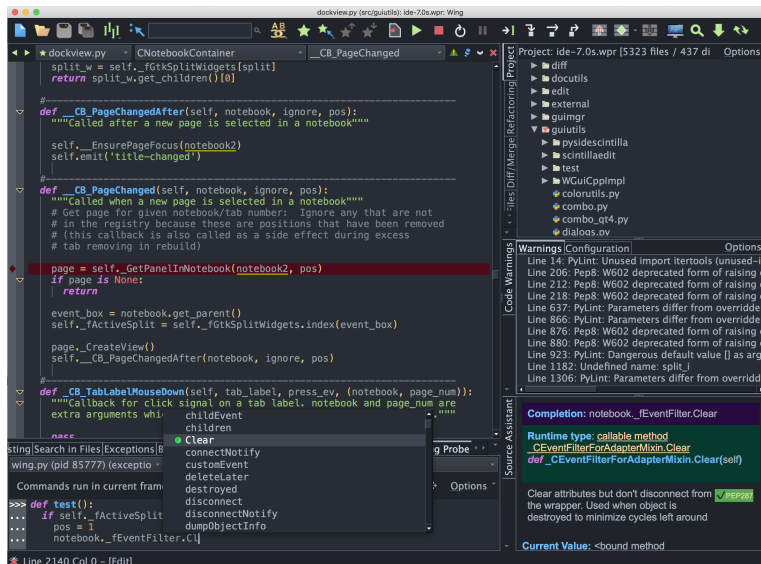




## Wing 101 Tutorial



This tutorial introduces Wing 101 by taking you through its feature set with a small coding example.

If you are new to programming, you may want to check out the book [Python Programming Fundamentals](#) and accompanying screen casts, which use Wing 101 to teach programming with Python.

Our [How-Tos](#) show how to use Wing with 3rd party web development frameworks, GUI toolkits, scientific data visualization tools, Python-based modeling, rendering & compositing systems, and other Python frameworks and toolkits.


To get started, press the **Next Page** icon in the toolbar immediately above this page.

The screenshots in this tutorial were made with Wing Pro and may contain some tools that are not available in Wing 101. These can be ignored and will not be discussed in the text that follows.

## Tutorial: Why Wing?

Wing 101 was designed with the University of Toronto to be the simplest Python IDE possible that fully supports students learning to program for the first time. It omits almost all of the features found in Wingware's other Wing Python IDEs, to avoid distracting from the most important first concepts in programming.

If you already know how to program, or if you are using Wing for development outside of introductory course work, you should instead use Wing Personal (simplified IDE for students and hobbyists) or Wing Pro (full-featured IDE for professional developers )instead. You will be much more productive, and chances are you will have no problem understanding and using the additional features provided by those products.

Let's get started! To get to the next page in the tutorial, use the  **Next Page** icon in the toolbar immediately above this page.

## Tutorial: Getting Started

To get started using this tutorial, you will need to:

### Install Python

If you don't already have it on your system, install Python from [python.org](https://python.org) or use [Anaconda](#) for seamless access to many third party Python libraries.

### Install Wing

Then install [Wing](#). For detailed instructions, see [Installing Wing](#).

### Start Wing

Wing can be started from a menu, desktop, or tray icon, or by using the command line executable. For detailed instructions, see [Running Wing](#).

### Switch to the Integrated Tutorial

Once Wing is running, you should switch to using the **Tutorial** listed in Wing's **Help** menu because it contains links directly into the IDE's functionality. This includes the next step below.

### Copy the Tutorial Directory

Copy the entire **tutorial** directory out of the **Install Directory** listed in Wing's **About box** to another location on disk. You can do this manually or use the following link, which will prompt you to select the target directory:

