

```
# fibonacci series
# 0 1 1 2 3 5 8 13 21 34

# 1 ---> 0
# 2 ---> 0 1
# 3 ---> 0 1 1

# for i in range(1,11):
#     print(i, end = ", ")
```

```
def fibonacci_seq(n):
    a = 0 # first number
    b = 1 # second number
    if n == 1:
        print(a)
    elif n == 2:
        print(a, b)
    else:
        print(a,b, end = " ")
        for i in range(n-2):
            c = a + b
            a = b
            b = c
            print(b , end = " ")
```

```
fibonacci_seq(120)
```

```
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181 6765 10946 17711 28657 46368 75025 121393 196418 317811 514229 832040 1313953 2131321 3442160 5577055 8968413 14328983 23187437 37514850 60695964 98174771 158135311 256735912 414921684 672571496 1088307408 1760681410 2853986609 4614688017 7470654326 12085816535 19601507444 31697312553 51309029989 83006342532 134307582521 217313735053 351620817574 568934512627 920548337680 1489483090207 2409026350787 3898510440984 6307534401191 10205750243175 16503284644366 26708984845541 43212238489717 70921223235268 114130612246806 185051838482074 299182450728281 484234289180355 783316127412636 1267550416592991 2051766546005627 3319282662518618 5371039168524245 8690805724530863 14061845890655108 22852651614784071 37014457780714179 60867109395494860 98879561075679039 160697670461073900 261566231756568759 422263802217642789 683861433973816748 1115437665730389537 1809298098687042326 2924735764417882075 4734033863094921612 7658771881782063647 12392805744800005722 20051582631671927369 32444388376471933091 52495971008141960460 84940359640813893551 137436330648955829911 222364308056997792472 360800638695811686023 583164946754777505934 943965254811789388407 1527068191517601004431 2471033446272380390348 3998098642890169404779 6469132089062550495127 10467165631852719599906 17006297680915270004035 27473459312767820499161 44479757003683090503196 72951054684598310507231 117420811697361130510427 190371866306513841017618 307792678003875971527845 500213489310389101538263 808006165316902906610881 1308219654626284208149144 2116225819943195309687407 3424445484569479515836551 5540671304512674825423958 8964896789082154335563409 14505518093594834151397367 23468614882677008466961276 37974132976271842802558643 61480651069868877058955019 100454784046140620325913662 162429435116008462384878681 262884219162149304950792643 425313654278158177234750724 688198873440307479185542967 1113512487718465656446293691 1801631338978623835631044515 2915143826697031315116588206 4716756164615654171562881721 7631897503593777986779409936 12347653670280402158342291657 20079451234874179140115179593 32427104905154581301857471229 52506556139928760441972650822 84933660045083341743829922461 137440216184238923045782573353 222373772323162684787755195775 360814388507401026231637768128 583164946754777505019392963803 943965254811789106255080732578 1527068191517601004431073696381 2471033446272380390348065660184 3998098642890169404779139356565 6469132089062550495127205016749 10467165631852719599906082582534 17006297680915270004035138328283 27473459312767820499164220910817 44479757003683090503196358659000 72951054684598310507231516977283 117420811697361130510427694847096 190371866306513841017618272024379 307792678003875971511658820601475 500213489310389101538299224612574 80800616531690290661084094668540 130821965462628420814913877129797 211622581994319530968755099798337 342444548456947951583658022218134 554067130451267482542393122016471 896489678908215433556345191814806 1450551809359483415139736614831177 234686148826770084669612763684554 379741329762718428025586465165991 614806510698688770589550196849546 1004547840461406203259136618435507 1624294351160084623848786815285053 262884219162149304950792643012050 425313654278158177234750724140555 688198873440307479185542967153606 1113512487718465656446293691266161 1801631338978623835631044515406717 2915143826697031315116588206562878 4716756164615654171562881721669595 763189750359377504991642209108177 1234765367028040215834229165713794 2007945123487417914011517959320599 3242710490515458130185747122926794 525065561399287604419726508228393 8493366004508334174382992246110727 1374402161842389230457825733531600 2223737723231626847877551957752999 3608143885074010262316377681284898 5831649467547775050193929638034897 9439652548117891062550807325787896 15270681915176010044310736963816893 2471033446272380390348065660184588 3998098642890169404779139356565487 646913208906255049512720501674938 1046716563185271959990608258253487 1700629768091527000403513832828386 2747345931276782049916422091081785 444797570036830905031963586590028 729510546845983105072315169772838 117420811697361130510427694847098 190371866306513841017618272024379 307792678003875971511658820656287 500213489310389101538299224611072 80800616531690290661084094668540 130821965462628420814913877129797 21162258199431953096875509979833 34244454845694795158365802221813 55406713045126748254239312201647 8964896789082154335563451918148 14505518093594834151397366148311 2346861488267700846696127636845 37974132976271842802558646516599 6148065106986887705895501968495 10045478404614062032591366184355 16242943511600846238487868152850 26288421916214930495079264301205 42531365427815817723475072414055 68819887344030747918554296715360 111351248771846565644629369126616 