<!-- Chapter doc: [\_OpenStax\_Python\_Ch01\_Statements](https://docs.google.com/document/d/1_iaLvYNdsz2MuIOtPnaGPHrahilRPN3vXNXY33tYaY8/edit) -->

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<!-- <h1 class="zybook-section-title">**Introduction**</h1> -->

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alt="Photo of green grass field at sunrise">



</zyGdocImage>

**<p style="text-align: center;"><sub>**

<zyLink link="<https://unsplash.com/photos/4miBe6zg5r0> ">Photo</zyLink>

by <zyLink link="<https://unsplash.com/@aleskrivec>">Ales Krivec</zyLink>

on <zyLink link="<https://unsplash.com/>">Unsplash</zyLink>

**</sub></p>**

**<p>**

Computers and programs are everywhere in today's world.

Programs affect many aspects of daily life and society as a whole.

People depend on programs for communication, shopping, entertainment, health care, and countless other needs.

Learning how to program computers opens the door to many careers and opportunities for building a better world.

**</p>**

**<p>**

Programs consist of statements to be run one after the other.

<zyDefn>A \_statement\_ describes some action to be carried out.</zyDefn>

The statement **<zyICode>**print("Good morning")**</zyICode>** instructs Python to output the message "Good morning" to the user.

The statement **<zyICode>**count = 0**</zyICode>** instructs Python to assign the integer 0 to the variable **<zyICode>**count**</zyICode>**.

**</p>**

**<p>**

This chapter introduces statements for input and output, assigning variables, and basic arithmetic.

Making mistakes is a normal part of programming, and the chapter includes advice on understanding error messages.

The chapter ends with a short history of Python and discusses why Python has become so popular today.

**</p>**

<h1 class="zybook-section-title">1.1 Introduction</h1>

</zyHTML>

<zyHTML id="6ae2e5fa-1cec-39c1-eac2-b29694ea9aa8">

### <h3>Learning objectives</h3>

<ul>

<!--

One LO is enough for the introduction. Don't need to be too granular.

But every other section has two, and these LO's are a good summary.

-->

<li>Name two examples of computer programs in everyday life.</li>

<li>Explain why Python is a good programming language to learn.</li>

</ul>

</zyHTML>

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### <h3>Computer programs</h3>

</zyHTML>

#### <!-- SAY -->

<zyHTML id="ce99d2eb-91d0-00e2-4220-3da3ccedba21">

**<p>**

**<zyDefn>**A \_computer\_ is an electronic device that stores and processes information.**</zyDefn>**

Examples of computers include smartphones, tablets, laptops, desktops, and servers.

Technically speaking, **<zyDefn>**a \_program\_ is a sequence of instructions that a computer can run.**</zyDefn>**

Programs help people accomplish everyday tasks, create new technology, and have fun.

**</p>**

**<p>**

The goal of this book is to teach introductory programming and problem solving.

Writing programs is a creative activity, inherently useful, and rewarding!

No prior background in mathematics or computer science is necessary to read this book.

Many different types of programs exist, as shown in the illustration below.

This book will focus on general purpose programs that typically run "behind the scenes."

**</p>**

</zyHTML>

#### <!-- SHOW -->

<!--

Images (CC Zero 1.0 Public Domain):

<https://openclipart.org/detail/172475/iphone-5-black>

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<https://openclipart.org/detail/181674/database-symbol>

<https://openclipart.org/detail/204822/moonbook-retina-laptop>

<https://openclipart.org/detail/12413/two-sixteeth-notes>

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<!-- Last modified Fri Jul 01 2022 16:05:29 GMT-0400 (Eastern Daylight Time) with version 2.19.0.1 -->

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**<text>Mobile**

**Apps</text>**

</zyObject>

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**<text>Server**

**Programs</text>**

</zyObject>

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**<text>Database**

**Programs</text>**

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**<text>Analysis**

**Programs</text>**

</zyObject>

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</zyObjects>

<zyInstructions>

<zyInstruction instrType="step1">

**<text>Every day, millions of people listen to music streamed over the internet.**

**Music sites like Spotify, YouTube, and Pandora depend on many programs.</text>**

</zyInstruction>

<zyInstruction instrType="fade" objNum="3" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="7" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="4" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="8" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="5" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="9" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="6" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="10" timeLabel="-" opacity="100"/>

