Python for Beginners

Glimpse of last lecture

Introduction (an overview to course)

- ~~Getting started "Hello World"~~
- ~~Keywords and identifiers~~
- ~~Comments~~ and Statements
- ~~Variables and assignments~~
- Data types
- Flow control
- Methods and Functions
- Reading and Writing files
- Modules and import
- Object Oriented Programming

Data types

- ~~Numbers~~
- ~~List~~
- ~~Tuple~~
- ~~String~~
- ~~Dictionary~~
- Set

Program Flow Control in Python

- *If* statement
- Elif statement
- More on if, elif and else
- *For* loop
- *While* loop
- Useful operators

Methods and Functions

- Defining a function
- Flow when calling a function
- Parameters and arguments
- Global/local
- Functions calling functions

Reading/Writing Files

- Files and directories in Python
- Reading from a file
- Parsing data
- Printing data to external file

Modules and Import

- Standard Python library
- Datetime module
- Math and Random module
- Generators and decorators
- NumPy, Pandas, Matplotlib (basic uses)

Object Oriented Programming

- Introduction to OOPs
- Attributes and Class keywords
- Inheritance and Polymorphism

Statistical analysis of data with Python

Sets

'Set' in python offers to store unordered collection of elements but without duplicity.

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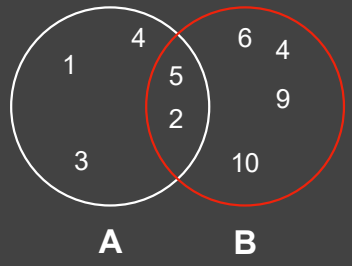
'Set' objects also support the basic mathematical functionalists :
union, intersection, difference.



	Python equivalent	
A ∪ B =	A | B	A ^ B (in either of them but not in both)
A ∩ B =	A & B	
A - B =	A - B	

'Set' can be constructed using two ways :

Using set( ) function

```
x = set('Mango', 'Banana', 'Apple')
y = set('tree', 'house', 'Banana')
```

Like dictionary (with keys only) using curly braces

```
SetA= {1,2,3,4,5}      Set1 = {'Mango', 'Banana', 'Apple'}
SetB= {2,5,6,9,10}     Set2 = {'tree', 'house', 'Banana'}
```

Hands-On 9

```
A = {'Mango', 'Banana', 'Apple'}
B = {'tree', 'house', 'Banana'}

A | B      A & B

A - B      A ^ B
```

Sets

'Set' in python offers to store unordered collection of elements but without duplicity.

'Set' objects also support the basic mathematical functionalists :
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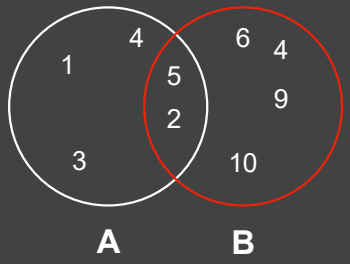

A ∪ B = 1, 3, 4, 5, 2, 6, 9, 10

A ∩ B = 5, 2

A - B = 1, 3, 4

Python equivalent	
A | B	
A & B	
A - B	

A ^ B
(in either of them but not in both)

'Set' can be constructed using two ways :

Using set( ) function

```
x = set(('Mango', 'Banana', 'Apple'))
y = set(('tree', 'house', 'Banana'))
```

Like dictionary (with keys only) using curly braces

```
SetA= {1,2,3,4,5}      Set1 = {'Mango', 'Banana', 'Apple'}
SetB= {2,5,6,9,10}     Set2 = {'tree', 'house', 'Banana'}
```

Hands-On 9

A = {'Mango', 'Banana', 'Apple'}
B = {'tree', 'house', 'Banana'}

A | B A & B

A - B A ^ B

Frequently used methods on Sets

add( )	Adds element to the set
clear( )	Remove all the elements from set
remove( )	Remove the specified element
difference( )	Difference b/w two or more sets
intersection( )	Intersection of two sets (common element)
union( )	Union of sets
update( )	Try to add list into Sets