### Copy Tutorial Now

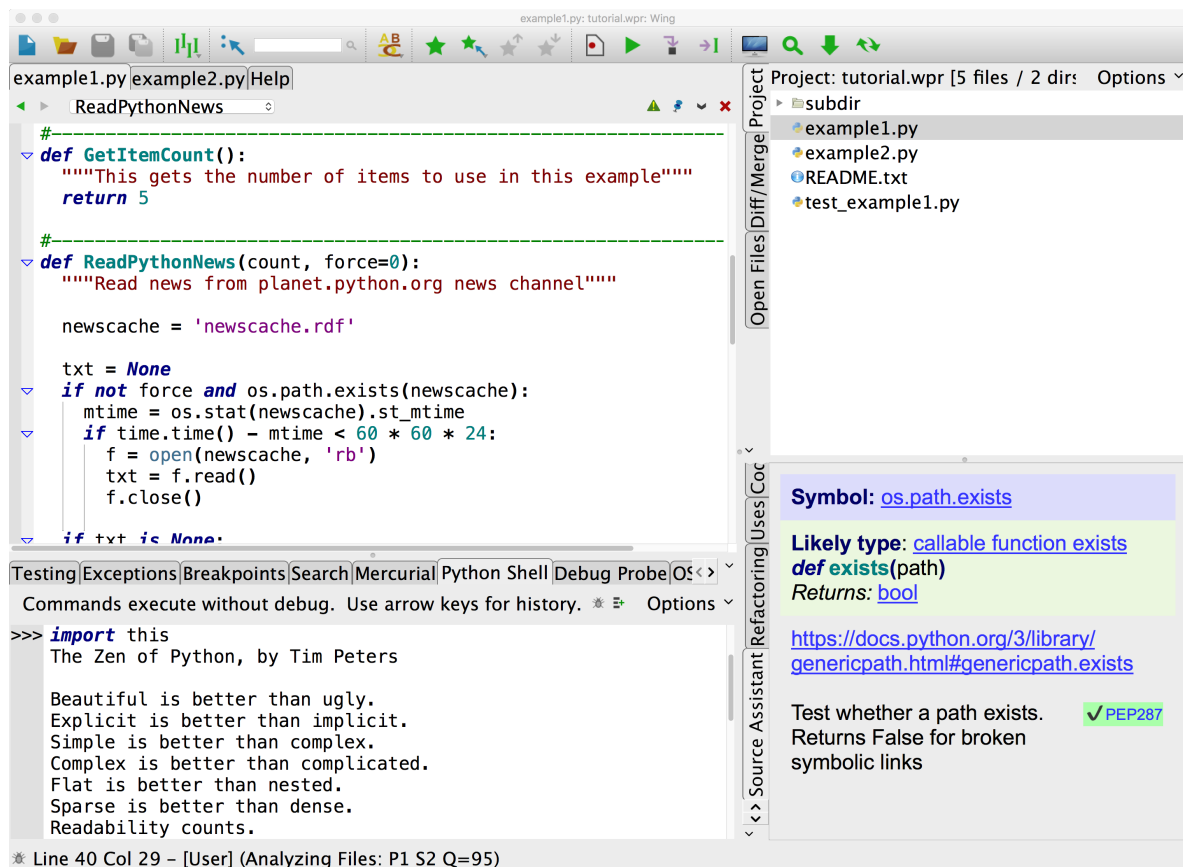
#### **Note**

We welcome feedback, which can be submitted with **Submit Feedback** in Wing's **Help** menu or by emailing [support@wingware.com](mailto:support@wingware.com)

# Tutorial: Getting Around Wing

Let's start with some basics that will help you get around Wing while working with this tutorial.

Wing's user interface is divided into an editor area and two toolboxes separated by draggable dividers. Try pressing **F1** and **F2** now to show or hide the two toolboxes. Also try **Shift-F2** to maximize the editor area temporarily, hiding both tool areas and toolbar until **Shift-F2** is pressed again.



Tool and editor tabs can be dragged to rearrange the user interface, optionally creating a new split or moving them to a separate window. Right click on the tabs for a menu of additional options, such as adding or removing splits or to move the toolbox from right to left. The number of splits shown by default in toolboxes will vary according to the size of your display.

Notice that you can click on an already-active tool tab to minimize that tool area. Click again on any tab to restore the toolbox to its previous size.

See [User Interface Layout](#) for details.

## Context Menus

In general, right-clicking provides a menu for interacting with or configuring a part of the user interface. On some systems you may need to configure your track pad to allow right-clicking, or use a keyboard modifier to emulate a right mouse click.

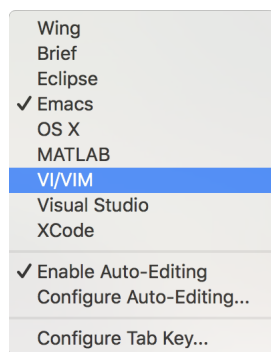
## Splitting the Editor Area

Splitting your editor area makes it easier to get around this tutorial. To do this now, right-click on the editor tab area and select **Split Side by Side**.

By default, the editor shows all open files in all splits, making it easy to work on different parts of a file simultaneously. This can be changed by unchecking **Show All Files in All Splits** in the right-click context menu on the editor tabs.

## Configuring the Keyboard

Use the **Edit > Keyboard Personality** menu or **User Interface > Keyboard > Personality** preference to tell Wing to emulate another editor, such as Visual Studio, VI/Vim, Emacs, Eclipse, XCode, MATLAB, or Brief.



The **Configure Tab Key** item in the **Edit > Keyboard Personality** menu or the **User Interface > Keyboard > Tab Key Action** preference can be used to select among available behaviors for the **Tab** key. The default is to match the selected Keyboard Personality.

When the Keyboard Personality is set to **Wing**, **Tab** acts differently according to context. For example, if lines are selected, repeated presses of **Tab** moves the lines among syntactically valid indent positions. And, when the caret is at the end of a line, pressing **Tab** adds one indent level.

