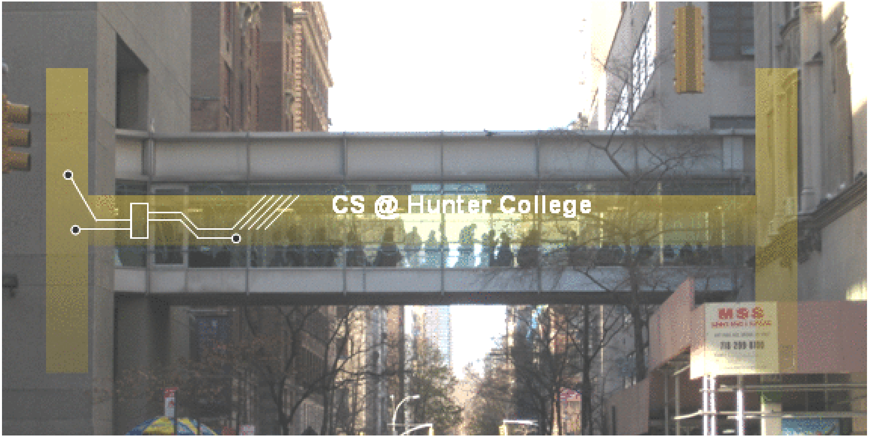
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Frequently Asked Questions

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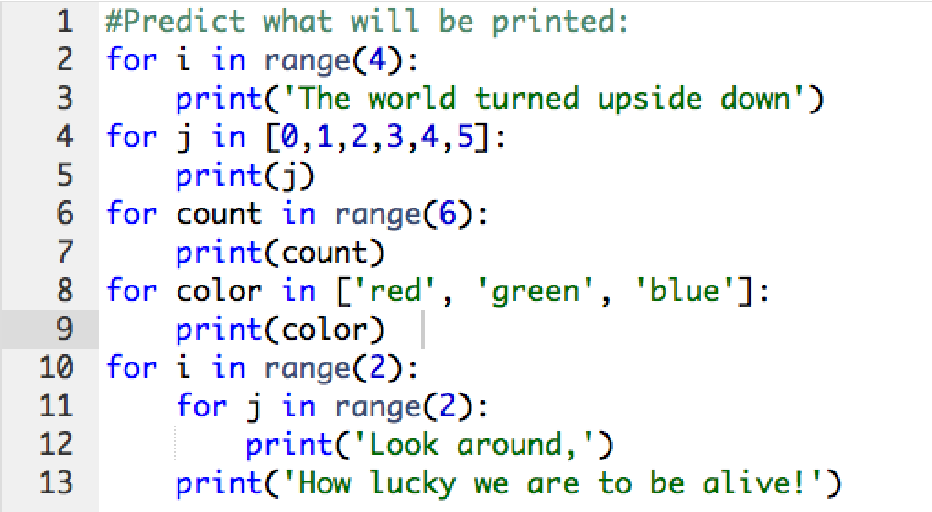
- **Can I work ahead?**
  Absolutely! Submission is open on Gradescope, 3 classes before the deadline.
- **When is the midterm?**
  There is no midterm. Instead there's required quizzes and programming assignments.

Today's Topics

- **For-loops**
- `range()`
- Variables
- Characters
- Strings

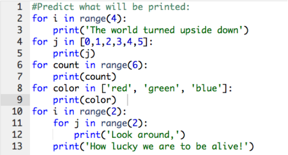
In Pairs or Triples...

Some review and some novel challenges:



```
#Predict what will be printed:
for i in range(4):
    print('The world turned upside down')
for j in [0,1,2,3,4,5]:
    print(j)
for count in range(6):
    print(count)
for color in ['red', 'green', 'blue']:
    print(color)
for i in range(2):
    for j in range(2):
        print('Look around,')
    print('How lucky we are to be alive!')
```

Python Tutor



```python
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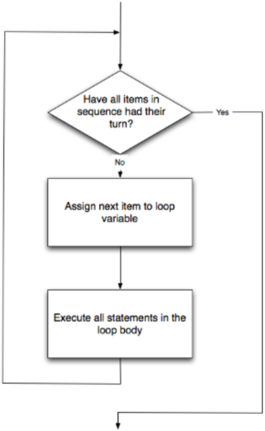
(Demo with pythonTutor)

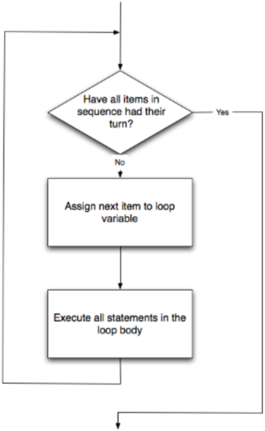
for-loop


Have all items in sequence had their turn?
Yes
No
Assign next item to loop variable
Execute all statements in the loop body

How to Think Like CS, §*4.5*

```
for  i in list:
     statement1
     statement2
     statement3
```

for-loop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for  i in list:
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where `list` is a list of items:

- stated explicitly (e.g. [1,2,3]) or
- generated by a function, e.g. `range()`.

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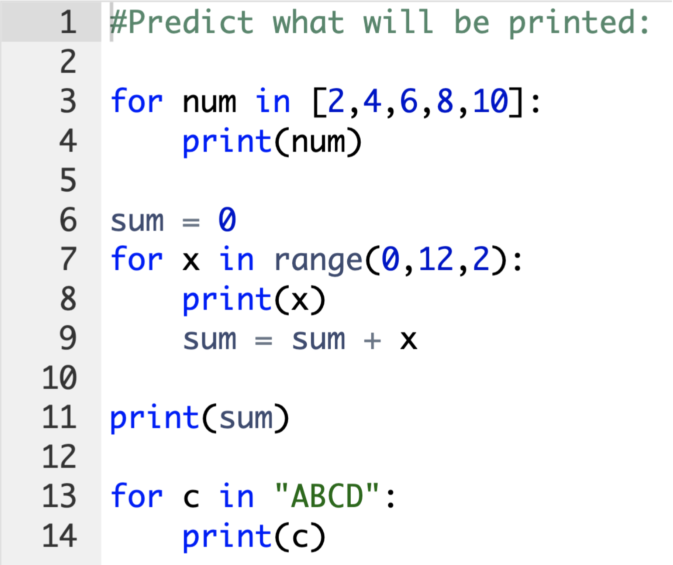
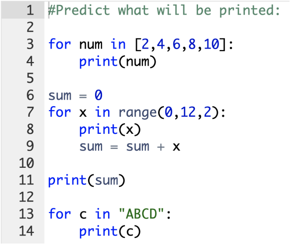
More on range():



```python
#Predict what will be printed:

for num in [2,4,6,8,10]:
    print(num)

sum = 0
for x in range(0,12,2):
    print(x)
    sum = sum + x

print(sum)

for c in "ABCD":
    print(c)
```

Python Tutor



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range()

Simplest version:

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- For example, if you want the the list [0,1,2,3,...,100], you would write:

range()

Simplest version:

- `range(stop)`
- Produces a list: [0,1,2,3,...,stop-1]
- For example, if you want the the list [0,1,2,3,...,100], you would write:

```
range(101)
```

`range()`

What if you wanted to start somewhere else:

range()

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- `range(start, stop)`

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What if you wanted to start somewhere else:

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  [start,start+1,...,stop-1]
- For example, if you want the the list
  [10,11,...,20]
  you would write:

range()

What if you wanted to start somewhere else:

- `range(start, stop)`
- Produces a list:
  [start,start+1,...,stop-1]
- For example, if you want the the list
  [10,11,...,20]
  you would write:

```
range(10,21)
```

range()

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What if you wanted to count by twos, or some other number:

- `range(start, stop, step)`
- Produces a list:
  [start,start+step,start+2*step...,last]
  (where last is the largest start+k*step less than stop)

range()

What if you wanted to count by twos, or some other number:

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- Produces a list:
  [start,start+step,start+2*step...,last]
  (where last is the largest start+k*step less than stop)
- For example, if you want the the list
  [5,10,...,50]
  you would write:

range()

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- `range(start, stop, step)`
- Produces a list: [start,start+step,start+2*step...,last] (where last is the largest start+k*step less than stop)
- For example, if you want the the list [5,10,...,50] you would write:

```
range(5,51,5)
```

In summary: range()

The three versions:

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- range(stop)

In summary: `range()`

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  - **list**: a sequence of items
    e.g. `[3, 1, 4, 5, 9]` or
    `['violet','purple','indigo']`
  - **class variables**: for complex objects, like turtles.
- In Python (unlike other languages) you don't need to specify the type; it is deduced by its value.

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- Can use the underscore ('_'), upper and lower case letters.
- Can also use numbers, just can't start a name with a number.
- Can't use symbols (like '+' or '*') since used for arithmetic.
- Can't use some words that Python has reserved for itself (e.g. `for`).
  (List of reserved words in *Think CS*, §2.5.)

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Standardized Code for Characters

American Standard Code for Information Interchange (ASCII), 1960.

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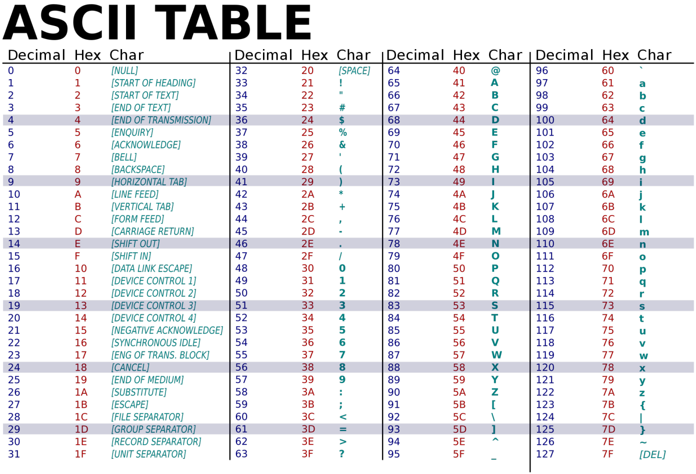


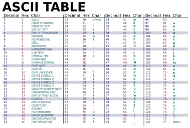
ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

(wiki)

Converting from Character to Code:

(There is a link to the ASCII table on the course webpage, under 'Useful Links'.)



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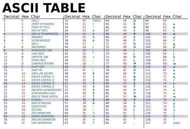

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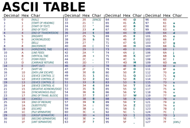

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5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
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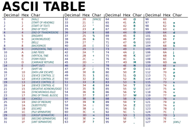

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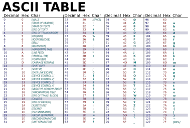

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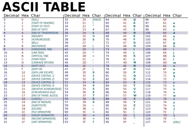

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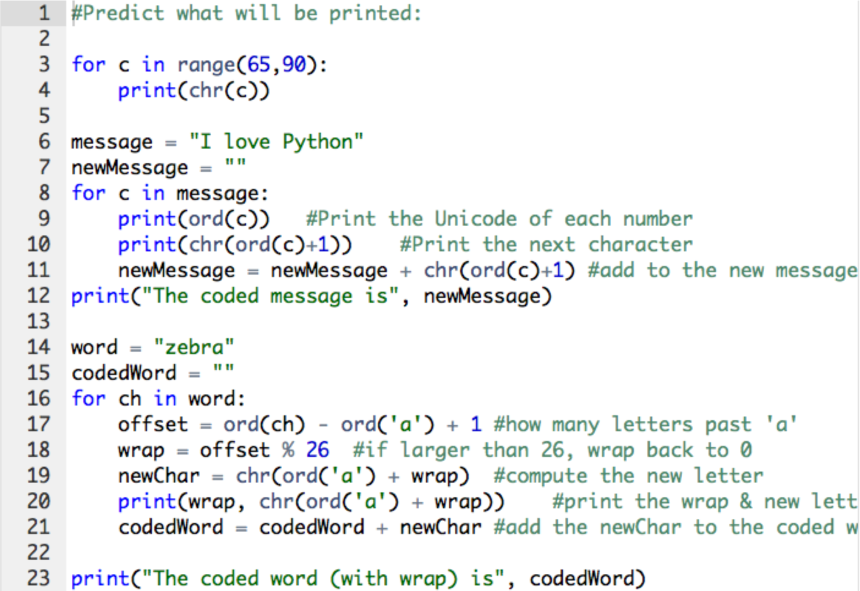
- What is `chr(33)`?

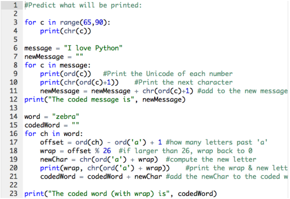
In Pairs or Triples...

Some review and some novel challenges:



```
#Predict what will be printed:

for c in range(65,90):
    print(chr(c))

message = "I love Python"
newMessage = ""
for c in message:
    print(ord(c))   #Print the Unicode of each number
    print(chr(ord(c)+1))    #Print the next character
    newMessage = newMessage + chr(ord(c)+1) #add to the new message
print("The coded message is", newMessage)

word = "zebra"
codedWord = ""
for ch in word:
    offset = ord(ch) - ord('a') + 1 #how many letters past 'a'
    wrap = offset % 26  #if larger than 26, wrap back to 0
    newChar = chr(ord('a') + wrap)  #compute the new letter
    print(wrap, chr(ord('a') + wrap))    #print the wrap & new lett
    codedWord = codedWord + newChar #add the newChar to the coded w

print("The coded word (with wrap) is", codedWord)
```

Python Tutor



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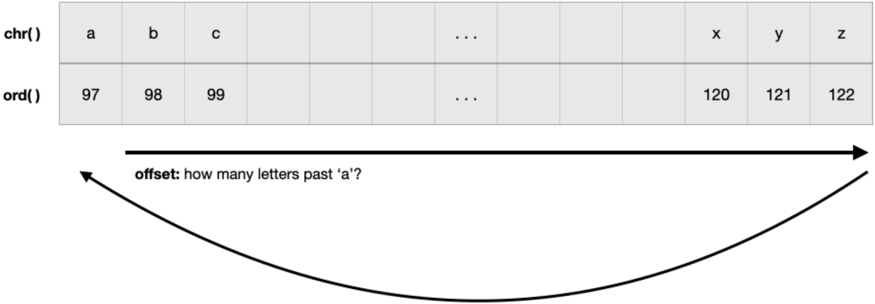
(Demo with `pythonTutor`)

Wrap



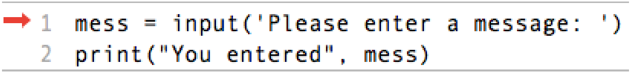
chr( )	a	b	c				. . .				x	y	z
ord( )	97	98	99				. . .				120	121	122

offset: how many letters past ‘a’?

wrap: if offset > 26 then wrap around
% is the reminder
27 % 26 = 1

User Input

Covered in detail in Lab 2:



```
mess = input('Please enter a message: ')
print("You entered", mess)
```

(Demo with `pythonTutor`)

Side Note: '+' for numbers and strings

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- `s = "hi" + "Mom"` stores `"hiMom"` in memory locations `s`.
- `s = s + "A"` adds the letter `"A"` to the end of the strings `s`.

Today's Topics

- For-loops
- `range()`
- Variables
- Characters
- **Strings**

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`

More on Strings: String Methods

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  - What would `print(s.count("sS"))` output?
  - What about:

    ```
    mess = "10 20 21 9 101 35"
    mults = mess.count("0 ")
    print(mults)
    ```

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
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- Strings are made up of individual characters (letters, numbers, etc.)

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F	r	i	d	a	y	s	S	a	...	S	u	n	d	a	y	s

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												...	-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

More on Strings: Indexing & Substrings

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- 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

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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

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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

- `s[1]` is

More on Strings: Indexing & Substrings

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s = "FridaysSaturdaysSundays"
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```

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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

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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

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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

- `s[-1]` is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
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```

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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

- `s[-1]` is `’s’`.

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- Strings are made up of individual characters (letters, numbers, etc.)
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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

- s[3:6] is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
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```

- 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

- s[:3] is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
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```

- 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

- `s[:3]` is `'Fri'`.

More on Strings: Indexing & Substrings

```
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```

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- 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
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- `s[:-1]` is

More on Strings: Indexing & Substrings

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s = "FridaysSaturdaysSundays"
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```

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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

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

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

More on Strings: Splits

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days = s[:-1].split("s")
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- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

```
"Friday~~s~~Saturday~~s~~Sunday"
days = ['Friday', 'Saturday', 'Sunday']
```

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- split() divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

More on Strings: Splits

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```

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"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

```
days = s[:-1].split("day")
```

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- split() divides a string into a list.
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"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

```
days = s[:-1].split("day")
```

"Fri~~day~~sSatur~~day~~sSun~~day~~"

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

```
days = s[:-1].split("day")
```

"Fri~~day~~sSatur~~day~~sSun~~day~~"

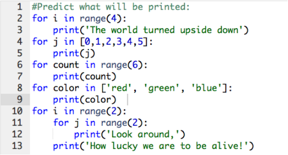
```
days = ['Fri', 'sSatur', 'sSun']
```

Today's Topics

- For-loops
- `range()`
- Variables
- Characters
- Strings
- **Recap**

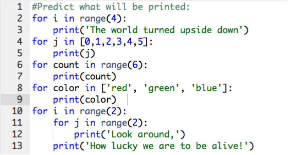
Recap

- In Python, we introduced:



```python
#Predict what will be printed:
for i in range(4):
    print('The world turned upside down')
for j in [0,1,2,3,4,5]:
    print(j)
for count in range(6):
    print(count)
for color in ['red', 'green', 'blue']:
    print(color)
for i in range(2):
    for j in range(2):
        print('Look around,')
    print('How lucky we are to be alive!')
```

Recap



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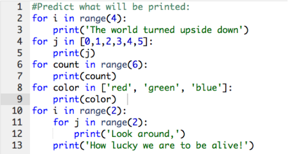
```

- In Python, we introduced:
    - For-loops

Recap



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```
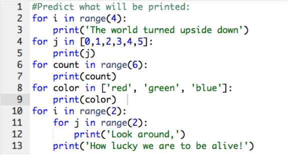

- In Python, we introduced:
  - For-loops
  - `range()`

Recap



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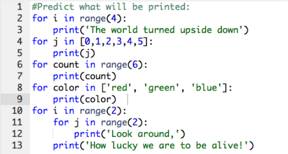
- In Python, we introduced:
  - For-loops
  - `range()`
  - Variables: ints and strings

Recap



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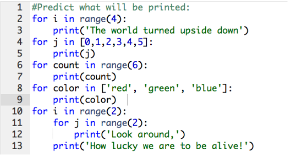
```

- In Python, we introduced:
  - For-loops
  - `range()`
  - Variables: ints and strings
  - Some arithmetic

Recap



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for i in range(4):
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- In Python, we introduced:
  - For-loops
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  - Variables: ints and strings
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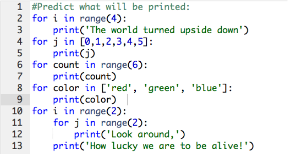
  - String concatenation

Recap



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```
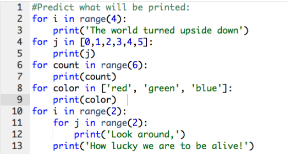

- In Python, we introduced:
  - For-loops
  - `range()`
  - Variables: ints and strings
  - Some arithmetic
  - String concatenation
  - Functions: `ord()` and `chr()`

Recap



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- In Python, we introduced:
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  - Functions: `ord()` and `chr()`
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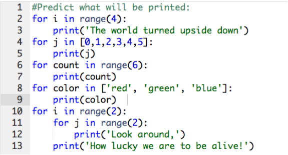
Recap



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  - For-loops
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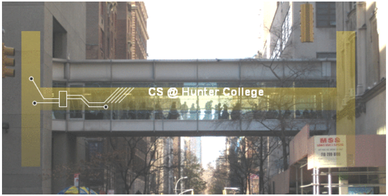
5 Minute Break!



