

# CSci 127: Introduction to Computer Science



[hunter.cuny.edu/csci](http://hunter.cuny.edu/csci)

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- Today is the last day to submit the first program ('Hello, World!') to Gradescope.
- Last day to submit in-class Quiz 1 is tomorrow (9/7)!

# Frequently Asked Questions

From lecture slips & recitation sections.

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*Wednesday, 20 December, 9-11am.*

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- Can I submit late homework?

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*No. Instead we drop the 5 lowest grades.*

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If you will miss  $\geq 3$  weeks ( $> 20\%$  of class), see us about taking a future term.*

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*It's great practice to explain technical work to others.*

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- Can I work ahead?



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*Yes! All programs are available, on gradescope, 3 weeks before the deadline.*

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*This is Pathways, but we hope that you will be a CS major/minor.*

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*Yes! All programs are available, on gradescope, 3 weeks before the deadline.*
- You said “when you take second semester...” I just took this class for Pathways...  
*This is Pathways, but we hope that you will be a CS major/minor.*
- We also hope: “Get your education don't forget whence you came...”

# Today's Topics



- For-loops
- `range()`
- Variables: ints and strings
- Lists

# In Pairs or Triples...

*Some review and some novel challenges:*

```
1 #Predict what will be printed:
2
3 for i in range(4):
4     print('The world turned upside down')
5
6 for j in [0,1,2,3,4,5]:
7     print(j)
8
9 for count in range(6):
10    print(count)
11
12 for color in ['red', 'green', 'blue']:
13    print(color)
14
15 print()
16 print()
17
18 for i in range(2):
19     for j in range(2):
20         print('Look around,')
21     print('How lucky we are to be alive!')
```

# Python Tutor

```
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(Demo with pythonTutor)

# Variables

- A **variable** is a reserved memory location for storing a value.





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  - ▶ **list**: a sequence of items

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- Different kinds, or **types**, of values need different amounts of space:
  - ▶ **int**: integer or whole numbers
  - ▶ **float**: floating point or real numbers
  - ▶ **string**: sequence of characters
  - ▶ **list**: a sequence of items
  - ▶ **class variables**: for complex objects, like turtles.

# Variable Names

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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.

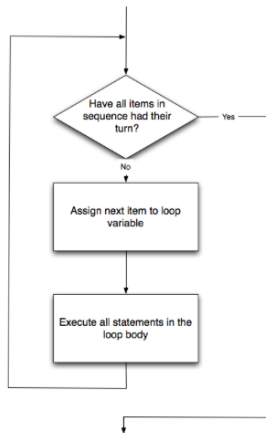


# Variable Names



- There's some rules about valid names for variables.
- 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.

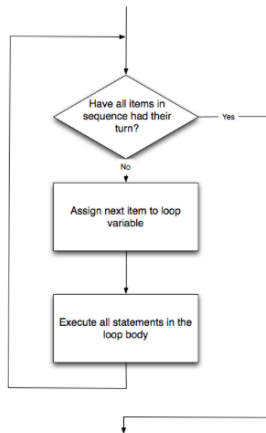
# for-loop



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

*How to Think Like CS, §4.5*

# for-loop



*How to Think Like CS, §4.5*

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

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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3 for num in [2,4,6,8,10]:
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5
6 sum = 0
7 for x in range(0,12,2):
8     print(x)
9     sum = sum + x
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11 print(x)
12
13 for c in "ABCD":
14     print(c)
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# range()

Simplest version:

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# range()

Simplest version:

- range(stop)

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Simplest version:

- `range(stop)`
- Produces a list: `[0,1,2,3,...,stop-1]`



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```

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()

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1 #Predict what will be printed:
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3 for num in [2,4,6,8,10]:
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13 for c in "ABCD":
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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:

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What if you wanted to start somewhere else:

- range(start, stop)

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What if you wanted to start somewhere else:

- `range(start, stop)`
- Produces a list:  
`[start, start+1, ..., stop-1]`

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# 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:

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# 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)`

```
1 #Predict what will be printed:
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3 for num in [2,4,6,8,10]:
4     print(num)
5
6 sum = 0
7 for x in range(0,12,2):
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What if you wanted to count by twos, or some other number:

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# range()

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)

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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:

```
1 #Predict what will be printed:
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3 for num in [2,4,6,8,10]:
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7 for x in range(0,12,2):
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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)`

```
1 #Predict what will be printed:
2
3 for num in [2,4,6,8,10]:
4     print(num)
5
6 sum = 0
7 for x in range(0,12,2):
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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)

# In Pairs or Triples...

*Some review and some novel challenges:*

```
1 #Predict what will be printed:
2
3 for c in range(65,90):
4     print(chr(c))
5
6 message = "I love Python"
7 newMessage = ""
8 for c in message:
9     print(ord(c))    #Print the Unicode of each number
10    print(chr(ord(c)+1))    #Print the next character
11    newMessage = newMessage + chr(ord(c)+1) #add to the new message
12 print("The coded message is", newMessage)
13
14 word = "zebra"
15 codedWord = ""
16 for ch in word:
17     offset = ord(ch) - ord('a') + 1 #how many letters past 'a'
18     wrap = offset % 26 #if larger than 26, wrap back to 0
19     newChar = chr(ord('a') + wrap) #compute the new letter
20     print(wrap, chr(ord('a') + wrap))    #print the wrap & new lett
21     codedWord = codedWord + newChar #add the newChar to the coded w
22
23 print("The coded word (with wrap) is", codedWord)
```



# Python Tutor

```
1 #Predict what will be printed:
2
3 for c in range(65,90):
4     print(chr(c))
5
6 message = "I love Python"
7 newMessage = ""
8 for c in message:
9     print(ord(c))    #Print the Unicode of each number
10    print(chr(ord(c)+1))    #Print the next character
11    newMessage = newMessage + chr(ord(c)+1) #Add to the new message
12 print("The coded message is", newMessage)
13
14 word = "zebra"
15 codedWord = ""
16 for ch in word:
17     offset = ord(ch) - ord('a') + 1 #how many letters past 'a'
18     wrap = offset % 26 #if larger than 26, wrap back to 0
19     newChar = chr(ord('a') + wrap) #compute the new letter
20     print(wrap, chr(ord('a') + wrap))    #Print the wrap & new lett
21     codedWord = codedWord + newChar #add the newChar to the coded w
22
23 print("The coded word (with wrap) is", codedWord)
```

(Demo with pythonTutor)

# Converting from Character to Code:

- `ord(c)`: returns Unicode (ASCII) of the character.

