Tkinter Pack

Summary: in this tutorial, you'll learn about the Tkinter `pack` geometry manager and how to use it to arrange widgets on a window.

Introduction to the Tkinter pack geometry manager

So far, you have learned how to use the `pack()` method to add widgets to a window.

Tkinter uses the geometry manager to arrange widgets on a window. The `pack()` method is one of three geometry managers in Tkinter. The other geometry managers are `grid()` (https://www.pythontutorial.net/tkinter/tkinter-grid/) and `place()` (https://www.pythontutorial.net/tkinter/tkinter-place/) .

The pack arranges widgets around the edges of their container. The container can be the root window or a frame (https://www.pythontutorial.net/tkinter/tkinter-frame/) .

Let's start with a simple program to understand each option better.

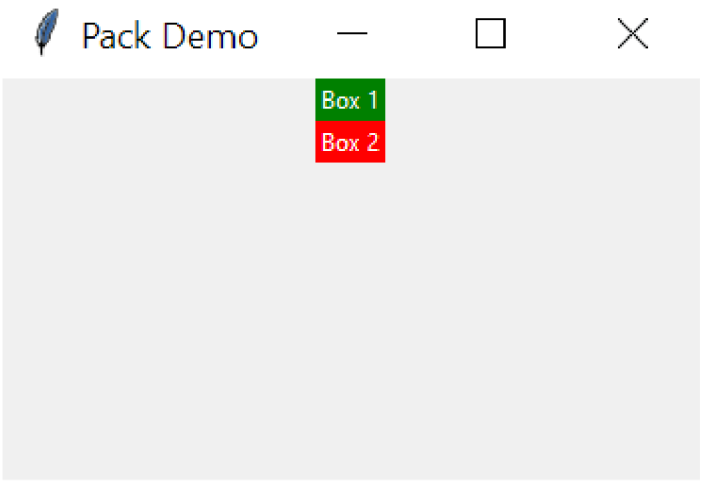
Tkinter pack geometry manager example

The `pack` geometry manager has many configurations. The following are the most commonly used options: `fill` , `expand` , `side` , `anchor` , `ipadx` , `ipady` , `padx` , and `pady` .

1) Pack with default options

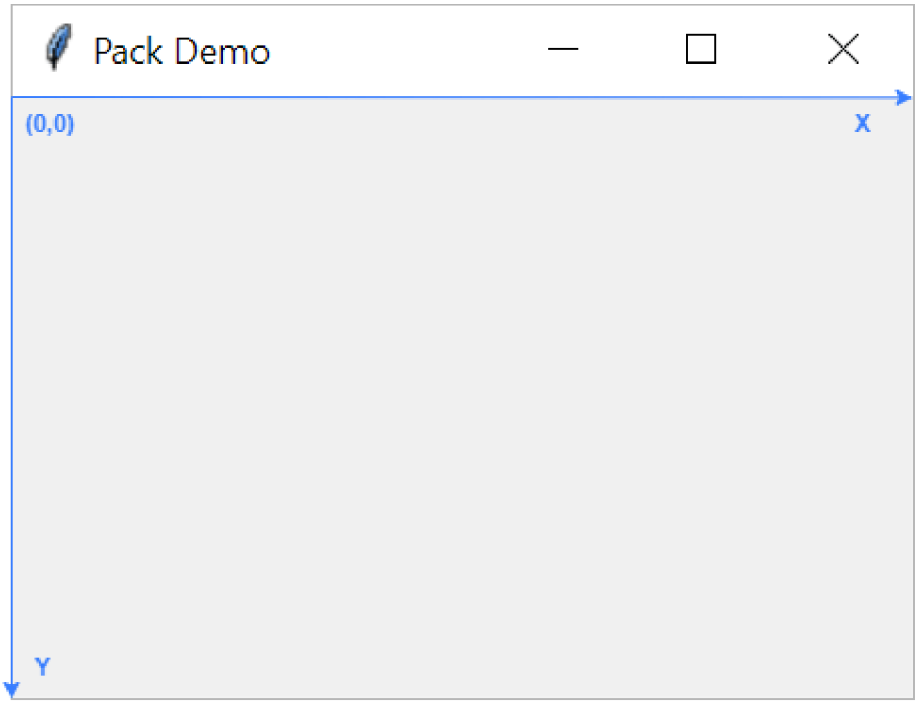
The following shows how to use the `pack` geometry manager to arrange two Label (https://www.pythontutorial.net/tkinter/tkinter-label/) widgets on the root window:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack()

