

Reference:

`print(objects, sep=' ', end='\n')`

Formatting Options

(1) **format FUNCTION** and (2) **str.format METHOD** **[**Both use the format string mini-language below**]****format Function** (easiest to use - no substitution fields - only text and number format and conversions): **Syntax:** `format(value, "format string")` **ex1:** `format(12345.6789, "0=+20,.3f")`
↳ **+000,000,012,345.679****str.format Method format & substitution****(1) format syntax:** `"{:format_string}".format(value)`**ex2:** `"{:0=+20,.3f}".format(12345.6789)` ↳ same as ex1**(2) sub syntax:** `"string with {sub(s) fields}".format(sub source(s))`
fields syntax: `{[replacement data] [! r/s/a] [:"format string"]}` below & p2format symbols meanings above: `"{": this is a format string; 0 fill with this character; = pad after sign & before number; + force a sign; 20 the required width in characters; , use commas for thousands; .3 set digit precision (3 in this case); f number type; > right adjust; }` close format string container**align** (fill with any character)

With sign: " " (space) force leading space on + and - sign; + sign all; - neg only (sign/align err with strings)

forces 0 between sign & number w/o align specified; like '0='; (err with s)

thousands separator (,) - (err with n or s)

width in chars

decimal places

[[fill] align] [sign] [# -alt form] [0 force padding default] [width] [_ , /] [.precision] [types]

<, >, ^ (centered), or =
'=' forces padding after a sign

Floats/Decimal - always have dec point; integers -> hex, oct, binary - add 0x/0o/0b; 'g'/'G' - retain zeros

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format(value, format string):
Function examples**Numeric output examples:** using 12345.6789, -12345.6721, 1234, and 10000000 **ex:** `fnt_str=",.2f"; print(format(x,fnt_str))`

Format spec string	Yields	Note "I" symbol below represents a column border	Description
"0.3f"	12345.679	-12345.672 1234.000 10000000.000	fixed, 3 places, float
"0,.2f"	12,345.68	-12,345.67 1,234.00 10,000,000.00	comma sep, fixed, 2 places, float
"013,.2f"	12,345.68	-12,345.67 1,234.00 10,000,000.00	width=13, comma sep, fixed, 3 places, float
"^13,.0f"	12,346	-12,346 1,234 10,000,000	center, width=13, comma, fixed, 3 places, float
"^13,e"	1.234568e+04	-1.234567e+04 1.234000e+03 1.000000e+07	center, set width (13), scientific
"~^13,.0f"	~12,346~	~-12,346~ ~1,234~ ~10,000,000~	fill ~, ctr, width=13, commas, 0 dec places, float
"0+,.0f"	+12,346	-12,346 +1,234 +10,000,000	sign, comma sep, fixed, no dec places, float
"0=+13,.0f"	+ 12,346	- 12,346 + 1,234 + 10,000,000	pad _ after sign, sign, comma, no dec plcs, float
"0,.1%"	1,234,567.9%	1,234,567.2% 123,400.0% 1,000,000,000.0%	comma sep, 1 place, *100 & add %
Conversions > using 17 and 256 and 65534 and 65536			
"x^10d"	xxxx17xxxx	xxx-256xxx xx65534xxx xx65536xxx	fill w/ x, center, width=10, integer (base 10)
">#12X"	0X11	-0X100 0XFFFE 0X10000	right align, width=12, hex (uppercase)
"b"	10001	-100000000 1111111111111110 10000000000000000	binary conversion

Integer types:**b** - binary**c** - Unicode char**d** - base 10 integer**o** - Octal**x** - Hex - lower cs**X** - Hex - upper cs**n** - like d but uses local separator definitions**Float/decimal types:****e** - scientific, e - exponent**E** - E for exponent**f** - fixed point (default 6)**F** - fixed, NAN and INF**g** - general format, rounds and formats**n** - like g but uses local separator definitions**%** - percentage, * 100, adds "%";**None** - g except 1 num > .**String: s** - string format, can omit, no commas sep.**str.format Method for ordering or substituting replacement data**, in 3 parts:**Part 1** a literal string with embedded placeholders for replacement fields which designate (1) a data position or field name; and optionally (2) a type conversion calling `ascii()`, `repr()`, or `str()` [`!a !r or !s`]; **and/or** (3) a mini-language format spec string preceded by ":"**Part 3** {data source(s)} and/or format string referenced inside **.format()** parens**str.format()** high abstraction example grammar:`print("literal string with {replacement fields}".format(variables, values, tuples* or dictionaries**))`replacement fields: `"{["field_name"] ["!" conversion] [:"format_spec"]}"`