Hands-On with sets

- How to check if an element/item is in a given set : ~~index~~, ~~key~~

Using 'in' keyword

```
my_firstSet = {34, 22, 12, 100, 20000, 1, 2, 5, 8, 213, 35, 'banana', 'mango', 'orange'}
print('mango' in my_firstSet)
```

difference( ) : return the difference between sets
difference_update( ) : removes the same items in two sets

intersection( ) : return interaction (common)of sets
intersection_update( ): remove the *uncommon item* in sets

isdisjoint( ) : *return true if no-common item in sets*, otherwise false

issubset( ) : one set has all elements of other set with additional elements
issuperset( ) : opposite to issubset

Hands-On with sets

- How to check if an element/item is in a given set : ~~index~~, ~~key~~

Using 'in' keyword

```
my_firstSet = {34, 22, 12, 100, 20000, 1, 2, 5, 8, 213, 35, 'banana', 'mango', 'orange'}
my_secondSet = { 22, 100, 213, 'banana'}
my_thirdSet = { 34, 100, 213, 'grapes'}
```

difference( ) : return the difference between sets
difference_update( ) : removes the same items in two sets

intersection( ) : return interaction (common)of sets
intersection_update( ): remove the *uncommon item* in sets

isdisjoint( ) : *return true if no-common item in sets*, otherwise false

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Comparison b/w data types

Based on quotes, braces and brackets : ‘ ’ or “ ”, ( ), { }, [ ]

	Mutability	Mixed data	Duplicacy	Ordered /Indexing
String **(single Or double quotes)**	No	No	Yes	Yes
List[ ]	Yes	Yes (list, set, tuple, int and dict.)	Yes	Yes
Tuple( )	No	Yes (list, set, tuple, int, dict.)	Yes	Yes
Dictionary{ }	Yes Keys are immutable type	Yes **Key can be int, str and tuple** but values can be of any data type	No	No
Set( )	No	Yes Only (int, str, tuple) Not (list, set,dict)	No	No

Python - statement

A statement can be understood as an instruction that the interpreter (in our case Python interpreter) can execute.

You have been working with two types of statements : assignment statement , print statement

"Remember: assignment statement doesn't produce any result"

On contrary, comments are not executed by interpreter.

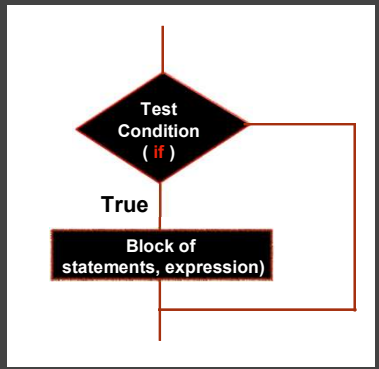
Python - Expressions

An expression may consists of ***variables***, ***operators*** and ***values***, which the Python interpreter evaluates and give the result.

If, elif, else statements (decision making building blocks in Python)

If, if-else, elif statements (decision making building blocks in Python)

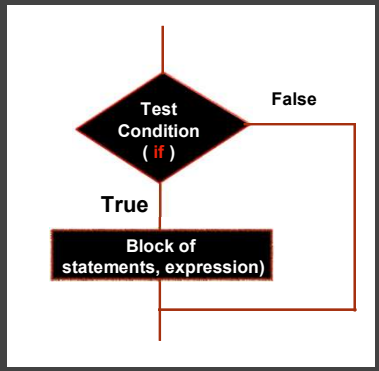
If Statement




```
x = 10
If x > 10:
    print(“ Number is Greater”)
```

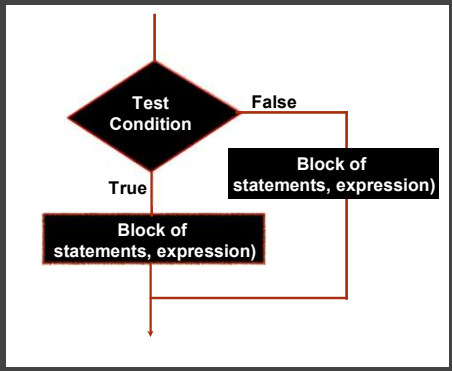
If, if-else, elif statements (decision making building blocks in Python)