## ASCII TABLE

| Decimal | Hex Value | Decimal | Hex Value | Decimal | Hex Value | Decimal | Hex Value |
|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| 0       |           | 16      |           | 32      |           | 48      |           |
| 1       |           | 17      |           | 33      |           | 49      |           |
| 2       |           | 18      |           | 34      |           | 50      |           |
| 3       |           | 19      |           | 35      |           | 51      |           |
| 4       |           | 20      |           | 36      |           | 52      |           |
| 5       |           | 21      |           | 37      |           | 53      |           |
| 6       |           | 22      |           | 38      |           | 54      |           |
| 7       |           | 23      |           | 39      |           | 55      |           |
| 8       |           | 24      |           | 40      |           | 56      |           |
| 9       |           | 25      |           | 41      |           | 57      |           |
| 10      |           | 26      |           | 42      |           | 58      |           |
| 11      |           | 27      |           | 43      |           | 59      |           |
| 12      |           | 28      |           | 44      |           | 60      |           |
| 13      |           | 29      |           | 45      |           | 61      |           |
| 14      |           | 30      |           | 46      |           | 62      |           |
| 15      |           | 31      |           | 47      |           | 63      |           |
| 16      |           | 32      |           | 48      |           | 64      |           |
| 17      |           | 33      |           | 49      |           | 65      | A         |
| 18      |           | 34      |           | 50      |           | 66      | B         |
| 19      |           | 35      |           | 51      |           | 67      | C         |
| 20      |           | 36      |           | 52      |           | 68      | D         |
| 21      |           | 37      |           | 53      |           | 69      | E         |
| 22      |           | 38      |           | 54      |           | 70      | F         |
| 23      |           | 39      |           | 55      |           | 71      |           |
| 24      |           | 40      |           | 56      |           | 72      |           |
| 25      |           | 41      |           | 57      |           | 73      |           |
| 26      |           | 42      |           | 58      |           | 74      |           |
| 27      |           | 43      |           | 59      |           | 75      |           |
| 28      |           | 44      |           | 60      |           | 76      |           |
| 29      |           | 45      |           | 61      |           | 77      |           |
| 30      |           | 46      |           | 62      |           | 78      |           |
| 31      |           | 47      |           | 63      |           | 79      |           |
| 32      |           | 48      |           | 64      |           | 80      |           |
| 33      |           | 49      |           | 65      |           | 81      |           |
| 34      |           | 50      |           | 66      |           | 82      |           |
| 35      |           | 51      |           | 67      |           | 83      |           |
| 36      |           | 52      |           | 68      |           | 84      |           |
| 37      |           | 53      |           | 69      |           | 85      |           |
| 38      |           | 54      |           | 70      |           | 86      |           |
| 39      |           | 55      |           | 71      |           | 87      |           |
| 40      |           | 56      |           | 72      |           | 88      |           |
| 41      |           | 57      |           | 73      |           | 89      |           |
| 42      |           | 58      |           | 74      |           | 90      |           |
| 43      |           | 59      |           | 75      |           | 91      | [         |
| 44      |           | 60      |           | 76      |           | 92      | ]         |
| 45      |           | 61      |           | 77      |           | 93      | ^         |
| 46      |           | 62      |           | 78      |           | 94      | _         |
| 47      |           | 63      |           | 79      |           | 95      | `         |
| 48      |           | 64      |           | 80      |           | 96      | a         |
| 49      |           | 65      |           | 81      |           | 97      | b         |
| 50      |           | 66      |           | 82      |           | 98      | c         |
| 51      |           | 67      |           | 83      |           | 99      | d         |
| 52      |           | 68      |           | 84      |           | 100     | e         |
| 53      |           | 69      |           | 85      |           | 101     | f         |
| 54      |           | 70      |           | 86      |           | 102     |           |
| 55      |           | 71      |           | 87      |           | 103     |           |
| 56      |           | 72      |           | 88      |           | 104     |           |
| 57      |           | 73      |           | 89      |           | 105     |           |
| 58      |           | 74      |           | 90      |           | 106     |           |
| 59      |           | 75      |           | 91      |           | 107     |           |
| 60      |           | 76      |           | 92      |           | 108     |           |
| 61      |           | 77      |           | 93      |           | 109     |           |
| 62      |           | 78      |           | 94      |           | 110     |           |
| 63      |           | 79      |           | 95      |           | 111     |           |
| 64      |           | 80      |           | 96      |           | 112     |           |
| 65      |           | 81      |           | 97      |           | 113     |           |
| 66      |           | 82      |           | 98      |           | 114     |           |
| 67      |           | 83      |           | 99      |           | 115     |           |
| 68      |           | 84      |           | 100     |           | 116     |           |
| 69      |           | 85      |           | 101     |           | 117     |           |
| 70      |           | 86      |           | 102     |           | 118     |           |
| 71      |           | 87      |           | 103     |           | 119     |           |
| 72      |           | 88      |           | 104     |           | 120     |           |
| 73      |           | 89      |           | 105     |           | 121     |           |
| 74      |           | 90      |           | 106     |           | 122     |           |
| 75      |           | 91      |           | 107     |           | 123     |           |
| 76      |           | 92      |           | 108     |           | 124     |           |
| 77      |           | 93      |           | 109     |           | 125     |           |
| 78      |           | 94      |           | 110     |           | 126     |           |
| 79      |           | 95      |           | 111     |           | 127     |           |
| 80      |           | 96      |           | 112     |           | 128     |           |
| 81      |           | 97      |           | 113     |           | 129     |           |
| 82      |           | 98      |           | 114     |           | 130     |           |
| 83      |           | 99      |           | 115     |           | 131     |           |
| 84      |           | 100     |           | 116     |           | 132     |           |
| 85      |           | 101     |           | 117     |           | 133     |           |
| 86      |           | 102     |           | 118     |           | 134     |           |
| 87      |           | 103     |           | 119     |           | 135     |           |
| 88      |           | 104     |           | 120     |           | 136     |           |
| 89      |           | 105     |           | 121     |           | 137     |           |
| 90      |           | 106     |           | 122     |           | 138     |           |
| 91      |           | 107     |           | 123     |           | 139     |           |
| 92      |           | 108     |           | 124     |           | 140     |           |
| 93      |           | 109     |           | 125     |           | 141     |           |
| 94      |           | 110     |           | 126     |           | 142     |           |
| 95      |           | 111     |           | 127     |           | 143     |           |
| 96      |           | 112     |           | 128     |           | 144     |           |
| 97      |           | 113     |           | 129     |           | 145     |           |
| 98      |           | 114     |           | 130     |           | 146     |           |
| 99      |           | 115     |           | 131     |           | 147     |           |
| 100     |           | 116     |           | 132     |           | 148     |           |
| 101     |           | 117     |           | 133     |           | 149     |           |
| 102     |           | 118     |           | 134     |           | 150     |           |
| 103     |           | 119     |           | 135     |           | 151     |           |
| 104     |           | 120     |           | 136     |           | 152     |           |
| 105     |           | 121     |           | 137     |           | 153     |           |
| 106     |           | 122     |           | 138     |           | 154     |           |
| 107     |           | 123     |           | 139     |           | 155     |           |
| 108     |           | 124     |           | 140     |           | 156     |           |
| 109     |           | 125     |           | 141     |           | 157     |           |
| 110     |           | 126     |           | 142     |           | 158     |           |
| 111     |           | 127     |           | 143     |           | 159     |           |
| 112     |           | 128     |           | 144     |           | 160     |           |
| 113     |           | 129     |           | 145     |           | 161     |           |
| 114     |           | 130     |           | 146     |           | 162     |           |
| 115     |           | 131     |           | 147     |           | 163     |           |
| 116     |           | 132     |           | 148     |           | 164     |           |
| 117     |           | 133     |           | 149     |           | 165     |           |
| 118     |           | 134     |           | 150     |           | 166     |           |