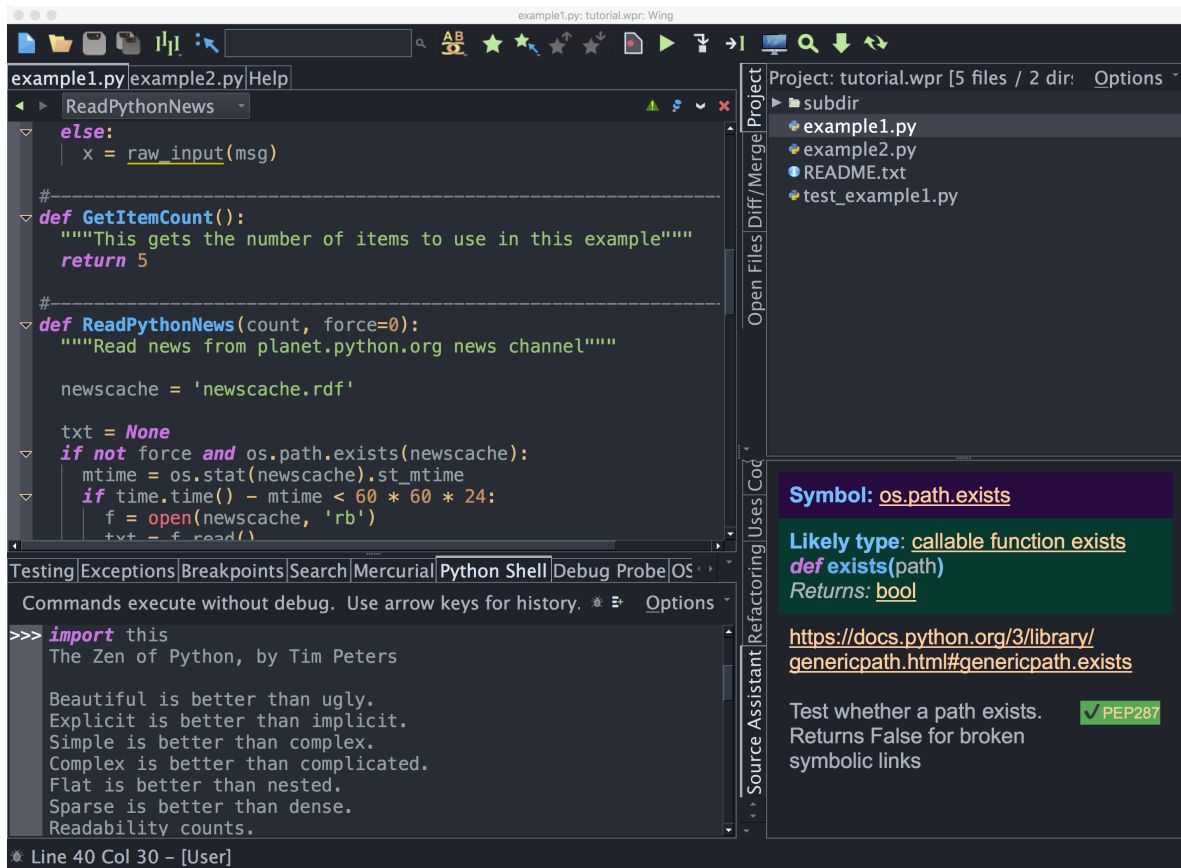
See [Keyboard Personalities](#) for details.

## Colors and Dark Mode

Wing's cross-platform user interface (UI) adjusts to the OS on which you are running it, except on Linux where it cannot use the system-provided UI. You can set the colors used in the editor with the **User Interface > Color Palette** preference. To apply this palette also to the rest of the UI, outside of editors, enable the **Use Color Palette Throughout the UI** preference.

To set a dark background display style, select **One Dark**, **Monokai**, **Black Background**, **Solarized - Dark**, **Sun Steel**, **Positronic**, **Dracula**, or **Cherry Blossom** as the **Color Palette**.

The color palette **One Dark** applied to the whole UI was used to create the following screenshot and those in the rest of this tutorial:



## Other Configuration Options

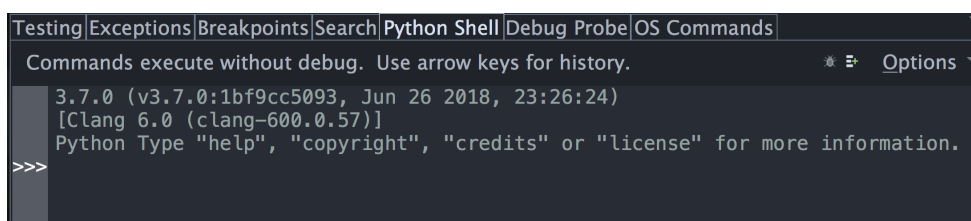
To set the fonts in the user interface and editor, change the **User Interface > Fonts > Display Font/Size** and **User Interface > Fonts > Editor Font/Size** preferences.