# box 2
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
box2.pack()

root.mainloop()
```



In this example, we have two boxes: green and red. The `pack()` places the boxes on top of each other because it uses the default options.

Before diving into other options, you need to understand the `x` and `y` coordinates of the window:



The top left corner of the window is the origin with the coordinate `(0,0)`. The x-coordinate increments from left to right and the y-coordinate increments from top to bottom.

2) ipadx & ipady: setting internal paddings

To create internal paddings for widgets, you use the `ipadx` and `ipady` parameters:

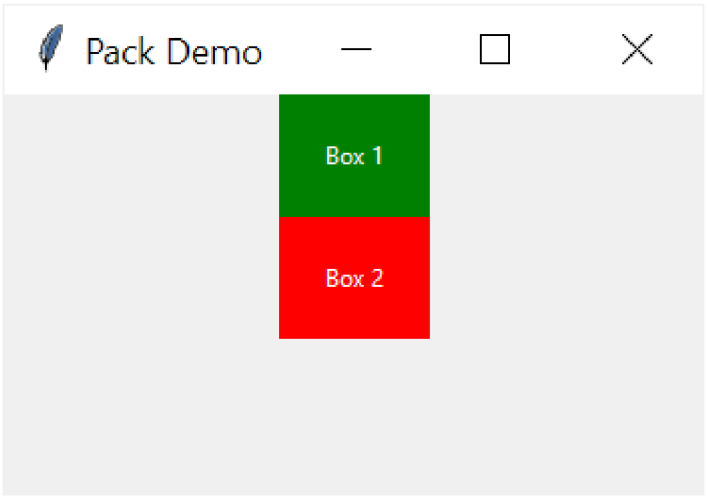
- `ipadx` creates padding left and right, or padding along the x-axis.
- `ipady` creates padding top and bottom, or padding along the y-axis.

For example, the following program uses `ipadx` and `ipady` parameters to set the internal paddings of each box:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack(ipadx=10, ipady=10)

# box 2
```

```
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
box2.pack(ipadx=10, ipady=10)

root.mainloop()
```

Output:



3) Using the *fill* option

The `fill` option accepts one of three string constants defined in the `tkinter` module.

- `tkinter.X` – fill available space along the x-axis
- `tkinter.Y` – fill available space along the y-axis
- `tkiniter.BOTH` – fill available space long both axises

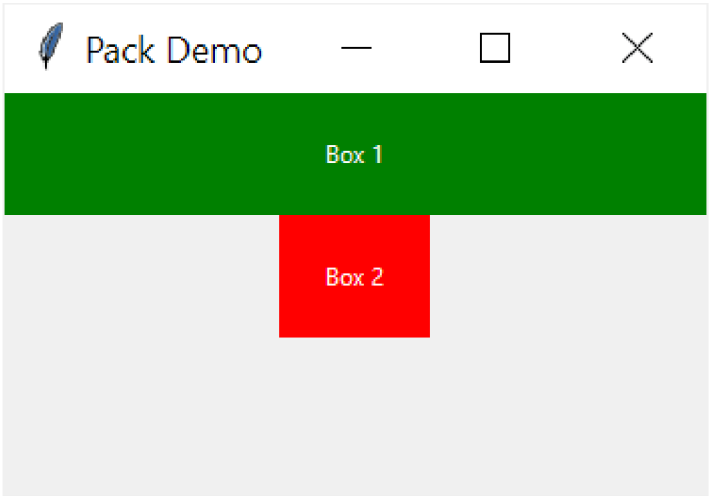
These string constants are equivalent to `'x'`, `'y'`, and `'both'`.

Note that if you import the `tkinter` module as `tk`, you need to reference the constants `X`, `Y`, and `BOTH` using the `tk` prefix e.g., `tk.X`, `tk.Y`, and `tk.BOTH`.