| 119     |           | 135     |           | 151     |           | 167     |           |
| 120     |           | 136     |           | 152     |           | 168     |           |
| 121     |           | 137     |           | 153     |           | 169     |           |
| 122     |           | 138     |           | 154     |           | 170     |           |
| 123     |           | 139     |           | 155     |           | 171     |           |
| 124     |           | 140     |           | 156     |           | 172     |           |
| 125     |           | 141     |           | 157     |           | 173     |           |
| 126     |           | 142     |           | 158     |           | 174     |           |
| 127     |           | 143     |           | 159     |           | 175     |           |
| 128     |           | 144     |           | 160     |           | 176     |           |
| 129     |           | 145     |           | 161     |           | 177     |           |
| 130     |           | 146     |           | 162     |           | 178     |           |
| 131     |           | 147     |           | 163     |           | 179     |           |
| 132     |           | 148     |           | 164     |           | 180     |           |
| 133     |           | 149     |           | 165     |           | 181     |           |
| 134     |           | 150     |           | 166     |           | 182     |           |
| 135     |           | 151     |           | 167     |           | 183     |           |
| 136     |           | 152     |           | 168     |           | 184     |           |
| 137     |           | 153     |           | 169     |           | 185     |           |
| 138     |           | 154     |           | 170     |           | 186     |           |
| 139     |           | 155     |           | 171     |           | 187     |           |
| 140     |           | 156     |           | 172     |           | 188     |           |
| 141     |           | 157     |           | 173     |           | 189     |           |
| 142     |           | 158     |           | 174     |           | 190     |           |
| 143     |           | 159     |           | 175     |           | 191     |           |
| 144     |           | 160     |           | 176     |           | 192     |           |
| 145     |           | 161     |           | 177     |           | 193     |           |
| 146     |           | 162     |           | 178     |           | 194     |           |
| 147     |           | 163     |           | 179     |           | 195     |           |
| 148     |           | 164     |           | 180     |           | 196     |           |
| 149     |           | 165     |           | 181     |           | 197     |           |
| 150     |           | 166     |           | 182     |           | 198     |           |
| 151     |           | 167     |           | 183     |           | 199     |           |
| 152     |           | 168     |           | 184     |           | 200     |           |
| 153     |           | 169     |           | 185     |           | 201     |           |
| 154     |           | 170     |           | 186     |           | 202     |           |
| 155     |           | 171     |           | 187     |           | 203     |           |
| 156     |           | 172     |           | 188     |           | 204     |           |
| 157     |           | 173     |           | 189     |           | 205     |           |
| 158     |           | 174     |           | 190     |           | 206     |           |
| 159     |           | 175     |           | 191     |           | 207     |           |
| 160     |           | 176     |           | 192     |           | 208     |           |
| 161     |           | 177     |           | 193     |           | 209     |           |
| 162     |           | 178     |           | 194     |           | 210     |           |
| 163     |           | 179     |           | 195     |           | 211     |           |
| 164     |           | 180     |           | 196     |           | 212     |           |
| 165     |           | 181     |           | 197     |           | 213     |           |
| 166     |           | 182     |           | 198     |           | 214     |           |
| 167     |           | 183     |           | 199     |           | 215     |           |
| 168     |           | 184     |           | 200     |           | 216     |           |
| 169     |           | 185     |           | 201     |           | 217     |           |
| 170     |           | 186     |           | 202     |           | 218     |           |
| 171     |           | 187     |           | 203     |           | 219     |           |
| 172     |           | 188     |           | 204     |           | 220     |           |
| 173     |           | 189     |           | 205     |           | 221     |           |
| 174     |           | 190     |           | 206     |           | 222     |           |
| 175     |           | 191     |           | 207     |           | 223     |           |
| 176     |           | 192     |           | 208     |           | 224     |           |
| 177     |           | 193     |           | 209     |           | 225     |           |
| 178     |           | 194     |           | 210     |           | 226     |           |
| 179     |           | 195     |           | 211     |           | 227     |           |
| 180     |           | 196     |           | 212     |           | 228     |           |
| 181     |           | 197     |           | 213     |           | 229     |           |
| 182     |           | 198     |           | 214     |           | 230     |           |
| 183     |           | 199     |           | 215     |           | 231     |           |
| 184     |           | 200     |           | 216     |           | 232     |           |
| 185     |           | 201     |           | 217     |           | 233     |           |
| 186     |           | 202     |           | 218     |           | 234     |           |
| 187     |           | 203     |           | 219     |           | 235     |           |
| 188     |           | 204     |           | 220     |           | 236     |           |
| 189     |           | 205     |           | 221     |           | 237     |           |
| 190     |           | 206     |           | 222     |           | 238     |           |
| 191     |           | 207     |           | 223     |           | 239     |           |
| 192     |           | 208     |           | 224     |           | 240     |           |
| 193     |           | 209     |           | 225     |           | 241     |           |
| 194     |           | 210     |           | 226     |           | 242     |           |
| 195     |           | 211     |           | 227     |           | 243     |           |
| 196     |           | 212     |           | 228     |           | 244     |           |
| 197     |           | 213     |           | 229     |           | 245     |           |
| 198     |           | 214     |           | 230     |           | 246     |           |
| 199     |           | 215     |           | 231     |           | 247     |           |
| 200     |           | 216     |           | 232     |           | 248     |           |
| 201     |           | 217     |           | 233     |           | 249     |           |
| 202     |           | 218     |           | 234     |           | 250     |           |
| 203     |           | 219     |           | 235     |           | 251     |           |
| 204     |           | 220     |           | 236     |           | 252     |           |
| 205     |           | 221     |           | 237     |           | 253     |           |
| 206     |           | 222     |           | 238     |           | 254     |           |
| 207     |           | 223     |           | 239     |           | 255     |           |
| 208     |           | 224     |           | 240     |           | 256     |           |
| 209     |           | 225     |           | 241     |           | 257     |           |
| 210     |           | 226     |           | 242     |           | 258     |           |
| 211     |           | 227     |           | 243     |           | 259     |           |
| 212     |           | 228     |           | 244     |           | 260     |           |
| 213     |           | 229     |           | 245     |           | 261     |           |
| 214     |           | 230     |           | 246     |           | 262     |           |
| 215     |           | 231     |           | 247     |           | 263     |           |
| 216     |           | 232     |           | 248     |           | 264     |           |
| 217     |           | 233     |           | 249     |           | 265     |           |
| 218     |           | 234     |           | 250     |           | 266     |           |
| 219     |           | 235     |           | 251     |           | 267     |           |
| 220     |           | 236     |           | 252     |           | 268     |           |
| 221     |           | 237     |           | 253     |           | 269     |           |
| 222     |           | 238     |           | 254     |           | 270     |           |
| 223     |           | 239     |           | 255     |           | 271     |           |
| 224     |           | 240     |           | 256     |           | 272     |           |
| 225     |           | 241     |           | 257     |           | 273     |           |
| 226     |           | 242     |           | 258     |           | 274     |           |
| 227     |           | 243     |           | 259     |           | 275     |           |
| 228     |           | 244     |           | 260     |           | 276     |           |
| 229     |           | 245     |           | 261     |           | 277     |           |
| 230     |           | 246     |           | 262     |           | 278     |           |
| 231     |           | 247     |           | 263     |           | 279     |           |
| 232     |           | 248     |           | 264     |           | 280     |           |
| 233     |           | 249     |           | 265     |           | 281     |           |
| 234     |           | 250     |           | 266     |           | 282     |           |
| 235     |           | 251     |           | 267     |           | 283     |           |
| 236     |           | 252     |           | 268     |           | 284     |           |
| 237     |           | 253     |           | 269     |           | 285     |           |
| 238     |           | 254     |           | 270     |           | 286     |           |
| 239     |           | 255     |           | 271     |           |         |           |

