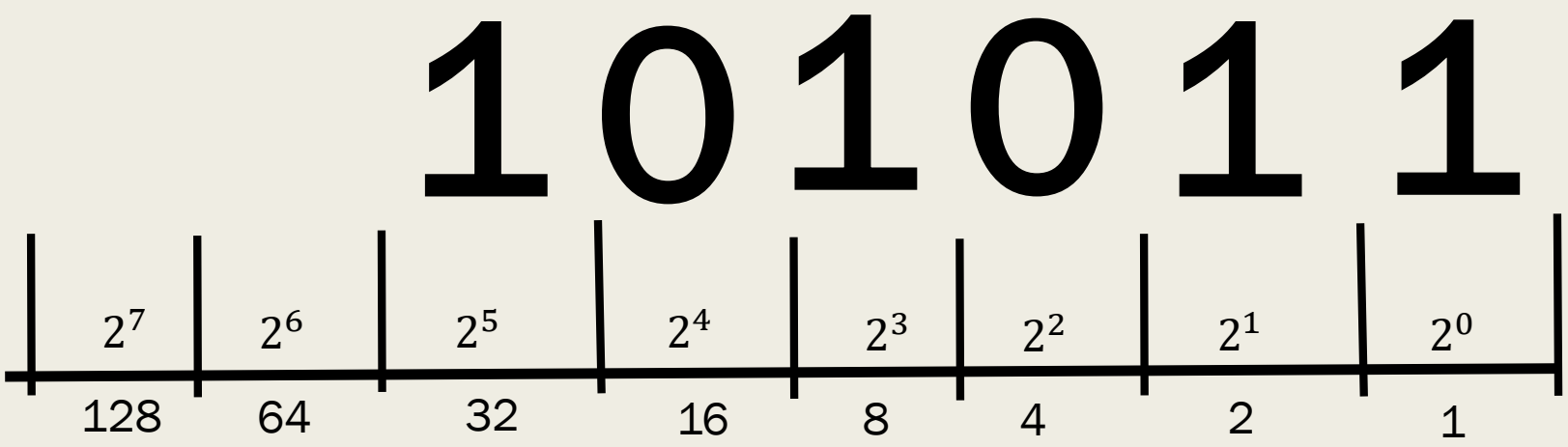
Denary 43:

Which is the largest power of 2 which fits in 43?

Now subtract the 32 from the original 43

Which is the largest power of 2 which fits in 11?

Now subtract the 8 from the 11



The Byte, The Nibble & The Bit

- Byte:
  - *An 8-Bit Binary Value*
    - 256 possible values
      - 2^8
- Nibble:
  - *A 4-Bit Binary Value*
    - 16 possible values (2^4)
- Bit:
  - *Single Binary Bit*
    - **0** or **1**
    - 2^1

Parity check

- If the Denary value is **odd**
  - *The **Least Significant Binary Bit** will be **1***
- If the Denary value is **even**
  - *The **Least Significant Binary Bit** will be **0***

Try it out for yourself part 1

- Write down an 8-Bit binary value
- Try to convert it into Denary
  - *Start with the Least Significant Digit (on the right)*
  - *Work through all the Bits*
  - *Add up the Denary values of each Bit*
- Write down the Denary value of the Binary value you started with
  - *On another piece of paper*

- Try another

Try it out for yourself part 2

- Try to convert each of the Denary values,
  - *back to their Binary representation*
  - *Try both methods*
  - *Make sure they both give you the same result*

An exercise for you:

Convert the **Denary** number 123 into **Binary:**

Converting Denary to Binary

123 / 2 = 61 remainder 1
61 / 2 = 30 remainder 1
30 / 2 = 15 remainder 0
15 / 2 = 7 remainder 1
7 / 2 = 3 remainder 1
3 / 2 = 1 remainder 1
1 / 2 = 0 remainder 1

1 1 1 1 0 1 1

Converting Denary to Binary

Denary 123:

