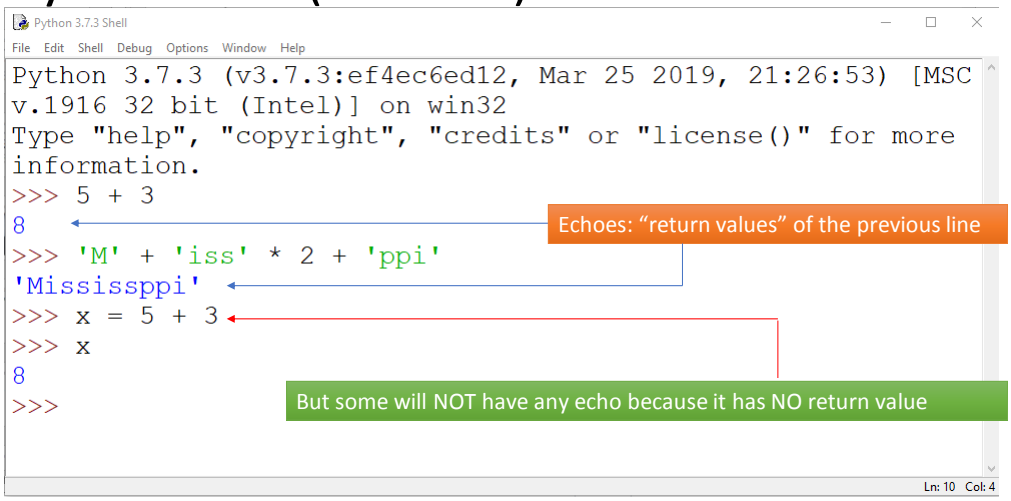
Tutorial

Week 1

Evaluation, Variables, Turtle Graphic

Python Shell(Console)



- However, this should NOT be the main area we work in

Arithmetic Evaluation

- What will be the evaluated values for the followings:

  3 * 4 + 5
  3 + 4 * 5
  5 ** 3 % 4
  97 / 4
  97 // 4

You should try evaluating these WITHOUT typing into Python first

Logical Evaluation

- What will be the evaluated values for the followings:

  1 == 1
  3 + 2 == 1 + 4
  3 + 2 != 1 + 4
  4 > 3
  4 > 4
  6 + 3 < 9 + 3
  True or False
  True and (False or True)

Logical Evaluation

- What will be the evaluated values for the followings:
  not True
  not False
  not not True
  not 0
  not 9999
  0 and 9999
  not 'abc'
  not ''

More about Truth Values

- Python has keywords `True` and `False`
- In Python 3.x, `True` and `False` will be equal to `1` and `0`
- Anything that is not `0` or empty will be evaluated as `True`
- Logic:

```
>>> True and 0
0
>>> not 'abc'
False
>>> 1 or 0
1
```

I-don't-know Evaluation

- What will be the evaluated values for the followings:

  True + 1
  False * 5
  0 + (not 1)

String Evaluations

- What will be the evaluated values for the followings:

```
'abc' + 'def'
'gala' * 3
'mu' + 'ha' * 4
('ba '*2+'bidu'*2+'bi ' + 'jam '*2)*3

'banana'[3]
'banana'[2:4]
'banana'[1::2]
```

String Slicing

	a	b	c	d	e	f
Index	0	1	2	3	4	5

- Let s = 'abcdef'
- What is the result of `s[2]` and `s[2:]` and `s[2::]`?
  - Are they the same?
- Only `s[2:]` and `s[2::]` are the same.
- What happens if we do `s[1:1]`?
  - Get '' (a blank string)

Start – By default, start from index 0.
Stop – By default, include the last letter.
Step – By default, "jump" by 1 step.

String Slicing

	a	b	c	d	e	f
Index	0	1	2	3	4	5

- Let s = 'abcdef'
- What is the result of `s[]` and `s[:2]` and `s[:2:]`?
  - Are they the same?
- Only `s[:2]` and `s[:2:]` are the same.
- `s[]` is a syntax error

Start – By default, start from index 0.
Stop – By default, include the last letter.
Step – By default, "jump" by 1 step.

String Slicing

	a	b	c	d	e	f
Index	0	1	2	3	4	5

- Let s = 'abcdef'
- What about `s[5:0:-1]`?

'fedcb'

- What happens if we do `s[:2:-1]`?

'fed'

- Lecture example: `s[::-1]`

'fedcba'

Start – By default, start from index 0.
Stop – By default, include the last letter.
Step – By default, "jump" by 1 step.