# Converting from Character to Code:

## ASCII TABLE

| Decimal | Hex Value | Character | Decimal | Hex Value | Character | Decimal | Hex Value | Character | Decimal | Hex Value | Character |
|---------|-----------|-----------|---------|-----------|-----------|---------|-----------|-----------|---------|-----------|-----------|
| 0       | 00        | NUL       | 1       | 01        | SOH       | 2       | 02        | STX       | 3       | 03        | ETX       |
| 4       | 04        | END       | 5       | 05        | ENQ       | 6       | 06        | ACK       | 7       | 07        | BEL       |
| 8       | 08        | BS        | 9       | 09        | HT        | 10      | 0A        | LF        | 11      | 0B        | VT        |
| 12      | 0C        | FF        | 13      | 0D        | CR        | 14      | 0E        | SO        | 15      | 0F        | SI        |
| 16      | 10        | DI        | 17      | 11        | DLE       | 18      | 12        | DC1       | 19      | 13        | DC2       |
| 20      | 14        | DC3       | 21      | 15        | DC4       | 22      | 16        | NAK       | 23      | 17        | SYN       |
| 24      | 18        | ETB       | 25      | 19        | CAN       | 26      | 1A        | EM        | 27      | 1B        | ESC       |
| 28      | 1C        | FS        | 29      | 1D        | GS        | 30      | 1E        | RS        | 31      | 1F        | US        |
| 32      | 20        | SP        | 33      | 21        | !         | 34      | 22        | "         | 35      | 23        | #         |
| 36      | 24        | \$        | 37      | 25        | %         | 38      | 26        | &         | 39      | 27        | '         |
| 40      | 28        | (         | 41      | 29        | )         | 42      | 2A        | *         | 43      | 2B        | +         |
| 44      | 2C        | ,         | 45      | 2D        | -         | 46      | 2E        | .         | 47      | 2F        | /         |
| 48      | 30        | 0         | 49      | 31        | 1         | 50      | 32        | 2         | 51      | 33        | 3         |
| 52      | 34        | 4         | 53      | 35        | 5         | 54      | 36        | 6         | 55      | 37        | 7         |
| 56      | 38        | 8         | 57      | 39        | 9         | 58      | 3A        | :         | 59      | 3B        | ;         |
| 60      | 3C        | <         | 61      | 3D        | =         | 62      | 3E        | >         | 63      | 3F        | ?         |
| 64      | 40        | @         | 65      | 41        | A         | 66      | 42        | B         | 67      | 43        | C         |
| 68      | 44        | D         | 69      | 45        | E         | 70      | 46        | F         | 71      | 47        | G         |
| 72      | 48        | H         | 73      | 49        | I         | 74      | 4A        | J         | 75      | 4B        | K         |
| 76      | 4C        | L         | 77      | 4D        | M         | 78      | 4E        | N         | 79      | 4F        | O         |
| 80      | 50        | P         | 81      | 51        | Q         | 82      | 52        | R         | 83      | 53        | S         |
| 84      | 54        | T         | 85      | 55        | U         | 86      | 56        | V         | 87      | 57        | W         |
| 88      | 58        | X         | 89      | 59        | Y         | 90      | 5A        | Z         | 91      | 5B        | [         |
| 92      | 5C        | \         | 93      | 5D        | ]         | 94      | 5E        | ^         | 95      | 5F        | _         |
| 96      | 60        | `         | 97      | 61        | a         | 98      | 62        | b         | 99      | 63        | c         |
| 100     | 64        | d         | 101     | 65        | e         | 102     | 66        | f         | 103     | 67        | g         |
| 104     | 68        | h         | 105     | 69        | i         | 106     | 6A        | j         | 107     | 6B        | k         |
| 108     | 6C        | l         | 109     | 6D        | m         | 110     | 6E        | n         | 111     | 6F        | o         |
| 112     | 70        | p         | 113     | 71        | q         | 114     | 72        | r         | 115     | 73        | s         |
| 116     | 74        | t         | 117     | 75        | u         | 118     | 76        | v         | 119     | 77        | w         |
| 120     | 78        | x         | 121     | 79        | y         | 122     | 7A        | z         | 123     | 7B        | {         |
| 124     | 7C        | }         | 125     | 7D        | ~         | 126     | 7E        | DEL       | 127     | 7F        | DEL       |

- `ord(c)`: returns Unicode (ASCII) of the character.
- Example: `ord('a')` returns 97.