<zyInstruction instrType="step">

**<text>A common example of a computer program is an interactive mobile app.**

**Some apps play music and allow people to manage their music collections.</text>**

</zyInstruction>

<zyInstruction instrType="fade" objNum="11" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="24" timeLabel="-" opacity="100"/>

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<zyInstruction instrType="fade" objNum="24" timeLabel="0" opacity="0"/>

<zyInstruction instrType="step">

**<text>Mobile apps connect to servers over the internet to download music.**

**These servers run specialized programs that respond to each request.</text>**

</zyInstruction>

<zyInstruction instrType="move" easing="swing" objNum="11" timeLabel="0" top="57" left="146"/>

<zyInstruction instrType="fade" objNum="12" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="13" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="14" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="15" timeLabel="-" opacity="100"/>

<zyInstruction instrType="step">

**<text>Music libraries are stored in large databases that run on many computers.**

**Databases are managed by programs that organize and optimize storage.</text>**

</zyInstruction>

<zyInstruction instrType="move" easing="swing" objNum="11" timeLabel="0" top="38" left="287"/>

<zyInstruction instrType="fade" objNum="16" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="17" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="18" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="19" timeLabel="-" opacity="100"/>

<zyInstruction instrType="resize" objNum="5" timeLabel="0" height="125" width="90"/>

<zyInstruction instrType="move" easing="swing" objNum="5" timeLabel="-" top="41" left="300"/>

<zyInstruction instrType="resize" objNum="5" timeLabel="0" height="100" width="72"/>

<zyInstruction instrType="move" easing="swing" objNum="5" timeLabel="-" top="53" left="310"/>

<zyInstruction instrType="step">

**<text>Other programs can access the servers to explore and analyze data.**

**Ex: Spotify engineers write programs that analyze the popularity of music.</text>**

</zyInstruction>

<zyInstruction instrType="resize" objNum="11" timeLabel="0" height="150" width="185"/>

<zyInstruction instrType="move" easing="swing" objNum="11" timeLabel="-" top="160" left="400"/>

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<zyInstruction instrType="fade" objNum="21" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="22" timeLabel="0" opacity="100"/>

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<zyInstruction instrType="startStep">

<text/>

</zyInstruction>

</zyInstructions>

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</zyAnimator>

#### <!-- ASK -->

**<zyQSetMultipleChoice** caption="Computers and programs" id="0f41ca2d-3937-4d36-a8ad-15bf36043bd6"**>**

<!--

**<zyQ>**

**<zyQText>**Learning to program is an important skill.**</zyQText>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**True**</zyQAns>**

**<zyQExpl>**That's right! Otherwise this book wouldn't exist.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**False**</zyQAns>**

**<zyQExpl>**Many skills, including programming, are important.**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

-->

**<zyQ>**

**<zyQText>**How many types of programs were described in the animation?**</zyQText>**

**<zyQChoice>**

**<zyQAns>**3**</zyQAns>**

**<zyQExpl>**The word "programs" is in the animation three times, but "apps" are programs too.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**4**</zyQAns>**

**<zyQExpl>**Each image in the animation represents a different type of computer program.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**5**</zyQAns>**

**<zyQExpl>**One could argue that music streaming involves many types of programs, but the animation showed only four.**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

**<zyQ>**

**<zyQText>**What type of program will this book explain how to write?**</zyQText>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**A tool that summarizes an individual's music preferences.**</zyQAns>**

**<zyQExpl>**This type of analysis requires basic knowledge of programming.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**A mobile app for managing and sharing playlists of songs.**</zyQAns>**

**<zyQExpl>**Mobile development is beyond the scope of this book.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**A website that shows the top artists for the past five years.**</zyQAns>**

**<zyQExpl>**Web development is beyond the scope of this book.**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

**<zyQ>**

**<zyQText>**Which of the following devices is an example of a computer?**</zyQText>**

**<zyQChoice>**

**<zyQAns>**Wired headphones that plug into a smartphone.**</zyQAns>**

**<zyQExpl>**Headphones typically do not run computer programs.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**Remote control that pauses or skips the current song.**</zyQAns>**

**<zyQExpl>**Remote controls typically do not run computer programs.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**Wi-Fi speaker that streams music from Amazon.**</zyQAns>**

**<zyQExpl>**Like mobile apps, Wi-Fi speakers run small programs that connect to servers.**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

**<zyQ>**

**<zyQText>**Reading this book requires a strong background in mathematics.**</zyQText>**

**<zyQChoice>**

**<zyQAns>**True**</zyQAns>**

**<zyQExpl>**Knowing math helps but is not crucial to learn the fundamentals of programming.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**False**</zyQAns>**

**<zyQExpl>**This book assumes readers understand the basics of algebra, but nothing too difficult.**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

**</zyQSetMultipleChoice>**

<zyAside type="elaboration" name="**Exploring further**" id="3caba5f1-beed-a0a6-9743-5091a8b28ee4">

The middle chapters of this book show how to write analysis programs using real data.