[identifier | digit+] ("." identifier | "[" digit+ | index_string "]") :["a" | "r" | "s"] :<format string>

tuple** to unpack preceded by a single **; **multiple** tuple items coded in the print string: `[tup#[item#]]`; or a dictionary to reference for keys coded in print string, preceded by ******`mytup = ("a","b","c")
print("I want {1} and {2}.".format(*mytup))`

See more examples on page 2

`x,y,z="dog",99.9596,"bird"
print("Is ${!s:>7} high for a { }.".format(format(y,".2f"),z))`**INTERPOLATION: "Old Style"** interpolation operator `%` Note: [in brackets] means optional, ↳ means yields or returns
to be deprecated, most widely used, (byte support added in [3.5]) There are **2** syntax formats:**1. string with format/insert (%) spec(s) % (insert values)**`print("The cost of %d widgets is $%.2f each, %s." % (5, 202.95, "Ed"))`

↳ The cost of 5 widgets is \$ 202.95 each, Ed.

2. "format string" % value to format`sft="011.4f" \ print((sft)%(-7.5129870))` ↳ -7.5130`sft` is a string variable to hold the format spec statement -> `%, min field width (11), precision(.4) 4 places, floating point (f)`

Start of format specifier

: alternate form, 0 : zero padded, - : left adjusted, ' ' (space) : space before pos numbers, + : sign +/- required

Precision starts with a decimal point followed by an integer specifying places

[len-mod] was planned but not implemented

% [(dict key)] [conversion flags] [minimum field width [*]] [precision: .## or [*]] conversion type

Mapping key in parens for a dictionary value

Example of format string:`%-14.4f` ↳ left adj, min 14 char, 4 decimal places, floating point or `%("key1")s` use dict value for a string

an integer specifying the minimum field width

<https://docs.python.org/3.8/library/stdtypes.html#string-formatting>i/d : signed integer decimal
o : signed octal
x : signed hex lower case
X : signed hex upper case
e : flt pt exp lower caseE : flt pt exp upper case
f : floating point dec format
r / s / a : string using `repr()`, `str()`, `ascii()` respectively
% : no arg converted,

...plus a LOT more at:
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Formatting Options

Examples using the order and replacement functions of the format method: "string" with {selection criteria}.format(sub source)

Objects in the following examples

```
OrderString = '{1}, {0}, {2}'
ShirtTuple = ('red', 'white', 'blue', 'purple')
StoogeDict = {'Straight': 'Larry',
'Dunce': 'Moe', 'Foil': 'Curley', 'Boob': 'Don'}
PetDict = {1: 'cow', 2: 'dog', 3: 'fish'}
StoogeTuple = ('Larry', 'Moe', 'Curley', 'Don')
```

Simple selection and ordering of values with literals

```
mystring = "The tourney ranking: {1}, {3}, {0}".format(
('Larry', 'Moe', 'Curley', 'Donald'))
print(mystring) # The tourney ranking is: Moe, Donald, Larry
# String holding substitution/replacement selections
print("The tourney rank is: " + OrderString.format('Abe', 'Bob', 'Cal', 'Don'))
# The tourney rank is: Bob, Abe, Cal
```

Named items

```
print("Winners: {FirstPlace}, {SecondPlace}".format(FirstPlace =
"Bob", SecondPlace = "Don")) # Winners: Bob, Don
# Use * to unpack a single tuple (BUT not a list-for lists use 0[val] )
print("The stooges are: {2}, {1}, and {0}".format(*StoogeTuple))
# note * & sub syntax # The stooges are: Curley, Moe, and Larry.
# Use the {index[value index]} without having to use * or for a list
print("My favorite stooge is {0[1]}".format(StoogeTuple))
# My favorite stooge is Moe. The use of index allows sub of
multiple tuples and lists
```

```
class Flowers(object):
    def __init__(self,
center, petals):
        self.center=center
        self.petals=petals
Daisy = Flowers
("black", "yellow")
Dogwood = Flowers
("brown", "white")
```

```
# Referring to an object's attribute combine with a class - powerful!
print("Daisy petals are bright {0.petals}, ".format(Daisy) + "its center
{0.center}.".format(Daisy) + " while the Dogwood petals are
{0.petals}.".format(Dogwood))
# Daisy petals are bright yellow, its center black, while the Dogwood
petals are white.
# The '[0[]]' structure enables us to select from multiple tuples
print("I saw {0[1]} in a {1[2]} shirt.".format(StoogeTuple, /
ShirtTuple)) # I saw Moe in a blue shirt.
# Use ** to access dictionary values by their keys with unpacking
print("The stooges are: {Straight}, {Foil}, {Dunce}.".format
(**StoogeDict)) # note ** "dictionary is external"
# The stooges are: Larry, Curley, Moe.
# Select a single dictionary item by unpacking
print("My favorite stooge is {Foil}.".format(**StoogeDict))
# My favorite stooge is Curley.
# A single dictionary item using the {x[]}] format and keyword
print("One stooge is {0[Foil]}.".format(StoogeDict))
# One stooge is Curley.
# Select multiple items from multiple dictionaries using keywords
print("It look like {0[Straight]} has a {1[1]} and a /
{1[2]} ".format(StoogeDict, PetDict ))
# It look like Larry has a cow and a dog
# using !r and !s - example borrowed from
https://docs.python.org/3/library/string.html#formatspec
print("repr() shows quotes: {!r}; str() doesn't: {!s}".format(
'test1', 'test2')) #best possible example we could imagine
```