The following example uses the fill parameter to set the `fill` option for the first label:

```
box1.pack(ipadx=20, ipady=20, fill=tk.X)
```

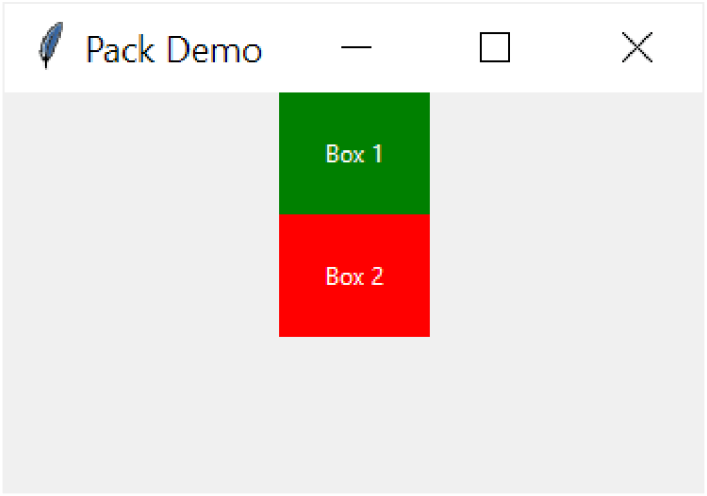
… you'll see that the widget fills all available space across the x-axis:



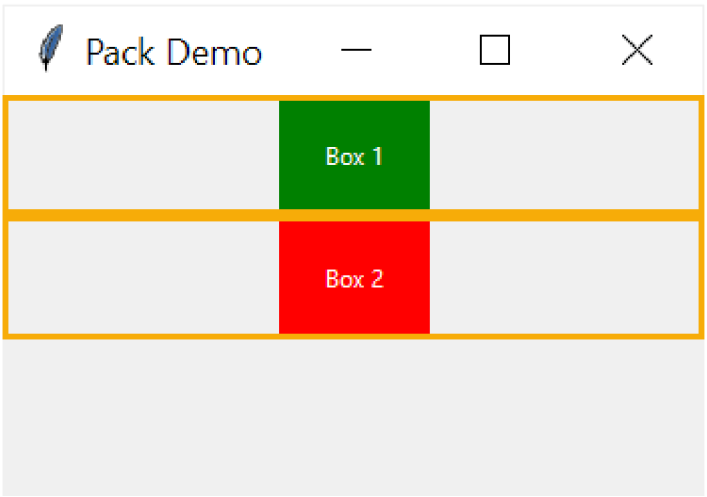
However, if you change to `fill=tk.Y` as follows:

```
box1.pack(ipadx=20,ipady=20,fill=tk.Y)
```

… you'll see that the first widget doesn't fill all spaces vertically:



This is because the `pack` allocates space to each widget as highlighted in the following picture:



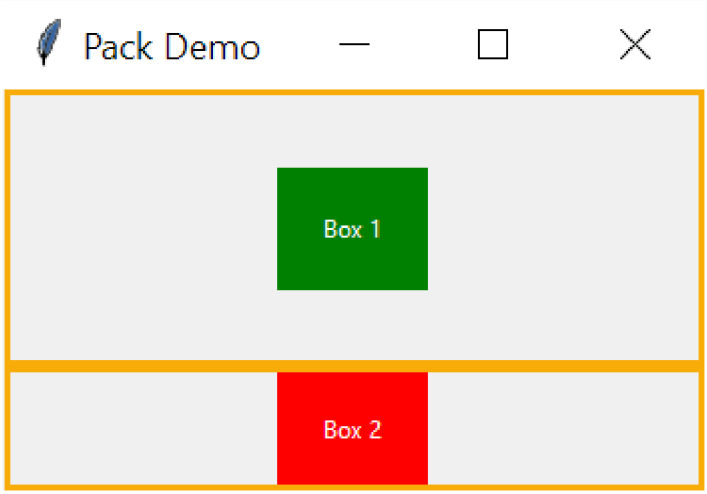
When you use the `fill` option, the area each widget can fill is constrained by their allocated areas.

4) Using the *expand* option

The `expand` option allocates more available space to a widget. If you add the `expand` option to the first widget:

```
box1.pack(ipadx=20,ipady=20,expand=True)
```

...you'll get the following output:



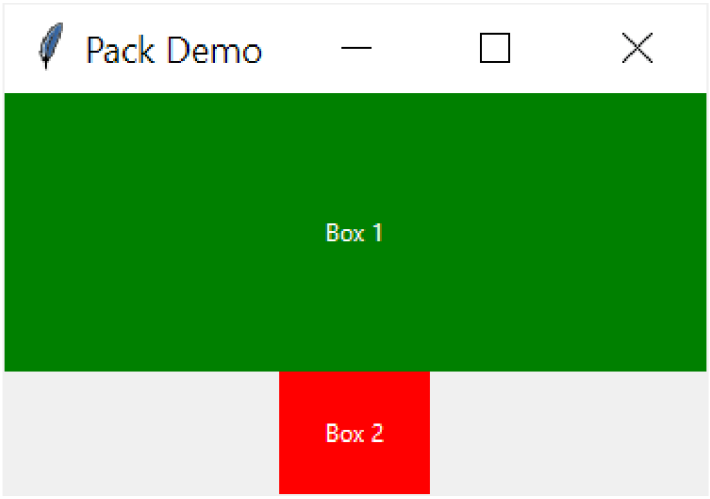
In this example, the first widget takes all available space in the window except for the space allocated to the second widget.

Since the first widget doesn't have the `fill` option, it floats in the middle of the allocated area.

If you set `fill` option of the first widget to `tk.BOTH` :

```
box1.pack(ipadx=20, ipady=20, fill=tk.BOTH, expand=True)
```

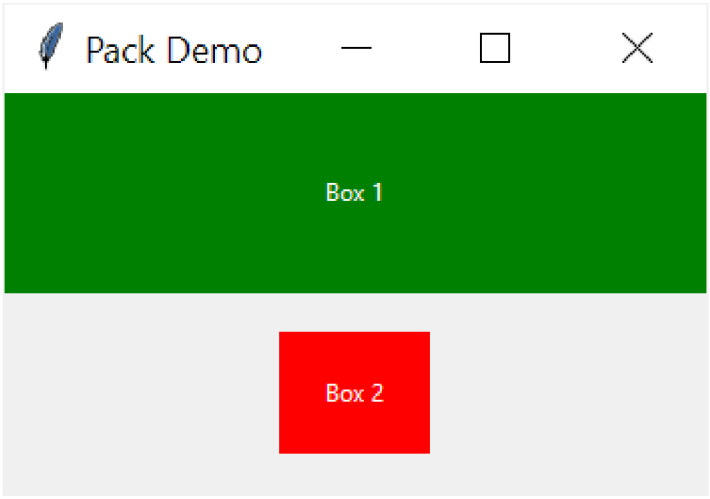
...you'll see that the first widget fills up all of its allocated space:



If you add the `expand` option to both widgets, the `pack` manager will allocate the space to them evenly. For example:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack(ipadx=20, ipady=20, fill=tk.BOTH, expand=True)

# box 2
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
box2.pack(ipadx=20, ipady=20, expand=True)

root.mainloop()
```

Output:



Notice that the second widget doesn't use all allocated space because it doesn't have the `fill` option.

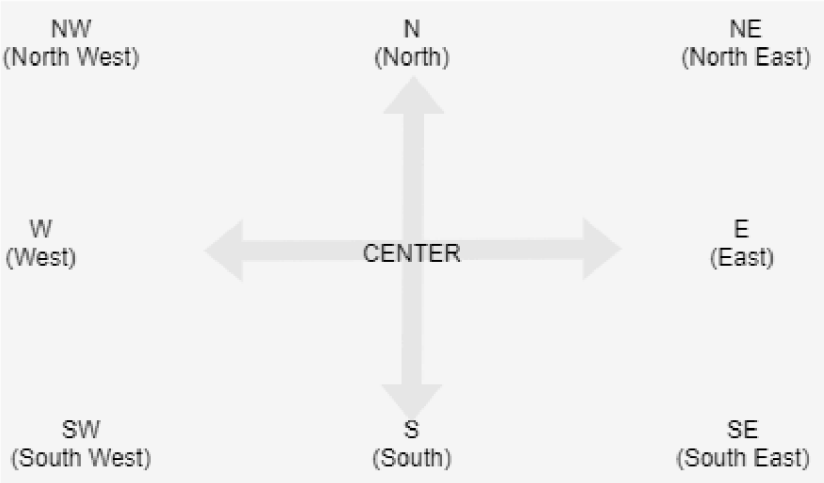
When you set the `expand` to `True` for all widgets, the `pack` geometry manager will allocate spaces to them evenly. However, this is only true when all the widgets share the same `side` .

5) Using the *anchor* option

The `anchor` allows you to anchor the widget to the edge of the allocated space. It accepts one of the following values:

Sticky	**Description**
N	North or Top Center
S	South or Bottom Center
E	East or Right Center
W	West or Left Center
NW	North West or Top Left
NE	North East or Top Right
SE	South East or Bottom Right
SW	South West or Bottom Left
CENTER	Center

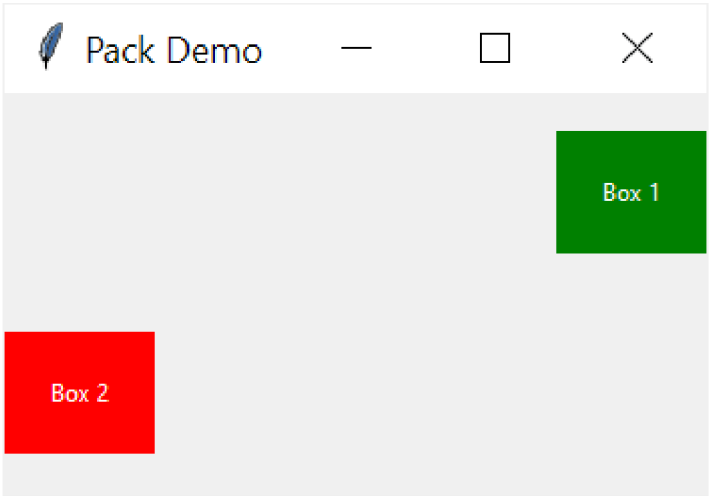
The following picture illustrates the anchor options:



For example, the following program shows widgets that use `E` and `W` anchors:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack(ipadx=20, ipady=20, anchor=tk.E,  expand=True)

# box 2
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
box2.pack(ipadx=20, ipady=20, anchor=tk.W, expand=True)



root.mainloop()
```