Example libraries that provide access to online streaming services include

<zyLink link="<https://spotipy.readthedocs.io/>">**Spotipy**</zyLink>,

<zyLink link="<https://pytube.io/>">**Pytube**</zyLink>, and

<zyLink link="<https://github.com/mcrute/pydora>">**Pydora**</zyLink>.

(Python-related tools often have the letters "py" in their name.)

</zyAside>

<zyHTML id="4b6ecbd1-b4ab-ae1d-4c73-5dc3944981df" subsection="true">

### <h3>The Python language</h3>

</zyHTML>

#### <!-- SAY -->

<zyHTML id="52cdab8c-7e85-2a13-a638-b8e6a5c91965">

**<p>**

This book introduces <zyLink link="<https://www.python.org/>">Python</zyLink>, one of the top programming languages today.

Leading tech giants like Google, Apple, NASA, Instagram, Pixar, and others use Python extensively.

**</p>**

**<p>**

One reason why Python is popular is because many libraries exist for doing real work.

**<zyDefn>**A \_library\_ is a collection of code that can be used in other programs.**</zyDefn>**

Python comes with an extensive <zyLink link="<https://docs.python.org/3/library/>">Standard Library</zyLink> for solving everyday computing problems like extracting data from files and creating summary reports.<!-- comment -->

In addition, the community develops many other libraries for Python.

Ex: <zyLink link="<https://pandas.pydata.org/>">Pandas</zyLink> is a widely used library for data analysis.

**</p>**

**<p>**

Another reason why Python is popular is because the syntax is easy to learn.

**<zyDefn>**The \_syntax\_ of a language defines how code must be structured.**</zyDefn>**

Syntax rules define the keywords, symbols, and formatting used in programs.

Compared to other programming languages, Python is more concise and straightforward.

**</p>**

</zyHTML>

<!-- comment -->

**<zyExample id="79cdebe6-d7a8-d6e5-42d6-9d7a70d9ed94" caption="Hello world in Python and Java">**

<p>

By tradition, <zyLink link="<https://en.wikipedia.org/wiki/%22Hello,_World!%22_program>">Hello World</zyLink> is the first program to write when learning a new language.

This program simply displays the message "Hello, World!" to the user.

The hello world program is only one line in Python:

</p>

<zyCode language="python" nobox="true">

print("Hello, World!")

</zyCode>

<p>

In contrast, the hello world program is five lines in Java (a different language).

Beginners often struggle with Java's required keywords and punctuation rules:

</p>

<zyCode language="java" nobox="true">

public class Hello {

public static void main(String[] args) {

System.out.println("Hello, World!");

}

}

</zyCode>

</zyExample>

<!--

**<zyAside type="elaboration" name="" id="41d181d7-ec65-1fec-51d8-3db78d2a8488">**

</zyAside>

**<zyHTML id="88f989b5-5bdc-12a8-c218-8427c8237389">**

</zyHTML>

**<zyExample id="285627ac-4ac1-eb28-963a-456a4744512b" caption="Hello World in Java">**

</zyExample>

-->

#### <!-- SHOW -->

<!-- Last modified Mon Aug 15 2022 10:45:10 GMT-0400 (Eastern Daylight Time) with version 2.19.0.1 -->

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**<text>Taylor Swift**

**Michael Jackson**

**Lady Gaga**

**Elvis Presley**

**Madonna**

**Bob Dylan**

**Eminem**

**Stevie Wonder**

**Beyonce&#x301;</text>**

</zyObject>

<zyObject objNum="3" objType="text" objName="filename" top="144px" left="428px" opacity="0" color="rgb(51, 51, 51)" font-weight="400" font-family="arial, sans-serif" padding-left="4px" padding-right="4px" padding-top="4px" padding-bottom="4px" border-width="2px" border-style="solid" border-color="rgb(175, 175, 175)">