String Slicing

	a	b	c	d	e	f
Index	0	1	2	3	4	5

- Let s = 'abcdef'
- What happened? By python convention, if step is **negative** default start is the last letter and default stop is the first letter, inclusive.
- Lecture example: s[::-1] is interpreted as "reversing the string"
- 'fedcba'
- Does this mean s[::-1] is the same as s[5:-1:-1]?
- No. s[5:-1:-1] will return a blank string.

Default

- If step > 0
  - Start – By default, start from index 0.
  - Stop – By default, include the last letter.
  - Step – By default, “jump” by 1 step.
- Else (step < 0)
  - Default start = last letter
  - Default end = -n-1

- Let n = length of your string
- If step > 0
  - Start = 0
  - Stop = n
- Else if step < 0
  - Start = n
  - Stop = -n-1

ASCII Table

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040		Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38					70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39					71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40					72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41					73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[	[	123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174			|
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135	]	]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177	&#127;	DEL

‘K’ is greater than ‘D’

‘p’ is greater than ‘P’

Lexicographical Order

- Compare letter-by-letter from left to right

```
>>> 'abc' > 'abd'
False
>>> 'abc' > 'aba'
True
```

- "winner" is decided when the comparison reaches a different letter

```
>>> 'ab' > 'aaabbbcccddd'
True
```

- "anything" is greater than "nothing"

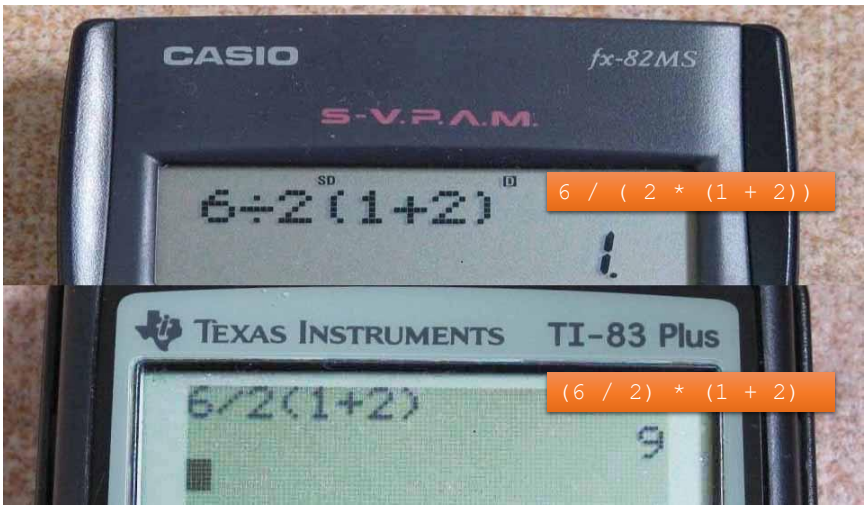
```
>>> 'abcd' > 'abc'
True
```

Lexicographical Order

- Compare letter-by-letter from left to right

```
>>> 'abc' > 'abd'
False
>>> 'abc' > 'aba'
True
```

Operator Precedence



Python Operator Precedence

- 6/2*(1+2)
- 6/2*(1+2)
- 6/2*3
- 3*3
- 9

Operator	Description
**	Exponentiation (raise to the power)
~ + -	Complement, unary plus and minus (method names for the last two are +@ and -@)
* / % //	Multiply, divide, modulo and floor division
+ -	Addition and subtraction
>> <<	Right and left bitwise shift
&	Bitwise 'AND'td>
^ |	Bitwise exclusive `OR' and regular `OR'
<= < > >=	Comparison operators
<> == !=	Equality operators
= %= /= //= -= += *= **=	Assignment operators
is is not	Identity operators
in not in	Membership operators
not or and	Logical operators

How Do I Remember It All ... ? BODMAS !

B	**B**rackets first
O	**O**rders (i.e. Powers and Square Roots, etc.)
DM	**D**ivision and **M**ultiplication (left-to-right)
AS	**A**ddition and **S**ubtraction (left-to-right)

Divide and Multiply rank equally (and go left to right).

Add and Subtract rank equally (and go left to right)

Arithmetic Evaluation

- What will be the evaluated values for the followings
- (or what is the orders of the operators?)