Today we have a second lecture portion! Take a quick break.

Frequently Asked Questions

From emails.

- **Gradescope does not give me credit but my program runs on my computer.**

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  We do not accept late work but we drop the lowest 5 program grades.

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- **There is a typo in the slides, should I report it?**

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  You must work on THIS WEEK'S PROGRAMS, *that way you will never miss a deadline!!!*
- **There is a typo in the slides, should I report it?**
  Yes, great catch! We really appreciate it when you tell us about any typos or errors, please send us email.

Today's Topics

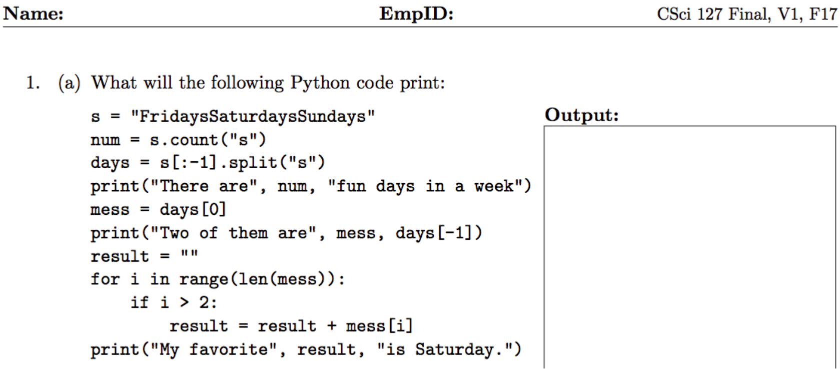
- More on Strings
- Arithmetic
- Indexing and Slicing Lists
- Colors & Hexadecimal Notation

Today's Topics

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

More on Strings...

From Final Exam, Fall 2017, Version 1, #1:



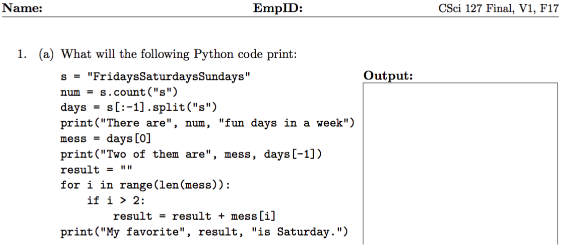
Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

More on Strings...



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1. (a) What will the following Python code print:

```
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days = s[:-1].split("s")
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mess = days[0]
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result = ""
for i in range(len(mess)):
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print("My favorite", result, "is Saturday.")
```
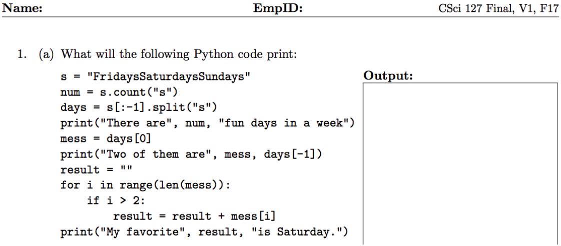

Output:

- Some we have seen before, some we haven't.

More on Strings...



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    if i > 2:
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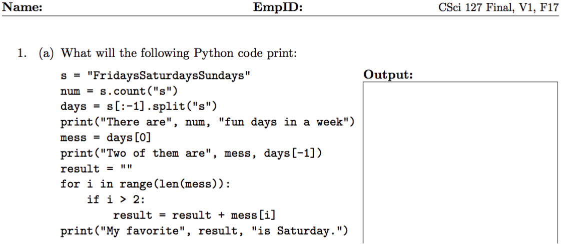
print("My favorite", result, "is Saturday.")
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

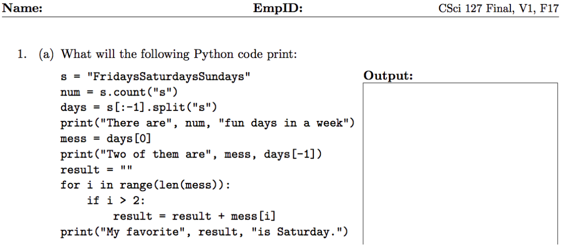
1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

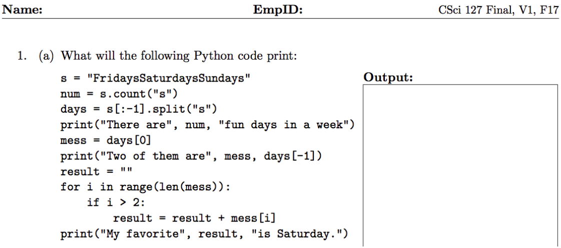
1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:
  - There are 3 `print()`.

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
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print("Two of them are", mess, days[-1])
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for i in range(len(mess)):
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        result = result + mess[i]
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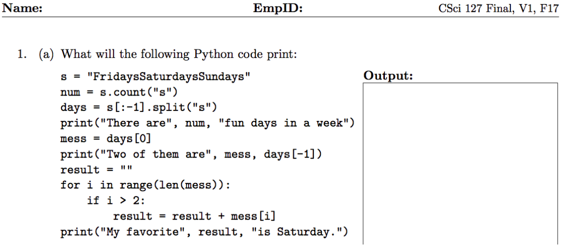
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:
    - There are 3 `print()`.
    - Output will have at least:

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
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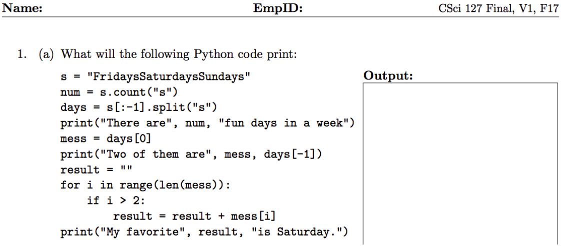
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:
  - There are 3 `print()`.
  - Output will have at least:

    ```
    There are ???  fun days in a week
    ```

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
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print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
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        result = result + mess[i]
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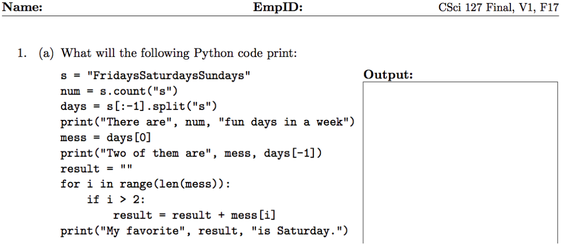
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:
  - There are 3 `print()`.
  - Output will have at least:

```
There are ???  fun days in a week
Two of them are ???
```

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
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print("Two of them are", mess, days[-1])
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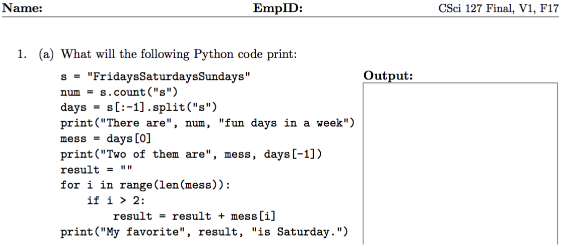
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:
  - There are 3 `print()`.
  - Output will have at least:

```
There are ???  fun days in a week
Two of them are ???
My favorite ???  is Saturday.
```

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
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        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Some we have seen before, some we haven't.
- Don't leave it blank– write what you know & puzzle out as much as possible.
- First, go through and write down what we know:
  - There are 3 `print()`.
  - Output will have at least:

    ```
    There are ???  fun days in a week
    Two of them are ???
    My favorite ???  is Saturday.
    ```
- *Will get* 1/3 *to* 1/2 *points for writing down the basic structure.*

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`
- There are many useful functions for strings (more in Lab 2).

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`
- There are many useful functions for strings (more in Lab 2).
- `s.count(x)` will count the number of times the pattern, `x`, appears in s.

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`
- There are many useful functions for strings (more in Lab 2).
- `s.count(x)` will count the number of times the pattern, `x`, appears in s.
  - `s.count("s")` counts the number of lower case `s` that occurs.

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`
- There are many useful functions for strings (more in Lab 2).
- `s.count(x)` will count the number of times the pattern, `x`, appears in s.
  - `s.count("s")` counts the number of lower case `s` that occurs.
  - `num = s.count("s")` stores the result in the variable `num`, for later.

More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`
- There are many useful functions for strings (more in Lab 2).
- `s.count(x)` will count the number of times the pattern, `x`, appears in s.
  - `s.count("s")` counts the number of lower case `s` that occurs.
  - `num = s.count("s")` stores the result in the variable `num`, for later.
  - What would `print(s.count("sS"))` output?

