Learning Objectives
Students will be able to:

Content:
• Define a lambda function
• Explain when a lambda function is appropriate

Process:
• Write code that uses a key for sorting data
• Write code that uses a lambda function for sorting

Prior Knowledge
• Python concepts from Activities 1-22.

Folks, this is a brand new activity. If you encounter any issues/typos, please let Iris know

Critical Thinking Questions:

1. Examine the sample code defining a list of lists, below.

```python
ranks = [['Smith',18],[‘Williams’,7],[‘Amherst’,9]]
sorted(ranks)
```

<table>
<thead>
<tr>
<th>Sample Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 &gt;&gt;&gt; ranks = [['Smith',18],[‘Williams’,7],[‘Amherst’,9]]</td>
</tr>
<tr>
<td>1 &gt;&gt;&gt; sorted(ranks)</td>
</tr>
<tr>
<td>2 [['Amherst',9],[‘Smith’,18],[‘Williams’,7]]</td>
</tr>
</tbody>
</table>

a. What index within the ranks list does ['Williams',7] appear on line 0? _______

b. What index within the ranks list does ['Williams',7] appear on line 2? _______

c. What index within the ranks list do you think the programmer wants ['Williams',7] to be located at? ________________

d. Why didn’t the ['Williams',7] element end up in that location?: ____________

e. What might python be sorting the elements of ranks based on?:

f. Write a few sentences about how you might write python to sort the list according to the college’s rank (pseudocode is fine here!)

______________________________
2. The following code includes a function on the left and the function’s output in interactive python is shown on the right:

```python
3  def byRank(pair):    >>> byRank(['Williams',7])
4      return pair[1]    7
                        >>> byRank(['Smith',18])
```

a. What two parameter values did we pass to `byRank(..)`?

b. Write another function call for `byRank(..)` with a different, valid parameter value:


c. What will the `byRank` function call you wrote in (b) return?

d. What does the `byRank` function do?

```
FYI: A named key parameter can be sent to the sorted function that specifies how to sort the elements.
```
4. Examine the following example code:

```python
8 >>> ranks = [['Smith',18],['Williams',7],['Amherst',9]]
9 >>> sorted(ranks, key=lambda pair:pair[1])
10 [['Williams',7],['Amherst',9],['Smith',18]]
```

a. Examine the text that follows the `lambda` keyword on line 9 above, and the text of the `byRank` function in question 2. How do these differ?

b. How does the output on lines 10 and 7 differ?

c. What might the `key=lambda pair:pair[1]` on line 9 be doing?

d. If we changed line 9 to be `sorted(ranks, key=lambda pair:pair[0])` what might the output be?

e. The code in lines 8-9 above accomplishes the same tasks as the code in lines 3-6. Why might we use one approach over another?

f. Write some code that sorts a list of strings based on the third letter in each string, using a `lambda` function:

```python
myStrings = ['pixel', 'annie', 'tally', 'waLly']
```

5. Examine the following example code:

```python
0 >>> def birthYear(dogDictionary):
1 ... return 2020-dogDictionary['age']

2 >>> dogs = [{'name':'pixel','age':2}]
3 >>> dogs.append({'name':'annie','age':5})
4 >>> dogs.append({'name':'linus','age':1})
5 >>> dogs
6 [{'name': 'pixel', 'age': 2}, {'name': 'annie', 'age': 5},
7  {'name': 'linus', 'age': 1}]
8 >>> sorted(dogs, key=birthYear)
9 [{'name': 'annie', 'age': 5}, {'name': 'pixel', 'age': 2},
10  {'name': 'linus', 'age': 1}]
```

a. What type of variable is `dogs`? What type of variable is `dogs[0]`?

b. What is stored at `dogs[1]['name']`? `dogs[1]['age']`?
c. What type of object is the value returned on line 6? On line 8?

________________________________________________________________________

________________________________________________________________________

d. How do lines 6 and lines 8 differ?

________________________________________________________________________

________________________________________________________________________

e. How is the data on line 8 being sorted? Based on what values?

________________________________________________________________________

f. What does the `birthYear` function do?

________________________________________________________________________

g. Where is the `birthYear` function being called?

________________________________________________________________________

h. What is the first value `dogDictionary` will have when this code is run?

________________________________________________________________________

i. How does the `birthYear` function access the dogs’ age in years?

________________________________________________________________________

g. Write some code to use a `lambda function` to sort the dictionaries based on age, rather than the `birthYear` function.

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________________________________________________________________________

6.

a.

b.

c.

d.

e.
Application Questions: Use the Python Interpreter to check your work

1. Lab 5 on matplotlib plotting will use lambda sorting with dictionaries. It’s good practice!