If Statement




```
x = 10
If x > 10:
    print(" Number is Greater")
```

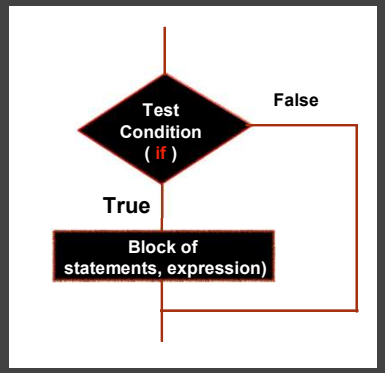
If-else Statement




```
If x > 10:
    print("Number is Greater")
else:
    print("Number is smaller")
```

If, if-else, elif statements (decision making building blocks in Python)

If Statement




```
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If x > 10:
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```
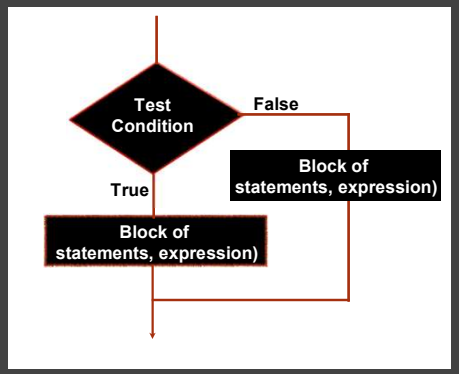
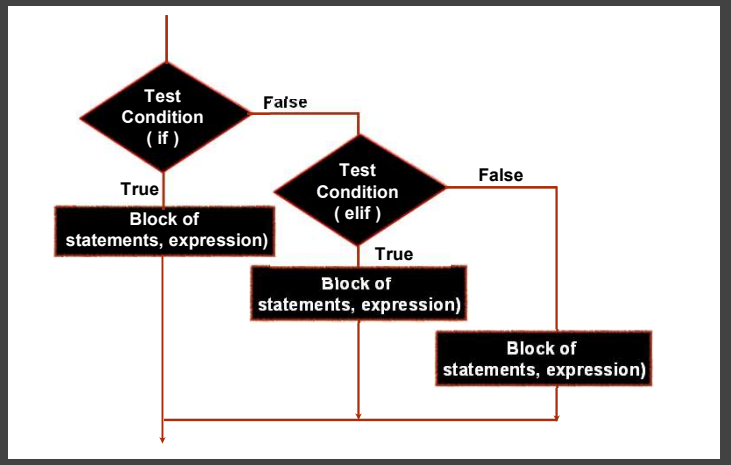

If-else Statement




```
If x > 10:
    print("Number is Greater")
else:
    print("Number is smaller")
```

If-elif Statement




```
If x > 10:
    print("Number is Greater")
elif x == 10:
    print("Number is smaller")
else:
    print("Number is smaller")
```

If, if-else, elif statements (decision making building blocks in Python)

Hands-On

Try to **define a variable**
with a number and
with a string

and apply,
if, elif, else statements

Hint -

x = 100; (use if, elif, else)

Name = 'Krakow' (use if-else)

If, if-else, elif statements (decision making building blocks in Python)

Hands-On

Try to **define a variable**
with a number and
with a string

and apply,
if, elif, else statements

Hint -

x = 100; (use if, elif, else)

Name = 'Krakow' (use if-else)

Using if-else statement with lists

```
Days = ['Monday', 'Tuesday', 'Wednesday']

If 'Tuesday' in Days:

    print('yes')

else:

    print('no')
```

Modify list:
Hint: Use append(item), insert(index,item)

If, if-else, elif statements (decision making building blocks in Python)

Hands-On

Multiple conditional statement using elif :

```
if today == 'Monday':
    print("Office day")

elif today == 'Tuesday':
    print("Work from home day")

elif today == 'Wednesday':
    print("Find excuse for not going to office")

elif today == 'Thursday':
    print("Work from home day")

elif today == 'Friday':
    print("Half day office")

else:
    print("Weekend, official-OFF day")
```

Single line conditional statement

```
Day = 'Friday'

if Day == 'Monday': print("Yes, today is Friday")
```

Nested if-else statements

If, if-else, elif statements (decision making building blocks in Python)

Hands-On

Nested if-else conditions

Initial inputs