Output:



6) Using the *side* option

The `side` option specifies the alignment of the widget:

- `tkinter.TOP`
- `tkinter.LEFT`
- `tkinter.RIGHT`
- `tkinter.BOTTOM`

They are equivalent to `'left'`, `'top'`, `'right'`, and `'bottom'`.

The `side` defaults to `TOP`. In other words, widgets are aligned to the top of their container.

The following example sets the `side` for the first widget to `tkinter.LEFT`:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack(ipadx=20, ipady=20, fill=tk.BOTH, expand=True, side=tk.LEFT)

# box 2
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
```

```
box2.pack(ipadx=20, ipady=20, fill=tk.BOTH, expand=True)

root.mainloop()
```

Output:

In this example, the `expand` option may not work as you expected. The reason is that widgets have different sides.

To make their space even again, you can:

- Set the `side` of both widgets to `'left'`
- Or set the side of a widget to `'left'` and the side of the other widget to `'right'` .

For example:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack(ipadx=20, ipady=20, fill=tk.BOTH, expand=True, side=tk.LEFT)

# box 2
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
```

```
box2.pack(ipadx=20, ipady=20, fill=tk.BOTH, expand=True, side=tk.RIGHT)

root.mainloop()
```

Output:

6) padx and pady: set the external paddings

To set the external paddings of widgets, you use the `padx` and `pady` parameters:

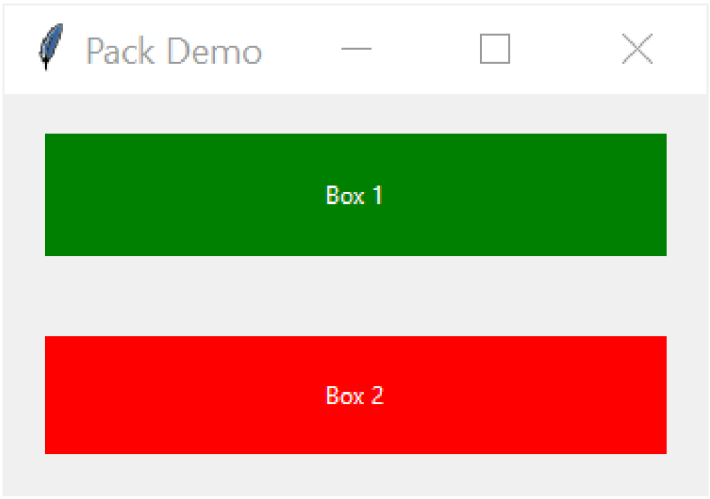
- `padx` – fill available space along the x-axis
- `pady` – fill available space along the y-axis

For example:

```
import tkinter as tk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("350x200")

# box 1
box1 = tk.Label(root, text="Box 1", bg="green", fg="white")
box1.pack(ipadx=20, ipady=20, padx=20, pady=20,
          fill=tk.BOTH, expand=True)

# box 2
```

```
box2 = tk.Label(root, text="Box 2", bg="red", fg="white")
box2.pack(ipadx=20, ipady=20, padx=20, pady=20,
          fill=tk.BOTH, expand=True)

root.mainloop()
```

Output:



When to use the pack geometry manager

The pack geometry manager is suitable for the following:

- Placing widgets in a top-down layout.
- Placing widgets side-by-side layout.

