**Learning Objectives**

Students will be able to:

**Content:**
- Define **pickling**
- Identify relevant circumstances for pickling
- Explain the parameters necessary to pickle

**Process:**
- Write code that pickles python objects
- Write code that loads pickled python objects.

**Prior Knowledge**
- Python concepts from Activities 1-20, file reading & writing

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**Critical Thinking Questions:**

1. Examine the code in the programmer’s terminal below.

   ```python
   0 --> python3
   1 >>> age = {'dizzy': 7, 'pixel': 1, 'tally': 2}
   2 >>> exit()
   3 --> python3
   4 >>> age['dizzy']
   ``

   a. What is stored in `age['dizzy']` after line 1?

   b. What does the programmer want to happen when line 4 is executed?

   c. What will happen when line 4 is executed?

   d. Write code to insert prior to line 4 to achieve the programmer’s intent from question 1b.

   e. If you could invent a feature for python to avoid having to repeat your response in 1d., what might that feature be?
2. Answer the following questions by examining this code from Terminal:

```
0 -> python3
1 >>> age = {'dizzy': 7, 'pixel': 1, 'tally': 2}
2 >>> import pickle
3 >>> pickle.dump(age, open('save.pickle', 'wb'))
4 >>> exit()
5 -> python3
6 >>> import pickle
7 >>> newage = pickle.load( open('save.pickle', 'rb') )
8 >>> newage['dizzy']
9 7
```

a. What new code does the programmer add before exiting python3 this time?

b. What does the ‘7’ on line 9 refer to?

c. What would happen if we typed newage['tally']?

d. What might be stored in the newage variable?

e. What happened in the above code?

3. Below is the pickle-specific code extracted from the lines above.

```
2 >>> import pickle
3 >>> pickle.dump(age, open('save.pickle', 'wb'))
7 >>> newage = pickle.load( open('save.pickle', 'rb') )
```

a. We have seen the special method \texttt{open(\ldots)} before, and again now on lines 3 and 7. What do we use the \texttt{open(\ldots)} method for?

b. What do you think the first parameter of \texttt{open(\ldots)} represents?

c. We’ve seen the second parameter, usually as \texttt{’w’} or \texttt{’r’} (and once as, \texttt{’a’}). What might the letters in \texttt{open(\ldots)} ‘s second argument on line 3 mean?

\textbf{FYI: Pickling} allows us to store objects by converting them to a byte stream for use later, much like placing a cucumber in a salt brine allows us to enjoy the pickle at a later time.
d. If we used a text editor to open 'save.pickle', what might we see?

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e. If we replaced 'save.pickle' on line 3 and 7 to 'age.p', what would the code do differently?

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f. The characters below are what you see when you open age.p with emacs (a raw text editor):

\200^C}q^@X^E^@^@dizzyq^AK^FX^E^@^@^@pixelq^BK^@X^E^@^@tallyq^CK^Au.

Why is the data stored in age.p not human-interpretable?

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Application Questions: Use the Python Interpreter to check your work

1. a. Write some code that creates a list object, fav, with all your favorite things about spring. Add code to pickle fav so it can be accessed again, even after the script stops running.

```python
if __name__ == "__main__":
    # Code to create and pickle fav
```

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b. Add functionality to your code from 1a. that loads your pickled list. Your code should print an error message if it loads an empty list.

```python
# Code to load pickled fav
```

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FYI: *Persistent objects* are those objects which survive between successive invocations of a program.

2. How does pickling relate to object persistence?