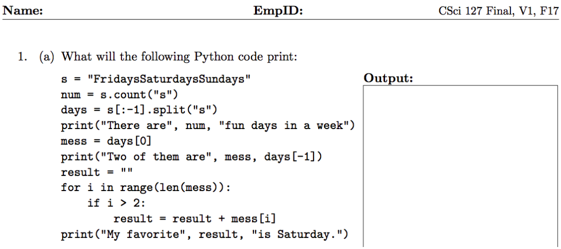
More on Strings: String Methods

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
```

- The first line creates a variable, called `s`, that stores the string: `"FridaysSaturdaysSundays"`
- There are many useful functions for strings (more in Lab 2).
- `s.count(x)` will count the number of times the pattern, `x`, appears in s.
  - `s.count("s")` counts the number of lower case `s` that occurs.
  - `num = s.count("s")` stores the result in the variable `num`, for later.
  - What would `print(s.count("sS"))` output?
  - What about:

    ```
    mess = "10 20 21 9 101 35"
    mults = mess.count("0 ")
    print(mults)
    ```

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

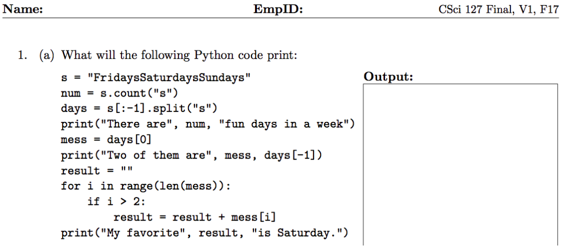
1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Don't leave it blank– write what you know & puzzle out as much as possible:

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Don't leave it blank– write what you know & puzzle out as much as possible:

```
There are 3 fun days in a week
Two of them are ???
My favorite ???  is Saturday.
```

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- Strings are made up of individual characters (letters, numbers, etc.)

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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.

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

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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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
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- Strings are made up of individual characters (letters, numbers, etc.)
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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

- `s[0]` is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- s[1] is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- `s[1]` is `’r’`.

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- `s[-1]` is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- `s[3:6]` is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

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

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- `s[:3]` is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- `s[:3]` is `’Fri’`.

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

- `s[:-1]` is

More on Strings: Indexing & Substrings

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- 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

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

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
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- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"
days = ['Friday', 'Saturday', 'Sunday']

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- split() divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- `split()` divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

```
days = s[:-1].split("day")
```

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- split() divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

"Friday~~s~~Saturday~~s~~Sunday"

```
days = ['Friday', 'Saturday', 'Sunday']
```

- Different delimiters give different lists:

```
days = s[:-1].split("day")
```

"Fri~~day~~sSatur~~day~~sSun~~day~~"

More on Strings: Splits

```
s = "FridaysSaturdaysSundays"
days = s[:-1].split("s")
```

- split() divides a string into a list.
- Cross out the delimiter, and the remaining items are the list.

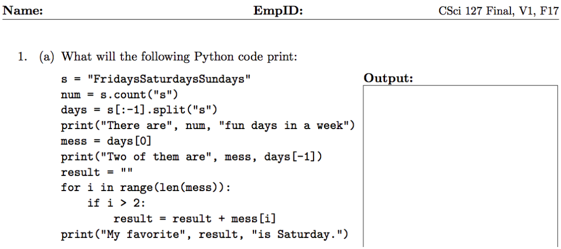
"Friday~~s~~Saturday~~s~~Sunday"
days = ['Friday', 'Saturday', 'Sunday']

- Different delimiters give different lists:

```
days = s[:-1].split("day")
```

"Fri~~day~~sSatur~~day~~sSun~~day~~"
days = ['Fri', 'sSatur', 'sSun']

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

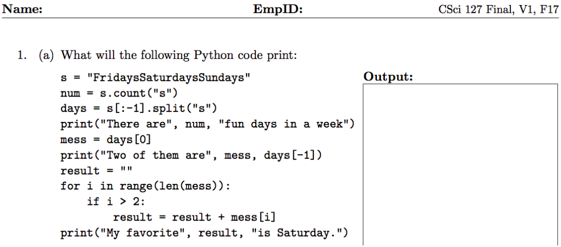
1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Don't leave it blank– write what you know & puzzle out as much as possible:

More on Strings...



Name: **EmpID:** CSci 127 Final, V1, F17

1. (a) What will the following Python code print:

```
s = "FridaysSaturdaysSundays"
num = s.count("s")
days = s[:-1].split("s")
print("There are", num, "fun days in a week")
mess = days[0]
print("Two of them are", mess, days[-1])
result = ""
for i in range(len(mess)):
    if i > 2:
        result = result + mess[i]
print("My favorite", result, "is Saturday.")
```

Output:

- Don't leave it blank– write what you know & puzzle out as much as possible:

```
There are 3 fun days in a week
Two of them are Friday Sunday
My favorite ???  is Saturday.
```

Today's Topics

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

Arithmetic

Some arithmetic operators in Python:

- Addition:

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction:

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication:

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication: `area = h * w`

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication: `area = h * w`
- Division:

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication: `area = h * w`
- Division: `ave = total / n`

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication: `area = h * w`
- Division: `ave = total / n`
- Floor or Integer Division:

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication: `area = h * w`
- Division: `ave = total / n`
- Floor or Integer Division:
  `weeks = totalDays // 7`

15 // 7 = 2

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - item`
- Multiplication: `area = h * w`
- Division: `ave = total / n`
- Floor or Integer Division: `weeks = totalDays // 7` *15 // 7 = 2*
- Remainder or Modulus:

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - 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*

Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - 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*
- Exponentiaion:

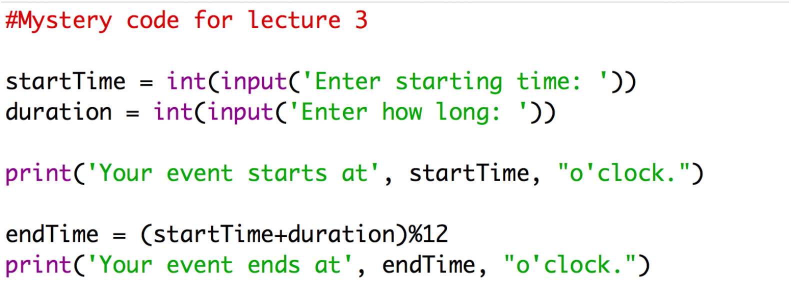
Arithmetic

Some arithmetic operators in Python:

- Addition: `sum = sum + 3`
- Subtraction: `deb = deb - 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*
- Exponentiaion:
  `pop = 2**time`

Challenge:

What does this code do?



```
#Mystery code for lecture 3

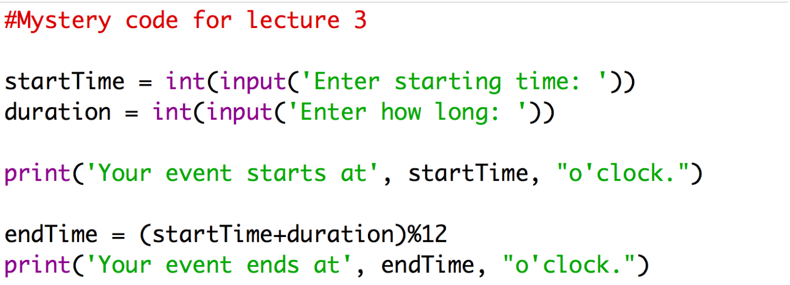
startTime = int(input('Enter starting time: '))
duration = int(input('Enter how long: '))

print('Your event starts at', startTime, "o'clock.")

endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

Challenge:

What does this code do?



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endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```
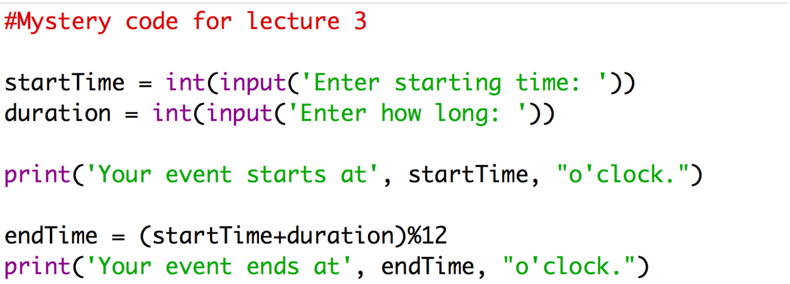

In particular, what is printed...

- If the user enters, 9 and 2.

Challenge:

What does this code do?