```
Shop = 'Fruits'
Type = ‘sweet'
color = 'Yellow'
```

Change inputs values and try to guess the expected answers

```
if Shop == 'Fruits':
    print(" Plan to buy Fruits today")

    if Type == 'sweet':
        print(" Fruits are sweet")
    elif Type == 'good':
        print("Not sweet, but still good fruits")

                                        Hint: Nested to last elif, indentation gives the clue
        if color == 'Yellow':
            print("Fruits are either sweet or good and color is yellow")
        else:
            print("Fruits are niether sweet, nor yellow")


    else:
        print(" Fruits are not sweet")

else:
    print(" Not buying fruits today")
```

Python - Operators

Operators allow to perform operations on operands

Variables or values of variables

In Python,

Operators are divided in the following groups

- Arithmetic operators
- Assignment operators
- Comparison operators
- Logical operators
- Identity operators
- Membership operator
- Bitwise operator

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Allow to apply mathematical operations with num. values : x = 9 , y = 2

Addition (+)	Adding the operands	x + y
Subtraction (-)	Subtracts R.H.S operand from L.H.S	x - y
Multiplication (*)	Multiply the operands	x * y
Division (/)	Divide L.H.S by R.H.S operand	x / y
Modulus (%)	Divide L.H.S by R.H.S, return remainder	x % y
Exponent (**)	Divide L.H.S by R.H.S, return remainder	x ** y
Floor division (//)	Divide L.H.S by R.H.S, round-up the quotient to nearest integer	x // y

Try to execute these Statements with x = 13, y = 3

Operators

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Allow to assign variables to variables; lets x = 9 , y = 2

(=)	**x = y**
(+=)	**x += y**
(-=)	**x -= y**
(*=)	**x *= y**
(/=)	**x /= y**
(%/=)	**x %= y**
(**=)	**x **= y**
(//=)	**x //= y**

Try to answer —

Operators

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Comparison operators allow to compare two operands; lets x = 9 , y = 2

Equal to (==)	**x == y**
Not equal to (!=)	**x != y**
Greater than (>)	**x > y**
Smaller than (<)	**x < y**
Greater or equal (>=)	**x >= y**
Smaller or equal (<=)	**x <= y**

Try to answer —

Operators

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Allow to combine multiple conditional statement : x = 9 , y = 2

and	**x > 5 and y < 4**	**Both statements should true *to return True***
or	**x > 5 or y < 2**	**If one of the statements is true, *return True***
not	**not (result) not(x > 5 and y < 4)**	**Reverse the state of result: False->Ture, True->False**

Operators

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Allow to *compare the memory location* of **objects** :

string, list[ ],…

is	**x is y**	**True, if both variables/object are same**
is not	**x is not y**	**True, if both variables/object are not same (not values, but locations)**