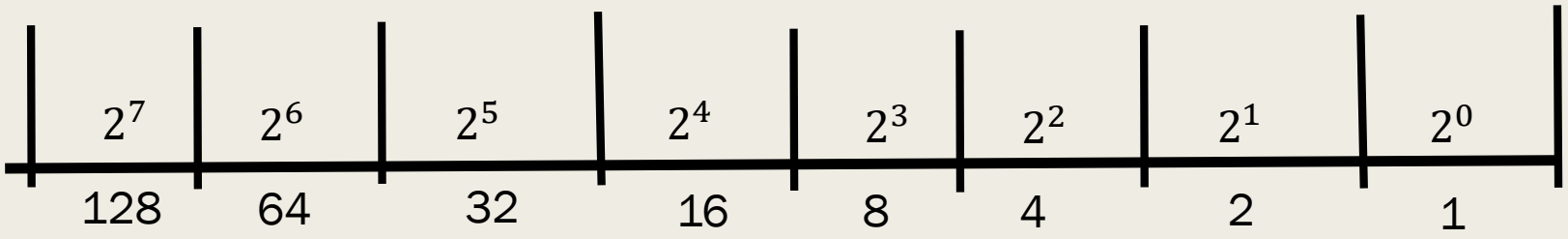
Which is the largest power of 2 which fits in 123?

Now subtract the 64 from the original 123

Which is the largest power of 2 which fits in 59?

Now subtract the 32 from the 59

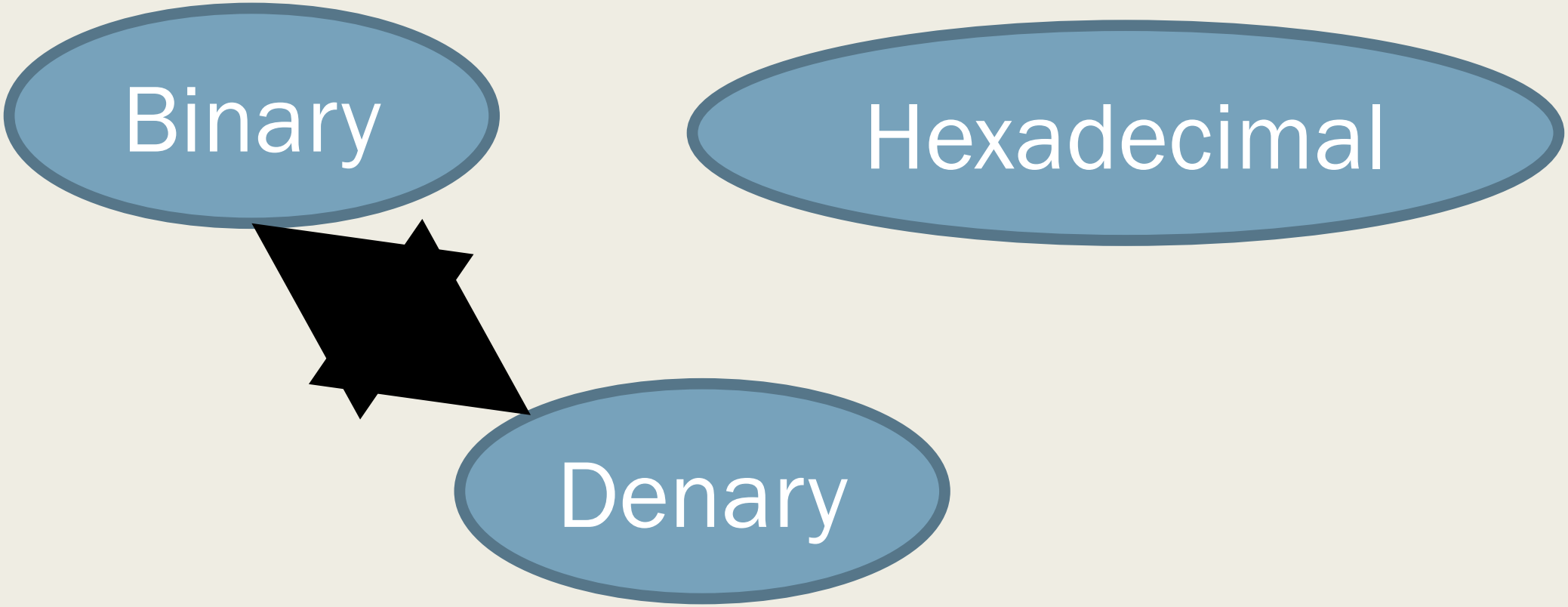
1 1 1 1 0 1 1



In this video we have covered:

- Binary:
  - *Converting from Binary to Denary*
  - *Converting from Denary to Binary*
    - Division by 2 method
    - Observation method

Number System Triangle



Tutorial exercise:

- This will provide you with:
  - *Binary values to convert to Denary*
  - *Denary values to convert to Binary*

In the next video we will cover:

- Hexadecimal:
  - *Theory*
  - *Denary – Binary – Hexadecimal triangle*
  - *Why use Hexadecimal*
  - *Quick Binary - Hexadecimal conversions*