18016313389786238356310445154067 29151438266970313151165882065628 47167561646156541715628817216695 76318975035937750499164220910817 123476536702804021583422916571379 200794512348741791401151795932059 324271049051545813018574712292679 52506556139928760441972650822839 849336600450833417438299224611072 1374402161842389230457825733531600 222373772323162684787755195775299 360814388507401026231637768128489 583164946754777505019392963803489 943965254811789106255080732578789 1527068191517601004431073696381689 247103344627238039034806566018458 399809864289016940477913935656548 64691320890625504951272050167493 104671656318527195999060825825348 170062976809152700040351383282838 274734593127678204991642209108178 44479757003683090503196358659002 72951054684598310507231516977283 11742081169736113051042769484709 19037186630651384101761827202437 30779267800387597151165882065628 50021348931038910153829922461107 8080061653169029066108409466854 13082196546262842081491387712979 2116225819943195309687550997983 3424445484569479515836580222181 5540671304512674825423931220164 896489678908215433556345191814 1450551809359483415139736614831 234686148826770084669612763684 3797413297627184280255864651659 614806510698688770589550196849 1004547840461406203259136618435 1624294351160084623848786815285 262884219162149304950792643012 425313654278158177234750724140 6881988734403074791855429671536 1113512487718465656446293691266 1801631338978623835631044515406 2915143826697031315116588206562 4716756164615654171562881721669 763189750359377504991642209108 12347653670280402158342291657137 2007945123487417914011517959320 3242710490515458130185747122926 5250655613992876044197265082283 8493366004508334174382992246110 1374402161842389230457825733531 2223737723231626847877551957752 3608143885074010262316377681284 5831649467547775050193929638034 9439652548117891062550807325787 15270681915176010044310736963816 2471033446272380390348065660184 3998098642890169404779139356565 6469132089062550495127205016749 1046716563185271959990608258253 1700629768091527000403513832828 2747345931276782049916422091081 4447975700368309050319635865900 7295105468459831050723151697728 1174208116973611305104276948470 1903718663065138410176182720243 3077926780038759715116588206562 5002134893103891015382992246110 808006165316902906610840946685 1308219654626284208149138771297 2116225819943195309687550997983 3424445484569479515836580222181 5540671304512674825423931220164 896489678908215433556345191814 1450551809359483415139736614831 234686148826770084669612763684 3797413297627184280255864651659 614806510698688770589550196849 1004547840461406203259136618435 1624294351160084623848786815285 262884219162149304950792643012 425313654278158177234750724140 6881988734403074791855429671536 1113512487718465656446293691266 1801631338978623835631044515406 2915143826697031315116588206562 4716756164615654171562881721669 763189750359377504991642209108 12347653670280402158342291657137 2007945123487417914011517959320 3242710490515458130185747122926 5250655613992876044197265082283 8493366004508334174382992246110 1374402161842389230457825733531 2223737723231626847877551957752 3608143885074010262316377681284 5831649467547775050193929638034 9439652548117891062550807325787 15270681915176010044310736963816 2471033446272380390348065660184 3998098642890169404779139356565 6469132089062550495127205016749 1046716563185271959990608258253 1700629768091527000403513832828 2747345931276782049916422091081 4447975700368309050319635865900 7295105468459831050723151697728 1174208116973611305104276948470 1903718663065138410176182720243 3077926780038759715116588206562 5002134893103891015382992246110 808006165316902906610840946685 1308219654626284208149138771297 2116225819943195309687550997983 3424445484569479515836580222181 5540671304512674825423931220164 896489678908215433556345191814 1450551809359483415139736614831 234686148826770084669612763684 3797413297627184280255864651659 614806510698688770589550196849 1004547840461406203259136618435 1624294351160084623848786815285 262884219162149304950792643012 425313654278158177234750724140 6881988734403074791855429671536 1113512487718465656446293691266 1801631338978623835631044515406 2915143826697031315116588206562 4716756164615654171562881721669 763189750359377504991642209108 12347653670280402158342291657137 2007945123487417914011517959320 3242710490515458130185747122926 5250655613992876044197265082283 8493366004508334174382992246110 1374402161842389230457825733531 2223737723231626847877551957752 3608143885074010262316377681284 5831649467547775050193929638034 9439652548117891062550807325787 15270681915176010044310736963816 2471033446272380390348065660184 3998098642890169404779139356565 6469132089062550495127205016749 1046716563185271959990608258253 1700629768091527000403513832828 2747345931276782049916422091081 4447975700368309050319635865900 7295105468459831050723151697728 1174208116973611305104276948470 1903718663065138410176182720243 3077926780038759715116588206562 5002134893103891015382992246110 808006165316902906610840946685 1308219654626284208149138771297 2116225819943195309687550997983 3424445484569479515836580222181 5540671304512674825423931220164 896489678908215433556345191814 1450551809359483415139736614831 234686148826770084669612763684 3797413297627184280255864651659 