The size and type of tools used in the toolbar at the top of Wing's window can be changed by right-clicking on one of the enabled tools.

For more information on adjusting the user interface to your needs, see [Customization](#).

## Tutorial: Check your Python Integration

Before starting with some code, let's make sure that Wing has succeeded in finding your Python installation. Bring up the **Python Shell** tool now from the **Tools** menu. If all goes well, it should start up Python and show you the Python command prompt like this:



If this is not working, or the wrong version of Python is being used, you can point Wing in the right direction with **Python Executable** in the **Python Configuration**, accessed from the **Edit** menu.

An easy way to determine the value to use for **Python Executable** is to start the Python you wish to use with Wing and type the following at Python's `>>>` prompt:

```
import sys
print(sys.executable)
```

You can also use a virtualenv or Anaconda environment by selecting the **Activated Env** option here, but for now let's just use the base Python installation.

You will need to **Restart Shell** from the **Options** menu in the **Python Shell** tool after altering **Python Executable**.

Once the shell works, copy/paste or drag and drop these lines of Python code into it:

```
for i in range(0, 10):
    print('*' * i)
```

This should print a triangle as follows:



```
>>> for i in range(0, 10):
...     print('*' * i)
...
*
**
***
****
*****
*****
*****
*****
*****
*****
>>>
```

Notice that the shell removes common leading white space when blocks of code are copied into it. This is useful when trying out code from source files.

Now type something into the shell, such as:

```
import sys
sys.getrefcount(i)
```

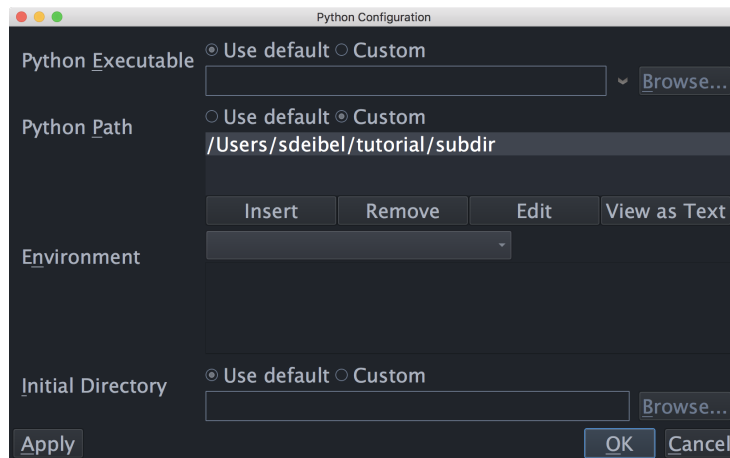
You can create as many instances of the **Python Shell** tool as you wish by right-clicking on a tool tab and selecting **Insert Tool**. Each one will run in its own process space.

## Tutorial: Setting Python Path

Python uses a search path referred to as the Python Path to find modules that are imported into code with the **import** statement. Most code only imports modules that are already on the default path, for example modules in the Python standard library, or modules installed into Python by **pip**, **pipenv**, **conda**, or some other package manager.

However, in some cases code will depend on a different path provided either by setting the environment variable **PYTHONPATH** before starting Python, or by modifying **sys.path** at runtime before importing modules.

If the **Python Path** is changed by one of these methods, you may also need to tell Wing about this change. This is done with **Python Path** in the **Configure Python** dialog, accessed from the **Edit** menu:



For this tutorial, you need to add the **subdir** sub-directory of your **tutorials** directory to **Python Path**, as shown above. This directory contains a module used as part of the first coding example.

Note that the full path to the directory **subdir** is used. This is strongly recommended because it avoids potential problems finding source code during debugging, if the starting directory is ambiguous or changes over time.

The configuration used here is for illustrative purposes only. You could run the example code without altering the **Python Path** by moving the **path\_example.py** file to the same location as the example scripts.

### Startup Environment

Wing uses its startup environment as the default environment for your Python code. As a result, if **PYTHONPATH** is set when you start Wing, it will also be used with your code. If this inherited path matches the needs of your code, then you don't need to set **Python Path** in Wing.

### Virtualenv and Anaconda Environments

If you are using **virtualenv**, Anaconda environments, or **pipenv** to set up your Python environment, you don't need to set **Python Path**. Instead, set **Python Executable** to **Activated Env** and enter the command that activates your environment. This causes Wing to pick up the correct path and other environment needed to run code in the environment. In this case, Python is launched by running **python** in that environment.

You can also create a new virtualenv or Anaconda environment at the same time as creating a Wing project by selecting the **Create New Virtualenv** or **Create New Anaconda Environment** project types in the **New Project** dialog, accessed from the **Project** menu.

But don't do this now; you'll need the current project as you work through this tutorial.

## Tutorial: Introduction to the Editor

Now we're ready to get started with some coding. Open up the file **example1.py** within Wing by selecting **Open** from the **File** menu.