# Converting from Character to Code:

**ASCII TABLE**

| Decimal | Hex Value | Decimal | Hex Value | Decimal | Hex Value | Decimal | Hex Value |
|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| 0       | 00        | 16      | 10        | 32      | 20        | 48      | 30        |
| 1       | 01        | 17      | 11        | 33      | 21        | 49      | 31        |
| 2       | 02        | 18      | 12        | 34      | 22        | 50      | 32        |
| 3       | 03        | 19      | 13        | 35      | 23        | 51      | 33        |
| 4       | 04        | 20      | 14        | 36      | 24        | 52      | 34        |
| 5       | 05        | 21      | 15        | 37      | 25        | 53      | 35        |
| 6       | 06        | 22      | 16        | 38      | 26        | 54      | 36        |
| 7       | 07        | 23      | 17        | 39      | 27        | 55      | 37        |
| 8       | 08        | 24      | 18        | 40      | 28        | 56      | 38        |
| 9       | 09        | 25      | 19        | 41      | 29        | 57      | 39        |
| 10      | 0A        | 26      | 1A        | 42      | 2A        | 58      | 3A        |
| 11      | 0B        | 27      | 1B        | 43      | 2B        | 59      | 3B        |
| 12      | 0C        | 28      | 1C        | 44      | 2C        | 60      | 3C        |
| 13      | 0D        | 29      | 1D        | 45      | 2D        | 61      | 3D        |
| 14      | 0E        | 30      | 1E        | 46      | 2E        | 62      | 3E        |
| 15      | 0F        | 31      | 1F        | 47      | 2F        | 63      | 3F        |
| 16      | 10        | 32      | 20        | 48      | 30        | 64      | 40        |
| 17      | 11        | 33      | 21        | 49      | 31        | 65      | 41        |
| 18      | 12        | 34      | 22        | 50      | 32        | 66      | 42        |
| 19      | 13        | 35      | 23        | 51      | 33        | 67      | 43        |
| 20      | 14        | 36      | 24        | 52      | 34        | 68      | 44        |
| 21      | 15        | 37      | 25        | 53      | 35        | 69      | 45        |
| 22      | 16        | 38      | 26        | 54      | 36        | 70      | 46        |
| 23      | 17        | 39      | 27        | 55      | 37        | 71      | 47        |
| 24      | 18        | 40      | 28        | 56      | 38        | 72      | 48        |
| 25      | 19        | 41      | 29        | 57      | 39        | 73      | 49        |
| 26      | 1A        | 42      | 2A        | 58      | 3A        | 74      | 4A        |
| 27      | 1B        | 43      | 2B        | 59      | 3B        | 75      | 4B        |
| 28      | 1C        | 44      | 2C        | 60      | 3C        | 76      | 4C        |
| 29      | 1D        | 45      | 2D        | 61      | 3D        | 77      | 4D        |
| 30      | 1E        | 46      | 2E        | 62      | 3E        | 78      | 4E        |
| 31      | 1F        | 47      | 2F        | 63      | 3F        | 79      | 4F        |
| 32      | 20        | 48      | 30        | 64      | 40        | 80      | 50        |
| 33      | 21        | 49      | 31        | 65      | 41        | 81      | 51        |
| 34      | 22        | 50      | 32        | 66      | 42        | 82      | 52        |
| 35      | 23        | 51      | 33        | 67      | 43        | 83      | 53        |
| 36      | 24        | 52      | 34        | 68      | 44        | 84      | 54        |
| 37      | 25        | 53      | 35        | 69      | 45        | 85      | 55        |
| 38      | 26        | 54      | 36        | 70      | 46        | 86      | 56        |
| 39      | 27        | 55      | 37        | 71      | 47        | 87      | 57        |
| 40      | 28        | 56      | 38        | 72      | 48        | 88      | 58        |
| 41      | 29        | 57      | 39        | 73      | 49        | 89      | 59        |
| 42      | 2A        | 58      | 3A        | 74      | 4A        | 90      | 5A        |
| 43      | 2B        | 59      | 3B        | 75      | 4B        | 91      | 5B        |
| 44      | 2C        | 60      | 3C        | 76      | 4C        | 92      | 5C        |
| 45      | 2D        | 61      | 3D        | 77      | 4D        | 93      | 5D        |
| 46      | 2E        | 62      | 3E        | 78      | 4E        | 94      | 5E        |
| 47      | 2F        | 63      | 3F        | 79      | 4F        | 95      | 5F        |
| 48      | 30        | 64      | 40        | 80      | 50        | 96      | 60        |
| 49      | 31        | 65      | 41        | 81      | 51        | 97      | 61        |
| 50      | 32        | 66      | 42        | 82      | 52        | 98      | 62        |
| 51      | 33        | 67      | 43        | 83      | 53        | 99      | 63        |
| 52      | 34        | 68      | 44        | 84      | 54        | 100     | 64        |
| 53      | 35        | 69      | 45        | 85      | 55        |         |           |
| 54      | 36        | 70      | 46        | 86      | 56        |         |           |
| 55      | 37        | 71      | 47        | 87      | 57        |         |           |
| 56      | 38        | 72      | 48        | 88      | 58        |         |           |
| 57      | 39        | 73      | 49        | 89      | 59        |         |           |
| 58      | 3A        | 74      | 4A        | 90      | 5A        |         |           |
| 59      | 3B        | 75      | 4B        | 91      | 5B        |         |           |
| 60      | 3C        | 76      | 4C        | 92      | 5C        |         |           |
| 61      | 3D        | 77      | 4D        | 93      | 5D        |         |           |
| 62      | 3E        | 78      | 4E        | 94      | 5E        |         |           |
| 63      | 3F        | 79      | 4F        | 95      | 5F        |         |           |
| 64      | 40        | 80      | 50        | 96      | 60        |         |           |
| 65      | 41        | 81      | 51        | 97      | 61        |         |           |
| 66      | 42        | 82      | 52        | 98      | 62        |         |           |
| 67      | 43        | 83      | 53        | 99      | 63        |         |           |
| 68      | 44        | 84      | 54        | 100     | 64        |         |           |
| 69      | 45        | 85      | 55        |         |           |         |           |
| 70      | 46        | 86      | 56        |         |           |         |           |
| 71      | 47        | 87      | 57        |         |           |         |           |
| 72      | 48        | 88      | 58        |         |           |         |           |
| 73      | 49        | 89      | 59        |         |           |         |           |
| 74      | 4A        | 90      | 5A        |         |           |         |           |
| 75      | 4B        | 91      | 5B        |         |           |         |           |
| 76      | 4C        | 92      | 5C        |         |           |         |           |
| 77      | 4D        | 93      | 5D        |         |           |         |           |
| 78      | 4E        | 94      | 5E        |         |           |         |           |
| 79      | 4F        | 95      | 5F        |         |           |         |           |
| 80      | 50        | 96      | 60        |         |           |         |           |
| 81      | 51        | 97      | 61        |         |           |         |           |
| 82      | 52        | 98      | 62        |         |           |         |           |
| 83      | 53        | 99      | 63        |         |           |         |           |
| 84      | 54        | 100     | 64        |         |           |         |           |
| 85      | 55        |         |           |         |           |         |           |
| 86      | 56        |         |           |         |           |         |           |
| 87      | 57        |         |           |         |           |         |           |
| 88      | 58        |         |           |         |           |         |           |
| 89      | 59        |         |           |         |           |         |           |
| 90      | 5A        |         |           |         |           |         |           |
| 91      | 5B        |         |           |         |           |         |           |
| 92      | 5C        |         |           |         |           |         |           |
| 93      | 5D        |         |           |         |           |         |           |
| 94      | 5E        |         |           |         |           |         |           |
| 95      | 5F        |         |           |         |           |         |           |
| 96      | 60        |         |           |         |           |         |           |
| 97      | 61        |         |           |         |           |         |           |
| 98      | 62        |         |           |         |           |         |           |
| 99      | 63        |         |           |         |           |         |           |
| 100     | 64        |         |           |         |           |         |           |

- `ord(c)`: returns Unicode (ASCII) of the character.
- Example: `ord('a')` returns 97.
- `chr(x)`: returns the character whose Unicode is x.