```
x = "'little','big'"
y = "'little','big'"
z = x
x == y
```

Try to answer —

Operators

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Allows to test if a strings, lists or tuples are members of other sequence (string, list or tuples)

in	Day in x	True, if Day(sequence) is in x
not in	Day2 in x	True, if Day2(sequence) is in x, otherwise false

x = ['Sunday', 'Monday', 'Tuesday', 'Wednesday']
Day = 'Monday'
Day2 = ['Thursday', 'Friday', 'Saturday']

Operators

..	32	16	8	4	2	1	
	..	..	0	0	0	0	For 0
			0	1	1	1	For 7
			1	1	1	1	For 15

In Python,

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a & b AND	Bitwise and
a | b OR	Bitwise or
a ^ b XOR	Bitwise exclusive
~ b NOT	Bitwise not
a << n left shift	shift a left by n(2) bits
	shift a right by n(2) bits

Operators

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Lets take few variables a = 60, b = 13

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Lets take few variables a = 60, b = 13

$a = (1\,1\,1\,1\,0\,0)_2$

$b = (0\,0\,1\,1\,0\,1)_2$

Operators

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	..	..	0	0	0	0 For 0
			0	1	1	1 For 7
			1	1	1	1 For 15

Lets take few variables a = 60, b = 13

$a = (1\,1\,1\,1\,0\,0)_2$

$b = (0\,0\,1\,1\,0\,1)_2$

- **a & b** AND — Bitwise and: 0 0 1 1 0 0 = 12
- **a | b** OR — Bitwise or: 1 1 1 1 0 1 = 61
- **a ^ b** XOR — Bitwise exclusive: 1 1 0 0 0 1 = 49
- **~ b** NOT — Bitwise not: 1 1 0 0 1 0
- **a << n** left shift — shift a left by n(2) bits
- shift a right by n(2) bits

Operators precedence follow in Python

**	Exponential or raise to power
~, +, -	Complement, unary plus, unary minus
*, /, %, //	Multiply, divide, modulus, floor division
+, -	Addition and subtraction
>>, <<	Bitwise : right , left
&	Bitwise : AND
^, |	Bitwise : exclusive OR , OR
<=, <, >, >=	Comparison operators
=, %=, /=, //=, -=, +=, *=, **=	Assignment operators
is, is not	Identity operators
in, not in	Membership operator
not, or, and	Logical operators

A = 20, B = 10, C = 15, D = 2

((A + B) * (C / D)) ** D ?

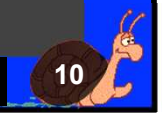
Looping in Python

After decision making,

LOOPs are another fundamental part of any fundamental language, that allows to execute the the same action several times.

Print integer numbers between 1 to 10 ?

```
print(1)
1
print(2)
2
print(3)
3
.
.
.print(10)
10
```

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```

Using LOOP :

```
for x in range(1,11):
    print(x)
```

Print only odd / Even numbers ?

Looping in Python

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Using LOOP :

```
for x in range(1,11):
    print(x)
```

Print only odd / Even numbers ?

```
for letter in "coffee":
    print(letter*10)
```

What it does ?

Looping in Python

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LOOPs are another fundamental part of any fundamental language, that allows to execute the the same action several times.

Print integer numbers between 1 to 10 ?

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Using LOOP :

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for x in range(1,11):
    print(x)
```

Print only odd / Even numbers ?

```
for letter in "coffee":
    print(letter*10)
```

What it does ?

Range in for loops

As per documentation, ‘ Range’ represents an immutable sequence of numbers and is commonly used for looping a specific number of times

Python ranges can be used in multiple forms

ranges(final) for x in range(11):

ranges(initial,final) for x in range(4,11):

ranges(initial,final,step)

- for x in range(4,11,1):
- for x in range(4,11,2):
- for x in range(11,1,-2):

Steps up / down

Hands - On

What are expected numbers generated by the following range ?

range(2,19) ?

What are expected numbers generated by the following range ?

range(5) ?

What are expected numbers generated by the following range ?

```
for x in range(18,0,-3):
print(x)
```

- Write a code using for loop to add odd/even numbers from range 1-100
- Modify code to print only odd numbers divisible by 3 from range 1-100
- Modify code to print only number which give remainder 1 after dividing by 4 from range 1-100

while loops

With while loop, one can do almost all actions which for loops can do, **with additional features**.

As the name suggests, it invoke the conditional statement

Syntax:

while *conditional_statement*:
Block_of_statements,
unless conditional statement become false

Difference between *while* and *for* loop

```
x = 1
While x <11:
    print(x)
    x+=1
```

```
for x in range(1,10):
    print(x)
```