Scroll down to the bottom of **example1.py** and enter the following code:

```
news = ReadPythonNews(GetItemCount())
```

Press enter a few times. Note that Wing auto-indents the subsequent lines and adds red error indicators under them shortly after you stop typing. This indicates that there is a syntax error in your code:

```
#-----
def PrintAsHTML(news):
    """Print Python news in simple HTML format"""

    for date, event, url in news:
        # NOTE: The line below contains a deliberate typo
        print('<p><i>%s</i> <a href="%s">%s</a></p>' % (data, url, event))

#####
# Enter code according to the tutorial here:

news = def ReadPythonNews(GetItemCount())
```

Once you correct the line and complete it by typing the final **)**, the error indicators will be removed. You should now have this complete line of code in your file:

```
news = ReadPythonNews(GetItemCount())
```


Then enter the following additional lines of code:

```
PrintAsText(news)
PromptToContinue()
PrintAsHTML(news)
```

At this point you have a complete program that can be run in the debugger.


## Tutorial: Debugging

The **example1.py** program you have just created connects to **python.org** via HTTP, reads and parses the Python-related news feed in RDF format, and then prints the most recent five items as text and HTML. Don't worry if you are working offline. The script has canned data it will use when it cannot connect to **python.org**.

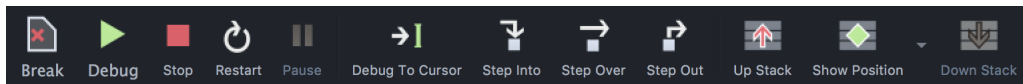
To start debugging, set a breakpoint on the line that reads **return 5** in the **GetItemCount** function. This can be done by clicking on the line and selecting the  **Break** toolbar item, or by clicking on the left-most margin to the left of the line. The breakpoint should appear as a filled red circle:





```
#-----
def GetItemCount():
    """This gets the number of items to use in this example"""
    return 5
```

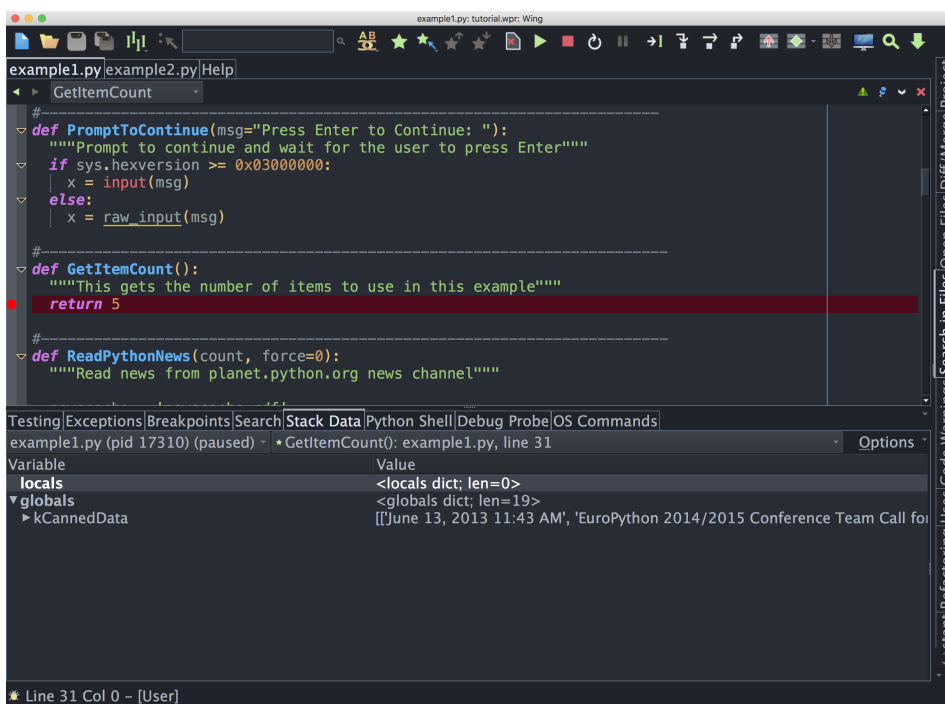
Next start the debugger with  **Debug** in the toolbar or **Start/Continue** in the **Debug** menu.

Wing will run to the breakpoint and stop, placing a red indicator on the line. Notice that the toolbar changes to include additional debug tools, as shown below:





Your display may vary depending on the size of your screen, or if you have altered the toolbar's configuration. Wing displays tooltips explaining what the items do when you hover the mouse over them.

Now you can inspect the program state at that point with the **Stack Data** tool and by going up and down the stack with  **Up Stack** and  **Down Stack** in the toolbar or from the **Debug** menu. The stack can also be viewed as a list using the **Call Stack** tool:




Notice that the debug status indicator in the lower left of Wing's main window changes color depending on the state of the debug process. Hover the mouse over the indicator to see detailed status in a tooltip.