# Converting from Character to Code:

**ASCII TABLE**

| Decimal | Hex | Char    | Decimal | Hex | Char    | Decimal | Hex | Char    | Decimal | Hex | Char    |
|---------|-----|---------|---------|-----|---------|---------|-----|---------|---------|-----|---------|
| 0       | 00  |         | 16      | 10  | P       | 32      | 20  | [space] | 48      | 30  | 0       |
| 1       | 01  |         | 17      | 11  | Q       | 33      | 21  | !       | 49      | 31  | 1       |
| 2       | 02  |         | 18      | 12  | R       | 34      | 22  | "       | 50      | 32  | 2       |
| 3       | 03  |         | 19      | 13  | S       | 35      | 23  | \$      | 51      | 33  | 3       |
| 4       | 04  |         | 20      | 14  | T       | 36      | 24  | %       | 52      | 34  | 4       |
| 5       | 05  |         | 21      | 15  | U       | 37      | 25  | &       | 53      | 35  | 5       |
| 6       | 06  |         | 22      | 16  | V       | 38      | 26  | '       | 54      | 36  | 6       |
| 7       | 07  |         | 23      | 17  | W       | 39      | 27  | (       | 55      | 37  | 7       |
| 8       | 08  |         | 24      | 18  | X       | 40      | 28  | )       | 56      | 38  | 8       |
| 9       | 09  |         | 25      | 19  | Y       | 41      | 29  | *       | 57      | 39  | 9       |
| 10      | 0A  |         | 26      | 1A  | Z       | 42      | 2A  | +       | 58      | 3A  | .       |
| 11      | 0B  |         | 27      | 1B  | [       | 43      | 2B  | ,       | 59      | 3B  | ,       |
| 12      | 0C  |         | 28      | 1C  | \       | 44      | 2C  | -       | 60      | 3C  | <       |
| 13      | 0D  |         | 29      | 1D  | ]       | 45      | 2D  | _       | 61      | 3D  | =       |
| 14      | 0E  |         | 30      | 1E  | ^       | 46      | 2E  | `       | 62      | 3E  | >       |
| 15      | 0F  |         | 31      | 1F  | _       | 47      | 2F  | ~       | 63      | 3F  | ?       |
| 16      | 10  | @       | 32      | 20  | [space] | 48      | 30  | 0       | 64      | 40  | @       |
| 17      | 11  | A       | 33      | 21  | !       | 49      | 31  | 1       | 65      | 41  | A       |
| 18      | 12  | B       | 34      | 22  | "       | 50      | 32  | 2       | 66      | 42  | B       |
| 19      | 13  | C       | 35      | 23  | \$      | 51      | 33  | 3       | 67      | 43  | C       |
| 20      | 14  | D       | 36      | 24  | %       | 52      | 34  | 4       | 68      | 44  | D       |
| 21      | 15  | E       | 37      | 25  | &       | 53      | 35  | 5       | 69      | 45  | E       |
| 22      | 16  | F       | 38      | 26  | '       | 54      | 36  | 6       | 70      | 46  | F       |
| 23      | 17  | G       | 39      | 27  | (       | 55      | 37  | 7       | 71      | 47  | G       |
| 24      | 18  | H       | 40      | 28  | )       | 56      | 38  | 8       | 72      | 48  | H       |
| 25      | 19  | I       | 41      | 29  | *       | 57      | 39  | 9       | 73      | 49  | I       |
| 26      | 1A  | J       | 42      | 2A  | +       | 58      | 3A  | .       | 74      | 4A  | J       |
| 27      | 1B  | K       | 43      | 2B  | ,       | 59      | 3B  | ,       | 75      | 4B  | K       |
| 28      | 1C  | L       | 44      | 2C  | -       | 60      | 3C  | <       | 76      | 4C  | L       |
| 29      | 1D  | M       | 45      | 2D  | _       | 61      | 3D  | =       | 77      | 4D  | M       |
| 30      | 1E  | N       | 46      | 2E  | `       | 62      | 3E  | >       | 78      | 4E  | N       |
| 31      | 1F  | O       | 47      | 2F  | ~       | 63      | 3F  | ?       | 79      | 4F  | O       |
| 32      | 20  | [space] | 48      | 30  | 0       | 64      | 40  | @       | 80      | 50  | [space] |
| 33      | 21  | !       | 49      | 31  | 1       | 65      | 41  | A       | 81      | 51  | !       |
| 34      | 22  | "       | 50      | 32  | 2       | 66      | 42  | B       | 82      | 52  | "       |
| 35      | 23  | \$      | 51      | 33  | 3       | 67      | 43  | C       | 83      | 53  | \$      |
| 36      | 24  | %       | 52      | 34  | 4       | 68      | 44  | D       | 84      | 54  | %       |
| 37      | 25  | &       | 53      | 35  | 5       | 69      | 45  | E       | 85      | 55  | &       |
| 38      | 26  | '       | 54      | 36  | 6       | 70      | 46  | F       | 86      | 56  | '       |
| 39      | 27  | (       | 55      | 37  | 7       | 71      | 47  | G       | 87      | 57  | (       |
| 40      | 28  | )       | 56      | 38  | 8       | 72      | 48  | H       | 88      | 58  | )       |
| 41      | 29  | *       | 57      | 39  | 9       | 73      | 49  | I       | 89      | 59  | *       |
| 42      | 2A  | +       | 58      | 3A  | .       | 74      | 4A  | J       | 90      | 5A  | +       |
| 43      | 2B  | ,       | 59      | 3B  | ,       | 75      | 4B  | K       | 91      | 5B  | ,       |
| 44      | 2C  | -       | 60      | 3C  | <       | 76      | 4C  | L       | 92      | 5C  | -       |
| 45      | 2D  | _       | 61      | 3D  | =       | 77      | 4D  | M       | 93      | 5D  | _       |
| 46      | 2E  | `       | 62      | 3E  | >       | 78      | 4E  | N       | 94      | 5E  | `       |
| 47      | 2F  | ~       | 63      | 3F  | ?       | 79      | 4F  | O       | 95      | 5F  | ~       |
| 48      | 30  | 0       | 64      | 40  | @       | 80      | 50  | [space] | 96      | 60  | 0       |
| 49      | 31  | 1       | 65      | 41  | A       | 81      | 51  | !       | 97      | 61  | 1       |
| 50      | 32  | 2       | 66      | 42  | B       | 82      | 52  | "       | 98      | 62  | 2       |
| 51      | 33  | 3       | 67      | 43  | C       | 83      | 53  | \$      | 99      | 63  | 3       |
| 52      | 34  | 4       | 68      | 44  | D       | 84      | 54  | %       | 100     | 64  | 4       |
| 53      | 35  | 5       | 69      | 45  | E       | 85      | 55  | &       |         |     |         |
| 54      | 36  | 6       | 70      | 46  | F       | 86      | 56  | '       |         |     |         |
| 55      | 37  | 7       | 71      | 47  | G       | 87      | 57  | (       |         |     |         |
| 56      | 38  | 8       | 72      | 48  | H       | 88      | 58  | )       |         |     |         |
| 57      | 39  | 9       | 73      | 49  | I       | 89      | 59  | *       |         |     |         |
| 58      | 3A  | .       | 74      | 4A  | J       | 90      | 5A  | +       |         |     |         |
| 59      | 3B  | ,       | 75      | 4B  | K       | 91      | 5B  | ,       |         |     |         |
| 60      | 3C  | <       | 76      | 4C  | L       | 92      | 5C  | -       |         |     |         |
| 61      | 3D  | =       | 77      | 4D  | M       | 93      | 5D  | _       |         |     |         |
| 62      | 3E  | >       | 78      | 4E  | N       | 94      | 5E  | `       |         |     |         |
| 63      | 3F  | ?       | 79      | 4F  | O       | 95      | 5F  | ~       |         |     |         |
| 64      | 40  | @       | 80      | 50  | [space] | 96      | 60  | 0       |         |     |         |
| 65      | 41  | A       | 81      | 51  | !       | 97      | 61  | 1       |         |     |         |
| 66      | 42  | B       | 82      | 52  | "       | 98      | 62  | 2       |         |     |         |
| 67      | 43  | C       | 83      | 53  | \$      | 99      | 63  | 3       |         |     |         |
| 68      | 44  | D       | 84      | 54  | %       |         |     |         |         |     |         |
| 69      | 45  | E       | 85      | 55  | &       |         |     |         |         |     |         |
| 70      | 46  | F       | 86      | 56  | '       |         |     |         |         |     |         |
| 71      | 47  | G       | 87      | 57  | (       |         |     |         |         |     |         |
| 72      | 48  | H       | 88      | 58  | )       |         |     |         |         |     |         |
| 73      | 49  | I       | 89      | 59  | *       |         |     |         |         |     |         |
| 74      | 4A  | J       | 90      | 5A  | +       |         |     |         |         |     |         |
| 75      | 4B  | K       | 91      | 5B  | ,       |         |     |         |         |     |         |
| 76      | 4C  | L       | 92      | 5C  | -       |         |     |         |         |     |         |
| 77      | 4D  | M       | 93      | 5D  | _       |         |     |         |         |     |         |
| 78      | 4E  | N       | 94      | 5E  | `       |         |     |         |         |     |         |
| 79      | 4F  | O       | 95      | 5F  | ~       |         |     |         |         |     |         |
| 80      | 50  | [space] | 96      | 60  | 0       |         |     |         |         |     |         |
| 81      | 51  | !       | 97      | 61  | 1       |         |     |         |         |     |         |
| 82      | 52  | "       | 98      | 62  | 2       |         |     |         |         |     |         |
| 83      | 53  | \$      | 99      | 63  | 3       |         |     |         |         |     |         |
| 84      | 54  | %       |         |     |         |         |     |         |         |     |         |
| 85      | 55  | &       |         |     |         |         |     |         |         |     |         |
| 86      | 56  | '       |         |     |         |         |     |         |         |     |         |
| 87      | 57  | (       |         |     |         |         |     |         |         |     |         |
| 88      | 58  | )       |         |     |         |         |     |         |         |     |         |
| 89      | 59  | *       |         |     |         |         |     |         |         |     |         |
| 90      | 5A  | +       |         |     |         |         |     |         |         |     |         |
| 91      | 5B  | ,       |         |     |         |         |     |         |         |     |         |
| 92      | 5C  | -       |         |     |         |         |     |         |         |     |         |
| 93      | 5D  | _       |         |     |         |         |     |         |         |     |         |
| 94      | 5E  | `       |         |     |         |         |     |         |         |     |         |
| 95      | 5F  | ~       |         |     |         |         |     |         |         |     |         |
| 96      | 60  | 0       |         |     |         |         |     |         |         |     |         |
| 97      | 61  | 1       |         |     |         |         |     |         |         |     |         |
| 98      | 62  | 2       |         |     |         |         |     |         |         |     |         |
| 99      | 63  | 3       |         |     |         |         |     |         |         |     |         |
| 100     | 64  | 4       |         |     |         |         |     |         |         |     |         |