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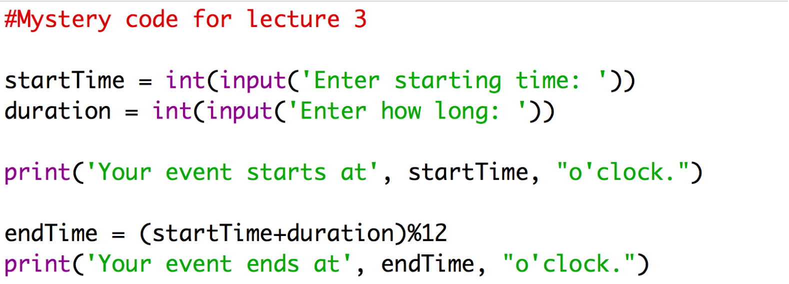
```

In particular, what is printed...

- If the user enters, 9 and 2.
- If the user enters, 12 and 4.

Challenge:

What does this code do?



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duration = int(input('Enter how long: '))

print('Your event starts at', startTime, "o'clock.")

endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```
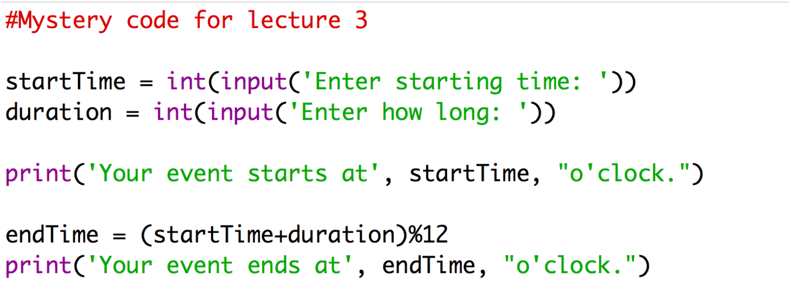

In particular, what is printed...

- If the user enters, 9 and 2.
- If the user enters, 12 and 4.
- If the user enters, 8 and 20.

Challenge:

What does this code do?



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duration = int(input('Enter how long: '))

print('Your event starts at', startTime, "o'clock.")

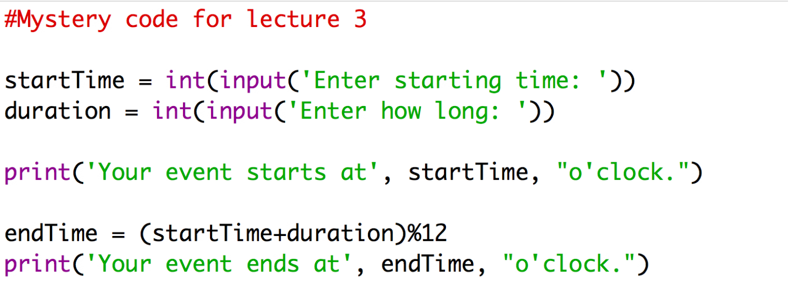
endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

In particular, what is printed...

- If the user enters, 9 and 2.
- If the user enters, 12 and 4.
- If the user enters, 8 and 20.
- If the user enters, 11 and 1.

Challenge:

What does this code do?



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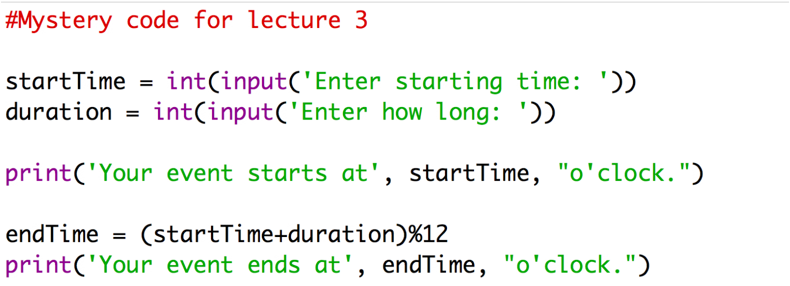

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print('Your event starts at', startTime, "o'clock.")

endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

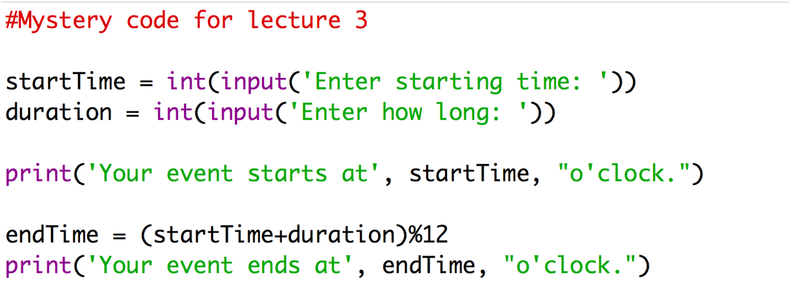
In particular, what is printed...

- If the user enters, 9 and 2.

```
Enter starting time: 9
Enter how long: 2
Your event starts at 9 o'clock.
Your event ends at 11 o'clock.
```

Challenge:

What does this code do?



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print('Your event starts at', startTime, "o'clock.")

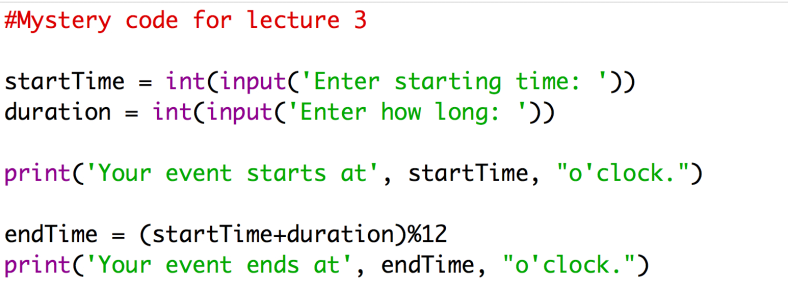
endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

In particular, what is printed...

- If the user enters, 12 and 4.

Challenge:

What does this code do?



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startTime = int(input('Enter starting time: '))
duration = int(input('Enter how long: '))

print('Your event starts at', startTime, "o'clock.")

endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

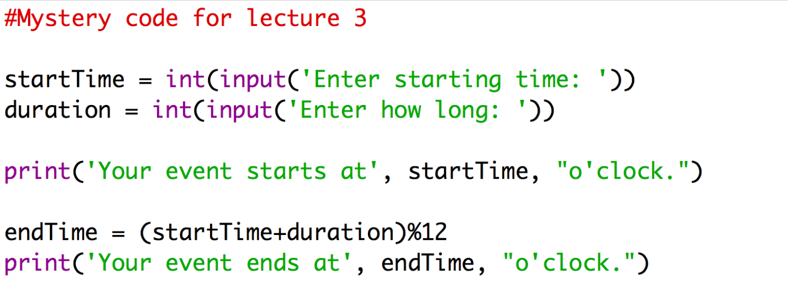
In particular, what is printed...

- If the user enters, 12 and 4.

```
Enter starting time: 12
Enter how long: 4
Your event starts at 12 o'clock.
Your event ends at 4 o'clock.
```

Challenge:

What does this code do?



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duration = int(input('Enter how long: '))

print('Your event starts at', startTime, "o'clock.")

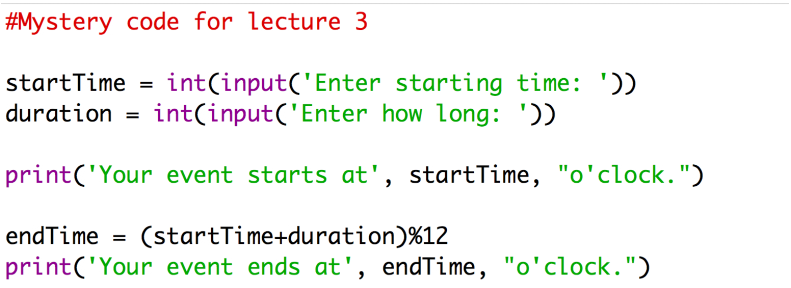
endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

In particular, what is printed...

- If the user enters, 8 and 20.

Challenge:

What does this code do?



```
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startTime = int(input('Enter starting time: '))
duration = int(input('Enter how long: '))

print('Your event starts at', startTime, "o'clock.")

endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

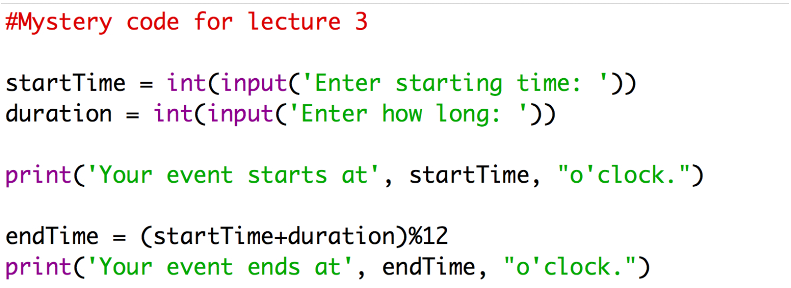
In particular, what is printed...

- If the user enters, 8 and 20.

```
Enter starting time: 8
Enter how long: 20
Your event starts at 8 o'clock.
Your event ends at 4 o'clock.
```

Challenge:

What does this code do?



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```
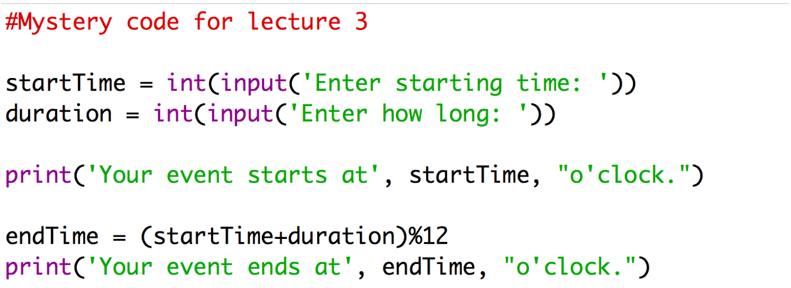

In particular, what is printed...

- If the user enters, 11 and 1.

Challenge:

What does this code do?