Next, try stepping out to the enclosing call to **ReadPythonNews**. In this particular context, you can achieve this in a single click with the  **Step Out** in the toolbar or **Debug** menu. Two clicks on  **Step Over** also work. **ReadPythonNews** is a good function to step through in order to try out the basic debugger features described above.

Try stepping or running to a breakpoint on the last line of this function, which reads `return news[:count]`. In this context, right-clicking on `news` under `locals` in **Stack Data** allows viewing the value in textual form or as an array. The latter loads data incrementally for only the visible portion of the value, which is useful with `numpy` arrays, pandas **DataFrames**, `sqlite` query results, and other larger data sets.

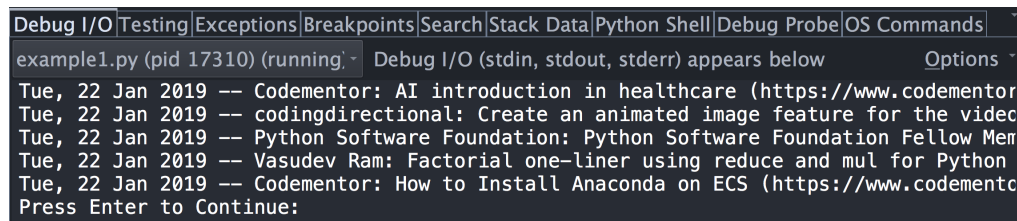
Data can also be viewed in tooltips on the editor by hovering the mouse over a value. Try this with `count` to see the value `5`.

Finally, try  **Step Over** to reach the return event in `ReadPythonNews`, which is indicated by a change from the solid debug line marker to an underline. Notice that hovering the mouse over `return` in the editor displays the value that is being returned from the function. Similarly, `<return value>` is added to the `locals` shown in the **Stack Data** tool.


## 7.1. Tutorial: Debug I/O

Before continuing any further in the debugger, bring up the **Debug I/O** tool so you can watch the subsequent output from the program. This is also where keyboard input takes place in debug code that requests it.

Once you step over the line `PrintAsText(news)` you should see output similar to the following:



```
Debug I/O | Testing | Exceptions | Breakpoints | Search | Stack Data | Python Shell | Debug Probe | OS Commands
example1.py (pid 17310) (running) | Debug I/O (stdin, stdout, stderr) appears below | Options
Tue, 22 Jan 2019 -- Codementor: AI introduction in healthcare (https://www.codementor
Tue, 22 Jan 2019 -- codingdirectional: Create an animated image feature for the vide
Tue, 22 Jan 2019 -- Python Software Foundation: Python Software Foundation Fellow Mer
Tue, 22 Jan 2019 -- Vasudev Ram: Factorial one-liner using reduce and mul for Python
Tue, 22 Jan 2019 -- Codementor: How to Install Anaconda on ECS (https://www.codementor
Press Enter to Continue:
```


For code that reads from `stdin` or uses `input()` or Python 2.x's `raw_input()`, the **Debug I/O** tool is where you would type input to your program. Try this now by stepping over the `PromptToContinue` call with  **Step Over** in the toolbar. You will see the prompt "Press Enter to Continue" appear in the **Debug I/O** tool and the debugger will not complete the **Step Over** operation until you press **Enter** while keyboard focus is in the **Debug I/O** tool.

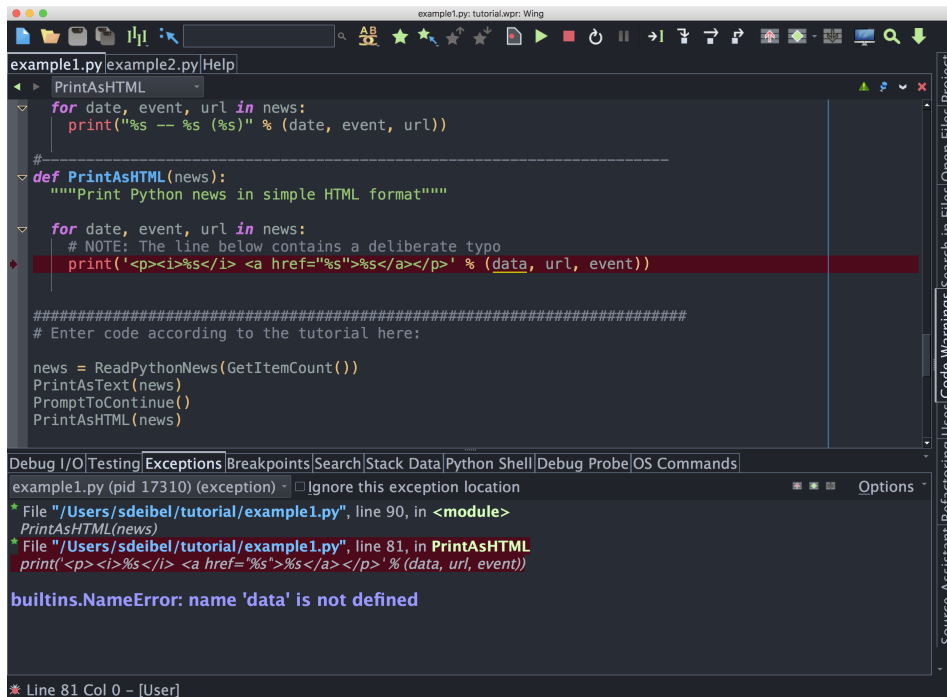
You can also configure Wing to use an external console from the **Options** menu in the **Debug I/O** tool. This is useful for programs that requires a more complete console implementation to run correctly, for example those that use the `curses` module.

