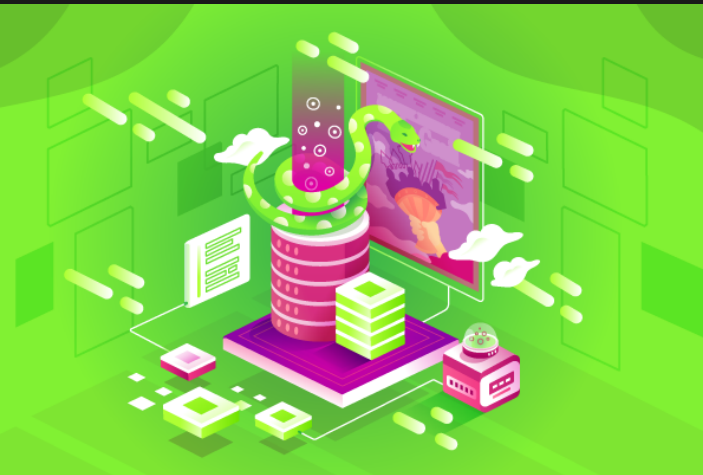


**Number Systems**  
Lesson 1

**Floating-Point Accuracy**  
Lesson 2



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What are Number Systems?

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Representing Other Number Systems in Python

Converting from One System to Another System

Fun Fact: There's more than one way to represent a number.

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Fun Fact: There's more than one way to represent a number.

Decimal: 15

Binary: 1111

Number Systems are specified by their base number.

Decimal is base 10

Binary is base 2

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## Common Number Systems

Decimal  
Base 10  
0 - 9

Binary  
Base 2  
0 - 1

Octal  
Base 8  
0 - 7

Hexadecimal  
Base 16  
0 - F (0 - 9 + A - F)

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## Representing Number Systems in Python

Binary  
Prefix 0b  
0b1001

Octal  
Prefix 0o  
0o7242

Hexadecimal  
Prefix 0x  
0xFF012

## Converting the Decimal number 15 to Binary

15 / 2 => 7 w/ remainder of 1	<div style="border-left: 2px solid red; height: 100px; position: relative;"> <div style="position: absolute; top: 0; right: 0; color: red;">Least Significant</div> <div style="position: absolute; bottom: 0; right: 0; color: red;">Most Significant</div> <div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%); color: red;">↑ ↓</div> </div>
7 / 2 => 3 w/ remainder of 1	
3 / 2 => 1 w/ remainder of 1	
1 / 2 => 0 w/ remainder of 1	

Binary Number: 1111

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## Converting back from binary to decimal

Binary Number: 1111

$$(1 \cdot 2^3) + (1 \cdot 2^2) + (1 \cdot 2^1) + (1 \cdot 2^0)$$

Most Significant

Least Significant

$$8 + 4 + 2 + 1$$

15

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Float Limitations

Floating-point numbers are stored as **binary fractions** in memory.

Not all decimals can be represented as binary fractions.

Example: **0.1** can't be represented cleanly

It approximates to something like: **0.1000000000000000055511151231257827021181583404541015625**