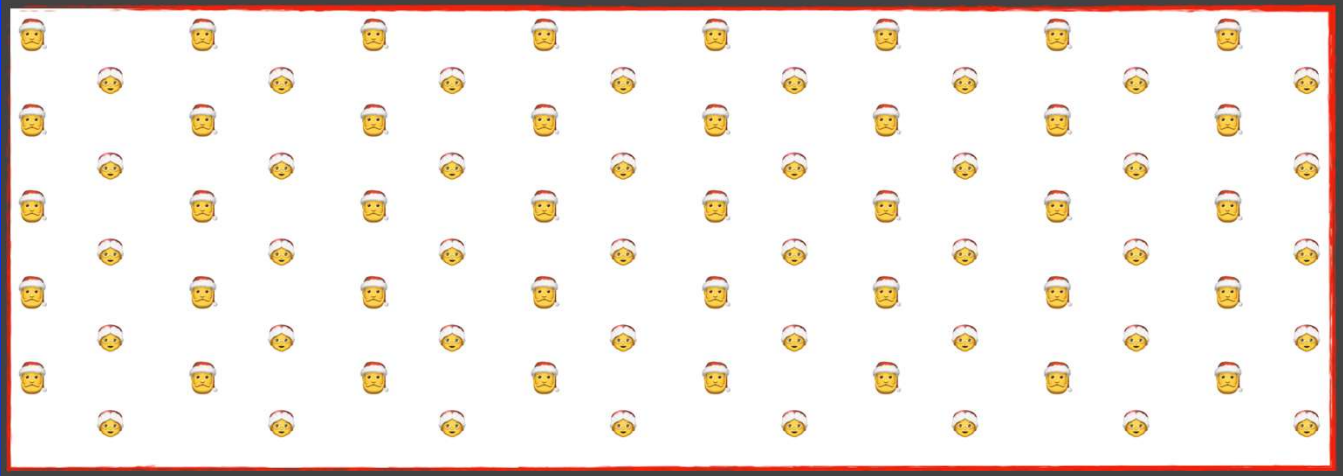
Hands-On

```
for num in range(1,11):
    print("\U0001f332")
```

- Print only, when num is even
- Print only, when num is odd
- Print both, even and odd

Print

Hands-On - print



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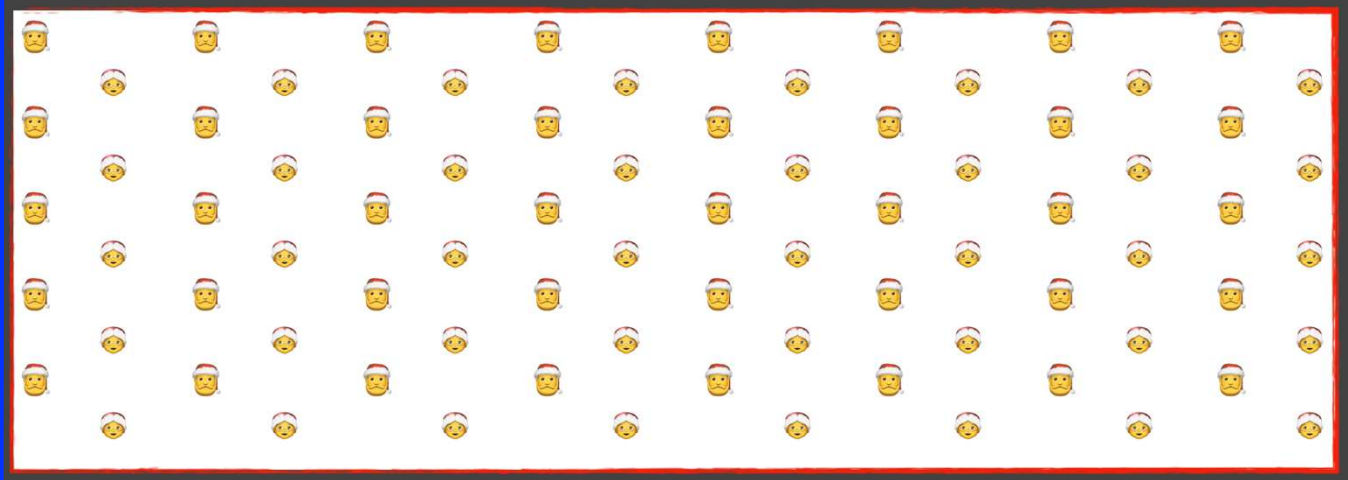
Hands-On - print



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\U0001f936

```
for num in range(1,11):

    if num % 2 == 0:

        print("    \U0001f936\t\t\U0001f936\t\t\U0001f936\t\t\U0001f936\t\t".expandtabs(4))

    elif num%2 ==1: print("\U0001f385\t\U0001f385\t\U0001f385\t\U0001f385\t".expandtabs())
```

Thank you !!!