See [Debug Process I/O](#) for details.

## 7.2. Tutorial: Debug Process Exception Reporting

Wing's debugger reports any exceptions that would be printed when running the code outside of the debugger.

Try this out by continuing execution of the debug process with the  **Debug** toolbar icon or **Start / Continue** in the **Debug** menu. Wing will stop on an incorrect line of code in `PrintAsHTML` and report the problem in the **Exceptions** tool:



The **Exceptions** tool highlights the current stack frame as you move up and down the stack. You can click on frames to navigate the exception backtrace, showing the source code for each frame.

Whenever you are stopped on an exception, the debugger status indicator in the lower left of Wing's main window turns red.

After reaching an exception in the debugger, you can correct your code, stop the debugger with the **Stop** icon in the toolbar, and then start debugging again.

### 7.3. Tutorial: Debugging from the Python Shell

In addition to launching code to debug from Wing's menu bar and **Debug** menu, it is also possible to debug code that is entered into the **Python Shell**.

Enable this now by clicking on the bug icon in the top right of the **Python Shell**. Once this is done, the status message at the top of the **Python Shell** should change to include **Commands will be debugged** and an extra margin is shown in which you can set breakpoints. Wing will reach those breakpoints, as well as any breakpoints in editors for code that is invoked. Any exceptions will be reported in the debugger.

Let's try this out. First stop any running debug process with the **Stop** icon in the toolbar. Then paste the following into the **Python Shell** and press **Enter** so that you are returned to the **>>>** prompt:

```
def test_function():
    x = 10
    print(x)
    x += 5
    y = 20
    print(x+y)
```

Next place a breakpoint on the line that reads **print(x)** by clicking in the breakpoint margin to the left of the prompt on that line.

Then type this into the **Python Shell** and press **Enter**:

```
test_function()
```

Wing should reach the breakpoint on **print(x)**.

You can now work with the debugger in the same way that you would if you had launched code from the toolbar or **Debug** menu. Try stepping and viewing the values of **x** and **y** as they change, either in the **Stack Data** tool or by hovering the mouse over the variable names.

Take a look at the stack in the **Call Stack** or **Stack Data** tool to see how stack frames that occur within the **Python Shell** are listed. You can move up and down the stack just as you would if your stack frames were in an editor.

Notice that if you step off the end of the call, you will return to the shell prompt. If you press the ■ **Stop** item in the toolbar or select **Stop Debugging** from the **Debug** menu, Wing will complete execution of the code without debug and return you to the **>>>** prompt. Note that the code is still executed to completion in this case because there is no way to simply abandon a number of stack frames in the Python interpreter.

See [Debugging Code in the Python Shell](#) for details.

## Tutorial: Indentation Features

Since indentation is syntactically significant in Python, Wing provides a number of features to make working with indentation easier.

### Auto-Indentation

By now you will have noticed that Wing auto-indents lines as you type, according to context. This can be disabled with the **Editor > Indentation > Auto-Indent** preference.

Wing also adjusts the indentation of blocks of code that are pasted into the editor. If the indentation change is not what you wanted, a single **Undo** removes the indentation adjustment, if there was one.

See [Auto-indent](#) for details.

### Block Indentation

One or more selected lines can be increased or reduced in indentation, or adjusted to match indentation according to context, from the **Indentation** toolbar group:



Repeated presses of the **Match Indent** tool will move the selected lines among the possible syntactically correct indent levels for that context. The default action of the **Tab** key does the same thing.

These indentation features are also available in the **Source** menu, where their key bindings are listed.

## Tutorial: Other Editor Features

There are a number of other editor features that are worth knowing about:

### Goto-Line

You can navigate quickly to a numbered source line with **Goto Line** in the **Edit** menu, or with the key binding displayed there. Type the line number and then press **Enter** to complete the action.

### Selection Mode and Structural Code Selection

Wing supports character, line, and block mode selection from **Selection Mode** in the **Edit** menu, and the key bindings shown there.

In Python code, the **Select** sub-menu in the **Edit** menu can be used to easily select and traverse logical blocks of code. The **Select More** and **Select Less** operations are particularly useful when preparing to type over or copy/paste ranges of text.