- `ord(c)`: returns Unicode (ASCII) of the character.
- Example: `ord('a')` returns 97.
- `chr(x)`: returns the character whose Unicode is x.
- Example: `chr(97)` returns 'a'.

# Converting from Character to Code:

**ASCII TABLE**

| Decimal | Hex | Char    | Decimal | Hex | Char    | Decimal | Hex | Char    | Decimal | Hex | Char    |
|---------|-----|---------|---------|-----|---------|---------|-----|---------|---------|-----|---------|
| 0       | 00  |         | 16      | 10  | P       | 32      | 20  | [space] | 48      | 30  | 0       |
| 1       | 01  |         | 17      | 11  | Q       | 33      | 21  | !       | 49      | 31  | 1       |
| 2       | 02  |         | 18      | 12  | R       | 34      | 22  | "       | 50      | 32  | 2       |
| 3       | 03  |         | 19      | 13  | S       | 35      | 23  | \$      | 51      | 33  | 3       |
| 4       | 04  |         | 20      | 14  | T       | 36      | 24  | %       | 52      | 34  | 4       |
| 5       | 05  |         | 21      | 15  | U       | 37      | 25  | &       | 53      | 35  | 5       |
| 6       | 06  |         | 22      | 16  | V       | 38      | 26  | '       | 54      | 36  | 6       |
| 7       | 07  |         | 23      | 17  | W       | 39      | 27  | (       | 55      | 37  | 7       |
| 8       | 08  |         | 24      | 18  | X       | 40      | 28  | )       | 56      | 38  | 8       |
| 9       | 09  |         | 25      | 19  | Y       | 41      | 29  | *       | 57      | 39  | 9       |
| 10      | 0A  |         | 26      | 1A  | Z       | 42      | 2A  | +       | 58      | 3A  | .       |
| 11      | 0B  |         | 27      | 1B  | [       | 43      | 2B  | ,       | 59      | 3B  | ,       |
| 12      | 0C  |         | 28      | 1C  | \       | 44      | 2C  | -       | 60      | 3C  | <       |
| 13      | 0D  |         | 29      | 1D  | ]       | 45      | 2D  | _       | 61      | 3D  | =       |
| 14      | 0E  |         | 30      | 1E  | ^       | 46      | 2E  | `       | 62      | 3E  | >       |
| 15      | 0F  |         | 31      | 1F  | _       | 47      | 2F  | ~       | 63      | 3F  | ?       |
| 16      | 10  | @       | 32      | 20  | [space] | 48      | 30  | 0       | 64      | 40  | @       |
| 17      | 11  | A       | 33      | 21  | !       | 49      | 31  | 1       | 65      | 41  | A       |
| 18      | 12  | B       | 34      | 22  | "       | 50      | 32  | 2       | 66      | 42  | B       |
| 19      | 13  | C       | 35      | 23  | \$      | 51      | 33  | 3       | 67      | 43  | C       |
| 20      | 14  | D       | 36      | 24  | %       | 52      | 34  | 4       | 68      | 44  | D       |
| 21      | 15  | E       | 37      | 25  | &       | 53      | 35  | 5       | 69      | 45  | E       |
| 22      | 16  | F       | 38      | 26  | '       | 54      | 36  | 6       | 70      | 46  | F       |
| 23      | 17  | G       | 39      | 27  | (       | 55      | 37  | 7       | 71      | 47  | G       |
| 24      | 18  | H       | 40      | 28  | )       | 56      | 38  | 8       | 72      | 48  | H       |
| 25      | 19  | I       | 41      | 29  | *       | 57      | 39  | 9       | 73      | 49  | I       |
| 26      | 1A  | J       | 42      | 2A  | +       | 58      | 3A  | .       | 74      | 4A  | J       |
| 27      | 1B  | K       | 43      | 2B  | ,       | 59      | 3B  | ,       | 75      | 4B  | K       |
| 28      | 1C  | L       | 44      | 2C  | -       | 60      | 3C  | <       | 76      | 4C  | L       |
| 29      | 1D  | M       | 45      | 2D  | _       | 61      | 3D  | =       | 77      | 4D  | M       |
| 30      | 1E  | N       | 46      | 2E  | `       | 62      | 3E  | >       | 78      | 4E  | N       |
| 31      | 1F  | O       | 47      | 2F  | ~       | 63      | 3F  | ?       | 79      | 4F  | O       |
| 32      | 20  | [space] | 48      | 30  | 0       | 64      | 40  | @       | 80      | 50  | [space] |
| 33      | 21  | !       | 49      | 31  | 1       | 65      | 41  | A       | 81      | 51  | !       |
| 34      | 22  | "       | 50      | 32  | 2       | 66      | 42  | B       | 82      | 52  | "       |
| 35      | 23  | \$      | 51      | 33  | 3       | 67      | 43  | C       | 83      | 53  | \$      |
| 36      | 24  | %       | 52      | 34  | 4       | 68      | 44  | D       | 84      | 54  | %       |
| 37      | 25  | &       | 53      | 35  | 5       | 69      | 45  | E       | 85      | 55  | &       |
| 38      | 26  | '       | 54      | 36  | 6       | 70      | 46  | F       | 86      | 56  | '       |
| 39      | 27  | (       | 55      | 37  | 7       | 71      | 47  | G       | 87      | 57  | (       |
| 40      | 28  | )       | 56      | 38  | 8       | 72      | 48  | H       | 88      | 58  | )       |
| 41      | 29  | *       | 57      | 39  | 9       | 73      | 49  | I       | 89      | 59  | *       |
| 42      | 2A  | +       | 58      | 3A  | .       | 74      | 4A  | J       | 90      | 5A  | +       |
| 43      | 2B  | ,       | 59      | 3B  | ,       | 75      | 4B  | K       | 91      | 5B  | ,       |
| 44      | 2C  | -       | 60      | 3C  | <       | 76      | 4C  | L       | 92      | 5C  | -       |
| 45      | 2D  | _       | 61      | 3D  | =       | 77      | 4D  | M       | 93      | 5D  | _       |
| 46      | 2E  | `       | 62      | 3E  | >       | 78      | 4E  | N       | 94      | 5E  | `       |
| 47      | 2F  | ~       | 63      | 3F  | ?       | 79      | 4F  | O       | 95      | 5F  | ~       |
| 48      | 30  | 0       | 64      | 40  | @       | 80      | 50  | [space] | 96      | 60  | 0       |
| 49      | 31  | 1       | 65      | 41  | A       | 81      | 51  | !       | 97      | 61  | 1       |
| 50      | 32  | 2       | 66      | 42  | B       | 82      | 52  | "       | 98      | 62  | 2       |
| 51      | 33  | 3       | 67      | 43  | C       | 83      | 53  | \$      | 99      | 63  | 3       |
| 52      | 34  | 4       | 68      | 44  | D       | 84      | 54  | %       | 100     | 64  | 4       |
| 53      | 35  | 5       | 69      | 45  | E       | 85      | 55  | &       |         |     |         |
| 54      | 36  | 6       | 70      | 46  | F       | 86      | 56  | '       |         |     |         |
