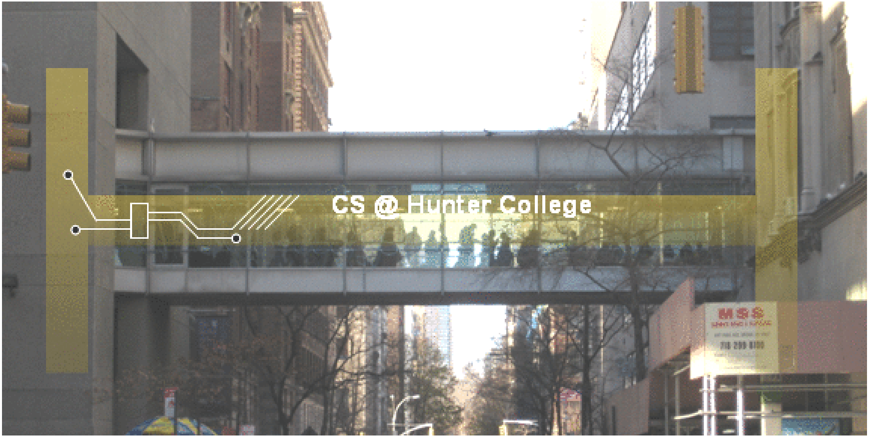
CSCI 127: Introduction to Computer Science



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Today's Topics

- More on Strings
- Arithmetic
- Indexing and Slicing Lists
- Colors & Hexadecimal Notation

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More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[7]
days = s[7:15]
days = s[:-1]
```

- Strings are made up of individual characters (letters, numbers, etc.)
- Useful to be able to refer to pieces of a string, either an individual location or a "substring" of the string.

0	1	2	3	4	5	6	7	8	...	16	17	18	19	20	21	22
F	r	i	d	a	y	s	S	a	...	S	u	n	d	a	y	s
												...	-4	-3	-2	-1

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F	r	i	d	a	y	s	S	a	...	S	u	n	d	a	y	s
												...	-4	-3	-2	-1

- `s[0]` is `"F"`.

More on Strings: Indexing & Substrings

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- `s[1]` is `"r"`.

More on Strings: Indexing & Substrings

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- `s[-1]` is `"s"`.

More on Strings: Indexing & Substrings

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- `s[3:6]` is `"day"`.

More on Strings: Indexing & Substrings

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F	r	i	d	a	y	s	S	a	...	S	u	n	d	a	y	s
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- `s[:3]` is `"Fri"`.

More on Strings: Indexing & Substrings

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- `s[:-1]` is `"FridaysSaturdaysSunday"`.
  (no trailing 's' at the end)

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Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `amt = amt - item`
- Multiplication: `area = h * w`
- Division: `ave = total / n`
- Floor or Integer Division:
  `weeks = totalDays // 7` *15 // 7 = 2*
- Remainder or Modulus:
  `days = totalDays % 7` *15 % 7 = 1*
- Exponentiation:
  `pop = 2**time`

Side Note: '+' for numbers and strings

- `x = 3 + 5` stores the number 8 in memory location `x`.
- `x = x + 1` increases `x` by 1.
- `s = "hi" + "Mom"` stores `"hiMom"` in memory locations `s`.
- `s = s + "A"` adds the letter `"A"` to the end of the strings `s`.

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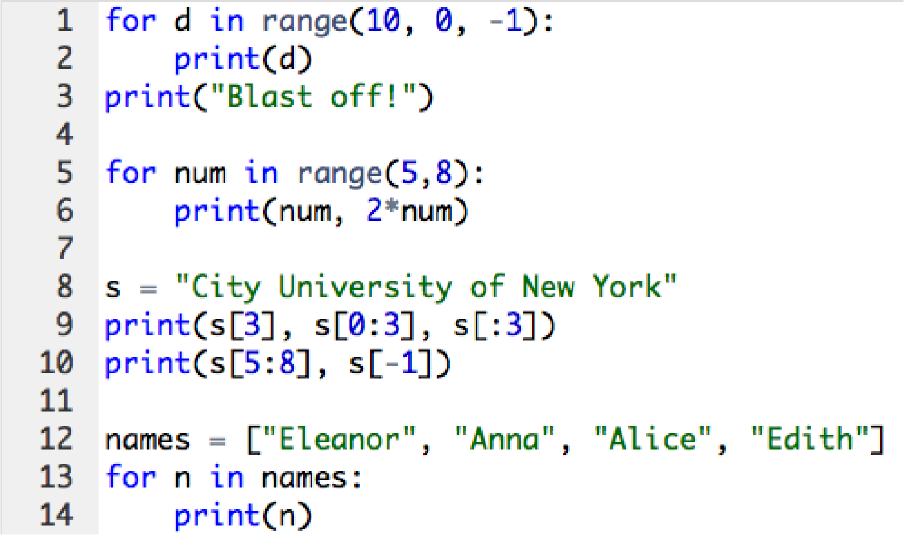
Challenge (Group Work):

Mostly review:



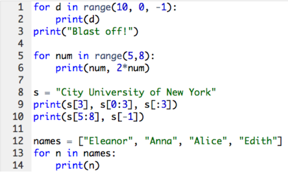
```
for d in range(10, 0, -1):
    print(d)
print("Blast off!")

for num in range(5,8):
    print(num, 2*num)

s = "City University of New York"
print(s[3], s[0:3], s[:3])
print(s[5:8], s[-1])

names = ["Eleanor", "Anna", "Alice", "Edith"]
for n in names:
    print(n)
```

Python Tutor



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names = ["Eleanor", "Anna", "Alice", "Edith"]
for n in names:
    print(n)
```