Try these out now on **urllib** in **ReadPythonNews** in **example1.py**. Each repeated press of **Ctrl-Up** will select more code in logical units. Press **Ctrl-Down** to select less code.

The other operations in the **Select** sub-menu can be used for selecting and moving forward or backward over whole statements, blocks, or scopes.

See [Selecting Text](#) for details.

### Code Warnings

As you probably noticed while working through the tutorial, Wing flags some types of incorrect code by underlining it. This is done for syntax errors, indentation errors, code that can't be reached, and other types of errors. Hovering the mouse cursor over an indicator on the editor displays details for that warning or error in a tooltip.

Note that Wing Pro implements a much richer code warnings capability that supports more error types and can display warnings from external checkers like mypy, Pylint, and pep8.

### Block Commenting

Lines of code can be commented out or un-commented quickly from the **Source** menu. In Python code, the **Editor > Block Commenting Style** preference controls the type of commenting that is used. The default is to use indented single **#** characters since this works better with some of Wing's other features.

### Brace Matching

Wing highlights brace matches as you type, unless this is disabled from the **Editor > Brace Matching > Brace Highlighting** preference. The **Match Braces** item in the **Source** menu causes Wing to select all the code that is contained in the nearest matching braces, as found from the current insertion point on the editor. Repeated invocations of the command will traverse outward or forward in the file.

### Text Reformatting

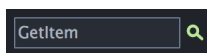
Code can be re-wrapped to the column configured in the preference **Editor > Line Wrapping > Reformatting Wrap Column** with the **Rewrap Text** item in the **Source** menu. This will limit wrapping to a single logical line of code, so it can be used to reformat function or method arguments or long list or tuple without altering surrounding code.

## Tutorial: Searching

Wing 101 provides several different interfaces for searching your code. Which you use depends on what you want to search and how you prefer to interact with the search and replace functionality.

### 10.1. Tutorial: Toolbar Search

A quick way to search through the current editor or documentation page is to enter your search string into the search area provided by the toolbar:



If you enter only lower case letters, then the search will be case-insensitive. Entering one or more upper-case letters causes the search to become case-sensitive.

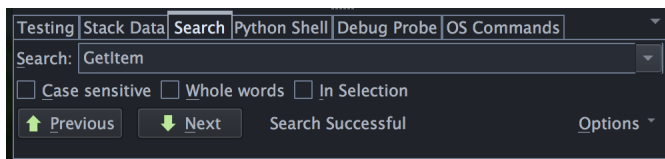
Try this now in **example1.py**: Type **GetItem** into the toolbar search area. Wing will search incrementally, starting when the first letter is typed. Press the **Enter** key to move on to the next match, wrapping around to the top of the file if necessary.

Toolbar-based searches always go forward in the file from the current editor caret position.

See [Toolbar Quick Search](#) for details.

### 10.2. Tutorial: Search Tool

The **Search** tool provides simple search and replace operations on the current editor or documentation page. Key bindings for operations on this tool are given in the **Search and Replace** group in the **Edit** menu.

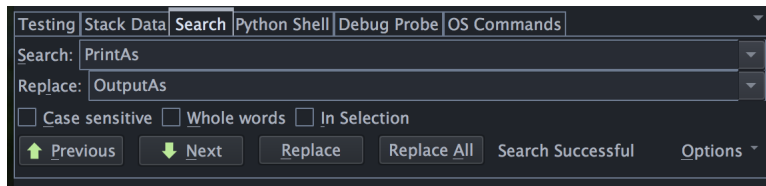


Searches may span the whole file or be constrained to the current selection, can be case sensitive or insensitive, and may optionally be constrained to matching only whole words.

By default, searching is incremental while you type your search string. To disable this, uncheck **Incremental** in the **Options** menu.

### Replacing

When the tool is displayed with **Replace**, or when the **Show Replace** item in the **Options** menu is activated, Wing will show an area for entering a replace string and add **Replace** and **Replace All** buttons to the Search tool:



Try replacing **example1.py** with search string **PrintAs** and replace string **OutputAs**.

Select the first result match and then **Replace** repeatedly. One search match will be replaced at a time. Search will occur again after each replace automatically unless you turn off the **Find After Replace** option. Changes can be undone in the editor, one at a time. Do this now to avoid saving this replace operation.

Next, try **Replace All** instead. Wing will simply replace all occurrences in the file at the same time. When this is done, a single undo in the editor will cancel the entire replace operation.

See also [Search Tool](#) for more information.

## Tutorial: Further Reading

Congratulations, you've finished the tutorial!

As you work with Wing 101 on your own software development projects, the following resources may be useful:

[Wing Reference Manual](#) which documents all the features in detail.

[Wing Support Website](#) which includes a Q&A support forum, mailing lists, documentation, links to social media, and other information for Wing users.

**Wing Tips** displayed at startup help you continue learning about the feature set over time. These are also accessible from the **Help** menu.

**Thanks for using Wing 101!**