| 55      | 37  | 7       | 71      | 47  | G       | 87      | 57  | (       |         |     |         |
| 56      | 38  | 8       | 72      | 48  | H       | 88      | 58  | )       |         |     |         |
| 57      | 39  | 9       | 73      | 49  | I       | 89      | 59  | *       |         |     |         |
| 58      | 3A  | .       | 74      | 4A  | J       | 90      | 5A  | +       |         |     |         |
| 59      | 3B  | ,       | 75      | 4B  | K       | 91      | 5B  | ,       |         |     |         |
| 60      | 3C  | <       | 76      | 4C  | L       | 92      | 5C  | -       |         |     |         |
| 61      | 3D  | =       | 77      | 4D  | M       | 93      | 5D  | _       |         |     |         |
| 62      | 3E  | >       | 78      | 4E  | N       | 94      | 5E  | `       |         |     |         |
| 63      | 3F  | ?       | 79      | 4F  | O       | 95      | 5F  | ~       |         |     |         |
| 64      | 40  | @       | 80      | 50  | [space] | 96      | 60  | 0       |         |     |         |
| 65      | 41  | A       | 81      | 51  | !       | 97      | 61  | 1       |         |     |         |
| 66      | 42  | B       | 82      | 52  | "       | 98      | 62  | 2       |         |     |         |
| 67      | 43  | C       | 83      | 53  | \$      | 99      | 63  | 3       |         |     |         |
| 68      | 44  | D       | 84      | 54  | %       |         |     |         |         |     |         |
| 69      | 45  | E       | 85      | 55  | &       |         |     |         |         |     |         |
| 70      | 46  | F       | 86      | 56  | '       |         |     |         |         |     |         |
| 71      | 47  | G       | 87      | 57  | (       |         |     |         |         |     |         |
| 72      | 48  | H       | 88      | 58  | )       |         |     |         |         |     |         |
| 73      | 49  | I       | 89      | 59  | *       |         |     |         |         |     |         |
| 74      | 4A  | J       | 90      | 5A  | +       |         |     |         |         |     |         |
| 75      | 4B  | K       | 91      | 5B  | ,       |         |     |         |         |     |         |
| 76      | 4C  | L       | 92      | 5C  | -       |         |     |         |         |     |         |
| 77      | 4D  | M       | 93      | 5D  | _       |         |     |         |         |     |         |
| 78      | 4E  | N       | 94      | 5E  | `       |         |     |         |         |     |         |
| 79      | 4F  | O       | 95      | 5F  | ~       |         |     |         |         |     |         |
| 80      | 50  | [space] | 96      | 60  | 0       |         |     |         |         |     |         |
| 81      | 51  | !       | 97      | 61  | 1       |         |     |         |         |     |         |
| 82      | 52  | "       | 98      | 62  | 2       |         |     |         |         |     |         |
| 83      | 53  | \$      | 99      | 63  | 3       |         |     |         |         |     |         |
| 84      | 54  | %       |         |     |         |         |     |         |         |     |         |
| 85      | 55  | &       |         |     |         |         |     |         |         |     |         |
| 86      | 56  | '       |         |     |         |         |     |         |         |     |         |
| 87      | 57  | (       |         |     |         |         |     |         |         |     |         |
| 88      | 58  | )       |         |     |         |         |     |         |         |     |         |
| 89      | 59  | *       |         |     |         |         |     |         |         |     |         |
| 90      | 5A  | +       |         |     |         |         |     |         |         |     |         |
| 91      | 5B  | ,       |         |     |         |         |     |         |         |     |         |
| 92      | 5C  | -       |         |     |         |         |     |         |         |     |         |
| 93      | 5D  | _       |         |     |         |         |     |         |         |     |         |
| 94      | 5E  | `       |         |     |         |         |     |         |         |     |         |
| 95      | 5F  | ~       |         |     |         |         |     |         |         |     |         |
| 96      | 60  | 0       |         |     |         |         |     |         |         |     |         |
| 97      | 61  | 1       |         |     |         |         |     |         |         |     |         |
| 98      | 62  | 2       |         |     |         |         |     |         |         |     |         |
| 99      | 63  | 3       |         |     |         |         |     |         |         |     |         |
| 100     | 64  | 4       |         |     |         |         |     |         |         |     |         |

- `ord(c)`: returns Unicode (ASCII) of the character.
- Example: `ord('a')` returns 97.
- `chr(x)`: returns the character whose Unicode is x.
- Example: `chr(97)` returns 'a'.

# User Input

*Covered in detail in Lab 2:*

---

```
→ 1 mess = input('Please enter a message: ')\n   2 print("You entered", mess)
```

---

(Demo with pythonTutor)

## Side Note: '+' for numbers and strings



- `x = 3 + 5` stores the number 8 in memory location `x`.



## Side Note: '+' for numbers and strings



- $x = 3 + 5$  stores the number 8 in memory location  $x$ .
- $x = x + 1$  increases  $x$  by 1.

## 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`.

## 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 `x` to the end of the strings `s`.

# Recap

- For-loops



# Recap



- For-loops
- `range()`

# Recap



- For-loops
- `range()`
- Variables: ints and strings

# Recap



- For-loops
- `range()`
- Variables: ints and strings
- Some arithmetic

# Recap



- For-loops
- `range()`
- Variables: ints and strings
- Some arithmetic
- String concatenation



# Recap



- For-loops
- `range()`
- Variables: ints and strings
- Some arithmetic
- String concatenation
- Functions: `ord()` and `char()`

# Lecture Slips & Writing Boards



- Turn in lecture slips & writing boards as you leave...