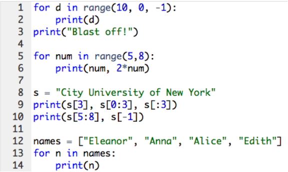
(Demo with `pythonTutor`)

Review: `range()`

The three versions:

- `range(stop)`
- `range(start, stop)`
- `range(start, stop, step)`

Slices



```python
for d in range(10, 0, -1):
    print(d)
print("Blast off!")

for num in range(5,8):
    print(num, 2*num)

s = "City University of New York"
print(s[3], s[0:3], s[:3])
print(s[5:8], s[-1])

names = ["Eleanor", "Anna", "Alice", "Edith"]
for n in names:
    print(n)
```

- Similar to `range()`, you can take portions or **slices** of lists and strings:

  ```
  s[5:8]
  ```

  gives: `"Uni"`
- Also works for lists:

  ```
  names[1:3]
  ```

  gives: `["Anna", "Alice"]`
- Python also lets you “count backwards”: last element has index: `-1`.

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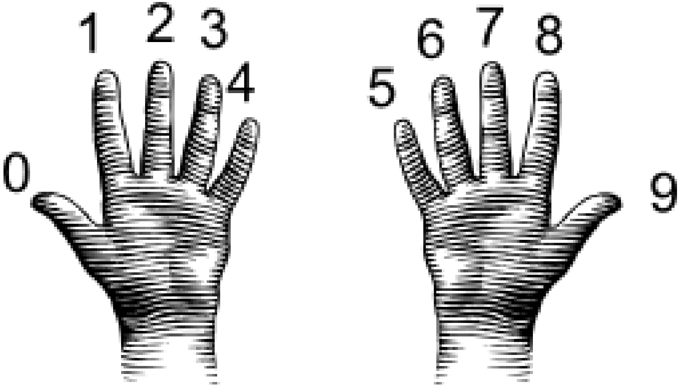
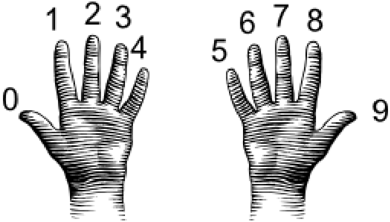
Decimal & Hexadecimal Numbers

Counting with 10 digits:



(from i-programmer.info)

Decimal



(from i-programmer.info)

00	01	02	03	04	05	06	07	08	09
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

$$10^1 + 10^0$$

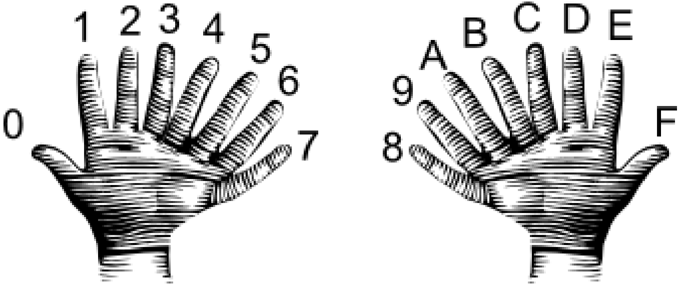
Max Number = 99

$$90 = (9 * 10^1) + (0 * 10^0)$$

$$99 = (9 * 10^1) + (9 * 10^0)$$

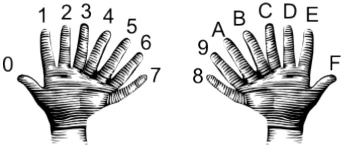
Decimal & Hexadecimal Numbers

Counting with 16 digits:



(from i-programmer.info)

Hexadecimal



(from i-programmer.info)

00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF

$$16^1 + 16^0$$

Max Number = 255

$$F0 = (F * 16^1) + (0 * 16^0)$$

$$F0 = (240) + (0) = 240$$

$$FF = (F * 16^1) + (F * 16^0)$$

$$FF = (240) + (15) = 255$$

Hexadecimal vs. Decimal Notation

- Hex notation: 16 possible digits
- Decimal notation: 10 possible digits
- Smallest and largest one-digit number:
  - Decimal: 0, 9
  - Hex: 0, F
- Smallest and largest two-digit number:
  - Decimal: 10, 99
  - Hex: 10, FF
- Place values:
  - Decimal: ten's place, one's place
  - Hex: sixteen's place, one's place

Converting from base-16 to base-10

Example:

$(D)_{16} = (13)_{10}$

$(4D)_{16} = (??)_{10}$

$4 * 16 = 64 \quad 13 * 1 = 13$

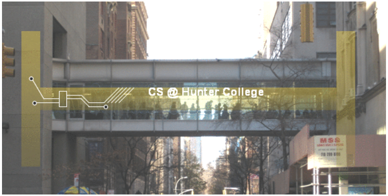
$64 + 13 = 77$

$(4D)_{16} = (77)_{10}$

Recap

- In Python, we introduced:
  - Indexing and Slicing Lists
  - Arithmetic
  - Hexadecimal Notation

Weekly Reminders!



Before next lecture, don't forget to:

- Work on this week's Online Lab
- Schedule an appointment to take the Quiz in lab 1001G Hunter North
- Schedule an appointment to take the Code Review in lab 1001G Hunter North
- Submit this week's programming assignments
- If you need help, schedule an appointment for Tutoring in lab 1001G 11:30am-5pm
- Take the Lecture Preview on Blackboard on Monday (or no later than 10 am on Tuesday)