Name:________________________________ **Partner:** ________________________

Python Activity 23: Lambda

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.

Sample Code

```
0 >>> ranks = [[‘Smith’,18],[‘Williams’,7],[‘Amherst’,9]]
1 >>> sorted(ranks)
2 [[‘Amherst’,9],[‘Smith,18],[‘Williams’,7]]
```

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!)

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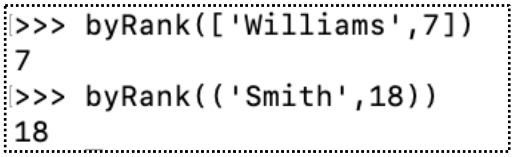
2. The following code includes a function on the left and the function's output in interactive python is shown on the right:

```
3 def byRank(pair):
4     return pair[1]
```



```
>>> byRank(['Williams',7])
7
>>> byRank(('Smith',18))
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?

3. The following code uses the `byRank` function from the previous question:

```
5 >>> ranks = [['Smith',18],['Williams',7],['Amherst',9]]
6 >>> sorted(ranks, key=byRank)
7 [['Williams',7],['Amherst',9],['Smith',18]]
```

a. How does line 6 above differ from line 1 from the first question?

b. How does the output on lines 7 and 2 differ?

c. What might `byRank` on line 6 be referring to?

d. What does the `key` variable on line 6 do?

e. If we reused the `sorted(..)` call from line 6 above on the following list, what would you expect the output to be? `[['pixel',3],['annie',0],['tally',2]]`

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:

```
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:
`myStrings = [‘pixel’, ‘annie’, ‘tally’, ‘waLly’]`

FYI: A ***lambda*** function is a single purpose, anonymous function.

5. Examine the following example code:

```
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},
{'name': 'linus', 'age': 1}]
7 >>> sorted(dogs, key=birthYear)
8 [{'name': 'annie', 'age': 5}, {'name':'pixel','age': 2},
{'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?

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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!