  1 + 2 * 3

  1 + 2 * 3 **4

  1 + 2 * 3 **4 – 5

  not 0 + 1

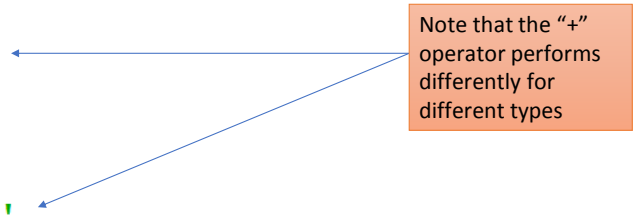
What is the difference between

- What do we have when we type ask if 1 is it the same as ‘1’?
  `1 == ‘1’`

- Or What is the difference between the following two lines?
  `123+456`
  `‘123’+’456’`

Type Conversions

```
>>> type(123)
<class 'int'>
>>> 123 + 456
579
>>> type('123')
<class 'str'>
>>> '123' + '456'
'123456'
>>> '123' + 456
Traceback (most recent call last):
  File "<pyshell#12>", line 1, in <module>
    '123' + 456
TypeError: can only concatenate str (not "int") to str
```



Type Conversions

- Converting floats into integers

```
>>> int(1.234)
1
>>> int(1.7)
1
```

- Can I say the integer produced is always smaller than the input float?

```
>>> int(-2.3)
-2
```

Variables

- Now you should know the followings:

  3 * 4 + 5

  3 + 4 * 5

- How about

  x = 3

  y = 4

  z = 5

  x * y + z

Variable Can Store Any Type

```
>>> 5 > 3
True
>>> x = 5 > 3
>>> x
True
>>> 5 > 3 and 3 > 9
False
>>>
```

"Creation" of Variables

- What will be the evaluated values for the followings:
  a * b + c

- Error! Why?
- Because a, b and c are undeclared
  - In another words, "not created", "not born yet"
  - Whenever you type a line
    a = …. (something)
  - A variable (a) is born

From scratch

```
m + 3
```

- Error!

```
m = 1
m + 3
```

Creation of the variable m

- Output:

```
4
```

Turtle Graphics

```
>>> from turtle import *
>>> forward(100)
>>>
```

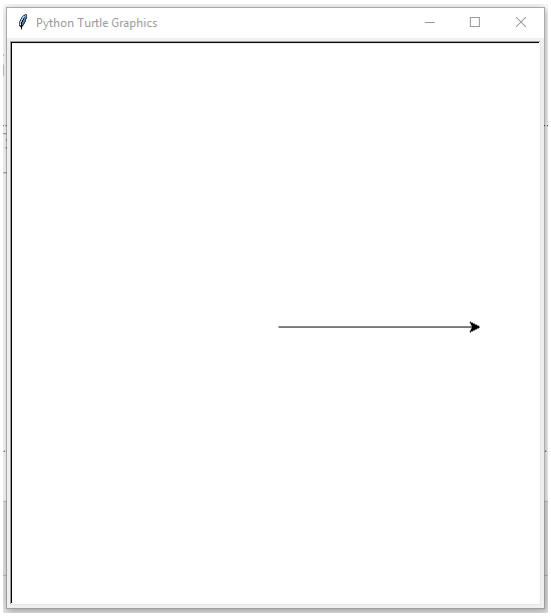
- Or you can use the short from

```
>>> from turtle import *
>>> fd(100)
```

- Or this,

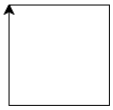
```
>>> import turtle
>>> turtle.fd(100)
```

- But for our course, please do NOT use the last form



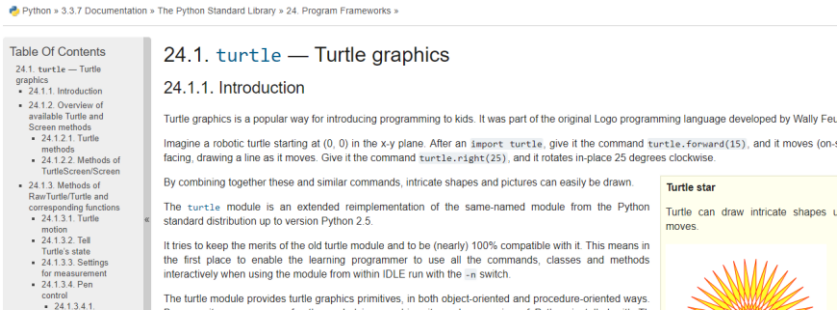
Turtle Graphics

```
>>> from turtle import *
>>> fd(100)
>>> rt(90)
>>> fd(100)
>>> rt(90)
>>> fd(100)
>>> rt(90)
>>> fd(100)
>>>
```



More Turtle Commands

- You can go to the website: https://docs.python.org/3.3/library/turtle.html?highlight=turtle
- Or just google “Python Turtle”



- Actually, this is how most of programmers do

Before we ended

- Anyone need help on Assignment 1?