Built-in String Format Methods

```
.capitalize() -1st letter
.center(width[, fillchar default: space])
.ljust( width[, fillchar] ) -justify
.rjust(width[, fillchar]) -right justify
.upper() -converted to uppercase
.lower() -convert to lowercase
.strip( [chars] ) -remove leading and
trailing chars
.lstrip([chars]) -remove leading chars
.rstrip( [chars]) -remove trailing chars
.title() -return a titlecased version
.zfill(width) - left fill with 0 to width
.swapcase() - upper to lower, visa versa
```

Template strings: A simple substitution function imported from the **string module**. (from **string import Template**) To keep it simple: (1) use the **Template** function to build a variable with named objects preceded by \$ to be replaced with subs, (2) then use **substitute(map object, **kws)** on that variable to define replacement values and build the string. (\$\$ escapes and yields \$)

from string import Template

```
stoogeDict= {'L': "Larry", "M": "Moe", "C": "Curley"}
funnyStr= Template("$C handed the goat to $L and butted $M.")
funnyStr= funnyStr.substitute(stoogeDict)
print(funnyStr)
```

Curley handed the goat to Larry and butted Moe.

....put together more suscintley

```
print(Template("$M and $C butted $L's goat.").substitute
(stoogeDict))
```

Moe and Curley butted Larry's goat.

Template strings are easy,
but VERY slow to execute!

.format dates: the easy way

```
import datetime
d = datetime.datetime(1948, 1, 19);
print('{: %m/%d/%Y}'.format(d))
# 01/19/1948 & see f-string ex below
```

New in version 3.6: f-strings - formatted string literals - prefixed with letters f or F

for more see: https://docs.python.org/3/reference/lexical_analysis.html#f-strings (2.4.3 Formatted string literals), ALSO see PEP 498

Text except }, {, or NULL - {{ & }} are
replaced with single braces

"s" | "r" | "a"
str(), repr(), ascii()

See mini-language described in **format()** Example:
see: `format(number, "0=+20,.3f")` explained on side 1.
In f string would be {number:0=+20,.3f}

f or F • opening quote " • [literal text] • {replacement fields [:format string]} • [literal text] • closing quote "

f_expression : (conditional_expression | **"**"**
or_expr) (" | conditional_expression | " | **"**"** or_expr)*
[" | "] (NO BACKSLASHES IN EXPRESSION PARTS;
Must put LAMBDA in parens ())

"{" f_expression ["!" conversion] [":" format_spec] "}"
*no backslashes var!s var!r var!a → 'var' is literal variable

```
nametup = ("Larry", "Curley", "Moe") # stuff for examples
myindex, Name, width, value, x = 2, 'Curley', 12, 12345.678, 75
state, subpart, subpart2 = 'Mississippi', 'iss', 'x'
lamstate = lambda state: state if subpart in state else "unknown"
intro_string = "Money: $"
import datetime
print(f'He said his name is {nametup[myindex]}.') #use index
print(f'{Name.upper(): ^10} center & caps!') #sub and format
print(f'{intro_string}{value: {width},.2f} is cheap?') #note space
print(f'Going to {(lamstate(state)).upper(): ^20}!') #conditional
print(f'Bound for {state if subpart in state else 'unknown'}!')
print(f'Going to {state if subpart2 in state else 'unknown'}!')
print(f'Curley's IQ is about {x!r}.') #conversion example
print(f'Today is {datetime.date.today(): %m/%d/%Y}.')
```

Other notes: **formatter** - formatter module has been deprecated.
pprint module - Data pretty printer - "provides a capability to "pretty-print" arbitrary Python data structures in a form which can be used as input to the interpreter." See: <https://docs.python.org/3.6/library/pprint.html#module-pprint> Beyond the scope of this toolbox document, but, import and create object with

```
pp = pprint.PrettyPrinter(args)
args: indent, width, depth, stream, *, compact
then send object to output with
command: pp.pprint(your object)
```

He said his name is Moe.
CURLEY center & caps!
Money: \$ 12,345.68 is cheap?
Going to MISSISSIPPI !
Bound for Mississippi!
Going to unknown!
Curley's IQ is about 75.
Today is 03/06/2020.

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