**<text>artists.txt</text>**

</zyObject>

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**<zyCode language="python" snippet="true" nobox="true" zyanimator="true">**

**data = open("artists.txt")**

**lines = data.readlines()**

**count = len(lines)**

**print("The file has", count, "lines.")**

**</zyCode>**

</zyObject>

<zyObject objNum="6" objType="box" objName="line1" top="105px" left="30px" opacity="0" background-color="rgb(175, 175, 175)" useConstrainedProportions="false" height="1px" width="330px" border-width="0px" border-style="none" border-color="rgb(175, 175, 175)"/>

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<text>Program</text>

</zyObject>

<zyObject objNum="8" objType="text" objName="Output label" top="210px" left="30px" opacity="0" color="rgb(51, 51, 51)" font-weight="400" font-family="arial, sans-serif" border-color="rgb(51, 51, 51)">

<text>Output</text>

</zyObject>

<zyObject objNum="9" objType="box" objName="Output box" top="235px" left="30px" opacity="0" useConstrainedProportions="false" height="50px" width="330px" border-color="rgb(51, 51, 51)"/>

<zyObject objNum="10" objType="text" objName="Output text" top="240px" left="35px" opacity="0" color="rgb(51, 51, 51)" font-weight="400" font-family="arial, sans-serif" border-color="rgb(51, 51, 51)">

<text>The file has 9 lines.</text>

</zyObject>

<zyObject objNum="11" objType="box" objName="highlight" top="112px" left="30px" opacity="0" useConstrainedProportions="false" height="15px" width="330px" border-color="rgb(30, 200, 30)"/>

<zyObject objNum="12" objType="text" objName="Java code" top="65px" left="10px" opacity="0" border-radius="4px" background-color="rgb(255, 255, 224)" color="rgb(51, 51, 51)" font-weight="400" padding-left="5px" padding-right="5px" padding-top="5px" padding-bottom="0px" border-color="rgb(51, 51, 51)"font-size="14px">

**<zyCode language="java" snippet="true" nobox="true" zyanimator="true">**

**import java.io.\*;**

**import java.util.\*;**

**public class CountLines {**

**public static void main(String[] args) {**

**try {**

**File file = new File("artists.txt");**

**Scanner in = new Scanner(file);**

**int count = 0;**

**while (in.hasNextLine()) {**

**in.nextLine();**

**count++;**

**}**

**System.out.println("The file has " + count + " lines.");**

**} catch (FileNotFoundException e) {**

**e.printStackTrace();**

**}**

**}**

**}</zyCode>**

</zyObject>

<zyObject objNum="14" objType="image" objName="Java image" top="80px" left="25px" opacity="0" useConstrainedProportions="true" constrainedProportionsHeight="246" constrainedProportionsWidth="523" googleDriveFileID="1-o5bEQx7mgtItEMdtLS6\_dIlJZltBG-f" height="246px" width="523px" border-width="0px" border-style="" border-color=""/>

</zyObjects>

<zyInstructions>

<zyInstruction instrType="step1">

**<text>A file named "artists.txt" stores the names of famous music artists.**

**A programmer would like to count the number of artists in the file.</text>**

</zyInstruction>

<zyInstruction instrType="fade" objNum="3" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="2" timeLabel="-" opacity="100"/>

<zyInstruction instrType="step">

**<text>This program requires four lines of Python code: open the file,**

**read the lines, count the lines, and display the result message.</text>**

</zyInstruction>

<zyInstruction instrType="fade" objNum="7" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="6" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="5" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="4" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="9" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="8" timeLabel="-" opacity="100"/>

<zyInstruction instrType="fade" objNum="11" timeLabel="0" opacity="100"/>

<zyInstruction instrType="move" easing="swing" objNum="11" timeLabel="0" top="126" left="30"/>

<zyInstruction instrType="move" easing="swing" objNum="11" timeLabel="0" top="140" left="30"/>

<zyInstruction instrType="move" easing="swing" objNum="11" timeLabel="0" top="154" left="30"/>