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print('Your event starts at', startTime, "o'clock.")

endTime = (startTime+duration)%12
print('Your event ends at', endTime, "o'clock.")
```

In particular, what is printed...

- If the user enters, 11 and 1.

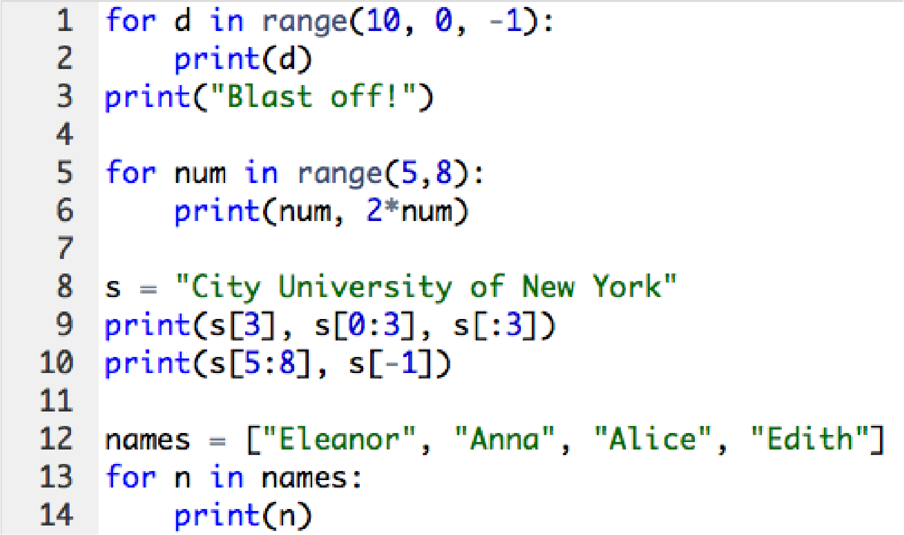
```
Enter starting time: 11
Enter how long: 1
Your event starts at 11 o'clock.
Your event ends at 0 o'clock.
```

Today's Topics

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

Challenge:

Mostly review:



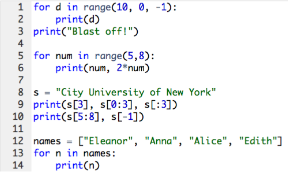
```
for d in range(10, 0, -1):
    print(d)
print("Blast off!")

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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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)
```

(Demo with `pythonTutor`)

Review: `range()`

The three versions:

Review: range()

The three versions:

- range(stop)

Review: `range()`

The three versions:

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

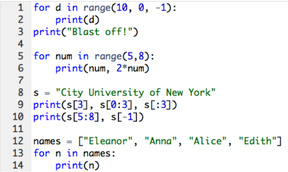
Review: `range()`

The three versions:

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

Slices

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



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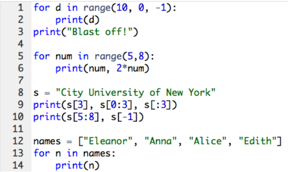
s = "City University of New York"
print(s[3], s[0:3], s[:3])
print(s[5:8], s[-1])

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

Slices



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s = "City University of New York"
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names = ["Eleanor", "Anna", "Alice", "Edith"]
for n in names:
    print(n)
```
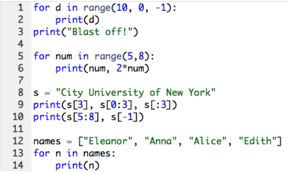

- Similar to `range()`, you can take portions or **slices** of lists and strings:

  `s[5:8]`

  gives: `"Uni"`

Slices



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

s = "City University of New York"
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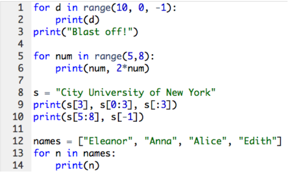
names = ["Eleanor", "Anna", "Alice", "Edith"]
for n in names:
    print(n)
```

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

  `s[5:8]`

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

Slices



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

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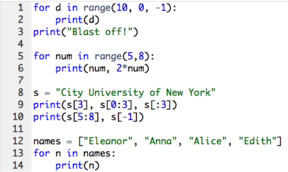
  gives: `"Uni"`

- Also works for lists:

  `names[1:3]`

Slices



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

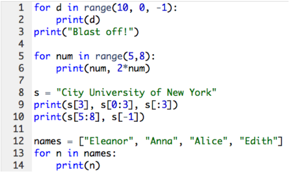
  `s[5:8]`

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

  `names[1:3]`

  gives: `["Anna", "Alice"]`

Slices



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```

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

  `s[5:8]`

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

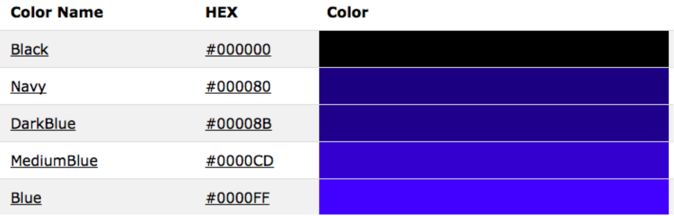
  `names[1:3]`

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

Today's Topics

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

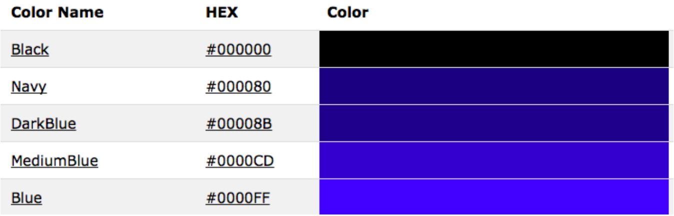
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by name.

Colors



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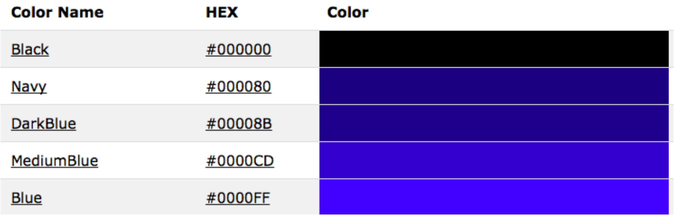
- Can specify by name.
- Can specify by numbers:

Colors



Color Name	HEX	Color
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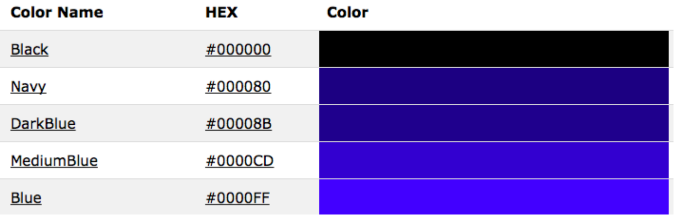
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by name.
- Can specify by numbers:
  - Amount of Red, Green, and Blue (RGB).

Colors



Color Name	HEX	Color
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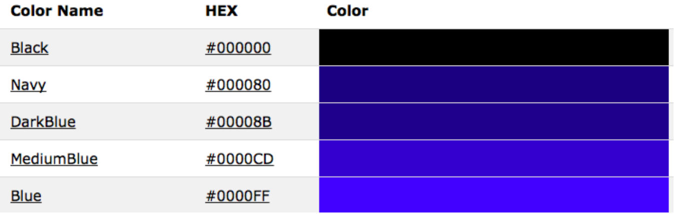
- Can specify by name.
- Can specify by numbers:
  - Amount of Red, Green, and Blue (RGB).
  - Adding light, not paint:

Colors



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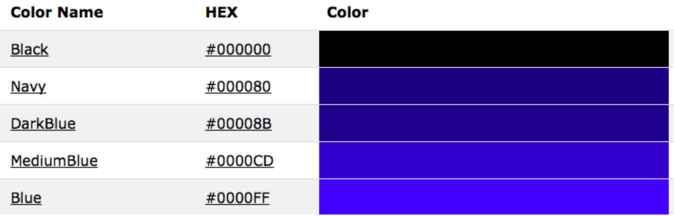
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by name.
- Can specify by numbers:
  - Amount of Red, Green, and Blue (RGB).
  - Adding light, not paint:
    - Black: 0% red, 0% green, 0% blue

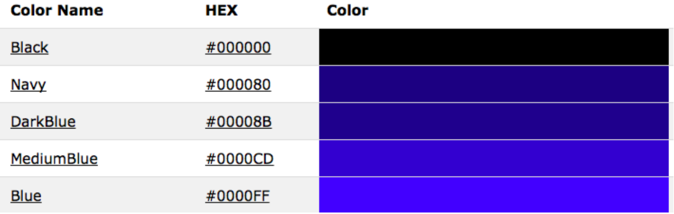
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by name.
- Can specify by numbers:
  - Amount of Red, Green, and Blue (RGB).
  - Adding light, not paint:
    - Black: 0% red, 0% green, 0% blue
    - White: 100% red, 100% green, 100% blue

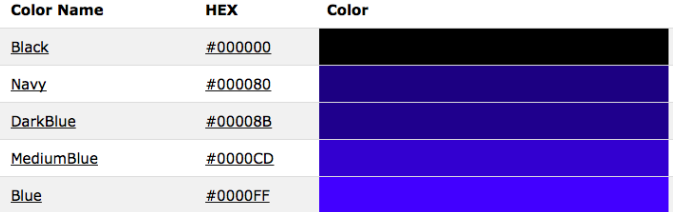
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):

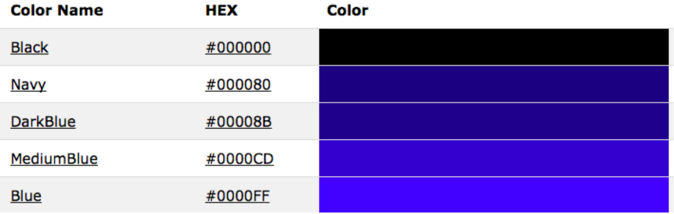
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:

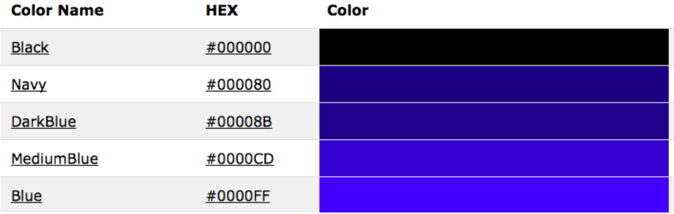
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:
    e.g. `(1.0, 0, 0)` is 100% red, no green, and no blue.

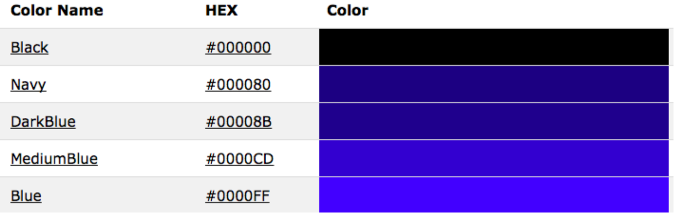
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:
    e.g. `(1.0, 0, 0)` is 100% red, no green, and no blue.
  - 8-bit colors: numbers from 0 to 255:

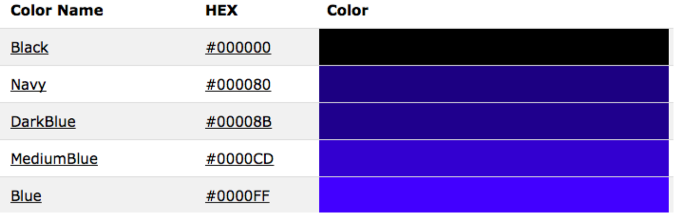
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:
    e.g. `(1.0, 0, 0)` is 100% red, no green, and no blue.
  - 8-bit colors: numbers from 0 to 255:
    e.g. `(0, 255, 0)` is no red, 100% green, and no blue.

Colors

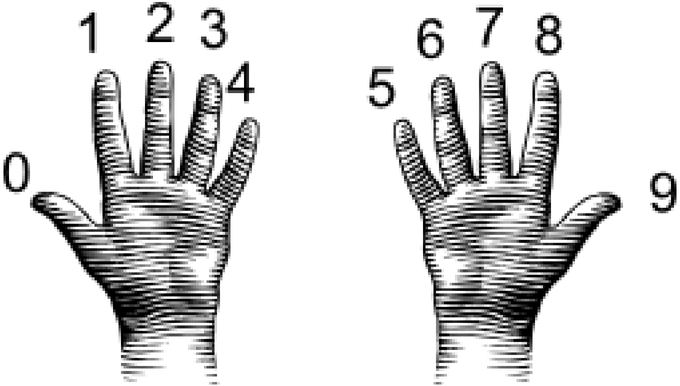


Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:
    e.g. `(1.0, 0, 0)` is 100% red, no green, and no blue.
  - 8-bit colors: numbers from 0 to 255:
    e.g. `(0, 255, 0)` is no red, 100% green, and no blue.
  - Hexcodes (base-16 numbers)...

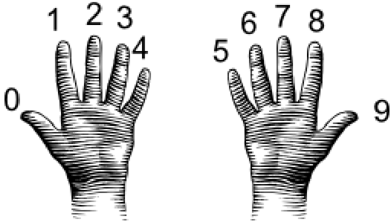
Decimal & Hexadecimal Numbers

Counting with 10 digits:



(from i-programmer.info)

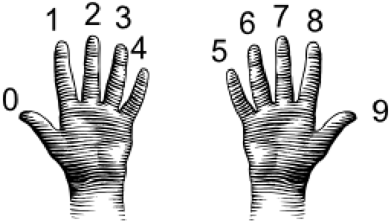
Decimal



(from i-programmer.info)

Decimal

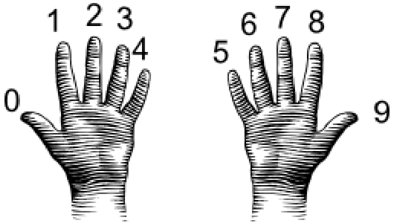
00 01 02 03 04 05 06 07 08 09



(from i-programmer.info)

Decimal

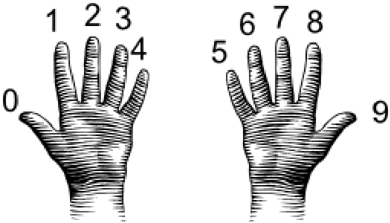
```
00 01 02 03 04 05 06 07 08 09
10 11 12 13 14 15 16 17 18 19
```



(from i-programmer.info)

Decimal