614806510698688770589550196849 1004547840461406203259136618435 1624294351160084623848786815285 262884219162149304950792643012 425313654278158177234750724140 6881988734403074791855429671536 1113512487718465656446293691266 1801631338978623835631044515406 2915143826697031315116588206562 4716756164615654171562881721669 763189750359377504991642209108 12347653670280402158342291657137 2007945123487417914011517959320 3242710490515458130185747122926 5250655613992876044197265082283 8493366004508334174382992246110 1374402161842389230457825733531 2223737723231626847877551957752 3608143885074010262316377681284 5831649467547775050193929638034 9439652548117891062550807325787 15270681915176010044310736963816 2471033446272380390348065660184 3998098642890169404779139356565 6469132089062550495127205016749 1046716563185271959990608258253 1700629768091527000403513832828 2747345931276782049916422091081 4447975700368309050319635865900 7295105468459831050723151697728 1174208116973611305104276948470 1903718663065138410176182720243 3077926780038759715116588206562 5002134893103891015382992246110 808006165316902906610840946685 1308219654626284208149138771297 2116225819943195309687550997983 3424445484569479515836580222181 5540671304512674825423931220164 896489678908215433556345191814 1450551809359483415139736614831 234686148826770084669612763684 3797413297627184280255864651659 614806510698688770589550196849 1004547840461406203259136618435 1624294351160084623848786815285 262884219162149304950792643012 425313654278158177234750724140 6881988734403074791855429671536 1113512487718465656446293691266 1801631338978623835631044515406 2915143826697031315116588206562 4716756164615654171562881721669 763189750359377504991642209108 12347653670280402158342291657137 2007945123487417914011517959320 3242710490515458130185747122926 52506556139928760441972650
```

```

mixed = [1, 2, 3, 4, "five", "six", 2.3, None]
print(mixed)

[1, 2, 3, 4]
['word1', 'word2', 'word3']
[1, 2, 3, 4, 'five', 'six', 2.3, None]

# Add data to list

fruits = ['grapes', 'apple']
fruits.append('mango') # (append is used to add the object in last place).

print(fruits)

['grapes', 'apple', 'mango']

# insert method is used to add the object in Last place

fruits1 = ['mango', 'orange']
fruits1.insert(2, "grapes")
print(fruits1)

['mango', 'orange', 'grapes']

# how to join (concatenate) two List

fruits1 = ['mango', 'orange']
fruits2 = ['grapes', 'apple']
fruits = fruits1 + fruits2
print(fruits)

['mango', 'orange', 'grapes', 'apple']

# extend method it is used list inside list

fruits1 = ['mango', 'orange']
fruits2 = ['grapes', 'apple']
fruits1.extend(fruits2)
print(fruits1)
print(fruits2)

☞ ['mango', 'orange', 'grapes', 'apple']
   ['grapes', 'apple']

# comman method to delete data from List

# pop method is used to delete the object into list.

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
fruits.pop(4)
print(fruits)

['orange', 'mango', 'apple', 'banana', 'pear']

# comman method to delete data from List

# del method

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
del fruits[1]
print(fruits)

['orange', 'apple', 'banana', 'kiwi', 'pear']

# comman method to delete data from list
# removed method

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
fruits.remove('banana')

```

```
print(fruits)

['orange', 'mango', 'apple', 'kiwi', 'pear']

# In keyword with list

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']

if 'mango' in fruits:
    print("mango is present ")
else:
    print("mango is not present")

mango is present

# count method

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
print(fruits.count('orange'))

1

# sort method it is used print in alphabate order

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
fruits.sort()
numbers = [3, 5, 1, 0, 2, 8]
numbers.sort()
print(numbers)
print(fruits)

[0, 1, 2, 3, 5, 8]
['apple', 'banana', 'kiwi', 'mango', 'orange', 'pear']

# sorted function

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
numbers = [3, 5, 1, 0, 2, 8]
print(sorted(numbers))
print(fruits)

[0, 1, 2, 3, 5, 8]
['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']

# clear method

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
numbers = [3, 5, 1, 0, 2, 8]
numbers.clear()
print(numbers)
print(fruits)

[]
['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']

# copy method
# sorted function

fruits = ['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
numbers = [3, 5, 1, 0, 2, 8]
numbers_copy = numbers.copy()
fruits_copy = fruits.copy()
print(numbers_copy)
print(fruits_copy)

[3, 5, 1, 0, 2, 8]
['orange', 'mango', 'apple', 'banana', 'kiwi', 'pear']
```

```
# split method
user_info = 'Akshay 12'.split()
print(user_info)
```

```
['Akshay', '12']
```

```
# Join method
```

```
user_info = ['Akshay', '15']
print(','.join(user_info))
```

```
Akshay,15
```

```
# List vs array
```

```
# c, c++, java
# array int, string
```

```
# List - store any data / flexible
```

```
# python array module - fix data type
# numpy arrays - binding with c libraries
# javascript array = python Lists / flexible
```

```
# strings are immutable
# Lists are mutable
```

```
s = "string"
t = s.title()
print(s)
```

```
l = ['word1', 'word2', 'word3']
l.pop(1)
print(l)
```

```
string
['word1', 'word3']
```