See the following example:

```
import tkinter as tk
from tkinter import ttk

root = tk.Tk()
root.title('Pack Demo')
root.geometry("300x200")

ipadding = {'ipadx': 10, 'ipady': 10}
```

```
# place widgets top down
label1 = tk.Label(root, text='Box 1', bg="red", fg="white")
label1.pack(**ipadding, fill=tk.X)

label2 = tk.Label(root, text='Box 2', bg="green", fg="white")
label2.pack(**ipadding, fill=tk.X)

label3 = tk.Label(root, text='Box 3', bg="blue", fg="white")
label3.pack(**ipadding, fill=tk.X)

# place widgets side by side
label4 = tk.Label(root, text='Left', bg="cyan", fg="black")
label4.pack(**ipadding, expand=True, fill=tk.BOTH, side=tk.LEFT)

label5 = tk.Label(root, text='Center', bg="magenta", fg="black")
label5.pack(**ipadding, expand=True, fill=tk.BOTH, side=tk.LEFT)

label6 = tk.Label(root, text='Right', bg="yellow", fg="black")
label6.pack(**ipadding, expand=True, fill=tk.BOTH, side=tk.LEFT)

root.mainloop()
```

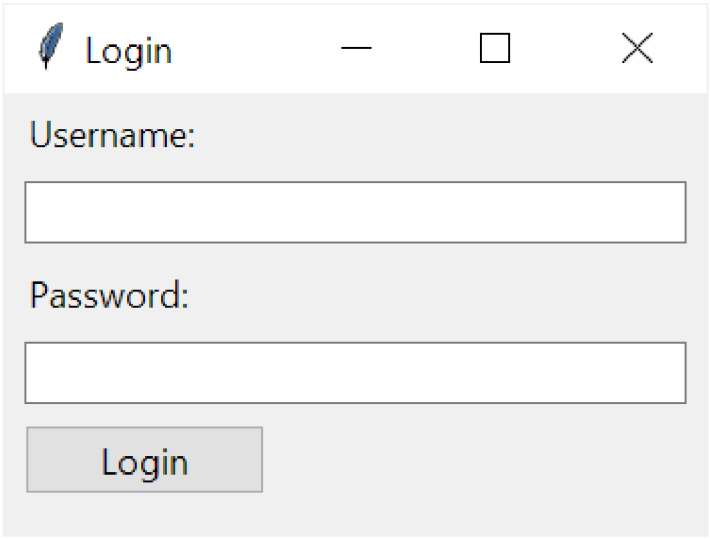
Output:

Using pack to create a login form example

The following example uses the pack() method to create a login form:

```
import tkinter as tk
from tkinter import ttk

root = tk.Tk()
root.title('Login')
root.geometry("350x220")


fields = {}

fields['username_label'] = ttk.Label(text='Username:')
fields['username'] = ttk.Entry()

fields['password_label'] = ttk.Label(text='Password:')
fields['password'] = ttk.Entry(show="*")


for field in fields.values():
    field.pack(anchor=tk.W, padx=10, pady=5, fill=tk.X)

ttk.Button(text='Login').pack(anchor=tk.W, padx=10, pady=5)

root.mainloop()
```

Output:



How it works.

First, initialize a dictionary to store the widgets:

```
fields = {}
```

Second, create Label and Entry widgets:

```
fields['username_label'] = ttk.Label(text='Username:')
fields['username'] = ttk.Entry()

fields['password_label'] = ttk.Label(text='Password:')
fields['password'] = ttk.Entry(show="*")
```

Third, iterate through the widgets and pack them:

```
for field in fields.values():
    field.pack(anchor=tk.W, padx=10, pady=5, fill=tk.X)
```

Finally, add the login button:

```
ttk.Button(text='Login').pack(anchor=tk.W, padx=10, pady=5)
```

Summary

- Use Tkinter pack geometry manager to arrange widgets in a top-down layout or side by side.
- Use the `fill`, `expand`, and `side` options of pack geometry manager to control how widgets are arranged.