```
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
```



(from i-programmer.info)

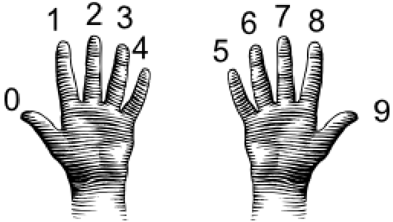
Decimal

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

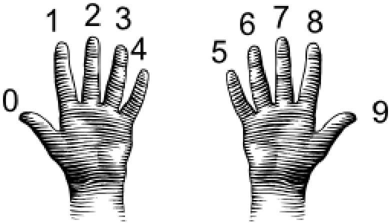
30 31 32 33 34 35 36 37 38 39



(from i-programmer.info)

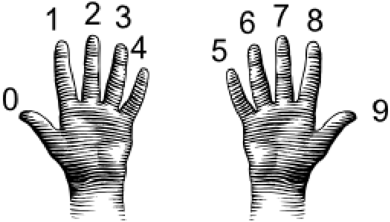
Decimal

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



(from i-programmer.info)

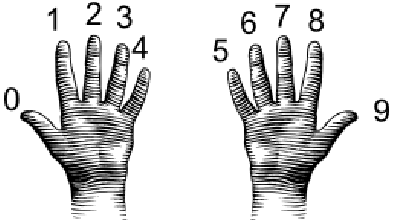
Decimal



(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

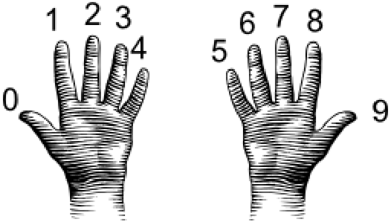
Decimal



(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

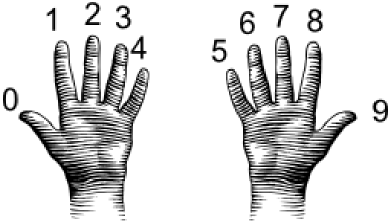
Decimal



(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

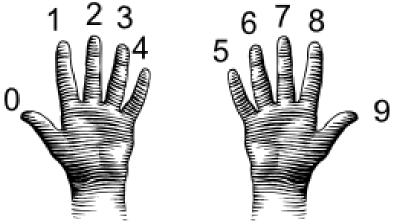
Decimal



(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

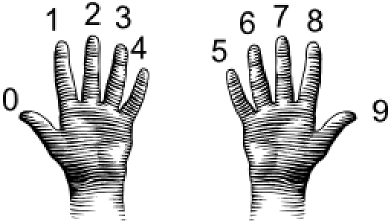
Decimal



(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

Decimal



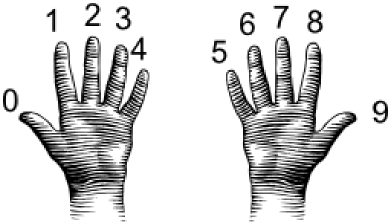
(from i-programmer.info)

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

Decimal



(from i-programmer.info)

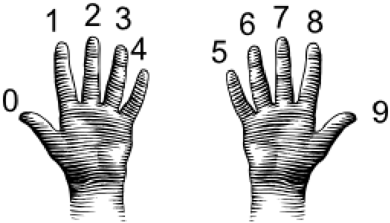
00	01	02	03	04	05	06	07	08	09
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

$$10^1 + 10^0$$

Max Number = 99

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

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

$$10^1 + 10^0$$

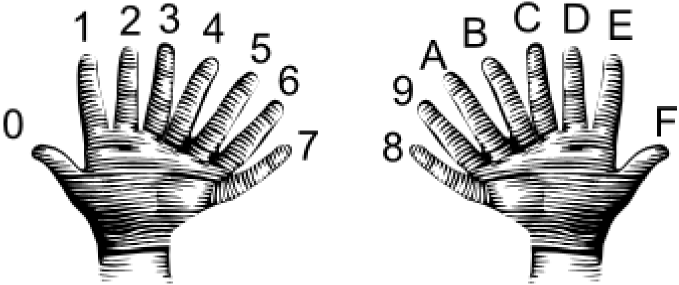
Max Number = 99

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

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

Decimal & Hexadecimal Numbers

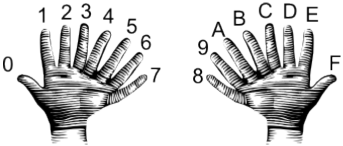
Counting with 16 digits:



(from i-programmer.info)

Hexadecimal

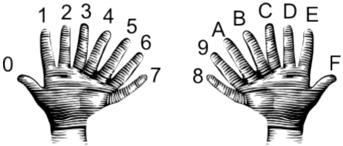
```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
```



(from i-programmer.info)

Hexadecimal

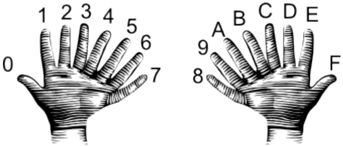
```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
```



(from i-programmer.info)

Hexadecimal

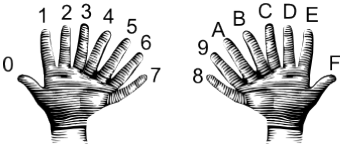
```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
```



(from i-programmer.info)

Hexadecimal

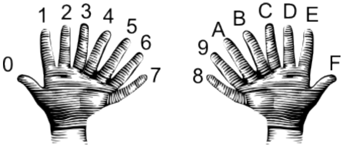
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F



(from i-programmer.info)

Hexadecimal

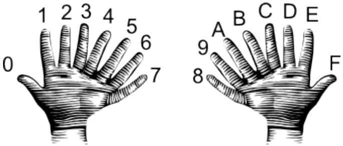
```
00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F
30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F
40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
```



(from i-programmer.info)

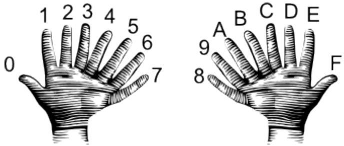
Hexadecimal