<zyInstruction instrType="fade" objNum="10" timeLabel="0" opacity="100"/>

<zyInstruction instrType="fade" objNum="11" timeLabel="-" opacity="0"/>

<zyInstruction instrType="step">

**<text>In Java, this program would require many more lines,**

**because Java's syntax and libraries are more difficult.</text>**

</zyInstruction>

<zyInstruction instrType="fade" objNum="14" timeLabel="0" opacity="100"/>

<zyInstruction instrType="step">

<!-- comment -->

**<text>Python's syntax reads more like English, and Python's**

**libraries provide convenient features for everyday tasks.</text>**

</zyInstruction>

<!-- comment

<zyInstruction instrType="fade" objNum="12" timeLabel="0" opacity="0"/>

-->

<zyInstruction instrType="resize" objNum="14" timeLabel="0" height="100" width="215"/>

<zyInstruction instrType="move" easing="swing" objNum="14" timeLabel="-" top="38" left="370"/>

<zyInstruction instrType="startStep">

<text/>

</zyInstruction>

</zyInstructions>

<zyAltDescription>undefined</zyAltDescription>

</zyAnimator>

#### <!-- ASK -->

**<zyQSetMultipleChoice** caption="Python vs Java syntax" id="da00e422-43ae-4036-bebe-0384f1fd6ca4"**>**

**<zyQ>**

**<zyQText>**In general, Python programs are \_\_\_\_\_ than Java programs.**</zyQText>**

**<zyQChoice>**

**<zyQAns>**faster**</zyQAns>**

**<zyQExpl>**Java programs typically run faster, but Python programs often take less time to write.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**longer**</zyQAns>**

**<zyQExpl>**Java programs are typically longer than Python programs, because Java's syntax is more verbose.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**shorter**</zyQAns>**

**<zyQExpl>**Python's syntax is more concise than Java's.**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

**<zyQ>**

**<zyQText>**In the example programs above, what syntax required by Java is not required by Python?**</zyQText>**

**<zyQChoice** correct="true"**>**

**<zyQAns>**semicolons**</zyQAns>**

**<zyQExpl>**Python does not require a semicolon at the end of each line. Braces are also not required.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**parentheses**</zyQAns>**

**<zyQExpl>**Both languages require parentheses when using the print function.**</zyQExpl>**

**</zyQChoice>**

**<zyQChoice>**

**<zyQAns>**quote marks**</zyQAns>**

**<zyQExpl>**Both languages require quote marks around the message "Hello, World!"**</zyQExpl>**

**</zyQChoice>**

**</zyQ>**

**</zyQSetMultipleChoice>**

<zyHTML id="112124d3-119d-7b87-2364-e1cbadcdd46a" subsection="true">

### <h3>Programming practice</h3>

</zyHTML>

#### <!-- P1 -->

**<zyTool** name="OpenStaxPythonCodeRunnerWrapper" caption="Favorite song" id="d227bc10-7d6e-4151-8b58-898173989fb6" parts="0" challenge="false" edited-last="Mon Jun 27 2022 16:17:00 GMT-0400 (Eastern Daylight Time)"**>**

**<zyInstructions>**

**<p>**

1. This program asks for your name and displays a friendly greeting.

Run the program and see what happens.

Notice the second sentence is incomplete.

**</p>**

**<p>**

2. Many of the programs in this chapter expect input from the user.

Enter your name in the Input box below the code.

Run the program again, and see what changes.

**</p>**

**<p>**

3. Copy the following lines to the end of the program:

**<zyCode** language="python" nobox="true"**>**

print("What is your favorite song?")

song = input()

print("Cool! I like", song, "too.")

**</zyCode>**

**</p>**

**<p>**

4. The modified program reads two lines of input: name and song.

Add your favorite song to the Input box below your name, and run the program again.

**</p>**

**<p>**

5. The next section of the book will explain how **<zyICode>**print()**</zyICode>** and **<zyICode>**input()**</zyICode>** work.

Feel free to experiment with this code until you are ready to move on.

**</p>**

**</zyInstructions>**

**<zyOptions** type="dict"**>**

**<files** type="list"**>**

**<li** type="dict"**>**

**<name** type="string"**>**favorite\_song.py**</name>**

**<contents** type="string"**>**print("Hello! What is your name?")

name = input()

print("Nice to meet you, " + name + ".")

**</contents>**

**<solution** type="string"**>**print("Hello! What is your name?")

name = input()

print("Nice to meet you, " + name + ".")

print("What is your favorite song?")

song = input()

print("Cool! I like", song, "too.")

**</solution>**

**</li>**

**</files>**

**<input** type="string"**/>**

**<showSolution** type="boolean"**>**true**</showSolution>**

**</zyOptions>**

**</zyTool>**

**</zySection>**