```
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
```



(from i-programmer.info)

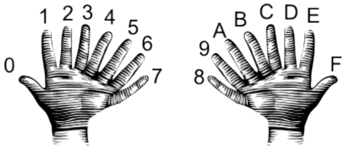
Hexadecimal



(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
```

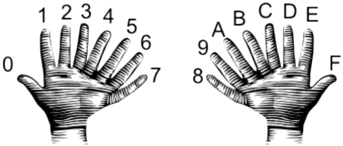
Hexadecimal



(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
```

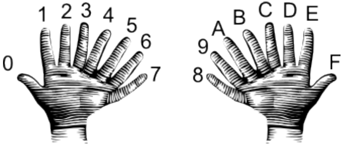
Hexadecimal



(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
```

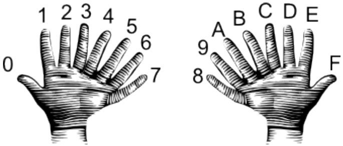
Hexadecimal



(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

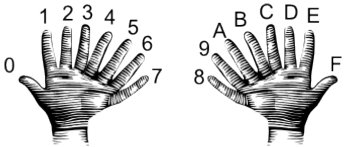
Hexadecimal



(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
```

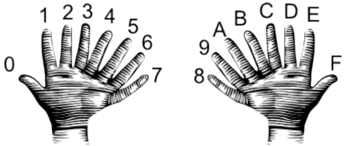
Hexadecimal



(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
```

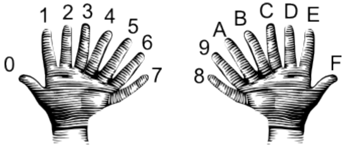
Hexadecimal



(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

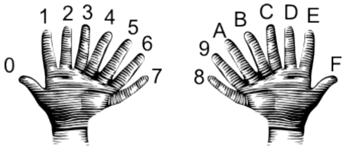
Hexadecimal



(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
```

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
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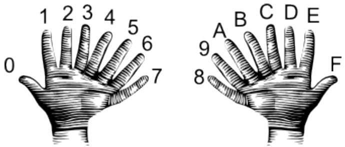
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D1	D2	D3	D4	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

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
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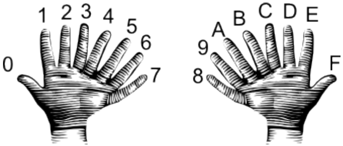
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F
90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D1	D2	D3	D4	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

Hexadecimal



(from i-programmer.info)

00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
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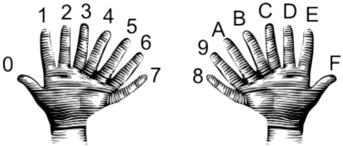
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF

$16^1 + 16^0$

Hexadecimal



(from i-programmer.info)

00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
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20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
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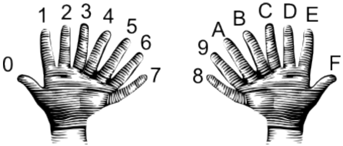
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF

$16^1 + 16^0$

Max Number = 255

Hexadecimal



(from i-programmer.info)

00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
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20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
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40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
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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

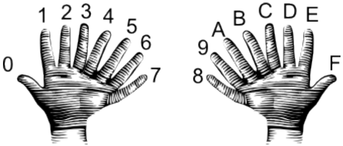
$16^1 + 16^0$

Max Number = 255

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

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

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
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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

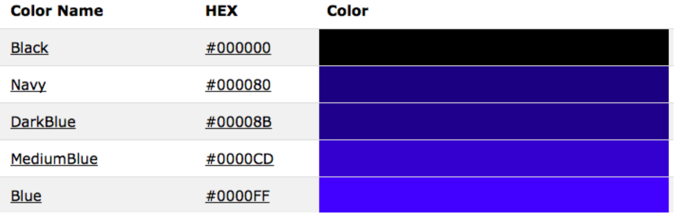
$$F0 = (F * 16^1) + (0 * 16^0)$$

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

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

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

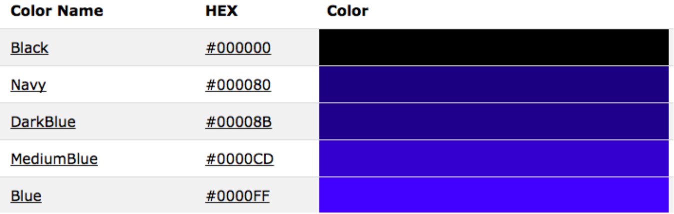
Colors



Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:
    e.g. `(1.0, 0, 0)` is 100% red, no green, and no blue.
  - 8-bit colors: numbers from 0 to 255:
    e.g. `(0, 255, 0)` is no red, 100% green, and no blue.
  - Hexcodes (base-16 numbers):

Colors

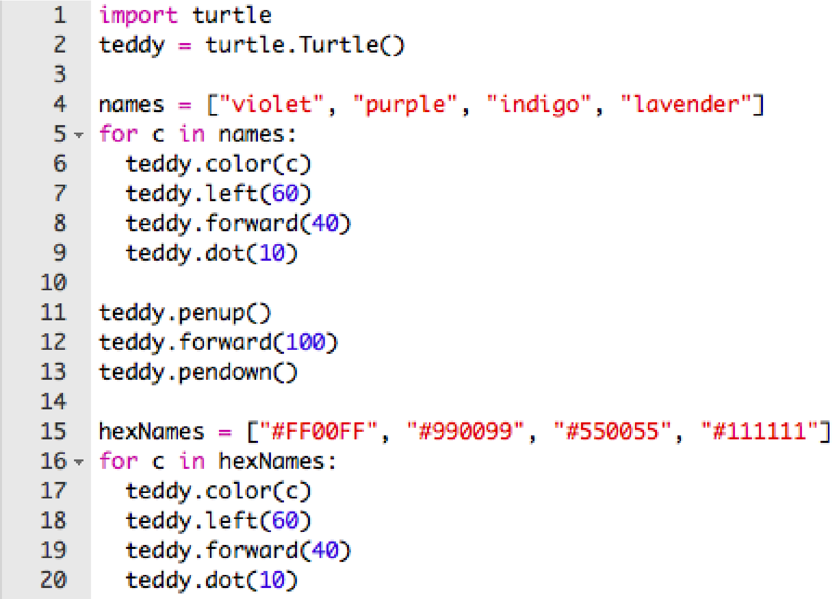


Color Name	HEX	Color
Black	#000000	⬛
Navy	#000080	🟦
DarkBlue	#00008B	🟦
MediumBlue	#0000CD	🟦
Blue	#0000FF	🟦

- Can specify by numbers (RGB):
  - Fractions of each:
    e.g. `(1.0, 0, 0)` is 100% red, no green, and no blue.
  - 8-bit colors: numbers from 0 to 255:
    e.g. `(0, 255, 0)` is no red, 100% green, and no blue.
  - Hexcodes (base-16 numbers):
    e.g. `#0000FF` is no red, no green, and 100% blue.

Challenge:

Some review and some novel challenges:



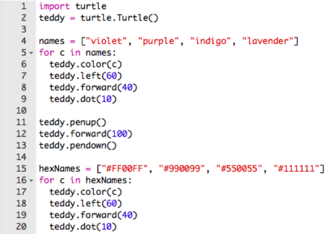
```python
import turtle
teddy = turtle.Turtle()

names = ["violet", "purple", "indigo", "lavender"]
for c in names:
  teddy.color(c)
  teddy.left(60)
  teddy.forward(40)
  teddy.dot(10)

teddy.penup()
teddy.forward(100)
teddy.pendown()

hexNames = ["#FF00FF", "#990099", "#550055", "#111111"]
for c in hexNames:
  teddy.color(c)
  teddy.left(60)
  teddy.forward(40)
  teddy.dot(10)
```

Trinkets



```
import turtle
teddy = turtle.Turtle()

names = ["violet", "purple", "indigo", "lavender"]
for c in names:
  teddy.color(c)
  teddy.left(60)
  teddy.forward(40)
  teddy.dot(10)

teddy.penup()
teddy.forward(100)
teddy.pendown()

hexNames = ["#FF00FF", "#990099", "#550055", "#111111"]
for c in hexNames:
  teddy.color(c)
  teddy.left(60)
  teddy.forward(40)
  teddy.dot(10)
```

(Demo with `trinkets`)

Recap

- In Python, we introduced:

Recap

- In Python, we introduced:
  - Indexing and Slicing Lists

Recap

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

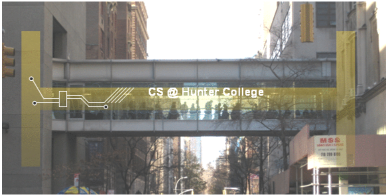
Recap

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

Recap

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

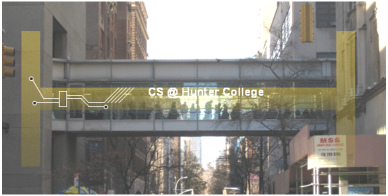
Class Reminders!



Before next class, don't forget to:

- Review this week's Lab

Class Reminders!



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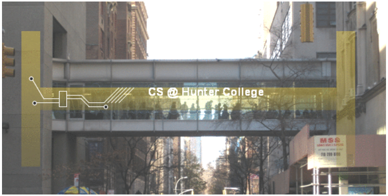
Class Reminders!



Before next class, don't forget to:

- Review this week's Lab
- Take the Lab Quiz on Gradescope by 6pm on today
- Submit this class's 5 programming assignments (programs 6-15)